The Global Data-processing and Forecasting Systems (GDPFS)

S-GDPFS Drafting Team Meeting

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Origine of the GDPFS

- UN Gen Assembly XVI (Dec 1961) adopted Resolution 1721 “International Cooperation in the Peaceful Uses of Outer Space”.
- WMO was requested to study measures to advance the state of atmospheric science and technology and to develop weather forecasting capabilities.
- WMO Cg 4 (1963) created WWW composed of GDPS, GOS -> WIGOS and GTS -> WIS operated by WMO Members for the collection, analysis and dissemination of meteorological data and processed products.
- On Recommendation of CBS-Ext(02), Cg 14 (2003) changed GDPS to GDPFS.
Purpose of the GDPFS

• The GDPFS provides the core operational prediction capabilities and systems of WMO (operated by Members)
  – Nowcasting (VSRF) – 0-6h
  – Numerical Weather Prediction & EPS – 6h-15d
  – Long-Range Forecasting – Sub-seasonal to Longer Time Scales – up to 2 years
  – Emergency Response Activities for Nuclear and Non-Nuclear dispersion
  – Specialised centres – eg sand and dust-storm, tropical cyclone centres
WMO operational networks

NMHSs deliver analyses, forecast and early warning services

The GDPFS:
Global, Regional Specialized Met. Centres (RSMC, RCC), and National Centres

191 NMHSs: satellites, land, ships, buoys, and aircraft contribute to Global Observing every day

Global Telecom with Regional Hubs – becoming the WMO Information System

NMHSs deliver analyses, forecast and early warning services
The Role of the GDPFS in creating services

Observations (in situ and remote sensing)

Data processing & Forecast Model

Knowledge & Research

Forecasting & service delivery

Users (DMCPA, sectors)
At the heart (engine room) of the WMO operational system

Global societal needs

Drivers

Inputs

Processes

Outputs

Societal benefits

- Disaster risk reduction
- Safety and economic operation of air, marine and land transport
- Resilience to climate variability and change
- Sustainable use of natural resources
- Economic growth

Enablers

- Standards, quality management, risk management, efficiency, effectiveness
- Capacity development
- Partnerships
The GDPFS ...  

- Is organized as a **three-level system** to carry out functions at global, regional and national levels

- World Meteorological Centre (WMC)
- Regional Specialized Meteorological Centre (RSMC) (incl. Regional Climate Centre (RCC))
- National Meteorological Centre (NMC)
WMO Designated Global Data-processing and Forecasting System Centres

Legend
- World Meteorological Centres *
- RSMCs Geographic
- RSMC Nowcasting
- Global Producing Centres for Long-Range Forecasts
- RSMCs TC
- RSMCs Sand/Dust
- Atmospheric Transport Modelling
- Regional Climate Centres

* World Meteorological Centres are also Global Producing Centres for a) Deterministic Numerical Weather Prediction, b) Ensemble Numerical Weather Prediction, and c) Long-Range Forecasts.

DESIGNATIONS USED
The depiction and use of boundaries, geographic names and related data shown on maps and included in lists, tables, documents, and databases on this website are not warranted to be error free nor do they necessarily imply official endorsement or acceptance by the WMO.
The GDPFS relates to **WIGOS** through:
- WMCs and RSMCs observational requirements for their functions through the Rolling Review of Requirements and associated Statement of Guidance (e.g. Global NWP, high-resolution NWP, Nowcasting and Very Short-range Forecasting, Sub-seasonal to Longer Predictions).
- Quality Control of GDPFS aligned with WIGOS quality assurance and quality control standards (e.g. through the WIGOS NWP monitoring Pilot Project).

The GDPFS relates to **WIS, the WMO Information System**
- For the exchange and delivery of GDPFS data, products and services. One of the key features of the WIS compared to the previous GTS is the expansion of the range of centres that can connect to the system; this in turn supports growth in the range of GDPFS applications. Currently, WMCs are registered under WIS as GISCs or DCPCs; RSMCs are registered under WIS as DCPCs and NMCs are registered under WIS as NCs.
FUTURE GDPFS
Some Emerging Needs influencing the GDPFS...

