World Meteorological Organization

Weather • Climate • Water

First WMO Workshop on Operational Climate Prediction
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Overview of the Global Data Processing and Forecasting System (GDPFS) and WMO infrastructure for long-range predictions

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Chief Data Processing and Forecasting System (WMO)

Origin 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 – 191)
  - 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

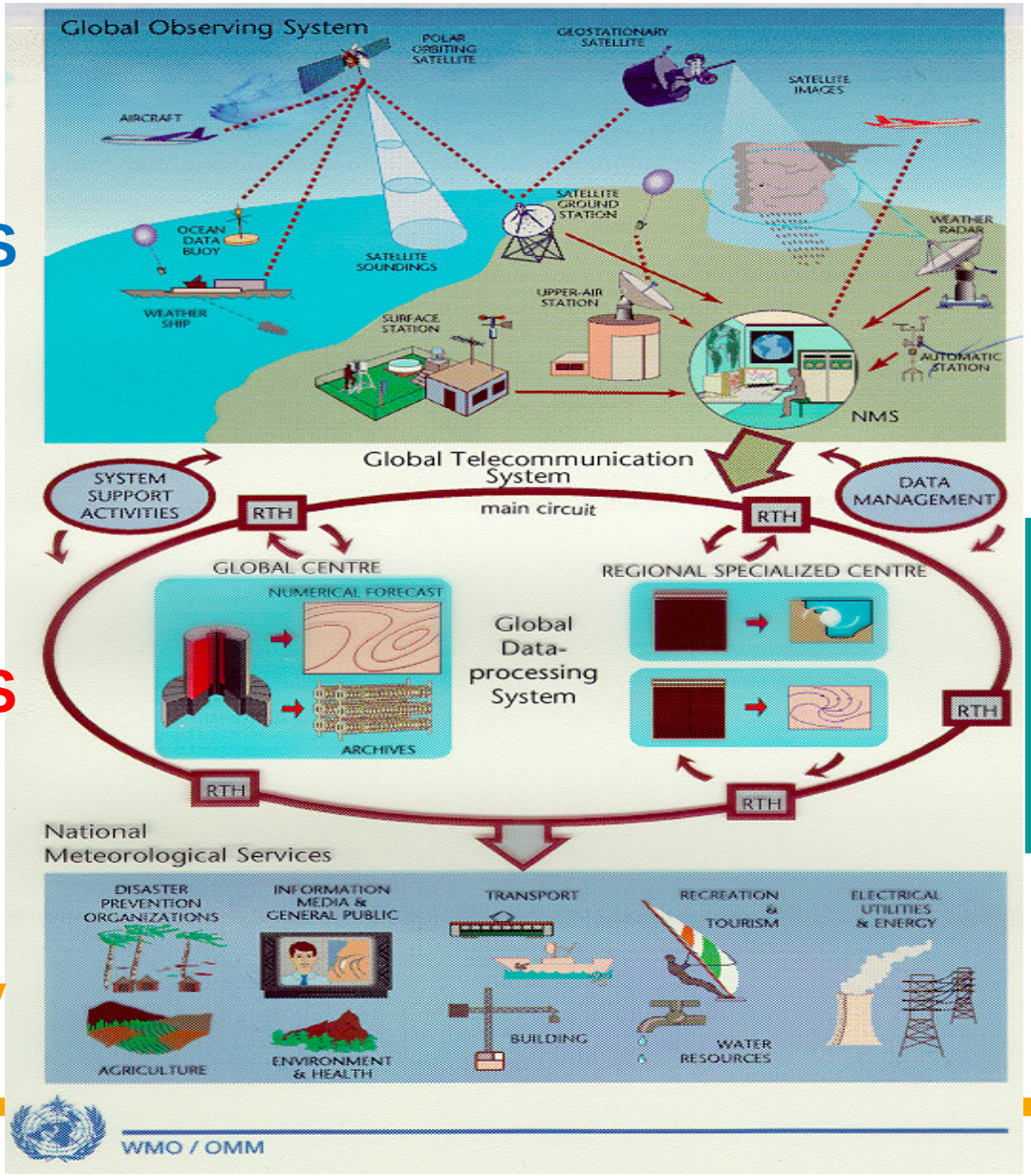
WMO operational networks

WIGOS

WIS

GDPFS

Service delivery



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

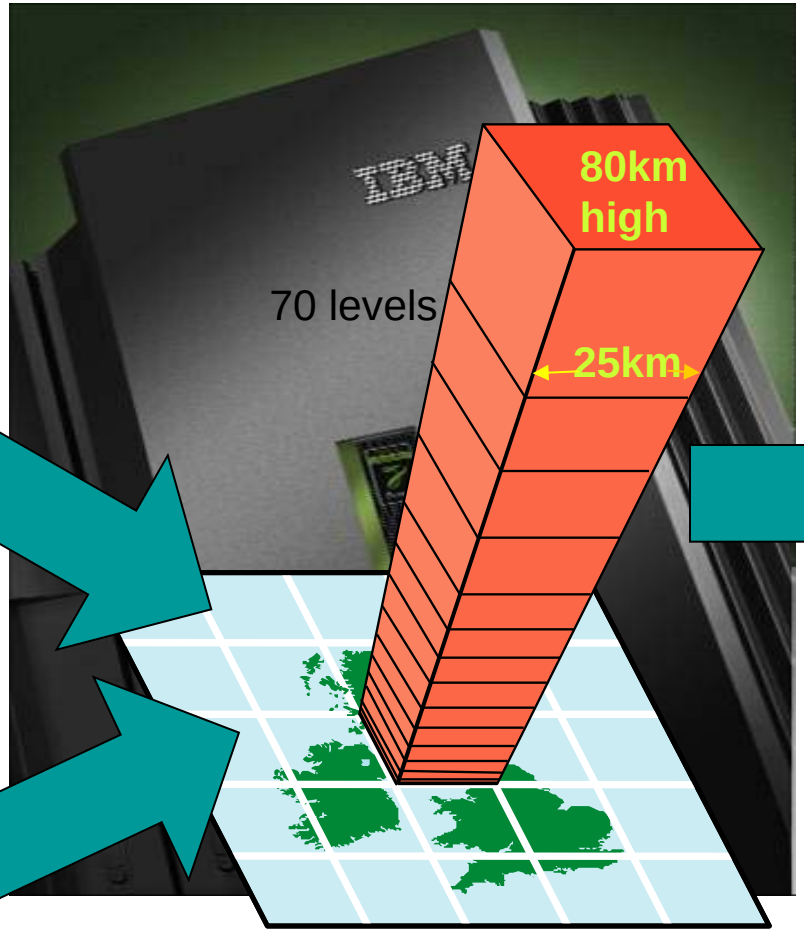
Global Telecom with Regional Hubs – becoming the WMO Information System

