Intercomparison of operational wave forecasting systems against buoys: data from ECMWF, MetOffice, FNMOC, MSC, NCEP, MeteoFrance, DWD, BoM, SHOM, JMA, KMA, Puerto del Estado, DMI, CNR-AM, METNO, SHN-SM

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Chapter 1

Forewords

Outputs from different fully operational forecasting centres are compared to buoy and platform data as broadcasted to the meteorological community via the Global Telecommunication System (GTS). On a monthly basis, data are gathered informally from weather services with an interest in wave forecasting (Bidlot and Holt, 2006). The different data sets are subsequently merged and made available to all participating partners for further evaluation. In this documents, examples, in graphical and tabular forms, are shown. These results have been processed at ECMWF and should served as an example to the kind of information that could be obtained from such comparison. No statement of quality, nor reasons why the different systems are performing differently will be given.
Chapter 2

Data

Before using observations for verification, care has to be taken to process the data to remove any erroneous observations. Moreover, extra care has to be taken to match the scale of both model and observations. This scale matching is achieved by averaging the hourly data in ±2 hour time windows centered on the four major synoptic times corresponding to the normal model output times. The original quality control and averaging procedure was discussed in Bidlot et al. (2002). It was extended to include platform data as described in Sætra and Bidlot (2004). Note that in this paper we refer to these data as buoy data since most of them are from moored buoys, except if stated otherwise.

The intercomparison relies on the exchange of model output at buoy locations. An agreed upon list of locations is used where observations are known to be available. Because buoy networks are changing with time, as witnessed by a rapid increase in the number of buoys available via the GTS since the mid-nineties, updates to the list have been necessary. Not all participating centres have been able to update their list however. Other participants are only running limited area model(s) or do produce the parameter(s) that can be compared to the buoy data. Because of the limited number of buoys, a fair comparison between the different systems can only be achieved if the same number of buoys and the same number of buoy-model collocations are used.

In this document, data that are common to ECMWF, MetOffice, FNMOC, MSC, NCEP, MeteoFrance, DWD, BoM, SHOM, JMA, KMA, Puerto del Estado, DMI, CNR-AM, METNO, SHN-SM are used whenever available. Some sub-areas might only have some of the participants and when all locations are considered, the limited models are left out. The other participants are left blank in the plots below.
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Chapter 3

Results

In the remaining pages, some of the results of the comparison with buoys are presented for all common buoys and for common buoys within a sub-area as displayed by the corresponding maps. Summary forecast scores are shown first, followed by density scatter diagrams with associated statistics for each subarea. Only common data to ECMWF, MetOffice, FNMOC, MSC, NCEP, MeteoFrance, DWD, BoM, SHOM, JMA, KMA, Puerto del Estado, DMI, CNR-AM, METNO, SHN-SM are used.

This report was generated automatically, which explains its very generic appearance.
3.1 Comparison for all buoys

Figure 3.1: Buoy locations
Figure 3.2: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common all buoys.
Figure 3.3: Forecast root mean square error (RMSE) and linear correlation coefficient at common all buoys.
Comparison of forecast(t+48) ECMWF wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed UKMO wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed FNMOC wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed ECMWF wave height with averaged buoy data, forecasts from 0 and 12Z.

Figure 3.4: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at all buoys.
Figure 3.5: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at all buoys.
Figure 3.6: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at all buoys.
Comparison of forecast(t=t+48) JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.7: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at all buoys.
Comparison of analysed DMI wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) DMI wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NIWA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) NIWA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed CNRAM wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) CNRAM wave height with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.8: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at all buoys.
Comparison of analysed METNO wave height with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000
CORR COEF =  0.000 SI =  0.000
RMSE =  0.000  BIAS =   0.000
LSQ FIT: SLOPE =  0.000  INTR =  0.000
BUOY MEAN =    0.00  STDEV =   0.000
MODEL MEAN =    0.00  STDEV =   0.000
ENTRIES =      0

Comparison of analysed SHNSM wave height with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000
CORR COEF =  0.000 SI =  0.000
RMSE =  0.000  BIAS =   0.000
LSQ FIT: SLOPE =  0.000  INTR =  0.000
BUOY MEAN =    0.00  STDEV =   0.000
MODEL MEAN =    0.00  STDEV =   0.000
ENTRIES =      0

Comparison of forecast (t+48) METNO wave height with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000
CORR COEF =  0.000 SI =  0.000
RMSE =  0.000  BIAS =   0.000
LSQ FIT: SLOPE =  0.000  INTR =  0.000
BUOY MEAN =    0.00  STDEV =   0.000
MODEL MEAN =    0.00  STDEV =   0.000
ENTRIES =      0

Comparison of forecast (t+48) SHNSM wave height with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000
CORR COEF =  0.000 SI =  0.000
RMSE =  0.000  BIAS =   0.000
LSQ FIT: SLOPE =  0.000  INTR =  0.000
BUOY MEAN =    0.00  STDEV =   0.000
MODEL MEAN =    0.00  STDEV =   0.000
ENTRIES =      0

(a) t+0
(b) t+48

Figure 3.9: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at all buoys.
Comparison of forecast(t=t+48) ECMWF wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of analysed ECMWF wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) UKMO wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of analysed UKMO wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) FNMOC wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of analysed FNMOC wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.10: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at all buoys.
Figure 3.11: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at all buoys.
Figure 3.12: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at all buoys.
Figure 3.13: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at all buoys.
Figure 3.14: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at all buoys.
Comparison of analysed METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000
CORR COEF =  0.000 SI =  0.000
RMSE =  0.000  BIAS =   0.000
LSQ FIT: SLOPE =  0.000  INTR =  0.000
BUOY  MEAN =    0.00  STDEV =   0.000
MODEL MEAN =    0.00  STDEV =   0.000
ENTRIES =      0

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000
CORR COEF =  0.000 SI =  0.000
RMSE =  0.000  BIAS =   0.000
LSQ FIT: SLOPE =  0.000  INTR =  0.000
BUOY  MEAN =    0.00  STDEV =   0.000
MODEL MEAN =    0.00  STDEV =   0.000
ENTRIES =      0

Figure 3.15: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at all buoys.
Comparison of analysed ECMWF peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) ECMWF peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed UKMO peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) UKMO peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed FNMOC peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) FNMOC peak period with averaged buoy data, forecasts from 0 and 12Z.

Figure 3.16: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at all buoys.
Comparison of analysed AES peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) AES peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NCEP peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) NCEP peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed METFR peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) METFR peak period with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.17: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at all buoys.
Figure 3.18: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at all buoys.
Comparison of analysed JMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS peak period with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.19: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at all buoys.
Figure 3.20: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at all buoys.
Figure 3.21: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at all buoys.
### 3.2 Comparison for Hawaiian buoys

#### Number of common observations for Hawaiian buoys (HW) from 201601 to 201612 (wind, Hs, Tp)

<table>
<thead>
<tr>
<th>Buoy ID</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>51000</td>
<td>718 718 718  Northern Hawaii One</td>
</tr>
<tr>
<td>51001</td>
<td>252 253 202  Northwestern Hawaii One</td>
</tr>
<tr>
<td>51002</td>
<td>524 567 524  South West Hawaii</td>
</tr>
<tr>
<td>51003</td>
<td>719 721 721  Western Hawaii</td>
</tr>
<tr>
<td>51004</td>
<td>719 719 719  SouthEast Hawaii</td>
</tr>
</tbody>
</table>

Figure 3.22: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.23: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common Hawaiian buoys.
Figure 3.24: Forecast root mean square error (RMSE) and linear correlation coefficient at common Hawaiian buoys.
Figure 3.25: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Hawaiian buoys.
Comparison of analysed AES wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) AES wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NCEP wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) NCEP wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed METFR wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) METFR wave height with averaged buoy data. forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.26: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Hawaiian buoys.
Comparison of analysed DWD wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DWD wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed AUSBM wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) AUSBM wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed SHOM wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) SHOM wave height with averaged buoy data, forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.27: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Hawaiian buoys.
Comparison of analysed JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTO5 wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTO5 wave height with averaged buoy data. forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.28: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Hawaiian buoys.
Figure 3.29: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Hawaiian buoys.
Comparison of analysed METNO wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed SHNSM wave height with averaged buoy data. forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.30: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Hawaiian buoys.
Figure 3.31: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Hawaiian buoys.
Comparison of analysed AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

- **Symmetric Slope:** 0.000
- **Corr Coef:** 0.000
- **RMSE:** 0.000
- **Bias:** 0.000
- **LSQ Fit: Slope:** 0.000
- **Intercept:** 0.000
- **Buoy Mean:** 0.00
- **Buoy Standard Deviation:** 0.000
- **Model Mean:** 0.00
- **Model Standard Deviation:** 0.000
- **Entries:** 0

Comparison of forecast (t=+48) AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

- **Entries:** 0
- **Model Mean:** 0.00
- **Buoy Mean:** 0.00
- **LSQ Fit: Slope:** 0.000
- **Corr Coef:** 0.000
- **Symmetric Slope:** 0.000

Comparison of analysed NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

- **Symmetric Slope:** 0.937
- **Corr Coef:** 0.950
- **RMSE:** 0.917
- **Bias:** -0.479
- **LSQ Fit: Slope:** 0.898
- **Intercept:** 0.283
- **Buoy Mean:** 7.47
- **Buoy Standard Deviation:** 2.505
- **Model Mean:** 6.99
- **Model Standard Deviation:** 2.368
- **Entries:** 3742

Comparison of forecast (t=+48) NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

- **Entries:** 1
- **Model Mean:** 7.07
- **Buoy Mean:** 7.46
- **LSQ Fit: Slope:** 0.840
- **Corr Coef:** 0.864
- **Symmetric Slope:** 0.948

Comparison of analysed MeteoFrance wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

- **Symmetric Slope:** 0.981
- **Corr Coef:** 0.953
- **RMSE:** 0.781
- **Bias:** -0.152
- **LSQ Fit: Slope:** 0.950
- **Intercept:** 0.223
- **Buoy Mean:** 7.48
- **Buoy Standard Deviation:** 2.510
- **Model Mean:** 7.32
- **Model Standard Deviation:** 2.439
- **Entries:** 3685

Comparison of forecast (t=+48) MeteoFrance wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

- **Entries:** 1
- **Model Mean:** 7.21
- **Buoy Mean:** 7.48
- **LSQ Fit: Slope:** 0.879
- **Corr Coef:** 0.879
- **Symmetric Slope:** 0.966

Figure 3.32: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Hawaiian buoys.
Comparison of analysed DWD wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed AUSBM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed SHOM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DWD wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) AUSBM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) SHOM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.33: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Hawaiian buoys.
Figure 3.34: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Hawaiian buoys.
Figure 3.35: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Hawaiian buoys.
Comparison of analysed METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

(a) t+0
(b) t+48

Figure 3.36: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Hawaiian buoys.
Figure 3.37: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Hawaiian buoys.
Figure 3.38: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Hawaiian buoys.
Figure 3.39: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Hawaiian buoys.
Comparison of analysed JMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS peak period with averaged buoy data. forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.40: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Hawaiian buoys.
Figure 3.41: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Hawaiian buoys.
Comparison of forecast (t+48) METNO peak period with averaged buoy data. Forecasts from 0 and 12Z.

Comparison of forecast (t+48) SHNSM peak period with averaged buoy data. Forecasts from 0 and 12Z.

Figure 3.42: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Hawaiian buoys.
3.3 Comparison for North East Pacific buoys

Figure 3.43: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.44: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common North East Pacific buoys.
Figure 3.45: Forecast root mean square error (RMSE) and linear correlation coefficient at common North East Pacific buoys.
Comparison of analysed ECMWF wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed UKMO wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed FNMOC wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) ECMWF wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) UKMO wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) FNMOC wave height with averaged buoy data, forecasts from 0 and 12Z.

Figure 3.46: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North East Pacific buoys.
Comparison of analysed AES wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) AES wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NCEP wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) NCEP wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed METFR wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) METFR wave height with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.47: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North East Pacific buoys.
Figure 3.48: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North East Pacific buoys.
Comparison of analysed JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.49: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North East Pacific buoys.
Comparison of analysed DMI wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DMI wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NIWA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) NIWA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed CNRAM wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) CNRAM wave height with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.50: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North East Pacific buoys.
Figure 3.51: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North East Pacific buoys.
Comparison of forecast(t=t+48) ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed UKMO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) FNMOC wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.52: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North East Pacific buoys.
Comparison of forecast (t=t+48) AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) METFR wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed METFR wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.53: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North East Pacific buoys.
Comparison of analysed DWD wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed AUSBM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed SHOM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

(a) t+0  

(b) t+48

Figure 3.54: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North East Pacific buoys.
Comparison of analysed JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.55: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North East Pacific buoys.
Figure 3.56: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North East Pacific buoys.
Comparison of analysed METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Symmetric Slope = 0.000
Corr Coef = 0.000
Si = 0.000
RMSE = 0.000
Bias = 0.000
LSQ Fit: Slope = 0.000
Intr = 0.000
Buoy Mean = 0.00
STDEV = 0.000
Model Mean = 0.00
STDEV = 0.000
Entries = 0

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Symmetric Slope = 0.000
Corr Coef = 0.000
Si = 0.000
RMSE = 0.000
Bias = 0.000
LSQ Fit: Slope = 0.000
Intr = 0.000
Buoy Mean = 0.00
STDEV = 0.000
Model Mean = 0.00
STDEV = 0.000
Entries = 0

Figure 3.57: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North East Pacific buoys.
Figure 3.58: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at North East Pacific buoys.

(a) t+0

(b) t+48
Figure 3.59: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at North East Pacific buoys.
Comparison of analysed DWD peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DWD peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed AUSBM peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) AUSBM peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed SHOM peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) SHOM peak period with averaged buoy data, forecasts from 0 and 12Z.