• Impact-Based Forecasting and Risk-based Warning: GDPFS need to integrate non conventional information: Vulnerability and Exposure

• Trajectory-Based Forecasting for Aviation: Nowcasting (landing/take off), short term forecasts (enroute): Seamless Met Info required for take off, enroute and landing – Requires seamless blending of nowcasting, mesoscale and global NWP

• Support to GFCS (extreme events, sub-seasonal to climate forecasting)

• Climate change and variability are imposing new challenges to National Meteorological and Hydrological Services (NMHSs) requiring them to produce information at various time scales.

• Technology advances at high pace (ie doubling of Computing capacity every ~18 months) and limited availability of resources
To meet these needs, the GDPFS must evolve to...

- Being capable of serving more users with one integrated system
- Being more agile and adaptable to serve Applications Programmes (AeM, AgMet, MMO, PWS), HydroMet and weather (polar & mountain areas), climate and environment related needs (forest fire, chemical spills, sand & dust storms, etc)
- Provide information seamlessly across:
  - **Time scales** (nowcasting, through weather forecasts for days and weeks ahead to long-range forecasts on seasonal and up to multi-annual scales) and;
  - **Disciplines** (Hydrology: flood, inundation, water management; Marine and Costal: Wave, Storm Surge; Air Quality and Sand and Dust Storm; Natural resources and Energy sectors, Tourism, Transports, etc.)
- Transfer science results to operation seamlessly
To that end Cg17 adopted Resolution 11:

• “Towards a future enhanced integrated and seamless Data-processing and forecasting system” expressed Congress decision to:

“Initiate a process for the gradual establishment of a future enhanced integrated and seamless WMO Data-processing and Forecasting System, in the light of the conclusions of the first World Weather Open Science Conference held in Montreal, Canada in August 2014, in particular that a seamless system encompasses several dimensions including timescales, multiple weather related hazards and societal impacts”
Seamless Prediction

Essential support to decision making on all timescales

Forecast lead-time

- Now
- Hours
- Days
- 1-week
- 1-month
- Seasonal
- Decadal
- Climate

Analysis of past weather observations to manage climate risks
Eg. Agriculture: informs crop choice, planting to yield optimisation and minimise crop failure risk.

Predicting routine and hazardous weather conditions.
Public, emergency response, international Disaster Risk Reduction

Monthly to decadal predictions - probability of drought, cold, hurricanes…
Contingency planners, national and international humanitarian response, government and private infrastructure investment

Global and regional climate predictions.
Informs mitigation policy and adaptation choices. Impacts on water resources, heat stress, crops, infrastructure.
In addition…

• Cg-16 (2011) through, Resolution 6, recognized the central role of the GDPFS by affirming that the Manual on the GDPFS (WMO-No 485) is the single source of technical regulations for all operational data-processing and forecasting systems operated by WMO Members.

• A new Manual is being developed and its adoption is planned for EC-69 following Recommendation from the upcoming CBS-16 (Nov 2016)
The Manual on the GDPFS (WMO-No. 485)

- A single source of technical regulations for all operational data-processing and forecasting systems operated by WMO Members (Cg-16)

- It includes the designation of meteorological centres, including those coordinated by CBS, jointly with other technical commission(s) and/or WMO Programme(s), as well as with other international organizations
What is new in the New GDPFS Manual?

- Clear Definition of Designation Criteria for Centres (WMC, RSMCs, GPCs) – Contribution of TCs (i.e., RSMC for Marine is required) – Metareas designated as RSMC
- Provision of detailed information regarding Centers implementation
  - Systems description and characteristics
  - Product metadata
- Verification of products
- Rolling Review of Centre Compliance (Regular Audit)
- Clear Establishment of Procedures for designation
- Additional WMCs a possibility
The CSIS & S-GDPFS

• The Climate Services Information System (CSIS) is the principal GFCS mechanism that will routinely collate, store and process information about past, present and future climate.

• **GDPFS needs to cover** climate timescales: *past* including historic data, *present* including climate monitoring, *future* including climate projections

• In designing the S-GDPFS, operational aspects of CSIS will need to be considered
S/GDPFS Implementation

• Draft IP development approach endorsed by EC-70
• IP to be developed and submitted to Cg-18
• Pilots projects to be considered in the IP
Thank you for your attention