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

NMHSs deliver analyses, forecast and early warning services

The Role of the GDPFS in creating services

Observations



Forecast Model

Interpretation, Risk Analysis & Communication

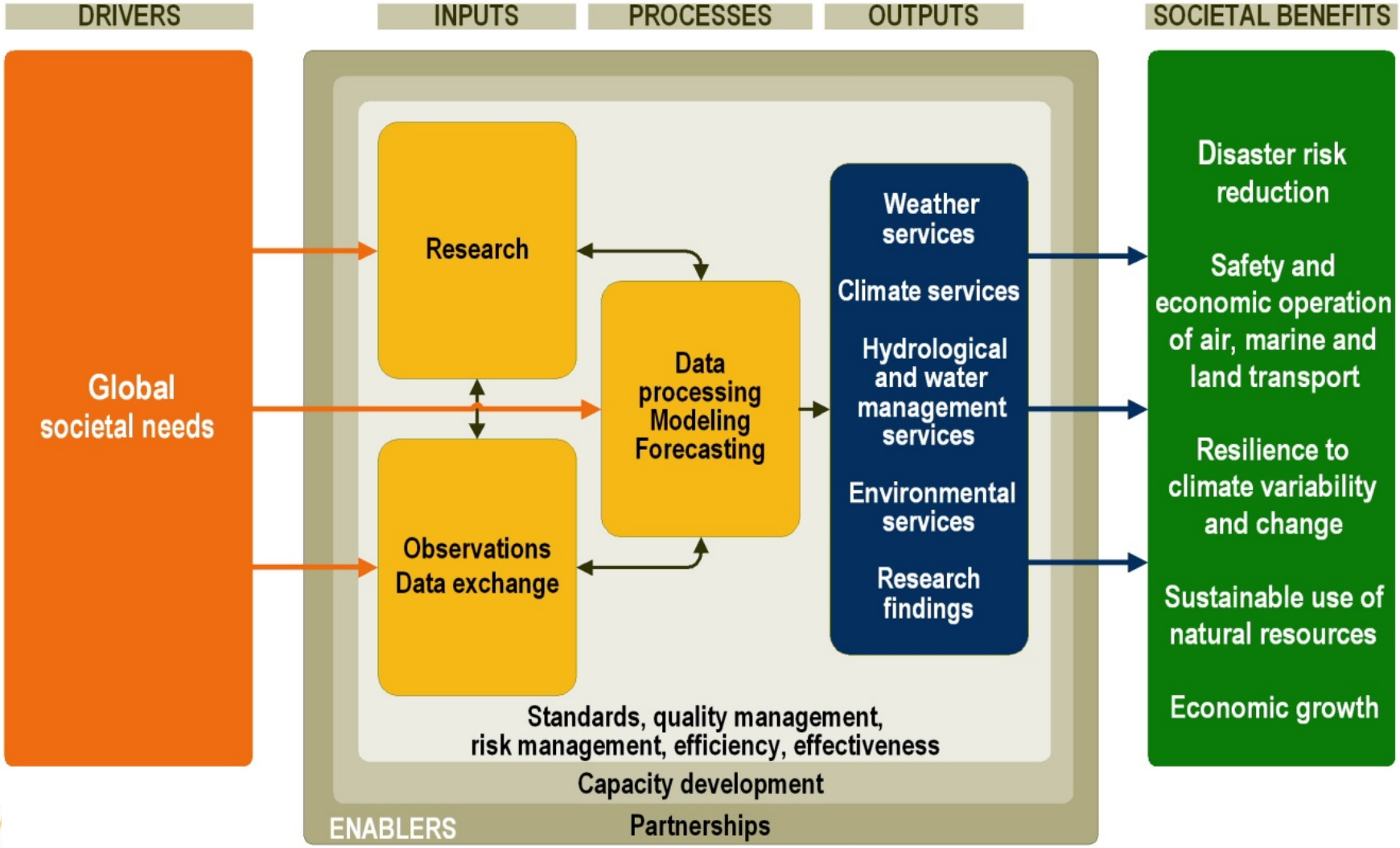
$$\frac{du}{dt} = \frac{\partial p}{\partial x} - fv$$