Figure 3.60: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at North East Pacific buoys.
Comparison of analysed JMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS peak period with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.61: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at North East Pacific buoys.
Figure 3.62: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at North East Pacific buoys.
Figure 3.63: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at North East Pacific buoys.
3.4 Comparison for North West Atlantic buoys

![Buoy locations](image)

Figure 3.64: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.65: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common North West Atlantic buoys.
Figure 3.66: Forecast root mean square error (RMSE) and linear correlation coefficient at common North West Atlantic buoys.
Figure 3.67: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North West Atlantic buoys.
Figure 3.68: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North West Atlantic buoys.
Comparison of analysed DWD wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DWD wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed AUSBM wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) AUSBM wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed SHOM wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) SHOM wave height with averaged buoy data. forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.69: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North West Atlantic buoys.
Figure 3.70: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North West Atlantic buoys.
Wave height (m)     buoy

Comparison of analysed DMI wave height with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000  CORR COEF =  0.000  SI =  0.000  RMSE =  0.000  BIAS =  0.000  LSQ FIT: SLOPE =  0.000  INTR =  0.000
BUOY  MEAN =    0.00  STDEV =   0.000  MODEL MEAN =    0.00  STDEV =   0.000  ENTRIES =      0

Wave height (m)     buoy

Comparison of analysed NIWA wave height with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000  CORR COEF =  0.000  SI =  0.000  RMSE =  0.000  BIAS =  0.000
LSQ FIT: SLOPE =  0.000  INTR =  0.000
BUOY  MEAN =    0.00  STDEV =   0.000  MODEL MEAN =    0.00  STDEV =   0.000  ENTRIES =      0

Wave height (m)     buoy

Comparison of analysed CNRAM wave height with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000  CORR COEF =  0.000  SI =  0.000  RMSE =  0.000  BIAS =  0.000
LSQ FIT: SLOPE =  0.000  INTR =  0.000
BUOY  MEAN =    0.00  STDEV =   0.000  MODEL MEAN =    0.00  STDEV =   0.000  ENTRIES =      0

Wave height (m)     buoy

Comparison of forecast(t=t+48) DMI wave height with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000  CORR COEF =  0.000  SI =  0.000  RMSE =  0.000  BIAS =  0.000
LSQ FIT: SLOPE =  0.000  INTR =  0.000
BUOY  MEAN =    0.00  STDEV =   0.000  MODEL MEAN =    0.00  STDEV =   0.000  ENTRIES =      0

Wave height (m)     buoy

Comparison of forecast(t=t+48) NIWA wave height with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000  CORR COEF =  0.000  SI =  0.000  RMSE =  0.000  BIAS =  0.000
LSQ FIT: SLOPE =  0.000  INTR =  0.000
BUOY  MEAN =    0.00  STDEV =   0.000  MODEL MEAN =    0.00  STDEV =   0.000  ENTRIES =      0

Wave height (m)     buoy

Comparison of forecast(t=t+48) CNRAM wave height with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000  CORR COEF =  0.000  SI =  0.000  RMSE =  0.000  BIAS =  0.000
LSQ FIT: SLOPE =  0.000  INTR =  0.000
BUOY  MEAN =    0.00  STDEV =   0.000  MODEL MEAN =    0.00  STDEV =   0.000  ENTRIES =      0

(Figure 3.71: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North West Atlantic buoys.)
Figure 3.72: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North West Atlantic buoys.
Figure 3.73: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North West Atlantic buoys.

(a) t+0
(b) t+48
Comparison of analysed AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed METFR wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) METFR wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.74: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North West Atlantic buoys.
Figure 3.75: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North West Atlantic buoys.
Figure 3.76: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North West Atlantic buoys.
Figure 3.77: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North West Atlantic buoys.

(a) t+0

(b) t+48
Figure 3.78: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North West Atlantic buoys.
Figure 3.79: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at North West Atlantic buoys.
Figure 3.80: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at North West Atlantic buoys.
Figure 3.81: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at North West Atlantic buoys.
Comparison of analysed JMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS peak period with averaged buoy data. forecasts from 0 and 12Z.

**Figure 3.82:** Scatter diagrams for peak period at step 0 and 48 for the displayed centres at North West Atlantic buoys.
Comparison of analysed DMI peak period with averaged buoy data. forecasts from 0 and 12Z.

**SYMMETRIC SLOPE** = 0.000  
**CORR COEF** = 0.000  
**SI** = 0.000  
**RMSE** = 0.000  
**BIAS** = 0.000

**LSQ FIT**:  
**SLOPE** = 0.000  
**INTR** = 0.000

**BUOY MEAN** = 0.00  
**STDEV** = 0.000

**MODEL MEAN** = 0.00  
**STDEV** = 0.000

**ENTRIES** = 0

Comparison of analysed NIWA peak period with averaged buoy data. forecasts from 0 and 12Z.

**SYMMETRIC SLOPE** = 0.000  
**CORR COEF** = 0.000  
**SI** = 0.000  
**RMSE** = 0.000  
**BIAS** = 0.000

**LSQ FIT**:  
**SLOPE** = 0.000  
**INTR** = 0.000

**BUOY MEAN** = 0.00  
**STDEV** = 0.000

**MODEL MEAN** = 0.00  
**STDEV** = 0.000

**ENTRIES** = 0

Comparison of analysed CNRAM peak period with averaged buoy data. forecasts from 0 and 12Z.

**SYMMETRIC SLOPE** = 0.000  
**CORR COEF** = 0.000  
**SI** = 0.000  
**RMSE** = 0.000  
**BIAS** = 0.000

**LSQ FIT**:  
**SLOPE** = 0.000  
**INTR** = 0.000

**BUOY MEAN** = 0.00  
**STDEV** = 0.000

**MODEL MEAN** = 0.00  
**STDEV** = 0.000

**ENTRIES** = 0

Comparison of forecast(t=t+48) DMI peak period with averaged buoy data. forecasts from 0 and 12Z.

**SYMMETRIC SLOPE** = 0.000  
**CORR COEF** = 0.000  
**SI** = 0.000  
**RMSE** = 0.000  
**BIAS** = 0.000

**LSQ FIT**:  
**SLOPE** = 0.000  
**INTR** = 0.000

**BUOY MEAN** = 0.00  
**STDEV** = 0.000

**MODEL MEAN** = 0.00  
**STDEV** = 0.000

**ENTRIES** = 0

Comparison of forecast(t=t+48) NIWA peak period with averaged buoy data. forecasts from 0 and 12Z.

**SYMMETRIC SLOPE** = 0.000  
**CORR COEF** = 0.000  
**SI** = 0.000  
**RMSE** = 0.000  
**BIAS** = 0.000

**LSQ FIT**:  
**SLOPE** = 0.000  
**INTR** = 0.000

**BUOY MEAN** = 0.00  
**STDEV** = 0.000

**MODEL MEAN** = 0.00  
**STDEV** = 0.000

**ENTRIES** = 0

Comparison of forecast(t=t+48) CNRAM peak period with averaged buoy data. forecasts from 0 and 12Z.

**SYMMETRIC SLOPE** = 0.000  
**CORR COEF** = 0.000  
**SI** = 0.000  
**RMSE** = 0.000  
**BIAS** = 0.000

**LSQ FIT**:  
**SLOPE** = 0.000  
**INTR** = 0.000

**BUOY MEAN** = 0.00  
**STDEV** = 0.000

**MODEL MEAN** = 0.00  
**STDEV** = 0.000

**ENTRIES** = 0

Figure 3.83: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at North West Atlantic buoys.
Figure 3.84: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at North West Atlantic buoys.
3.5 Comparison for Gulf of Mexico buoys

Figure 3.85: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.86: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common Gulf of Mexico buoys.
SIGNIFICANT WAVE HEIGHT ROOT MEAN SQUARE ERROR at 10 Gulf of Mexico buoys

10m WIND SPEED ROOT MEAN SQUARE ERROR at 9 Gulf of Mexico buoys

PEAK PERIOD ROOT MEAN SQUARE ERROR at 10 Gulf of Mexico buoys

(a) R.M.S.E.

SIGNIFICANT WAVE HEIGHT CORRELATION COEFFICIENT at 10 Gulf of Mexico buoys

10m WIND SPEED CORRELATION COEFFICIENT at 9 Gulf of Mexico buoys

PEAK PERIOD CORRELATION COEFFICIENT at 10 Gulf of Mexico buoys

(b) Correlation Coefficient

Figure 3.87: Forecast root mean square error (RMSE) and linear correlation coefficient at common Gulf of Mexico buoys.
### Gulf of Mexico buoys 201601 to 201612

**Comparison of analysed ECMWF wave height with averaged buoy data. forecasts from 0 and 12Z.**

<table>
<thead>
<tr>
<th>Entries</th>
<th>1</th>
<th>3</th>
<th>8</th>
<th>21</th>
<th>55</th>
<th>150</th>
<th>408</th>
<th>1110</th>
</tr>
</thead>
</table>

**SYMMETRIC SLOPE** = 0.992

**CORR COEF** = 0.967

**SI** = 0.156

**RMSE** = 0.168

**BIAS** = -0.002

**LSQ FIT: SLOPE** = 0.944

**INTR** = 0.059

**BUOY MEAN** = 1.07

**STDEV** = 0.656

**MODEL MEAN** = 1.07

**STDEV** = 0.640

**ENTRIES** = 6408

---

**Comparison of forecast(t+48) ECMWF wave height with averaged buoy data. forecasts from 0 and 12Z.**

<table>
<thead>
<tr>
<th>Entries</th>
<th>1</th>
<th>3</th>
<th>8</th>
<th>20</th>
<th>55</th>
<th>147</th>
<th>398</th>
<th>1080</th>
</tr>
</thead>
</table>

**SYMMETRIC SLOPE** = 0.956

**CORR COEF** = 0.937

**SI** = 0.214

**RMSE** = 0.235

**BIAS** = -0.050

**LSQ FIT: SLOPE** = 0.902

**INTR** = 0.055

**BUOY MEAN** = 1.07

**STDEV** = 0.658

**MODEL MEAN** = 1.02

**STDEV** = 0.633

**ENTRIES** = 6272


### MetOffice

**Comparison of analysed UKMO wave height with averaged buoy data. forecasts from 0 and 12Z.**

<table>
<thead>
<tr>
<th>Entries</th>
<th>1</th>
<th>3</th>
<th>8</th>
<th>20</th>
<th>55</th>
<th>147</th>
<th>398</th>
<th>1080</th>
</tr>
</thead>
</table>

**SYMMETRIC SLOPE** = 1.007

**CORR COEF** = 0.924

**SI** = 0.243

**RMSE** = 0.261

**BIAS** = -0.001

**LSQ FIT: SLOPE** = 0.948

**INTR** = 0.055

**BUOY MEAN** = 1.07

**STDEV** = 0.658

**MODEL MEAN** = 1.07

**STDEV** = 0.675

**ENTRIES** = 6272

---

**Comparison of forecast(t+48) UKMO wave height with averaged buoy data. forecasts from 0 and 12Z.**

<table>
<thead>
<tr>
<th>Entries</th>
<th>1</th>
<th>3</th>
<th>8</th>
<th>20</th>
<th>55</th>
<th>147</th>
<th>398</th>
<th>1080</th>
</tr>
</thead>
</table>

**SYMMETRIC SLOPE** = 0.987

**CORR COEF** = 0.892

**SI** = 0.290

**RMSE** = 0.313

**BIAS** = -0.032

**LSQ FIT: SLOPE** = 0.919

**INTR** = 0.055

**BUOY MEAN** = 1.07

**STDEV** = 0.658

**MODEL MEAN** = 1.04

**STDEV** = 0.678

**ENTRIES** = 6272

---

**Comparison of forecast(t+48) FNMOC wave height with averaged buoy data. forecasts from 0 and 12Z.**

<table>
<thead>
<tr>
<th>Entries</th>
<th>1</th>
<th>3</th>
<th>8</th>
<th>20</th>
<th>55</th>
<th>147</th>
<th>398</th>
<th>1080</th>
</tr>
</thead>
</table>

**SYMMETRIC SLOPE** = 0.988

**CORR COEF** = 0.956

**SI** = 0.179

**RMSE** = 0.193

**BIAS** = -0.009

**LSQ FIT: SLOPE** = 0.934

**INTR** = 0.062

**BUOY MEAN** = 1.07

**STDEV** = 0.656

**MODEL MEAN** = 1.06

**STDEV** = 0.641

**ENTRIES** = 6408


### F.N.M.O.C.

**Comparison of forecast(t+48) FNMOC wave height with averaged buoy data. forecasts from 0 and 12Z.**

<table>
<thead>
<tr>
<th>Entries</th>
<th>1</th>
<th>3</th>
<th>8</th>
<th>20</th>
<th>55</th>
<th>147</th>
<th>398</th>
<th>1080</th>
</tr>
</thead>
</table>

**SYMMETRIC SLOPE** = 0.999

**CORR COEF** = 0.960

**SI** = 0.175

**RMSE** = 0.188

**BIAS** = -0.007

**LSQ FIT: SLOPE** = 0.970

**INTR** = 0.025

**BUOY MEAN** = 1.07

**STDEV** = 0.656

**MODEL MEAN** = 1.07

**STDEV** = 0.663

**ENTRIES** = 6272

---

**Figure 3.88:** Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
Figure 3.89: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
Figure 3.90: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
Figure 3.91: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
Figure 3.92: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
Figure 3.93: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
Figure 3.94: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
Comparison of analysed AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000  CORR COEF =  0.000  SI =  0.000  RMSE =  0.000  BIAS =   0.000

LSQ FIT: SLOPE =  0.000  INTR =  0.000

BUOY MEAN =    0.00  STDEV =   0.000
MODEL MEAN =    0.00  STDEV =   0.000
ENTRIES =      0

Comparison of forecast(t=t+48) AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000  CORR COEF =  0.000  SI =  0.000  RMSE =  0.000  BIAS =   0.000

LSQ FIT: SLOPE =  0.000  INTR =  0.000

BUOY MEAN =    0.00  STDEV =   0.000
MODEL MEAN =    0.00  STDEV =   0.000
ENTRIES =      0

Comparison of analysed NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.964  CORR COEF =  0.840  SI =  0.256  RMSE =  1.582  BIAS =  -0.199

LSQ FIT: SLOPE =  0.795  INTR =  1.056

BUOY MEAN =    6.12  STDEV =   2.836
MODEL MEAN =    5.92  STDEV =   2.685
ENTRIES =   5524

Comparison of forecast(t=t+48) NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.951  CORR COEF =  0.852  SI =  0.246  RMSE =  1.533  BIAS =  -0.287

LSQ FIT: SLOPE =  0.801  INTR =  0.934

BUOY MEAN =    6.12  STDEV =   2.836
MODEL MEAN =    5.84  STDEV =   2.666
ENTRIES =   5524

Figure 3.95: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
Figure 3.96: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
Comparison of analysed JMA wind speed with height corrected averaged buoy data forecasts from 0 and 12Z.

Comparison of analysed KMA wind speed with height corrected averaged buoy data forecasts from 0 and 12Z.

Comparison of analysed PRTOS wind speed with height corrected averaged buoy data forecasts from 0 and 12Z.

Comparison of forecast(t=48) JMA wind speed with height corrected averaged buoy data forecasts from 0 and 12Z.

Comparison of forecast(t=48) KMA wind speed with height corrected averaged buoy data forecasts from 0 and 12Z.

Comparison of forecast(t=48) PRTOS wind speed with height corrected averaged buoy data forecasts from 0 and 12Z.

Figure 3.97: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
Comparison of analysed DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000 BIAS = 0.000
LSQ FIT: SLOPE = 0.000 INTR = 0.000
BUOY MEAN = 0.00 STDEV = 0.000
MODEL MEAN = 0.00 STDEV = 0.000
ENTRIES = 0

Comparison of analysed NIWA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000 BIAS = 0.000
LSQ FIT: SLOPE = 0.000 INTR = 0.000
BUOY MEAN = 0.00 STDEV = 0.000
MODEL MEAN = 0.00 STDEV = 0.000
ENTRIES = 0

Comparison of analysed CNRAM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000 BIAS = 0.000
LSQ FIT: SLOPE = 0.000 INTR = 0.000
BUOY MEAN = 0.00 STDEV = 0.000
MODEL MEAN = 0.00 STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000 BIAS = 0.000
LSQ FIT: SLOPE = 0.000 INTR = 0.000
BUOY MEAN = 0.00 STDEV = 0.000
MODEL MEAN = 0.00 STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) NIWA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000 BIAS = 0.000
LSQ FIT: SLOPE = 0.000 INTR = 0.000
BUOY MEAN = 0.00 STDEV = 0.000
MODEL MEAN = 0.00 STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) CNRAM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000 BIAS = 0.000
LSQ FIT: SLOPE = 0.000 INTR = 0.000
BUOY MEAN = 0.00 STDEV = 0.000
MODEL MEAN = 0.00 STDEV = 0.000
ENTRIES = 0

(a) t+0
(b) t+48

Figure 3.98: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
Figure 3.99: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
Figure 3.100: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
Figure 3.101: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
Figure 3.102: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
Figure 3.103: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
Figure 3.104: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
Comparison of analysed METNO peak period with averaged buoy data. forecasts from 0 and 12Z.

