

# Weather Forecasting: WMO's GLOBAL DATA- PROCESSING AND FORECASTING SYSTEM

Meteorological services to support humanitarian  
contingency planning and response  
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# *Weather forecasting – the GDPFS*

## **Outline**

- *Introduction to “GDPFS”*
- *GDPFS and Disaster Risk Reduction*
- *Organization of the GDPFS*
- *Activities of data-processing and forecasting, and environmental emergency response*
- *Some thoughts and considerations...*



# Numerical simulations of the atmosphere

*“In general, the public is not aware that our daily weather forecasts start out as initial value problems on the major national weather services supercomputers. Numerical weather prediction provides the basic guidance for weather forecasting beyond the first few hours.”*

*- Eugenia Kalnay (2003)*



# So... where do you get your weather forecast?

*Dressing for work?  
Umbrella or Wellies?  
Planning outdoor work?*

*Planning your first wedding?  
Planning your vacation?  
Investment in futures?*





## Purpose and Scope

### **GLOBAL DATA-PROCESSING & FORECASTING SYSTEM**

To make available to WMO Members, weather and climate analyses, predictions/forecasts to enable them *to provide in the most cost-effective way, high-quality weather forecasts, warnings and other information services in national activities related to weather, environmental quality and climate-sensitive areas*

To support other WMO programmes, and relevant programmes of other international organizations.

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## GDPFS Functions

- ◆ **24/7 real-time weather forecasting:** collection and processing of data, preparation of analyses and predictions of structure of the atmosphere, preparation of forecasts and warnings (basic and derived atmospheric parameters), specialized products and services, monitoring data quality.
- ◆ **Delayed-mode:** climate diagnoses, verification of NWP products, archiving of data and products, case-studies, product development, training and building capacity, interaction with users and R&D.



# GDPFS relative to Disaster Risk Reduction

- ✓ *Operational infrastructure and role of national meteorological centres, and of Regional Specialized Meteorological Centres (RSMC)*
- ✓ *Applications of Numerical Weather Prediction outputs to forecasting severe and high-impact weather*
- ✓ *Probabilistic approach to forecasting rare events, e.g. use of “ensemble” products*
- ✓ *Improved skill and lead-time of predictions*
- ✓ *Severe Weather Forecasting Demonstration Project*

# GDPFS relative to Disaster Risk Reduction

## **GDPFS supporting Environmental Emergency Response**

- ✓ *Tracking airborne hazards*
- ✓ *Role of RSMCs for operational atmospheric transport modelling*
- ✓ *Natural events of extreme intensity can trigger an environmental emergency*
- ✓ *Meteorological support to emergencies includes support to response operations, and advice on atmospheric dispersion*

## **Agreements with International Organizations**

- *Specified products and standards with IAEA, CTBTO, ICAO*
- *Discussions with UN-OCHA, WHO*





# WMO Manual on the GDPFS

*A Technical Document: WMO - No. 485*

*Volume I – Global Aspects is part of the WMO Technical Regulations*

*Centres of the GDPFS must follow the regulations in relation to operational products and their delivery*

- *Organization of the GDPFS*
- *Functions of the Centres of the GDPFS*
- *Including: “Arrangements for meteorological assistance to UN Humanitarian Missions” (Appendix I-5)*



# Official 3-Level Organization of “GDPFS”

- ◆ **World Meteorological Centres “WMC”**
- ◆ **Regional Specialized Meteorological Centres,  
“RSMC”**
- ◆ **National Meteorological Centres, “NMC”**



## *Status of GDPFS*

### ◆ **Global Models (16 centres)**

- 11 of those sharing global results with 187 NMCs (via GTS, Satellite broadcast, or Internet)
- 7 of those providing boundary conditions to NMCs to run Limited Area Model (LAM)

### ◆ **Limited Area Models (83 centres)**

- High-resolution “meso-scale” NWP, limited coverage, over entire country, or highly populated subregions