$$\frac{dv}{dt} = \frac{\partial p}{\partial y} + fu$$

$$\frac{p}{\rho} = RT$$

Knowledge

At the heart (engine room) of the WMO operational system

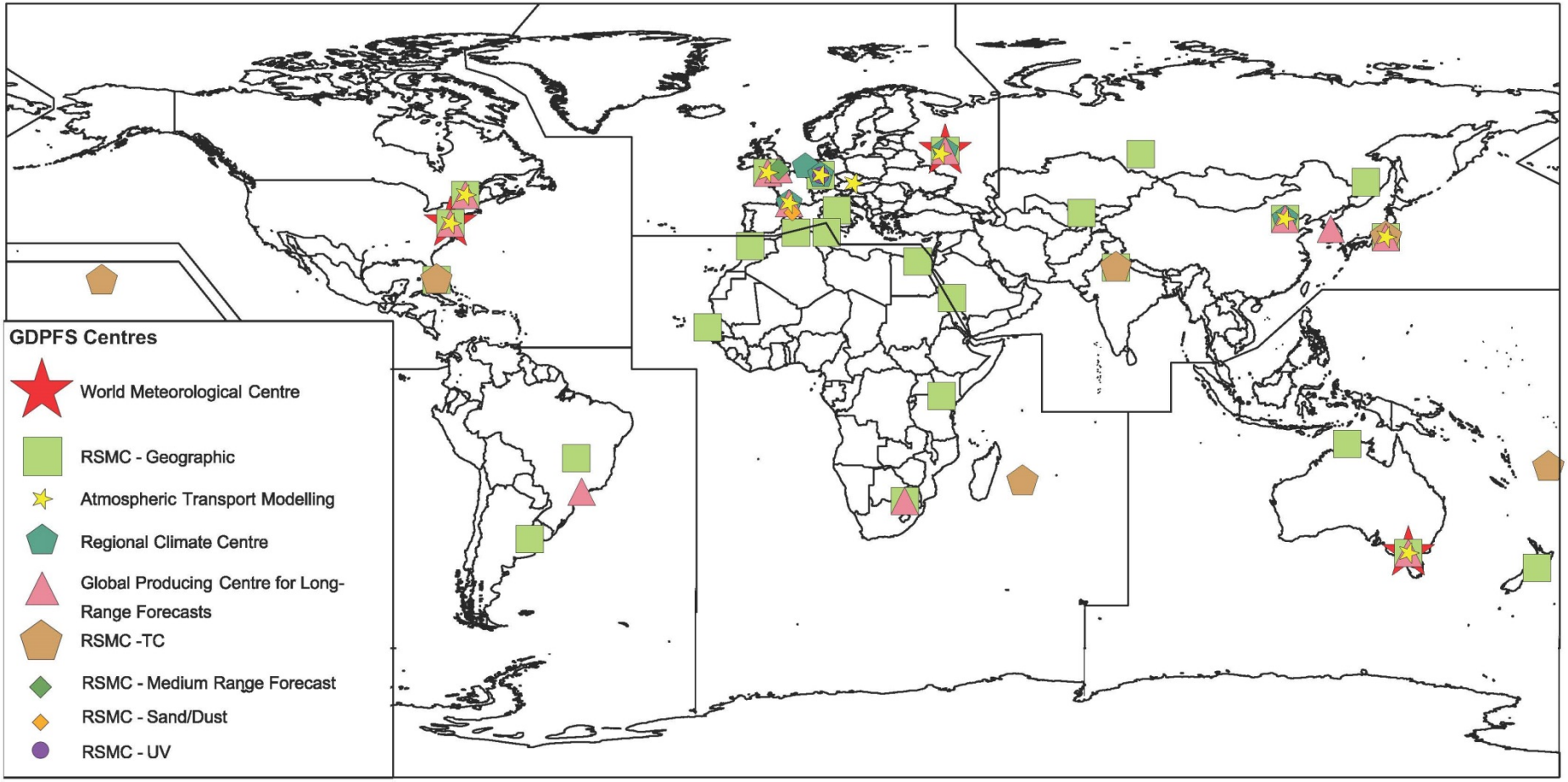


The GDPFS …

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

  - World Meteorological Centre (WMC) / Global Producing Centre (GPC)
  - Regional Specialized Meteorological Centre / Regional Climate Centre (RSMC / RCC)
  - National Meteorological Centre (NMC) / National Climate Centre