**SYMMETRIC SLOPE** = 0.000  
**CORR COEF** = 0.000  
**SL** = 0.000  
**RMSE** = 0.000  
**BIAS** = 0.000  
**LSQ FIT: SLOPE** = 0.000  
**INTR** = 0.000  
**BUOY MEAN** = 0.00  
**STDEV** = 0.000  
**MODEL MEAN** = 0.00  
**STDEV** = 0.000  
**ENTRIES** = 0

Comparison of analysed SHNSM peak period with averaged buoy data. forecasts from 0 and 12Z.

**SYMMETRIC SLOPE** = 0.000  
**CORR COEF** = 0.000  
**SL** = 0.000  
**RMSE** = 0.000  
**BIAS** = 0.000  
**LSQ FIT: SLOPE** = 0.000  
**INTR** = 0.000  
**BUOY MEAN** = 0.00  
**STDEV** = 0.000  
**MODEL MEAN** = 0.00  
**STDEV** = 0.000  
**ENTRIES** = 0

(a) t+0

(b) t+48

Figure 3.105: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Gulf of Mexico buoys.
3.6 Comparison for Caribbean Sea buoys

Figure 3.106: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.107: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common Caribbean Sea buoys.
Figure 3.108: Forecast root mean square error (RMSE) and linear correlation coefficient at common Caribbean Sea buoys.
Comparison of forecasted ECMWF wave height with averaged buoy data. forecasts from 0 and 12Z.

Number of entries:

SYMMETRIC SLOPE = 1.010
CORR COEF = 0.965 SI = 0.100
RMSE = 0.178  BIAS = 0.034
LSQ FIT: SLOPE = 0.910  INTR = 0.191
BUOY MEAN = 1.76  STDEV = 0.660
MODEL MEAN = 1.79  STDEV = 0.623
ENTRIES = 6521

Comparison of forecasted UKMO wave height with averaged buoy data. forecasts from 0 and 12Z.

Number of entries:

SYMMETRIC SLOPE = 1.039
CORR COEF = 0.906 SI = 0.160
RMSE = 0.293  BIAS = 0.085
LSQ FIT: SLOPE = 0.876  INTR = 0.301
BUOY MEAN = 1.75  STDEV = 0.654
MODEL MEAN = 1.83  STDEV = 0.633
ENTRIES = 6383

Comparison of forecasted FNMOC wave height with averaged buoy data. forecasts from 0 and 12Z.

Number of entries:

SYMMETRIC SLOPE = 0.994
CORR COEF = 0.941 SI = 0.127
RMSE = 0.222  BIAS = 0.004
LSQ FIT: SLOPE = 0.872  INTR = 0.228
BUOY MEAN = 1.75  STDEV = 0.654
MODEL MEAN = 1.75  STDEV = 0.606
ENTRIES = 6383

Figure 3.109: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Caribbean Sea buoys.

(a) t+0
(b) t+48
Figure 3.110: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Caribbean Sea buoys.
Figure 3.111: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Caribbean Sea buoys.
Caribbean Sea buoys  201601 to 201612

Comparison of analysed JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.112: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Caribbean Sea buoys.
Comparison of analysed DMI wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NIWA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed CNRAM wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DMI wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) NIWA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) CNRAM wave height with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.113: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Caribbean Sea buoys.
Comparison of analysed METNO wave height with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed SHNSM wave height with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

(a) t+0
(b) t+48

Figure 3.114: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Caribbean Sea buoys.
Figure 3.115: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Caribbean Sea buoys.
Figure 3.116: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Caribbean Sea buoys.
Wind Speed (m/s)     buoy

Comparison of analysed DWD wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DWD wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed AUSBM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) AUSBM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed SHOM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) SHOM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.117: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Caribbean Sea buoys.
Comparison of analysed JMA wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of analysed KMA wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of analysed PRTOS wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Figure 3.118: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Caribbean Sea buoys.
Comparison of analysed DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

\[ \text{SYMMETRIC SLOPE} = 0.000 \]
\[ \text{CORR COEF} = 0.000 \]
\[ \text{SI} = 0.000 \]
\[ \text{RMSE} = 0.000 \]
\[ \text{BIAS} = 0.000 \]
\[ \text{LSQ FIT: SLOPE} = 0.000 \]
\[ \text{INTR} = 0.000 \]
\[ \text{BUOY MEAN} = 0.00 \]
\[ \text{STDEV} = 0.000 \]
\[ \text{MODEL MEAN} = 0.00 \]
\[ \text{STDEV} = 0.000 \]
\[ \text{ENTRIES} = 0 \]

Comparison of analysed NIWA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

\[ \text{SYMMETRIC SLOPE} = 0.000 \]
\[ \text{CORR COEF} = 0.000 \]
\[ \text{SI} = 0.000 \]
\[ \text{RMSE} = 0.000 \]
\[ \text{BIAS} = 0.000 \]
\[ \text{LSQ FIT: SLOPE} = 0.000 \]
\[ \text{INTR} = 0.000 \]
\[ \text{BUOY MEAN} = 0.00 \]
\[ \text{STDEV} = 0.000 \]
\[ \text{MODEL MEAN} = 0.00 \]
\[ \text{STDEV} = 0.000 \]
\[ \text{ENTRIES} = 0 \]

Comparison of analysed CNRAM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

\[ \text{SYMMETRIC SLOPE} = 0.000 \]
\[ \text{CORR COEF} = 0.000 \]
\[ \text{SI} = 0.000 \]
\[ \text{RMSE} = 0.000 \]
\[ \text{BIAS} = 0.000 \]
\[ \text{LSQ FIT: SLOPE} = 0.000 \]
\[ \text{INTR} = 0.000 \]
\[ \text{BUOY MEAN} = 0.00 \]
\[ \text{STDEV} = 0.000 \]
\[ \text{MODEL MEAN} = 0.00 \]
\[ \text{STDEV} = 0.000 \]
\[ \text{ENTRIES} = 0 \]

Comparison of forecast(t=t+48) DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

\[ \text{SYMMETRIC SLOPE} = 0.000 \]
\[ \text{CORR COEF} = 0.000 \]
\[ \text{SI} = 0.000 \]
\[ \text{RMSE} = 0.000 \]
\[ \text{BIAS} = 0.000 \]
\[ \text{LSQ FIT: SLOPE} = 0.000 \]
\[ \text{INTR} = 0.000 \]
\[ \text{BUOY MEAN} = 0.00 \]
\[ \text{STDEV} = 0.000 \]
\[ \text{MODEL MEAN} = 0.00 \]
\[ \text{STDEV} = 0.000 \]
\[ \text{ENTRIES} = 0 \]

Comparison of forecast(t=t+48) NIWA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

\[ \text{SYMMETRIC SLOPE} = 0.000 \]
\[ \text{CORR COEF} = 0.000 \]
\[ \text{SI} = 0.000 \]
\[ \text{RMSE} = 0.000 \]
\[ \text{BIAS} = 0.000 \]
\[ \text{LSQ FIT: SLOPE} = 0.000 \]
\[ \text{INTR} = 0.000 \]
\[ \text{BUOY MEAN} = 0.00 \]
\[ \text{STDEV} = 0.000 \]
\[ \text{MODEL MEAN} = 0.00 \]
\[ \text{STDEV} = 0.000 \]
\[ \text{ENTRIES} = 0 \]

Comparison of forecast(t=t+48) CNRAM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

\[ \text{SYMMETRIC SLOPE} = 0.000 \]
\[ \text{CORR COEF} = 0.000 \]
\[ \text{SI} = 0.000 \]
\[ \text{RMSE} = 0.000 \]
\[ \text{BIAS} = 0.000 \]
\[ \text{LSQ FIT: SLOPE} = 0.000 \]
\[ \text{INTR} = 0.000 \]
\[ \text{BUOY MEAN} = 0.00 \]
\[ \text{STDEV} = 0.000 \]
\[ \text{MODEL MEAN} = 0.00 \]
\[ \text{STDEV} = 0.000 \]
\[ \text{ENTRIES} = 0 \]

(a) \( t+0 \)

(b) \( t+48 \)

Figure 3.119: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Caribbean Sea buoys.
Comparison of analysed METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast at step 0 METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast at step 0 SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast at step 48 SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.120: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Caribbean Sea buoys.
Comparison of analysed ECMWF peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed UKMO peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed FNMOC peak period with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.121: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Caribbean Sea buoys.

(a) t+0

(b) t+48
Figure 3.122: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Caribbean Sea buoys.

(a) t+0

(b) t+48
Figure 3.123: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Caribbean Sea buoys.
Caribbean Sea buoys 201601 to 201612

Comparison of forecast (t=t+48) JMA peak period with averaged buoy data. Forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) KMA peak period with averaged buoy data. Forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) PRTOS peak period with averaged buoy data. Forecasts from 0 and 12Z.

Figure 3.124: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Caribbean Sea buoys.
Figure 3.125: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Caribbean Sea buoys.
Figure 3.126: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Caribbean Sea buoys.
3.7 Comparison for North East Atlantic buoys

Number of common observations for North East Atlantic buoys (NEATL) from 201601 to 201612 (wind, Hs, Tp)

<table>
<thead>
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<th>Buoy ID</th>
<th>N</th>
<th>Hs</th>
<th>Tp</th>
<th>Notes</th>
</tr>
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<td>62029</td>
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<td>62163</td>
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<td>64045</td>
<td>365</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 3.127: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.128: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common North East Atlantic buoys.
Figure 3.129: Forecast root mean square error (RMSE) and linear correlation coefficient at common North East Atlantic buoys.
Figure 3.130: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North East Atlantic buoys.
Comparison of analysed AES wave height with averaged buoy data. forecasts from 0 and 12Z.

**M.S.C.**

- Symmetric Slope: 0.000
- Corr Coef: 0.000
- RMSE: 0.000
- BIAS: 0.000
- LSQ Fit: Slope = 0.000, Intr = 0.000
- Buoy Mean: 0.000
- Model Mean: 0.000
- Entries: 0

Comparison of forecast(t=t+48) AES wave height with averaged buoy data. forecasts from 0 and 12Z.

**M.S.C.**

- Symmetric Slope: 0.000
- Corr Coef: 0.000
- RMSE: 0.000
- BIAS: 0.000
- LSQ Fit: Slope = 0.000, Intr = 0.000
- Buoy Mean: 0.000
- Model Mean: 0.000
- Entries: 0

Comparison of analysed NCEP wave height with averaged buoy data. forecasts from 0 and 12Z.

**N.C.E.P.**

- Symmetric Slope: 0.985
- Corr Coef: 0.982
- RMSE: 0.340
- BIAS: -0.071
- LSQ Fit: Slope = 0.988, Intr = -0.028
- Buoy Mean: 3.48
- Model Mean: 3.41
- Entries: 2876

Comparison of forecast(t=t+48) NCEP wave height with averaged buoy data. forecasts from 0 and 12Z.

**N.C.E.P.**

- Symmetric Slope: 1.007
- Corr Coef: 0.969
- RMSE: 0.457
- BIAS: -0.016
- LSQ Fit: Slope = 1.017, Intr = -0.076
- Buoy Mean: 3.48
- Model Mean: 3.46
- Entries: 2814

Comparison of analysed METFR wave height with averaged buoy data. forecasts from 0 and 12Z.

**MeteoFrance**

- Symmetric Slope: 0.997
- Corr Coef: 0.974
- RMSE: 0.405
- BIAS: -0.028
- LSQ Fit: Slope = 0.992, Intr = 0.000
- Buoy Mean: 3.48
- Model Mean: 3.45
- Entries: 2814

Comparison of forecast(t=t+48) METFR wave height with averaged buoy data. forecasts from 0 and 12Z.

**MeteoFrance**

- Symmetric Slope: 0.997
- Corr Coef: 0.974
- RMSE: 0.405
- BIAS: -0.028
- LSQ Fit: Slope = 0.992, Intr = 0.000
- Buoy Mean: 3.48
- Model Mean: 3.45
- Entries: 2814

Figure 3.131: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North East Atlantic buoys.
Figure 3.132: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North East Atlantic buoys.
Comparison of analysed JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.133: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North East Atlantic buoys.
Comparison of analysed DMI wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DMI wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) NIWA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) CNRAM wave height with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.134: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North East Atlantic buoys.
Figure 3.135: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North East Atlantic buoys.
North East Atlantic buoys  201601 to 201612

Comparison of analysed ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed UKMO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) UKMO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed FNMOC wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) FNMOC wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.136: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North East Atlantic buoys.
North East Atlantic buoys 201601 to 201612

Comparison of analysed AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

M.S.C.

Comparison of forecast(t=t+48) NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) METFR wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Number of entries:

(a) t+0

(b) t+48

Figure 3.137: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North East Atlantic buoys.
Comparison of analysed DWD wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed AUSBM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed SHOM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecasted DWD wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecasted AUSBM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecasted SHOM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.138: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North East Atlantic buoys.
Comparison of analysed JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOs wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOs wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.139: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North East Atlantic buoys.
Comparison of analysed DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.986
CORR COEF = 0.957 SI = 0.128
RMSE = 1.242 BIAS = -0.246
LSQ FIT: SLOPE = 1.004 INTR = -0.287
BUOY MEAN = 9.49 STDEV = 3.995
MODEL MEAN = 9.25 STDEV = 4.193
ENTRIES = 2486

Comparison of forecast (t+48) DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.984
CORR COEF = 0.894 SI = 0.200
RMSE = 1.916 BIAS = -0.279
LSQ FIT: SLOPE = 0.946 INTR = 0.232
BUOY MEAN = 9.48 STDEV = 3.975
MODEL MEAN = 9.20 STDEV = 4.206
ENTRIES = 2443

Comparison of analysed NIWA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000 BIAS = 0.000
LSQ FIT: SLOPE = 0.000 INTR = 0.000
BUOY MEAN = 0.00 STDEV = 0.000
MODEL MEAN = 0.00 STDEV = 0.000
ENTRIES = 0

Comparison of forecast (t+48) NIWA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000 BIAS = 0.000
LSQ FIT: SLOPE = 0.000 INTR = 0.000
BUOY MEAN = 0.00 STDEV = 0.000
MODEL MEAN = 0.00 STDEV = 0.000
ENTRIES = 0

Comparison of analysed CNRAM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000 BIAS = 0.000
LSQ FIT: SLOPE = 0.000 INTR = 0.000
BUOY MEAN = 0.00 STDEV = 0.000
MODEL MEAN = 0.00 STDEV = 0.000
ENTRIES = 0

Comparison of forecast (t+48) CNRAM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000 BIAS = 0.000
LSQ FIT: SLOPE = 0.000 INTR = 0.000
BUOY MEAN = 0.00 STDEV = 0.000
MODEL MEAN = 0.00 STDEV = 0.000
ENTRIES = 0

Figure 3.140: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North East Atlantic buoys.
Comparison of analysed METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000  CORR COEF = 0.000  SI = 0.000  RMSE = 0.000  BIAS = 0.000  LSQ FIT: SLOPE = 0.000  INTR = 0.000

BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000  CORR COEF = 0.000  SI = 0.000  RMSE = 0.000  BIAS = 0.000  LSQ FIT: SLOPE = 0.000  INTR = 0.000

BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

(a) t+0

(b) t+48

Figure 3.141: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North East Atlantic buoys.
3.8 Comparison for Euro-Atlantic Coast buoys

Figure 3.142: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.143: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common Euro-Atlantic Coast buoys.
SIGNIFICANT WAVE HEIGHT ROOT MEAN SQUARE ERROR at 9 Euro-Atlantic Coast buoys

10m WIND SPEED ROOT MEAN SQUARE ERROR at 5 Euro-Atlantic Coast buoys

PEAK PERIOD ROOT MEAN SQUARE ERROR at 2 Euro-Atlantic Coast buoys

(a) R.M.S.E.

(b) Correlation Coefficient

Figure 3.144: Forecast root mean square error (RMSE) and linear correlation coefficient at common Euro-Atlantic Coast buoys.
Figure 3.145: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Euro-Atlantic Coast buoys.
Figure 3.146: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Euro-Atlantic Coast buoys.
Figure 3.147: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Euro-Atlantic Coast buoys.
Comparison of forecast(t=t+48) JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.148: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Euro-Atlantic Coast buoys.
Figure 3.149: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Euro-Atlantic Coast buoys.
Figure 3.150: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Euro-Atlantic Coast buoys.
Euro-Atlantic Coast buoys 201601 to 201612

Comparison of analysed ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

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<th>SYMMETRIC SLOPE</th>
<th>CORR COEF</th>
<th>SI</th>
<th>RMSE</th>
<th>BIAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.042</td>
<td>0.941</td>
<td>0.193</td>
<td>1.345</td>
<td>0.379</td>
</tr>
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</table>

Comparison of forecast(t=+48) ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

<table>
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<tr>
<th>SYMMETRIC SLOPE</th>
<th>CORR COEF</th>
<th>SI</th>
<th>RMSE</th>
<th>BIAS</th>
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</thead>
<tbody>
<tr>
<td>1.029</td>
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<td>1.822</td>
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</tr>
</tbody>
</table>

Figure 3.151: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Euro-Atlantic Coast buoys.
Figure 3.152: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Euro-Atlantic Coast buoys.
Figure 3.153: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Euro-Atlantic Coast buoys.
Comparison of analysed JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

\[
\begin{align*}
\text{SYMMETRIC SLOPE} & = 0.000 \\
\text{CORR COEF} & = 0.000 \\
\text{RMSE} & = 0.000 \\
\text{BIAS} & = 0.000 \\
\text{LSQ FIT: SLOPE} & = 0.000 \\
\text{BUOY MEAN} & = 0.00 \\
\text{STDEV} & = 0.000 \\
\text{MODEL MEAN} & = 0.00 \\
\text{STDEV} & = 0.000 \\
\text{ENTRIES} & = 0
\end{align*}
\]

Comparison of analysed KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

\[
\begin{align*}
\text{SYMMETRIC SLOPE} & = 0.000 \\
\text{CORR COEF} & = 0.000 \\
\text{RMSE} & = 0.000 \\
\text{BIAS} & = 0.000 \\
\text{LSQ FIT: SLOPE} & = 0.000 \\
\text{BUOY MEAN} & = 0.00 \\
\text{STDEV} & = 0.000 \\
\text{MODEL MEAN} & = 0.00 \\
\text{STDEV} & = 0.000 \\
\text{ENTRIES} & = 0
\end{align*}
\]

Comparison of analysed PRTOS wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

\[
\begin{align*}
\text{SYMMETRIC SLOPE} & = 0.000 \\
\text{CORR COEF} & = 0.000 \\
\text{RMSE} & = 0.000 \\
\text{BIAS} & = 0.000 \\
\text{LSQ FIT: SLOPE} & = 0.000 \\
\text{BUOY MEAN} & = 0.00 \\
\text{STDEV} & = 0.000 \\
\text{MODEL MEAN} & = 0.00 \\
\text{STDEV} & = 0.000 \\
\text{ENTRIES} & = 0
\end{align*}
\]

Comparison of forecast(t=48) JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

\[
\begin{align*}
\text{SYMMETRIC SLOPE} & = 0.000 \\
\text{CORR COEF} & = 0.000 \\
\text{RMSE} & = 0.000 \\
\text{BIAS} & = 0.000 \\
\text{LSQ FIT: SLOPE} & = 0.000 \\
\text{BUOY MEAN} & = 0.00 \\
\text{STDEV} & = 0.000 \\
\text{MODEL MEAN} & = 0.00 \\
\text{STDEV} & = 0.000 \\
\text{ENTRIES} & = 0
\end{align*}
\]

Comparison of forecast(t=48) KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

\[
\begin{align*}
\text{SYMMETRIC SLOPE} & = 0.000 \\
\text{CORR COEF} & = 0.000 \\
\text{RMSE} & = 0.000 \\
\text{BIAS} & = 0.000 \\
\text{LSQ FIT: SLOPE} & = 0.000 \\
\text{BUOY MEAN} & = 0.00 \\
\text{STDEV} & = 0.000 \\
\text{MODEL MEAN} & = 0.00 \\
\text{STDEV} & = 0.000 \\
\text{ENTRIES} & = 0
\end{align*}
\]

Comparison of forecast(t=48) PRTOS wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

\[
\begin{align*}
\text{SYMMETRIC SLOPE} & = 0.000 \\
\text{CORR COEF} & = 0.000 \\
\text{RMSE} & = 0.000 \\
\text{BIAS} & = 0.000 \\
\text{LSQ FIT: SLOPE} & = 0.000 \\
\text{BUOY MEAN} & = 0.00 \\
\text{STDEV} & = 0.000 \\
\text{MODEL MEAN} & = 0.00 \\
\text{STDEV} & = 0.000 \\
\text{ENTRIES} & = 0
\end{align*}
\]

Figure 3.154: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Euro-Atlantic Coast buoys.
Figure 3.155: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Euro-Atlantic Coast buoys.
Comparison of analysed METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000
SI = 0.000
RMSE = 0.000
BIAS = 0.000
LSQ FIT: SLOPE = 0.000
BUOY MEAN = 0.00
STDEV = 0.000
MODEL MEAN = 0.00
STDEV = 0.000
ENTRIES = 0

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000
SI = 0.000
RMSE = 0.000
BIAS = 0.000
LSQ FIT: SLOPE = 0.000
BUOY MEAN = 0.00
STDEV = 0.000
MODEL MEAN = 0.00
STDEV = 0.000
ENTRIES = 0

(a) t+0

(b) t+48

Figure 3.156: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Euro-Atlantic Coast buoys.
3.9 Comparison for North Sea platforms

Figure 3.157: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.158: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common North Sea platforms.
Figure 3.159: Forecast root mean square error (RMSE) and linear correlation coefficient at common North Sea platforms.
Figure 3.160: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North Sea platforms.
Figure 3.161: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North Sea platforms.
Figure 3.162: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North Sea platforms.
Comparison of analysed JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.163: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North Sea platforms.
Comparison of analysed DMI wave height with averaged buoy data. forecasts from 0 and 12Z.

- **Model** MEAN = 2.42
- **Buoy** MEAN = 2.23
- **RMSE** = 0.398
- **Bias** = 0.187
- **LSQ Fit**: SLOPE = 1.041, INTR = 0.097

Comparison of analysed NIWA wave height with averaged buoy data. forecasts from 0 and 12Z.

- **Model** MEAN = 2.37
- **Buoy** MEAN = 2.21
- **RMSE** = 0.000
- **Bias** = 0.000
- **LSQ Fit**: SLOPE = 0.000, INTR = 0.000

Comparison of analysed CNRAM wave height with averaged buoy data. forecasts from 0 and 12Z.

- **Model** MEAN = 2.19
- **Buoy** MEAN = 0.00
- **RMSE** = 0.000
- **Bias** = 0.000
- **LSQ Fit**: SLOPE = 0.000, INTR = 0.000

Comparison of forecast(t=t+48) DMI wave height with averaged buoy data. forecasts from 0 and 12Z.

- **Model** MEAN = 2.37
- **Buoy** MEAN = 2.21
- **RMSE** = 0.483
- **Bias** = 0.165
- **LSQ Fit**: SLOPE = 1.009, INTR = 0.146

Comparison of forecast(t=t+48) NIWA wave height with averaged buoy data. forecasts from 0 and 12Z.

- **Model** MEAN = 0.00
- **Buoy** MEAN = 0.00
- **RMSE** = 0.000
- **Bias** = 0.000
- **LSQ Fit**: SLOPE = 0.000, INTR = 0.000

Comparison of forecast(t=t+48) CNRAM wave height with averaged buoy data. forecasts from 0 and 12Z.

- **Model** MEAN = 0.00
- **Buoy** MEAN = 0.00
- **RMSE** = 0.000
- **Bias** = 0.000
- **LSQ Fit**: SLOPE = 0.000, INTR = 0.000

Figure 3.164: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North Sea platforms.
Comparison of analysed METNO wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) METNO wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed S.H.N.S.M. wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) S.H.N.S.M. wave height with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.165: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North Sea platforms.
Comparison of analysed ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed UKMO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) UKMO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed FNMOC wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) FNMOC wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.166: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North Sea platforms.
Comparison of forecast $t=+48$ AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast $t=+48$ NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast $t=+48$ METFR wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.167: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North Sea platforms.
Figure 3.168: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North Sea platforms.
Comparison of analysed JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.169: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North Sea platforms.
Comparison of analysed DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NIWA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) NIWA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed CNRAM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) CNRAM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.170: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North Sea platforms.
Comparison of analysed METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

<table>
<thead>
<tr>
<th>SYMMETRIC SLOPE</th>
<th>CORR COEF</th>
<th>SI</th>
<th>RMSE</th>
<th>BIAS</th>
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<td>1.572</td>
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</table>

**LSQ FIT:**
- SLOPE = 1.019
- INTR = 0.402

**BUOY MEANS:**
- MEAN = 8.04
- STDEV = 4.056

**MODEL MEAN:**
- MEAN = 8.59
- STDEV = 4.385

**ENTRIES:**
- 1287

Comparison of forecast(t=t+48) METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

<table>
<thead>
<tr>
<th>SYMMETRIC SLOPE</th>
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<th>RMSE</th>
<th>BIAS</th>
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<td>0.273</td>
<td>2.240</td>
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</table>

**LSQ FIT:**
- SLOPE = 0.907
- INTR = 1.308

**BUOY MEANS:**
- MEAN = 7.95
- STDEV = 4.010

**MODEL MEAN:**
- MEAN = 8.52
- STDEV = 4.217

**ENTRIES:**
- 8536

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

<table>
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<tr>
<th>SYMMETRIC SLOPE</th>
<th>CORR COEF</th>
<th>SI</th>
<th>RMSE</th>
<th>BIAS</th>
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<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

**LSQ FIT:**
- SLOPE = 0.000
- INTR = 0.000

**BUOY MEANS:**
- MEAN = 0.00
- STDEV = 0.000

**MODEL MEAN:**
- MEAN = 0.00
- STDEV = 0.000

**ENTRIES:**
- 0

Comparison of forecast(t=t+48) SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

<table>
<thead>
<tr>
<th>SYMMETRIC SLOPE</th>
<th>CORR COEF</th>
<th>SI</th>
<th>RMSE</th>
<th>BIAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000</td>
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<td>0.000</td>
<td>0.000</td>
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</tbody>
</table>

**LSQ FIT:**
- SLOPE = 0.000
- INTR = 0.000

**BUOY MEANS:**
- MEAN = 0.00
- STDEV = 0.000

**MODEL MEAN:**
- MEAN = 0.00
- STDEV = 0.000

**ENTRIES:**
- 0

Figure 3.171: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North Sea platforms.
3.10 Comparison for North Sea buoys

Figure 3.172: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.173: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common North Sea buoys.
Figure 3.174: Forecast root mean square error (RMSE) and linear correlation coefficient at common North Sea buoys.
Comparison of analysed ECMWF wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) ECMWF wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed UKMO wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) UKMO wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed FNMOC wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) FNMOC wave height with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.175: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North Sea buoys.
Figure 3.176: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North Sea buoys.
Figure 3.177: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North Sea buoys.
Figure 3.178: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North Sea buoys.
Figure 3.179: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North Sea buoys.
Comparison of analysed METNO wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=48) METNO wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed SHNSM wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=48) SHNSM wave height with averaged buoy data, forecasts from 0 and 12Z.

Figure 3.180: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at North Sea buoys.
Figure 3.181: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North Sea buoys.
Figure 3.182: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North Sea buoys.
Comparison of analysed DWD wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of analysed AUSBM wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of analysed SHOM wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of forecast (t+48) DWD wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of forecast (t+48) AUSBM wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of forecast (t+48) SHOM wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.183: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North Sea buoys.
Comparison of analysed JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.184: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North Sea buoys.
Comparison of analysed DMI wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DMI wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed NIWA wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) NIWA wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed CNRAM wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) CNRAM wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.185: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North Sea buoys.
Comparison of analysed METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000  
CORR COEF =  0.000  
SI =  0.000  
RMSE =  0.000  
BIAS =   0.000  
LSQ FIT: SLOPE =  0.000  
INTR =  0.000  
BUOY MEAN =    0.00  
STDEV =   0.000  
MODEL MEAN =    0.00  
STDEV =   0.000  
ENTRIES =      0  

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000  
CORR COEF =  0.000  
SI =  0.000  
RMSE =  0.000  
BIAS =   0.000  
LSQ FIT: SLOPE =  0.000  
INTR =  0.000  
BUOY MEAN =    0.00  
STDEV =   0.000  
MODEL MEAN =    0.00  
STDEV =   0.000  
ENTRIES =      0  

Comparison of forecast(t=t+48) METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000  
CORR COEF =  0.000  
SI =  0.000  
RMSE =  0.000  
BIAS =   0.000  
LSQ FIT: SLOPE =  0.000  
INTR =  0.000  
BUOY MEAN =    0.00  
STDEV =   0.000  
MODEL MEAN =    0.00  
STDEV =   0.000  
ENTRIES =      0  

Comparison of forecast(t=t+48) SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000  
CORR COEF =  0.000  
SI =  0.000  
RMSE =  0.000  
BIAS =   0.000  
LSQ FIT: SLOPE =  0.000  
INTR =  0.000  
BUOY MEAN =    0.00  
STDEV =   0.000  
MODEL MEAN =    0.00  
STDEV =   0.000  
ENTRIES =      0  

Figure 3.186: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at North Sea buoys.
Figure 3.187: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at North Sea buoys.
Comparison of analysed AES peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed NCEP peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed METFR peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast (t+t=48) AES peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast (t+t=48) NCEP peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast (t+t=48) METFR peak period with averaged buoy data, forecasts from 0 and 12Z.