The GDPFS today…



- **3 WMCs**
- **25 RSMCs with Geographical Specialization and 16 with Activity Specialization**
- **12 GPCs (LRF)**
- **5 RCCs and 1 RCC-Network**

Handling Long-Range Forecasting (LRF)
A network of Centres

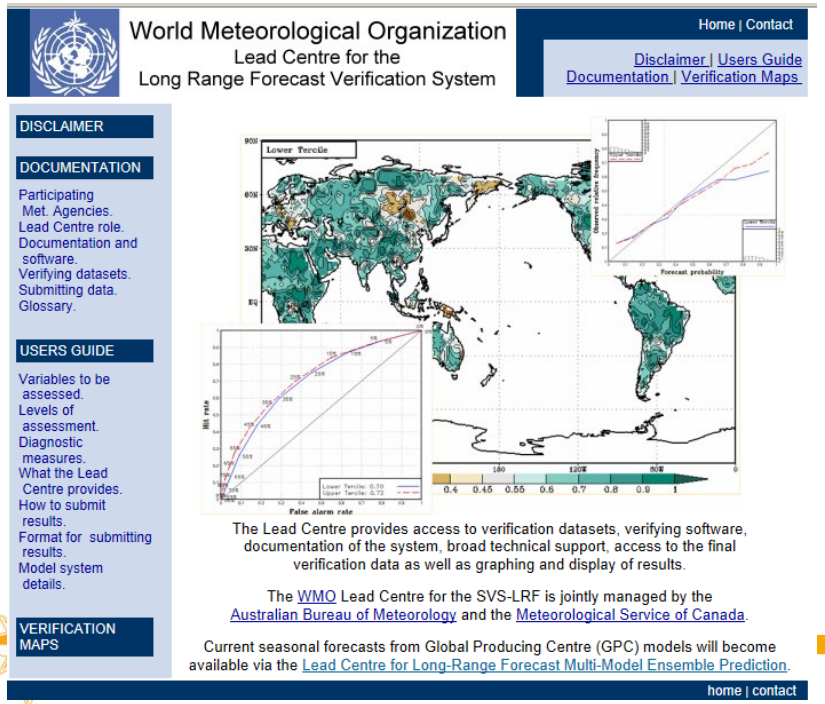
- **12 Global Producing Centres of Long-Range Forecasts (GPCs)**: Beijing, CPTEC (Brazil), Exeter, Melbourne, Montreal, Moscow, Pretoria, Seoul, Tokyo, Toulouse, Washington, ECMWF