Figure 3.188: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at North Sea buoys.
Figure 3.189: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at North Sea buoys.
Figure 3.190: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at North Sea buoys.
Comparison of forecast (t=t+48) DMI peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) NIWA peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) CNRAM peak period with averaged buoy data, forecasts from 0 and 12Z.

Figure 3.191: Scatter diagrams for peak period at step 0 and 48 for the displayed centers at North Sea buoys.
Figure 3.192: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at North Sea buoys.
### 3.11 Comparison for Icelandic buoys and Norwegian platforms

#### Figure 3.193: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.194: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common Icelandic buoys and Norwegian platforms.
Figure 3.195: Forecast root mean square error (RMSE) and linear correlation coefficient at common Icelandic buoys and Norwegian platforms.
Figure 3.196: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Icelandic buoys and Norwegian platforms.
Figure 3.197: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Icelandic buoys and Norwegian platforms.
Figure 3.198: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Icelandic buoys and Norwegian platforms.
Figure 3.199: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Icelandic buoys and Norwegian platforms.
Figure 3.200: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Icelandic buoys and Norwegian platforms.
Figure 3.201: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Icelandic buoys and Norwegian platforms.
Comparison of analysed ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

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<th>Buoy Mean</th>
<th>LSG Fit</th>
<th>Slope</th>
<th>Intr</th>
<th>RMSE</th>
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<tr>
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Comparison of forecast(t=+48) ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

<table>
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<th>LSG Fit</th>
<th>Slope</th>
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Comparison of analysed UKMO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

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<th>Buoy Mean</th>
<th>LSG Fit</th>
<th>Slope</th>
<th>Intr</th>
<th>RMSE</th>
<th>Bias</th>
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<td>1.117</td>
<td>0.983</td>
<td>0.951</td>
<td>0.330</td>
<td>2.645</td>
<td>0.769</td>
<td>0.931</td>
<td>0.330</td>
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<td>3999</td>
<td>0.983</td>
<td>0.108</td>
<td>2.645</td>
<td>0.729</td>
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<td></td>
<td>201601 to 201612</td>
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Comparison of forecast(t=+48) UKMO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

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<th>Model Mean</th>
<th>Buoy Mean</th>
<th>LSG Fit</th>
<th>Slope</th>
<th>Intr</th>
<th>RMSE</th>
<th>Bias</th>
<th>SYMMETRIC SLOPE</th>
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<td>201601 to 201612</td>
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Figure 3.202: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Icelandic buoys and Norwegian platforms.
Figure 3.203: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Icelandic buoys and Norwegian platforms.
Figure 3.204: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Icelandic buoys and Norwegian platforms.
Figure 3.205: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Icelandic buoys and Norwegian platforms.
Figure 3.206: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Icelandic buoys and Norwegian platforms.
Figure 3.207: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Icelandic buoys and Norwegian platforms.
3.12 Comparison for Barents Sea buoys

Figure 3.208: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
SIGNIFICANT WAVE HEIGHT SCATTER INDEX at 0 Barents Sea buoys

SIGNIFICANT WAVE HEIGHT BIAS at 0 Barents Sea buoys

10m WIND SPEED SCATTER INDEX at 0 Barents Sea buoys

10m WIND SPEED BIAS at 0 Barents Sea buoys

PEAK PERIOD SCATTER INDEX at 0 Barents Sea buoys

PEAK PERIOD BIAS at 0 Barents Sea buoys

(a) Scatter Index (%)

(b) Bias (model-buoy)

Figure 3.209: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common Barents Sea buoys.
Figure 3.210: Forecast root mean square error (RMSE) and linear correlation coefficient at common Barents Sea buoys.
Figure 3.211: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Barents Sea buoys.
Comparison of analysed AES wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) AES wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NCEP wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) NCEP wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed METFR wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) METFR wave height with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.212: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Barents Sea buoys.
Figure 3.213: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Barents Sea buoys.
Comparison of analysed JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.214: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Barents Sea buoys.
Comparison of analysed DMI wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DMI wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NIWA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) NIWA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed CNRAM wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) CNRAM wave height with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.215: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Barents Sea buoys.
Comparison of analysed METNO wave height with averaged buoy data. forecasts from 0 and 12Z.

\[ \text{SYMMETRIC SLOPE} = 0.000 \]
\[ \text{CORR COEF} = 0.000 \]
\[ \text{RMSE} = 0.000 \]
\[ \text{BIAS} = 0.000 \]

Comparison of forecast\( (t=t+48) \) METNO wave height with averaged buoy data. forecasts from 0 and 12Z.

\[ \text{SYMMETRIC SLOPE} = 0.000 \]
\[ \text{CORR COEF} = 0.000 \]
\[ \text{RMSE} = 0.000 \]
\[ \text{BIAS} = 0.000 \]

Comparison of analysed SHNSM wave height with averaged buoy data. forecasts from 0 and 12Z.

\[ \text{SYMMETRIC SLOPE} = 0.000 \]
\[ \text{CORR COEF} = 0.000 \]
\[ \text{RMSE} = 0.000 \]
\[ \text{BIAS} = 0.000 \]

Comparison of forecast\( (t=t+48) \) SHNSM wave height with averaged buoy data. forecasts from 0 and 12Z.

\[ \text{SYMMETRIC SLOPE} = 0.000 \]
\[ \text{CORR COEF} = 0.000 \]
\[ \text{RMSE} = 0.000 \]
\[ \text{BIAS} = 0.000 \]

**Figure 3.216:** Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Barents Sea buoys.
Figure 3.217: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Barents Sea buoys.
Comparison of analysed AES wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) AES wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed NCEP wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) NCEP wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed METFR wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) METFR wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

(a) t+0
(b) t+48

Figure 3.218: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Barents Sea buoys.
Comparison of analysed DWD wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of analysed AUSBM wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of analysed SHOM wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of forecast(t=+48) DWD wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of forecast(t=+48) AUSBM wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of forecast(t=+48) SHOM wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Figure 3.219: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Barents Sea buoys.
Comparison of analysed JMA wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed KMA wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed PRTOS wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Figure 3.220: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Barents Sea buoys.
Comparison of analysed DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NIWA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) NIWA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed CNRAM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) CNRAM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.221: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Barents Sea buoys.
Figure 3.222: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Barents Sea buoys.
3.13 Comparison for Baltic Sea buoys

Figure 3.223: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.224: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common Baltic Sea buoys.
Figure 3.225: Forecast root mean square error (RMSE) and linear correlation coefficient at common Baltic Sea buoys.
Figure 3.226: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Baltic Sea buoys.
**Figure 3.227:** Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Baltic Sea buoys.
Comparison of analysed DWD wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DWD wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed BoM wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) BoM wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed SHOM wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) SHOM wave height with averaged buoy data, forecasts from 0 and 12Z.

Figure 3.228: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Baltic Sea buoys.
Comparison of analysed JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.229: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Baltic Sea buoys.
Figure 3.230: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Baltic Sea buoys.
Comparison of analysed METNO wave height with averaged buoy data. forecasts from 0 and 12Z.

MASTER:
- Symmetric Slope = 1.359
- Corr Coef = 0.923
- SI = 0.449
- RMSE = 0.462
- BIAS = 0.242

LSQ FIT:
- Slope = 1.454
- Intr = -0.157

BUOY:
- Mean = 0.88
- Stdev = 0.521

MODEL:
- Mean = 1.12
- Stdev = 0.821

Entries = 142

Comparison of forecast (t=48) METNO wave height with averaged buoy data. forecasts from 0 and 12Z.

MASTER:
- Symmetric Slope = 1.338
- Corr Coef = 0.890
- SI = 0.452
- RMSE = 0.470
- BIAS = 0.242

LSQ FIT:
- Slope = 1.354
- Intr = -0.074

BUOY:
- Mean = 0.89
- Stdev = 0.519

MODEL:
- Mean = 1.14
- Stdev = 0.789

Entries = 133

Comparison of analysed SHNSM wave height with averaged buoy data. forecasts from 0 and 12Z.

MASTER:
- Symmetric Slope = 0.000
- Corr Coef = 0.000
- SI = 0.000
- RMSE = 0.000
- BIAS = 0.000

LSQ FIT:
- Slope = 0.000
- Intr = 0.000

BUOY:
- Mean = 0.00
- Stdev = 0.000

MODEL:
- Mean = 0.00
- Stdev = 0.000

Entries = 0

Comparison of forecast (t=48) SHNSM wave height with averaged buoy data. forecasts from 0 and 12Z.

MASTER:
- Symmetric Slope = 0.000
- Corr Coef = 0.000
- SI = 0.000
- RMSE = 0.000
- BIAS = 0.000

LSQ FIT:
- Slope = 0.000
- Intr = 0.000

BUOY:
- Mean = 0.00
- Stdev = 0.000

MODEL:
- Mean = 0.00
- Stdev = 0.000

Entries = 0

Figure 3.231: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Baltic Sea buoys.
Comparison of analysed ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z. number of entries: 942
SYMMETRIC SLOPE = 0.946 CORR COEF = 0.958 SI = 0.133 RMSE = 1.090 BIAS = -0.349 LSQ FIT: SLOPE = 0.862 INTR = 0.723 BUOY MEAN = 7.75 STDEV = 3.528 MODEL MEAN = 7.40 STDEV = 3.174 ENTRIES = 942

Comparison of analysed UKMO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z. number of entries: 913
SYMMETRIC SLOPE = 0.937 CORR COEF = 0.956 SI = 0.133 RMSE = 1.163 BIAS = -0.541 LSQ FIT: SLOPE = 0.924 INTR = 0.046 BUOY MEAN = 7.75 STDEV = 3.528 MODEL MEAN = 7.21 STDEV = 3.410 ENTRIES = 913

Comparison of analysed FNMOC wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z. number of entries: 0
SYMMETRIC SLOPE = 0.000 CORR COEF = 0.000 SI = 0.000 RMSE = 0.000 BIAS = 0.000 LSQ FIT: SLOPE = 0.000 INTR = 0.000 BUOY MEAN = 0.00 STDEV = 0.000 MODEL MEAN = 0.00 STDEV = 0.000 ENTRIES = 0

Comparison of forecast(t=t+48) ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z. number of entries: 913
SYMMETRIC SLOPE = 0.956 CORR COEF = 0.902 SI = 0.198 RMSE = 1.535 BIAS = -0.265 LSQ FIT: SLOPE = 0.823 INTR = 1.090 BUOY MEAN = 7.65 STDEV = 3.506 MODEL MEAN = 7.39 STDEV = 3.198 ENTRIES = 913

Comparison of forecast(t=t+48) UKMO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z. number of entries: 913
SYMMETRIC SLOPE = 1.020 CORR COEF = 0.882 SI = 0.226 RMSE = 1.735 BIAS = 0.143 LSQ FIT: SLOPE = 0.903 INTR = 0.882 BUOY MEAN = 7.65 STDEV = 3.506 MODEL MEAN = 7.79 STDEV = 3.593 ENTRIES = 913

Comparison of forecast(t=t+48) FNMOC wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z. number of entries: 0
SYMMETRIC SLOPE = 0.000 CORR COEF = 0.000 SI = 0.000 RMSE = 0.000 BIAS = 0.000 LSQ FIT: SLOPE = 0.000 INTR = 0.000 BUOY MEAN = 0.00 STDEV = 0.000 MODEL MEAN = 0.00 STDEV = 0.000 ENTRIES = 0

Figure 3.232: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Baltic Sea buoys.
Baltic Sea buoys 201601 to 201612

Comparison of analysed AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed MeteoFrance wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) MeteoFrance wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Figure 3.233: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Baltic Sea buoys.
Figure 3.234: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Baltic Sea buoys.
Figure 3.235: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Baltic Sea buoys.
Comparison of analysed DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) N.I.W.A. wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) CNRAM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.236: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Baltic Sea buoys.
Comparison of analysed METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 1.018  
CORR COEF = 0.948  SI = 0.151  
RMSE = 1.176  BIAS = 0.087  
LSQ FIT: SLOPE = 0.993  INTR = 0.139  
BUOY MEAN = 7.75  STDEV = 3.528  
MODEL MEAN = 7.84  STDEV = 3.696  
ENTRIES = 942

Comparison of forecast(t=t+48) METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 1.014  
CORR COEF = 0.873  SI = 0.235  
RMSE = 1.796  BIAS = 0.080  
LSQ FIT: SLOPE = 0.901  INTR = 0.837  
BUOY MEAN = 7.65  STDEV = 3.506  
MODEL MEAN = 7.73  STDEV = 3.617  
ENTRIES = 913

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000  
CORR COEF = 0.000  SI = 0.000  
RMSE = 0.000  BIAS = 0.000  
LSQ FIT: SLOPE = 0.000  INTR = 0.000  
BUOY MEAN = 0.00  STDEV = 0.000  
MODEL MEAN = 0.00  STDEV = 0.000  
ENTRIES = 0

Comparison of forecast(t=t+48) SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000  
CORR COEF = 0.000  SI = 0.000  
RMSE = 0.000  BIAS = 0.000  
LSQ FIT: SLOPE = 0.000  INTR = 0.000  
BUOY MEAN = 0.00  STDEV = 0.000  
MODEL MEAN = 0.00  STDEV = 0.000  
ENTRIES = 0

Figure 3.237: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Baltic Sea buoys.
Figure 3.238: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Baltic Sea buoys.
Comparison of analysed AES peak period with averaged buoy data. forecasts from 0 and 12Z.

**M.S.C.**

SYMMETRIC SLOPE = 0.000  
CORR COEF = 0.000  
RMSE = 0.000  
BIAS = 0.000  
LSQ FIT: SLOPE = 0.000  
BUOY MEAN = 0.00  
MODEL MEAN = 0.00  
ENTRIES = 0

Comparison of forecast(t=t+48) AES peak period with averaged buoy data. forecasts from 0 and 12Z.

**M.S.C.**

SYMMETRIC SLOPE = 0.000  
CORR COEF = 0.000  
RMSE = 0.000  
BIAS = 0.000  
LSQ FIT: SLOPE = 0.000  
BUOY MEAN = 0.00  
MODEL MEAN = 0.00  
ENTRIES = 0

Comparison of analysed NCEP peak period with averaged buoy data. forecasts from 0 and 12Z.

**N.C.E.P.**

SYMMETRIC SLOPE = 0.000  
CORR COEF = 0.000  
RMSE = 0.000  
BIAS = 0.000  
LSQ FIT: SLOPE = 0.000  
BUOY MEAN = 0.00  
MODEL MEAN = 0.00  
ENTRIES = 0

Comparison of forecast(t=t+48) NCEP peak period with averaged buoy data. forecasts from 0 and 12Z.

**N.C.E.P.**

SYMMETRIC SLOPE = 0.000  
CORR COEF = 0.000  
RMSE = 0.000  
BIAS = 0.000  
LSQ FIT: SLOPE = 0.000  
BUOY MEAN = 0.00  
MODEL MEAN = 0.00  
ENTRIES = 0

Comparison of analysed METFR peak period with averaged buoy data. forecasts from 0 and 12Z.

**MeteoFrance**

SYMMETRIC SLOPE = 1.016  
CORR COEF = 0.624  
RMSE = 0.782  
BIAS = 0.078  
LSQ FIT: SLOPE = 0.600  
BUOY MEAN = 4.34  
MODEL MEAN = 4.42  
ENTRIES = 36

Comparison of forecast(t=t+48) METFR peak period with averaged buoy data. forecasts from 0 and 12Z.

**MeteoFrance**

SYMMETRIC SLOPE = 1.019  
CORR COEF = 0.626  
RMSE = 0.793  
BIAS = 0.094  
LSQ FIT: SLOPE = 0.603  
BUOY MEAN = 4.33  
MODEL MEAN = 4.43  
ENTRIES = 32

Figure 3.239: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Baltic Sea buoys.
Figure 3.240: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Baltic Sea buoys.
Figure 3.241: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Baltic Sea buoys.
Figure 3.242: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Baltic Sea buoys.
Comparison of analysed METNO peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed SHNSM peak period with averaged buoy data. forecasts from 0 and 12Z.

(a) $t+0$

(b) $t+48$

Figure 3.243: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Baltic Sea buoys.
3.14 Comparison for English Channel and Irish Sea

Figure 3.24: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.245: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common English Channel and Irish Sea.
Figure 3.246: Forecast root mean square error (RMSE) and linear correlation coefficient at common English Channel and Irish Sea.
Figure 3.247: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at English Channel and Irish Sea.
Figure 3.248: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at English Channel and Irish Sea.
Figure 3.249: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at English Channel and Irish Sea.
Figure 3.250: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at English Channel and Irish Sea.
Comparison of analysed DMI wave height with averaged buoy data. forecasts from 0 and 12Z.

**Entries:** 1451  
**Model Mean:** 1.11  
**Buoy Mean:** 0.99  
**LSQ Fit:** SLOPE = 1.159, INTR = 0.035  
**RMSE:** 0.319  
**Bias:** 0.123  
**Symmetric Slope:** 1.158  
**Correlation Coef:** 0.951  
**Standard Deviation:** 0.298  

**Entries:** 1389  
**Model Mean:** 1.11  
**Buoy Mean:** 0.99  
**LSQ Fit:** SLOPE = 1.159, INTR = 0.017  
**RMSE:** 0.384  
**Bias:** 0.120  
**Symmetric Slope:** 1.164  
**Correlation Coef:** 0.918  
**Standard Deviation:** 0.369

Comparison of analysed NIWA wave height with averaged buoy data. forecasts from 0 and 12Z.

**Entries:** 0  
**Model Mean:** 0.00  
**Buoy Mean:** 0.00  
**LSQ Fit:** SLOPE = 0.000, INTR = 0.000  
**RMSE:** 0.000  
**Bias:** 0.000  
**Symmetric Slope:** 0.000  
**Correlation Coef:** 0.000  
**Standard Deviation:** 0.000

Comparison of analysed CNRAM wave height with averaged buoy data. forecasts from 0 and 12Z.

**Entries:** 0  
**Model Mean:** 0.00  
**Buoy Mean:** 0.00  
**LSQ Fit:** SLOPE = 0.000, INTR = 0.000  
**RMSE:** 0.000  
**Bias:** 0.000  
**Symmetric Slope:** 0.000  
**Correlation Coef:** 0.000  
**Standard Deviation:** 0.000

(a) t+0

(b) t+48

Figure 3.251: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at English Channel and Irish Sea.
Figure 3.252: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at English Channel and Irish Sea.
Figure 3.253: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at English Channel and Irish Sea.
Figure 3.254: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at English Channel and Irish Sea.
Figure 3.255: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at English Channel and Irish Sea.
Figure 3.256: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at English Channel and Irish Sea.
Figure 3.257: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at English Channel and Irish Sea.
Figure 3.258: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at English Channel and Irish Sea.
3.15 Comparison for Western Mediterranean Sea buoys

Figure 3.259: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.260: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common Western Mediterranean Sea buoys.
Figure 3.261: Forecast root mean square error (RMSE) and linear correlation coefficient at common Western Mediterranean Sea buoys.
Figure 3.262: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Western Mediterranean Sea buoys.
Figure 3.263: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Western Mediterranean Sea buoys.
Figure 3.264: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Western Mediterranean Sea buoys.
Figure 3.265: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Western Mediterranean Sea buoys.
Western Mediterranean Sea buoys  201601 to 201612

Comparison of analysed DMI wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) DMI wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NIWA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) NIWA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed CNRAM wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) CNRAM wave height with averaged buoy data. forecasts from 0 and 12Z.

**Figure 3.266:** Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Western Mediterranean Sea buoys.
Figure 3.267: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Western Mediterranean Sea buoys.
Figure 3.268: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Western Mediterranean Sea buoys.
Figure 3.269: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Western Mediterranean Sea buoys.
Figure 3.270: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Western Mediterranean Sea buoys.
Comparison of analysed JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) PRTOS wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.271: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Western Mediterranean Sea buoys.
Figure 3.272: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Western Mediterranean Sea buoys.
Western Mediterranean Sea buoys 201601 to 201612

Comparison of analysed METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000
RMSE = 0.000
BIAS = 0.000
LSQ FIT: SLOPE = 0.000
BUOY MEAN = 0.00
STDEV = 0.000

ENTRIES = 0
MODEL MEAN = 0.00
STDEV = 0.000
LSQ FIT: SLOPE = 0.000
STDEV = 0.000
CORR COEF = 0.000
STDEV = 0.000
SYMMETRIC SLOPE = 0.000

Comparison of forecast(t=48) METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000
RMSE = 0.000
BIAS = 0.000
LSQ FIT: SLOPE = 0.000
BUOY MEAN = 0.00
STDEV = 0.000

ENTRIES = 0
MODEL MEAN = 0.00
STDEV = 0.000
LSQ FIT: SLOPE = 0.000
STDEV = 0.000
CORR COEF = 0.000
STDEV = 0.000
SYMMETRIC SLOPE = 0.000

Western Mediterranean Sea buoys 201601 to 201612

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000
RMSE = 0.000
BIAS = 0.000
LSQ FIT: SLOPE = 0.000
BUOY MEAN = 0.00
STDEV = 0.000

ENTRIES = 0
MODEL MEAN = 0.00
STDEV = 0.000
LSQ FIT: SLOPE = 0.000
STDEV = 0.000
CORR COEF = 0.000
STDEV = 0.000
SYMMETRIC SLOPE = 0.000

Comparison of forecast(t=48) SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000
RMSE = 0.000
BIAS = 0.000
LSQ FIT: SLOPE = 0.000
BUOY MEAN = 0.00
STDEV = 0.000

ENTRIES = 0
MODEL MEAN = 0.00
STDEV = 0.000
LSQ FIT: SLOPE = 0.000
STDEV = 0.000
CORR COEF = 0.000
STDEV = 0.000
SYMMETRIC SLOPE = 0.000

Figure 3.273: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Western Mediterranean Sea buoys.
3.16 Comparison for Mediterranean Sea buoys

Number of common observations for Mediterranean Sea buoys (MEDIT) from 201601 to 201612 (wind, Hs, Tp)

<table>
<thead>
<tr>
<th>61X03</th>
<th>131</th>
<th>159</th>
<th>0</th>
<th>Athos, North Aegean Sea (HCMR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>61X08</td>
<td>1</td>
<td>121</td>
<td>0</td>
<td>Pytos, Ionian Sea (HCMR)</td>
</tr>
</tbody>
</table>

Figure 3.274: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.275: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common Mediterranean Sea buoys.
Figure 3.276: Forecast root mean square error (RMSE) and linear correlation coefficient at common Mediterranean Sea buoys.
Figure 3.277: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.
Figure 3.278: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.
Figure 3.279: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.
Figure 3.280: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.
Figure 3.281: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.

(a) t+0

(b) t+48
Comparison of analysed METNO wave height with averaged buoy data. forecasts from 0 and 12Z. 

SYMMETRIC SLOPE = 0.000  CORR COEF = 0.000  SI = 0.000  RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000

BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed SHNSM wave height with averaged buoy data. forecasts from 0 and 12Z. 

SYMMETRIC SLOPE = 0.000  CORR COEF = 0.000  SI = 0.000  RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000

BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Figure 3.282: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.
Figure 3.283: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.
Figure 3.284: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.
Comparison of analysed DWD wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

**SYMMETRIC SLOPE = 0.000**
**CORR COEF = 0.000**
**SI = 0.000**
**RMSE = 0.000**
**BIAS = 0.000**

**LSQ FIT:**
**SLOPE = 0.000**
**INTR = 0.000**

**BUOY MEAN = 0.00**
**STDEV = 0.000**

**MODEL MEAN = 0.00**
**STDEV = 0.000**

**ENTRIES = 0**

Comparison of forecast (t=t+48) DWD wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

**SYMMETRIC SLOPE = 0.000**
**CORR COEF = 0.000**
**SI = 0.000**
**RMSE = 0.000**
**BIAS = 0.000**

**LSQ FIT:**
**SLOPE = 0.000**
**INTR = 0.000**

**BUOY MEAN = 0.00**
**STDEV = 0.000**

**MODEL MEAN = 0.00**
**STDEV = 0.000**

**ENTRIES = 0**

Comparison of analysed AUSBM wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

**SYMMETRIC SLOPE = 0.000**
**CORR COEF = 0.000**
**SI = 0.000**
**RMSE = 0.000**
**BIAS = 0.000**

**LSQ FIT:**
**SLOPE = 0.000**
**INTR = 0.000**

**BUOY MEAN = 0.00**
**STDEV = 0.000**

**MODEL MEAN = 0.00**
**STDEV = 0.000**

**ENTRIES = 0**

Comparison of forecast (t=t+48) AUSBM wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

**SYMMETRIC SLOPE = 0.000**
**CORR COEF = 0.000**
**SI = 0.000**
**RMSE = 0.000**
**BIAS = 0.000**

**LSQ FIT:**
**SLOPE = 0.000**
**INTR = 0.000**

**BUOY MEAN = 0.00**
**STDEV = 0.000**

**MODEL MEAN = 0.00**
**STDEV = 0.000**

**ENTRIES = 0**

Comparison of analysed SHOM wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

**SYMMETRIC SLOPE = 1.016**
**CORR COEF = 0.849**
**SI = 0.377**
**RMSE = 2.336**
**BIAS = 0.402**

**LSQ FIT:**
**SLOPE = 0.771**
**INTR = 1.805**

**BUOY MEAN = 6.13**
**STDEV = 4.343**

**MODEL MEAN = 6.54**
**STDEV = 3.945**

**ENTRIES = 128**

Comparison of forecast (t=t+48) SHOM wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

**SYMMETRIC SLOPE = 1.016**
**CORR COEF = 0.849**
**SI = 0.377**
**RMSE = 2.336**
**BIAS = 0.402**

**LSQ FIT:**
**SLOPE = 0.771**
**INTR = 1.805**

**BUOY MEAN = 6.13**
**STDEV = 4.343**

**MODEL MEAN = 6.54**
**STDEV = 3.945**

**ENTRIES = 128**

(a) t+0

(b) t+48

Figure 3.285: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.
Figure 3.286: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.
Figure 3.287: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.
Comparison of analysed METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.288: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.
Figure 3.289: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.
Figure 3.290: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.
Comparison of analysed DWD peak period with averaged buoy data. Forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed BoM peak period with averaged buoy data. Forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed SHOM peak period with averaged buoy data. Forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) DWD peak period with averaged buoy data. Forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) BoM peak period with averaged buoy data. Forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) SHOM peak period with averaged buoy data. Forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

(a) t+0
(b) t+48

Figure 3.291: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.
Figure 3.292: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.
Figure 3.293: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.
Figure 3.294: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Mediterranean Sea buoys.
3.17 Comparison for Korean buoys

Figure 3.295: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.296: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common Korean buoys.
Figure 3.297: Forecast root mean square error (RMSE) and linear correlation coefficient at common Korean buoys.
Figure 3.298: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Korean buoys.
Figure 3.299: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Korean buoys.
Comparison of analysed DWD wave height with averaged buoy data. forecasts from 0 and 12Z.

Symmetric slope = 0.000  
Corr coef = 0.000  
SI = 0.000  
RMSE = 0.000  
BIAS = 0.000  
LSQ fit: Slope = 0.000  Intr = 0.000  
Buoy mean = 0.00  Stdev = 0.000  
Model mean = 0.00  Stdev = 0.000  
Entries = 0

Comparison of analysed BoM wave height with averaged buoy data. forecasts from 0 and 12Z.

Symmetric slope = 0.000  
Corr coef = 0.000  
SI = 0.000  
RMSE = 0.000  
BIAS = 0.000  
LSQ fit: Slope = 0.000  Intr = 0.000  
Buoy mean = 0.00  Stdev = 0.000  
Model mean = 0.00  Stdev = 0.000  
Entries = 0

Comparison of analysed SHOM wave height with averaged buoy data. forecasts from 0 and 12Z.

Symmetric slope = 0.764  
Corr coef = 0.891  
SI = 0.322  
RMSE = 0.436  
BIAS = -0.271  
LSQ fit: Slope = 0.713  Intr = 0.034  
Buoy mean = 1.06  Stdev = 0.740  
Model mean = 0.79  Stdev = 0.592  
Entries = 4000

Comparison of forecast(t=48) DWD wave height with averaged buoy data. forecasts from 0 and 12Z.

Symmetric slope = 0.000  
Corr coef = 0.000  
SI = 0.000  
RMSE = 0.000  
BIAS = 0.000  
LSQ fit: Slope = 0.000  Intr = 0.000  
Buoy mean = 0.00  Stdev = 0.000  
Model mean = 0.00  Stdev = 0.000  
Entries = 0

Comparison of forecast(t=48) BoM wave height with averaged buoy data. forecasts from 0 and 12Z.

Symmetric slope = 0.000  
Corr coef = 0.000  
SI = 0.000  
RMSE = 0.000  
BIAS = 0.000  
LSQ fit: Slope = 0.000  Intr = 0.000  
Buoy mean = 0.00  Stdev = 0.000  
Model mean = 0.00  Stdev = 0.000  
Entries = 0

Comparison of forecast(t=48) SHOM wave height with averaged buoy data. forecasts from 0 and 12Z.

Symmetric slope = 0.438  
Corr coef = 0.938  
SI = 0.322  
RMSE = 0.438  
BIAS = -0.271  
LSQ fit: Slope = 0.674  Intr = 0.201  
Buoy mean = 1.06  Stdev = 0.740  
Model mean = 0.791  Stdev = 0.592  
Entries = 4000

Figure 3.300: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Korean buoys.
Comparison of analysed JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.301: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Korean buoys.