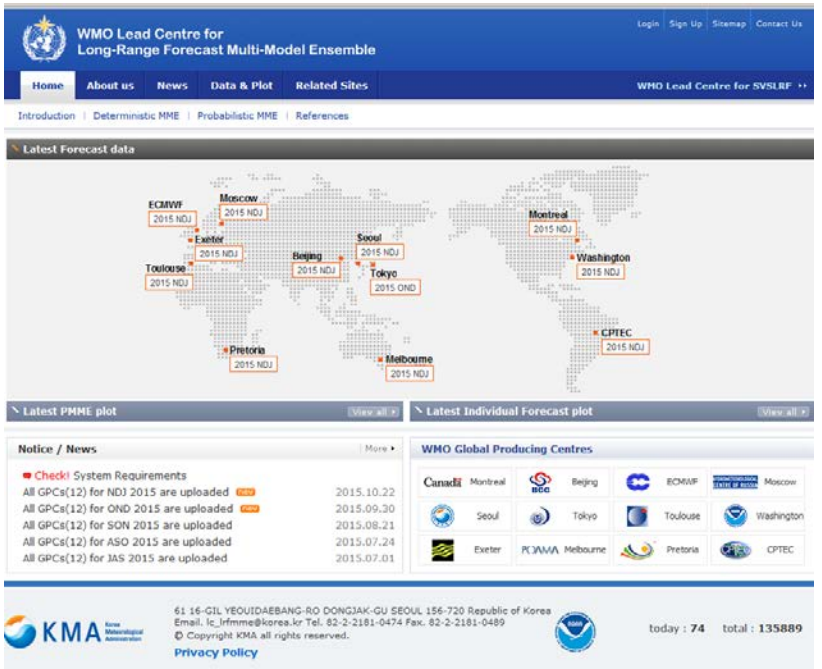
- **Regional Climate Centres (RCCs)**: Africa hosted by ACMAD (RA I), Beijing (RA II), Tokyo (RA II), Moscow (RA II) – NEACC, Western South America hosted by CIIFEN (RA III), Network (RA VI)

- **National Climate Centres (NCCs)**

Handling Long-Range Forecasting (LRF)
A network of Centres (Cont…)

- **Lead Centre for Standard Verification System of LRF** (Melbourne-Montreal) : **LC- SVSLRF**





- **Lead Centre for LRF Multi-Model Ensemble** (Seoul-Washington): **LC-LRFMME**

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

- 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

Manual on the GDPFS (WMO-No. 485)

- Current version: https://www.wmo.int/pages/prog/www/DPFS/Manual/GDPFS-Manual.html

- New Edition: https://www.wmo.int/pages/prog/www/DPS/Manual/Table-of-content_Manual-gdpfs.html

What is new in the New GDPFS Manual?

- Clear Definition of Designation Criteria
- Provision of detailed information regarding Center's implementation
  - Systems description and characteristics
  - Product metadata
- Verification of products
- Rolling Review of Centre Compliance (Regular Audit)
- Clear Establishment of Procedures

Emerging Issues and Pressures on GDPFS…

- Requirement to move to 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 (Xtreme 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.
- Users' needs are becoming more and more sophisticated and varied while the technology is evolving at high pace (ie doubling of Computing capacity every ~18 months)
- Requirement from Govts to produce more information with less resources – Fiscal restreints

To address these issues, the GDPFS needs to 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 , Tourisme, Transports, etc.)

Cg17 Resolution 11 – Future of the GDPFS

- **: “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”

Addressing the Cg 17 Resolution 11

- Setting up a team of Experts to discuss how to go about this task and to propose a:
  - Roadmap and;
  - White paper on the subject

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Thank you for your attention!