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Figure 3.302: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Korean buoys.
Comparison of analysed METNO wave height with averaged buoy data. forecasts from 0 and 12Z.

\[ \text{SYMMETRIC SLOPE} = 0.000 \]
\[ \text{CORR COEF} = 0.000 \]
\[ \text{RMSE} = 0.000 \]
\[ \text{BIAS} = 0.000 \]

Comparison of analysed SHNSM wave height with averaged buoy data. forecasts from 0 and 12Z.

\[ \text{SYMMETRIC SLOPE} = 0.000 \]
\[ \text{CORR COEF} = 0.000 \]
\[ \text{RMSE} = 0.000 \]
\[ \text{BIAS} = 0.000 \]

Comparison of forecasted METNO wave height with averaged buoy data. forecasts from 0 and 12Z.

\[ \text{SYMMETRIC SLOPE} = 0.000 \]
\[ \text{CORR COEF} = 0.000 \]
\[ \text{RMSE} = 0.000 \]
\[ \text{BIAS} = 0.000 \]

Comparison of forecasted SHNSM wave height with averaged buoy data. forecasts from 0 and 12Z.

\[ \text{SYMMETRIC SLOPE} = 0.000 \]
\[ \text{CORR COEF} = 0.000 \]
\[ \text{RMSE} = 0.000 \]
\[ \text{BIAS} = 0.000 \]

Figure 3.303: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Korean buoys.
Figure 3.304: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Korean buoys.
Figure 3.305: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Korean buoys.
Figure 3.306: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Korean buoys.
Comparison of analysed JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.307: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Korean buoys.
Figure 3.308: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Korean buoys.
Figure 3.309: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Korean buoys.
Figure 3.310: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Korean buoys.
Figure 3.311: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Korean buoys.
Comparison of analysed DWD peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DWD peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed AUSBM peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) AUSBM peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed SHOM peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) SHOM peak period with averaged buoy data, forecasts from 0 and 12Z.

Figure 3.312: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Korean buoys.
Comparison of analysed JMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS peak period with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.313: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Korean buoys.
Comparison of analysed DMI peak period with averaged buoy data. forecasts from 0 and 12Z.

**Korean buoys** 201601 to 201612

**Comparison of forecast(t=t+48) DMI peak period with averaged buoy data. forecasts from 0 and 12Z.**

**N.I.W.A.**

**Comparison of forecast(t=t+48) NIWA peak period with averaged buoy data. forecasts from 0 and 12Z.**

**C.N.R.A.M.**

**Comparison of forecast(t=t+48) CNRAM peak period with averaged buoy data. forecasts from 0 and 12Z.**

(a) $t+0$

(b) $t+48$

Figure 3.314: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Korean buoys.
Figure 3.315: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Korean buoys.
3.18 Comparison for Japanese buoys

Figure 3.316: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.317: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common Japanese buoys.
Figure 3.318: Forecast root mean square error (RMSE) and linear correlation coefficient at common Japanese buoys.
Figure 3.319: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Japanese buoys.
Figure 3.320: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Japanese buoys.
Figure 3.321: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Japanese buoys.
Figure 3.322: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Japanese buoys.
Figure 3.323: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Japanese buoys.
Comparison of analysed METNO wave height with averaged buoy data. Forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000
RMSE = 0.000
BIAS = 0.000
LSQ FIT: SLOPE = 0.000
BUOY MEAN = 0.00
MODEL MEAN = 0.00
STDEV = 0.00

Comparison of forecast(t=0) METNO wave height with averaged buoy data. Forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000
RMSE = 0.000
BIAS = 0.000
LSQ FIT: SLOPE = 0.000
BUOY MEAN = 0.00
MODEL MEAN = 0.00
STDEV = 0.00

Comparison of analysed SHNSM wave height with averaged buoy data. Forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000
RMSE = 0.000
BIAS = 0.000
LSQ FIT: SLOPE = 0.000
BUOY MEAN = 0.00
MODEL MEAN = 0.00
STDEV = 0.00

Comparison of forecast(t=48) SHNSM wave height with averaged buoy data. Forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000
RMSE = 0.000
BIAS = 0.000
LSQ FIT: SLOPE = 0.000
BUOY MEAN = 0.00
MODEL MEAN = 0.00
STDEV = 0.00

(a) t+0

(b) t+48

Figure 3.324: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Japanese buoys.
Japanese buoys 201601 to 201612

Comparison of analysed ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed UKMO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed FNMOC wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.325: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Japanese buoys.
Comparison of analysed AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

**M.S.C.**

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

**N.C.E.P.**

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed METFR wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

**MeteoFrance**

SYMMETRIC SLOPE = 0.857
CORR COEF = 0.867 SI = 0.261
RMSE = 2.078  BIAS = -1.002
LSQ FIT: SLOPE = 0.745  INTR = 0.776
BUOY MEAN = 6.97  STDEV = 3.658
MODEL MEAN = 5.97  STDEV = 3.142
ENTRIES = 21178

Comparison of forecast(t=t+48) AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

**M.S.C.**

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

**N.C.E.P.**

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) METFR wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

**MeteoFrance**

SYMMETRIC SLOPE = 0.863
CORR COEF = 0.777 SI = 0.335
RMSE = 2.531  BIAS = -0.976
LSQ FIT: SLOPE = 0.680  INTR = 1.255
BUOY MEAN = 6.97  STDEV = 3.664
MODEL MEAN = 5.99  STDEV = 3.207
ENTRIES = 2137

(a) t+0

(b) t+48

Figure 3.326: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Japanese buoys.
Figure 3.327: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Japanese buoys.

(a) *t* + 0

(b) *t* + 48
Comparison of analysed JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed PRTOS wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.328: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Japanese buoys.
Japanese buoys 201601 to 201612

Comparison of analysed DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NIWA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) NIWA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed CNRAM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) CNRAM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.329: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Japanese buoys.
Comparison of analysed METNO wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

(a) t+0

(b) t+48

Figure 3.330: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Japanese buoys.
Japanese buoys 201601 to 201612

E.C.M.W.F.

Comparison of analysed ECMWF peak period with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

MetOffice

Comparison of analysed UKMO peak period with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

F.N.M.O.C.

Comparison of analysed FNMOC peak period with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

(a) t+0

(b) t+48

Figure 3.331: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Japanese buoys.
Figure 3.332: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Japanese buoys.
Comparison of analysed DWD peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed AUSBM peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed SHOM peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t+48) DWD peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t+48) AUSBM peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t+48) SHOM peak period with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.333: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Japanese buoys.

(a) $t+0$

(b) $t+48$
Figure 3.334: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Japanese buoys.
Figure 3.335: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Japanese buoys.
Figure 3.336: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Japanese buoys.
Figure 3.337: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.338: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common buoys in list.
Figure 3.339: Forecast root mean square error (RMSE) and linear correlation coefficient at common Buoys in list.
Figure 3.340: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Buoys in list.
Figure 3.341: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Buoys in list.
Figure 3.342: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Buoys in list.
Comparison of analysed JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=48) JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=48) KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=48) PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.343: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Buoys in list.
Figure 3.344: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Buoys in list.
Comparison of analysed METNO wave height with averaged buoy data. Forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed SHNSM wave height with averaged buoy data. Forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t+48) METNO wave height with averaged buoy data. Forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t+48) SHNSM wave height with averaged buoy data. Forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

(a) t+0
(b) t+48

Figure 3.345: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Buoys in list.
Comparison of analysed ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed UKMO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed FNMOC wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast (t=48) ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast (t=48) UKMO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast (t=48) FNMOC wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Figure 3.346: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Buoys in list.
Figure 3.347: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Buoys in list.
Figure 3.348: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Buoys in list.
Comparison of analysed JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PDELESTADO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast\((t+48)\) JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast\((t+48)\) KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast\((t+48)\) PDELESTADO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.349: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Buoys in list.
Figure 3.350: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Buoys in list.
Comparison of analysed METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000  CORR COEF = 0.000  SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000  CORR COEF = 0.000  SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000  CORR COEF = 0.000  SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000  CORR COEF = 0.000  SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Figure 3.351: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Buoys in list.
Figure 3.352: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Buoys in list.
Figure 3.353: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Buoys in list.
Figure 3.354: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Buoys in list.
Figure 3.355: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Buoys in list.

(a) t+0

(b) t+48
Comparison of analysed DMI peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) DMI peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NIWA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) NIWA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed CNRAM peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) CNRAM peak period with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.356: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Buoys in list.
Figure 3.357: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Buoys in list.
3.20 Comparison for Australian South East Coast buoys

Figure 3.358: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.359: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common Australian South East Coast buoys.
Figure 3.360: Forecast root mean square error (RMSE) and linear correlation coefficient at common Australian South East Coast buoys.
Figure 3.361: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
Figure 3.362: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
Figure 3.363: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
Australian South East Coast buoys 201601 to 201612

Comparison of analysed JMA wave height with averaged buoy data. forecasts from 0 and 12Z. 

Comparison of forecast(t=t+48) JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

(a) t+0

(b) t+48

Figure 3.364: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
Figure 3.365: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
Figure 3.366: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
Australian South East Coast buoys 201601 to 201612

Comparison of analysed ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed UKMO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed FNMOC wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) UKMO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) FNMOC wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.367: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
Comparison of analysed AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t+48) AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t+48) NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed METFR wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t+48) METFR wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.368: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
Comparison of analysed DWD wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed AUSBM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed SHOM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DWD wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) AUSBM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) SHOM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.369: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
Figure 3.370: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
Comparison of analysed DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NIWA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) NIWA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed CNRAM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) CNRAM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.371: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
Comparison of analysed METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

**SYMMETRIC SLOPE =** 0.000  
**CORR COEF =** 0.000  
**SI =** 0.000  
**RMSE =** 0.000  
**BIAS =** 0.000

**LSQ FIT: SLOPE =** 0.000  
**INTR =** 0.000

**BUOY MEAN =** 0.00  
**STDEV =** 0.000

**MODEL MEAN =** 0.00  
**STDEV =** 0.000

**ENTRIES =** 0

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

**SYMMETRIC SLOPE =** 0.000  
**CORR COEF =** 0.000  
**SI =** 0.000  
**RMSE =** 0.000  
**BIAS =** 0.000

**LSQ FIT: SLOPE =** 0.000  
**INTR =** 0.000

**BUOY MEAN =** 0.00  
**STDEV =** 0.000

**MODEL MEAN =** 0.00  
**STDEV =** 0.000

**ENTRIES =** 0

Comparison of forecast(t=t+48) METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

**SYMMETRIC SLOPE =** 0.000  
**CORR COEF =** 0.000  
**SI =** 0.000  
**RMSE =** 0.000  
**BIAS =** 0.000

**LSQ FIT: SLOPE =** 0.000  
**INTR =** 0.000

**BUOY MEAN =** 0.00  
**STDEV =** 0.000

**MODEL MEAN =** 0.00  
**STDEV =** 0.000

**ENTRIES =** 0

Comparison of forecast(t=t+48) SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

**SYMMETRIC SLOPE =** 0.000  
**CORR COEF =** 0.000  
**SI =** 0.000  
**RMSE =** 0.000  
**BIAS =** 0.000

**LSQ FIT: SLOPE =** 0.000  
**INTR =** 0.000

**BUOY MEAN =** 0.00  
**STDEV =** 0.000

**MODEL MEAN =** 0.00  
**STDEV =** 0.000

**ENTRIES =** 0

(a) t+0  
(b) t+48

Figure 3.372: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
Figure 3.373: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
Figure 3.374: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
Figure 3.375: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
Australian South East Coast buoys 201601 to 201612

Comparison of analysed JMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS peak period with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.376: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
(a) $t+0$

Figure 3.377: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
Comparison of analysed METNO peak period with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000  CORR COEF =  0.000  SI =  0.000  RMSE =  0.000  BIAS =   0.000
LSQ FIT: SLOPE =  0.000  INTR =  0.000
BUOY  MEAN =    0.00  STDEV =   0.000
MODEL MEAN =    0.00  STDEV =   0.000
ENTRIES =      0

Comparison of forecast(t=t+48) METNO peak period with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE =  0.000  CORR COEF =  0.000  SI =  0.000  RMSE =  0.000  BIAS =   0.000
LSQ FIT: SLOPE =  0.000  INTR =  0.000
BUOY  MEAN =    0.00  STDEV =   0.000
MODEL MEAN =    0.00  STDEV =   0.000
ENTRIES =      0

Figure 3.378: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian South East Coast buoys.
3.21 Comparison for Australian Great Barrier Reef buoys

Figure 3.379: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.380: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common Australian Great Barrier Reef buoys.
Figure 3.381: Forecast root mean square error (RMSE) and linear correlation coefficient at common Australian Great Barrier Reef buoys.
Figure 3.382: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
Australian Great Barrier Reef buoys 201601 to 201612

Figure 3.383: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
Figure 3.384: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
Figure 3.385: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
Figure 3.386: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
Figure 3.387: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
Comparison of analysed ECMWF wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of analysed UKMO wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of analysed FNMOC wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of forecast(t=48) ECMWF wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of forecast(t=48) UKMO wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Comparison of forecast(t=48) FNMOC wind speed with height corrected averaged buoy data. Forecasts from 0 and 12Z.

Figure 3.388: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
Figure 3.389: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
Figure 3.390: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
Figure 3.391: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
Figure 3.392: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
Figure 3.393: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
Figure 3.394: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
Figure 3.395: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
Figure 3.396: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
Figure 3.397: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
Figure 3.398: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
Figure 3.399: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian Great Barrier Reef buoys.
3.22 Comparison for Australian South West facing Coast buoys

Figure 3.400: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.401: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common Australian South West facing Coast buoys.
Figure 3.402: Forecast root mean square error (RMSE) and linear correlation coefficient at common Australian South West facing Coast buoys.
Comparison of analysed ECMWF wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed UKMO wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed FNMOC wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) ECMWF wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) UKMO wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) FNMOC wave height with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.403: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.
Figure 3.404: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.
Figure 3.405: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.
Comparison of analysed JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Sympatic SLOPE = 0.000  
CORR COEF = 0.000  
RMSE = 0.000  
BIAS = 0.000

LSQ FIT:  
BUOY MEAN = 0.00  
MODEL MEAN = 0.00  
ENTRIES = 0

Comparison of analysed KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

Sympatic SLOPE = 0.000  
CORR COEF = 0.000  
RMSE = 0.000  
BIAS = 0.000

LSQ FIT:  
BUOY MEAN = 0.00  
MODEL MEAN = 0.00  
ENTRIES = 0

Comparison of analysed PRITOS wave height with averaged buoy data. forecasts from 0 and 12Z.

Sympatic SLOPE = 0.000  
CORR COEF = 0.000  
RMSE = 0.000  
BIAS = 0.000

LSQ FIT:  
BUOY MEAN = 0.00  
MODEL MEAN = 0.00  
ENTRIES = 0

(a) \( t+0 \)

(b) \( t+48 \)

Figure 3.406: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.
Figure 3.407: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.
Figure 3.408: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.
Figure 3.409: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.
Australian South West facing Coast buoys 201601 to 201612

Comparison of analysed AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed METFR wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) METFR wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Figure 3.410: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.
Figure 3.411: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.
Australian South West facing Coast buoys 201601 to 201612

Comparison of analysed JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.412: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.

(a) t+0

(b) t+48

ENTRIES = 0
MODEL MEAN = 0.00 STDEV = 0.000
BUOY MEAN = 0.00 STDEV = 0.000
LSQ FIT: SLOPE = 0.000 INTR = 0.000
RMSE = 0.000 BIAS = 0.000
CORR COEF = 0.000 SI = 0.000
SYMMETRIC SLOPE = 0.000

ENTRIES = 0
MODEL MEAN = 0.00 STDEV = 0.000
BUOY MEAN = 0.00 STDEV = 0.000
LSQ FIT: SLOPE = 0.000 INTR = 0.000
RMSE = 0.000 BIAS = 0.000
CORR COEF = 0.000 SI = 0.000
SYMMETRIC SLOPE = 0.000

ENTRIES = 0
MODEL MEAN = 0.00 STDEV = 0.000
BUOY MEAN = 0.00 STDEV = 0.000
LSQ FIT: SLOPE = 0.000 INTR = 0.000
RMSE = 0.000 BIAS = 0.000
CORR COEF = 0.000 SI = 0.000
SYMMETRIC SLOPE = 0.000

ENTRIES = 0
MODEL MEAN = 0.00 STDEV = 0.000
BUOY MEAN = 0.00 STDEV = 0.000
LSQ FIT: SLOPE = 0.000 INTR = 0.000
RMSE = 0.000 BIAS = 0.000
CORR COEF = 0.000 SI = 0.000
SYMMETRIC SLOPE = 0.000

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Figure 3.413: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.

(a) \( t+0 \)

(b) \( t+48 \)
Australian South West facing Coast buoys 201601 to 201612

Comparison of analysed METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Figure 3.414: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.
Figure 3.415: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.
Figure 3.416: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.
Figure 3.417: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.
Figure 3.418: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.
Figure 3.419: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.
Comparison of analysed METNO peak period with averaged buoy data. forecasts from 0 and 12Z.

**SYMMETRIC SLOPE = 0.000**
**CORR COEF = 0.000**
**SI = 0.000**
**RMSE = 0.000**
**BIAS = 0.000**

**LSQ FIT: SLOPE = 0.000**
**INTR = 0.000**

**BUOY MEAN = 0.00**
**STDEV = 0.000**

**MODEL MEAN = 0.00**
**STDEV = 0.000**

**ENTRIES = 0**

Comparison of forecast(t=t+48) METNO peak period with averaged buoy data. forecasts from 0 and 12Z.

**SYMMETRIC SLOPE = 0.000**
**CORR COEF = 0.000**
**SI = 0.000**
**RMSE = 0.000**
**BIAS = 0.000**

**LSQ FIT: SLOPE = 0.000**
**INTR = 0.000**

**BUOY MEAN = 0.00**
**STDEV = 0.000**

**MODEL MEAN = 0.00**
**STDEV = 0.000**

**ENTRIES = 0**

Comparison of analysed SHNSM peak period with averaged buoy data. forecasts from 0 and 12Z.

**SYM= 1.070**
**CORR COEF = 0.574**
**SI = 0.140**
**RMSE = 2.001**
**BIAS = 0.916**

**LSQ FIT: SLOPE = 0.551**
**INTR = 6.620**

**BUOY MEAN = 12.70**
**STDEV = 1.966**

**MODEL MEAN = 13.61**
**STDEV = 1.886**

**ENTRIES = 2053**

Comparison of forecast(t=t+48) SHNSM peak period with averaged buoy data. forecasts from 0 and 12Z.

**SYM= 1.068**
**CORR COEF = 0.594**
**SI = 0.138**
**RMSE = 1.963**
**BIAS = 0.887**

**LSQ FIT: SLOPE = 0.584**
**INTR = 6.175**

**BUOY MEAN = 12.71**
**STDEV = 1.961**

**MODEL MEAN = 13.60**
**STDEV = 1.927**

**ENTRIES = 2015**

Figure 3.420: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian South West facing Coast buoys.
Figure 3.421: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.422: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common Australian North West Coast buoys.
Figure 3.423: Forecast root mean square error (RMSE) and linear correlation coefficient at common Australian North West Coast buoys.
Figure 3.424: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian North West Coast buoys.
Figure 3.425: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian North West Coast buoys.
Figure 3.426: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian North West Coast buoys.
Figure 3.427: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian North West Coast buoys.
Comparison of analysed DMI wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed NIWA wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed CNRAM wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DMI wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) NIWA wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) CNRAM wave height with averaged buoy data, forecasts from 0 and 12Z.

Figure 3.428: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian North West Coast buoys.
Comparison of analysed METNO wave height with averaged buoy data, forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000  CORR COEF = 0.000  SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed SHNSM wave height with averaged buoy data, forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000  CORR COEF = 0.000  SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t+0) METNO wave height with averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t+48) SHNSM wave height with averaged buoy data, forecasts from 0 and 12Z.

(a) t+0
(b) t+48

Figure 3.429: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Australian North West Coast buoys.
Comparison of analysed ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed UKMO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed FNMOC wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) ECMWF wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) UKMO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) FNMOC wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.430: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian North West Coast buoys.
Comparison of analysed AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed METFR wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) METFR wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.431: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian North West Coast buoys.

(a) t+0

(b) t+48
Figure 3.432: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian North West Coast buoys.
Comparison of analysed JMA wind speed with height corrected averaged buoy data. 
forecasts from 0 and 12Z.

Comparison of analysed KMA wind speed with height corrected averaged buoy data. 
forecasts from 0 and 12Z.

Comparison of analysed PRTOS wind speed with height corrected averaged buoy data. 
forecasts from 0 and 12Z.

(a) t=0
(b) t=48

Figure 3.433: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian North West Coast buoys.
Figure 3.434: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian North West Coast buoys.
Comparison of analysed METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000
RMSE = 0.000
BIAS = 0.000
LSQ FIT: SLOPE = 0.000
BUOY MEAN = 0.00
STDEV = 0.000
MODEL MEAN = 0.00
STDEV = 0.000
ENTRIES = 0

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000
RMSE = 0.000
BIAS = 0.000
LSQ FIT: SLOPE = 0.000
BUOY MEAN = 0.00
STDEV = 0.000
MODEL MEAN = 0.00
STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000
RMSE = 0.000
BIAS = 0.000
LSQ FIT: SLOPE = 0.000
BUOY MEAN = 0.00
STDEV = 0.000
MODEL MEAN = 0.00
STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000
RMSE = 0.000
BIAS = 0.000
LSQ FIT: SLOPE = 0.000
BUOY MEAN = 0.00
STDEV = 0.000
MODEL MEAN = 0.00
STDEV = 0.000
ENTRIES = 0

Figure 3.435: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Australian North West Coast buoys.
Figure 3.436: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian North West Coast buoys.
Australian North West Coast buoys 201601 to 201612

(a) t+0

Figure 3.437: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian North West Coast buoys.
Comparison of analysed DWD peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed AUSBM peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed SHOM peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DWD peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) AUSBM peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) SHOM peak period with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.438: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian North West Coast buoys.
Australian North West Coast buoys 201601 to 201612

Comparison of analysed JMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS peak period with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.439: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian North West Coast buoys.
Figure 3.440: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian North West Coast buoys.
Comparison of analysed METNO peak period with averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed SHNSM peak period with averaged buoy data, forecasts from 0 and 12Z.

(a) t+0
(b) t+48

Figure 3.441: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Australian North West Coast buoys.
Figure 3.442: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.443: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common New Zealand buoy.
Figure 3.444: Forecast root mean square error (RMSE) and linear correlation coefficient at common New Zealand buoy.
Comparison of analysed ECMWF wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) ECMWF wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed UKMO wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) UKMO wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed FNMOC wave height with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) FNMOC wave height with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.445: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at New Zealand buoy.
Figure 3.446: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at New Zealand buoy.
Figure 3.447: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at New Zealand buoy.
Comparison of analysed JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

ENTRIES = 660
MODEL MEAN = 1.90 STDEV = 0.746
BUOY MEAN = 1.95 STDEV = 0.745
RMSE = 0.376 BIAS = -0.054
SYMMETRIC SLOPE = 0.976

Comparison of forecast(t=t+48) JMA wave height with averaged buoy data. forecasts from 0 and 12Z.

ENTRIES = 650
MODEL MEAN = 1.69 STDEV = 0.771
BUOY MEAN = 1.96 STDEV = 0.739
RMSE = 0.472 BIAS = -0.265
SYMMETRIC SLOPE = 0.877

Comparison of analysed KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

ENTRIES = 660
MODEL MEAN = 2.06 STDEV = 0.771
BUOY MEAN = 2.00 STDEV = 0.784
LDG FIT: SLOPE = 0.867 INTR = 0.367
RMSE = 0.439 BIAS = 0.123
SYMMETRIC SLOPE = 0.010

Comparison of forecast(t=t+48) KMA wave height with averaged buoy data. forecasts from 0 and 12Z.

ENTRIES = 650
MODEL MEAN = 2.15 STDEV = 0.826
BUOY MEAN = 1.96 STDEV = 0.739
LSQ FIT: SLOPE = 0.952 INTR = 0.282
RMSE = 0.473 BIAS = 0.189
SYMMETRIC SLOPE = 1.099

Comparison of analysed PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

ENTRIES = 0
MODEL MEAN = 0.00 STDEV = 0.000
BUOY MEAN = 0.00 STDEV = 0.000
RMSE = 0.000 BIAS = 0.000
SYMMETRIC SLOPE = 0.000

Comparison of forecast(t=t+48) PRTOS wave height with averaged buoy data. forecasts from 0 and 12Z.

ENTRIES = 0
MODEL MEAN = 0.00 STDEV = 0.000
BUOY MEAN = 0.00 STDEV = 0.000
RMSE = 0.000 BIAS = 0.000
SYMMETRIC SLOPE = 0.000

(a) $t+0$

(b) $t+48$

Figure 3.448: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at New Zealand buoy.
Figure 3.449: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at New Zealand buoy.
Figure 3.450: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at New Zealand buoy.
Figure 3.451: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at New Zealand buoy.
Comparison of analysed AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) AES wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) NCEP wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed METFR wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) METFR wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Figure 3.452: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at New Zealand buoy.
Figure 3.453: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at New Zealand buoy.
Comparison of analysed JMA wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed KMA wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of analysed PRTOS wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=48) JMA wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=48) KMA wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Comparison of forecast(t=48) PRTOS wind speed with height corrected averaged buoy data, forecasts from 0 and 12Z.

Figure 3.454: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at New Zealand buoy.
Comparison of analysed DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed NIWA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed CNRAM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) DMI wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) NIWA wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=48) CNRAM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

(a) $t+0$

(b) $t+48$

Figure 3.455: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at New Zealand buoy.
Figure 3.456: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at New Zealand buoy.
Figure 3.457: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at New Zealand buoy.
Figure 3.458: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at New Zealand buoy.
Figure 3.459: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at New Zealand buoy.
Comparison of analysed JMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) JMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) KMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) PRTOS peak period with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.460: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at New Zealand buoy.
Figure 3.461: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at New Zealand buoy.
Figure 3.462: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at New Zealand buoy.

(a) t+0

(b) t+48
3.25 Comparison for Brazilian buoys

Figure 3.463: Buoy locations. The numbers in the table following each buoy identifier are the number of collocations between models and buoy wind speed, wave height and peak period.
Figure 3.464: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations) and bias (model-buoy) at common Brazilian buoys.
Figure 3.465: Forecast root mean square error (RMSE) and linear correlation coefficient at common Brazilian buoys.
Figure 3.466: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Brazilian buoys.
Figure 3.467: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Brazilian buoys.
Figure 3.468: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Brazilian buoys.
Figure 3.469: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Brazilian buoys.
Figure 3.470: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Brazilian buoys.
Figure 3.471: Scatter diagrams for wave height at step 0 and 48 for the displayed centres at Brazilian buoys.
Figure 3.472: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Brazilian buoys.
Figure 3.473: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Brazilian buoys.
Figure 3.474: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Brazilian buoys.
Figure 3.475: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Brazilian buoys.
Figure 3.476: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Brazilian buoys.

(a) t+0

(b) t+48
Comparison of analysed METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000  CORR COEF = 0.000  SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=t+48) METNO wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000  CORR COEF = 0.000  SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.961  CORR COEF = 0.778  SI = 0.288
RMSE = 2.224  BIAS = -0.309
LSQ FIT: SLOPE = 0.751  INTR = 1.590
BUOY MEAN = 7.64  STDEV = 3.360
MODEL MEAN = 7.33  STDEV = 3.246
ENTRIES = 868

Comparison of forecast(t=t+48) SHNSM wind speed with height corrected averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.966  CORR COEF = 0.723  SI = 0.324
RMSE = 2.481  BIAS = -0.280
LSQ FIT: SLOPE = 0.707  INTR = 1.952
BUOY MEAN = 7.62  STDEV = 3.350
MODEL MEAN = 7.34  STDEV = 3.277
ENTRIES = 850

Figure 3.477: Scatter diagrams for wind speed at step 0 and 48 for the displayed centres at Brazilian buoys.
Figure 3.478: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Brazilian buoys.
Figure 3.479: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Brazilian buoys.
Comparison of analysed DWD peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) DWD peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed AUSBM peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) AUSBM peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed SHOM peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast(t=t+48) SHOM peak period with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.480: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Brazilian buoys.
Comparison of analysed JMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) JMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed KMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) KMA peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of analysed PRTOS peak period with averaged buoy data. forecasts from 0 and 12Z.

Comparison of forecast (t=t+48) PRTOS peak period with averaged buoy data. forecasts from 0 and 12Z.

Figure 3.481: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Brazilian buoys.
Comparison of analysed DMI peak period with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed NIWA peak period with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of analysed CNRAM peak period with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=48) DMI peak period with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=48) NIWA peak period with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

Comparison of forecast(t=48) CNRAM peak period with averaged buoy data. forecasts from 0 and 12Z.

SYMMETRIC SLOPE = 0.000
CORR COEF = 0.000 SI = 0.000
RMSE = 0.000  BIAS = 0.000
LSQ FIT: SLOPE = 0.000  INTR = 0.000
BUOY MEAN = 0.00  STDEV = 0.000
MODEL MEAN = 0.00  STDEV = 0.000
ENTRIES = 0

(a) t+0

(b) t+48

Figure 3.482: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Brazilian buoys.
Comparison of analysed METNO peak period with averaged buoy data. Forecasts from 0 and 12Z.

\[
\text{SYMMETRIC SLOPE} = 0.000 \quad \text{CORR COEF} = 0.000 \quad \text{SI} = 0.000
\]

\[
\text{RMSE} = 0.000 \quad \text{BIAS} = 0.000
\]

\[
\text{LSQ FIT: SLOPE} = 0.000 \quad \text{INTR} = 0.000
\]

\[
\text{BUOY MEAN} = 0.00 \quad \text{STDEV} = 0.000
\]

\[
\text{MODEL MEAN} = 0.00 \quad \text{STDEV} = 0.000
\]

\[
\text{ENTRIES} = 0
\]

Comparison of analysed SHNSM peak period with averaged buoy data. Forecasts from 0 and 12Z.

\[
\text{SYMMETRIC SLOPE} = 0.995 \quad \text{CORR COEF} = 0.412 \quad \text{SI} = 0.249
\]

\[
\text{RMSE} = 2.393 \quad \text{BIAS} = -0.043
\]

\[
\text{LSQ FIT: SLOPE} = 0.403 \quad \text{INTR} = 5.715
\]

\[
\text{BUOY MEAN} = 9.65 \quad \text{STDEV} = 2.238
\]

\[
\text{MODEL MEAN} = 9.61 \quad \text{STDEV} = 2.191
\]

\[
\text{ENTRIES} = 129
\]

Figure 3.483: Scatter diagrams for peak period at step 0 and 48 for the displayed centres at Brazilian buoys.