- ◆ 105 NMCs do not run any NWP model, including about 30 NMCs are not automated

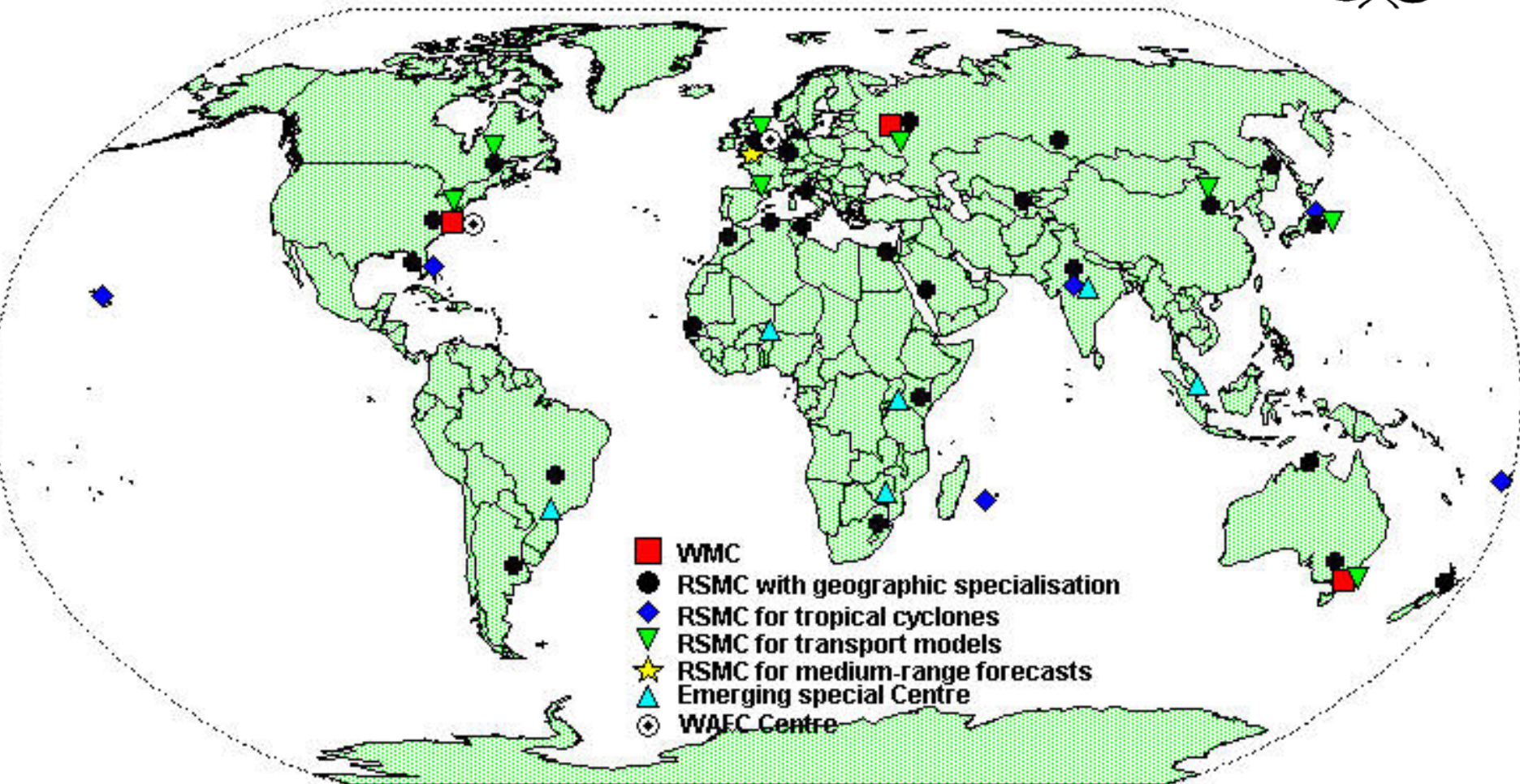
# 40 RSMCs of the GDPFS

*Centres are “Regional” and “Specialized” and operational 24/7:*

- ◆ *Geographical Specialization, or*
- ◆ *Activity Specialization*
  - ✓ *Medium-range forecasting*
  - ✓ *Tropical Cyclones (forecasting)*
  - ✓ *Atmospheric Transport Modelling (environmental emergencies)*
  - ✓ *Global Producing Centres for Long-range Forecasts and Regional Climate Centres*
  - ✓ *affiliated: ICAO Volcanic Ash Advisory Centres*



# GDPFS CENTRES



- WMC
- RSMC with geographic specialisation
- ◆ RSMC for tropical cyclones
- ▼ RSMC for transport models
- ★ RSMC for medium-range forecasts
- ▲ Emerging special Centre
- ⊕ WAFC Centre

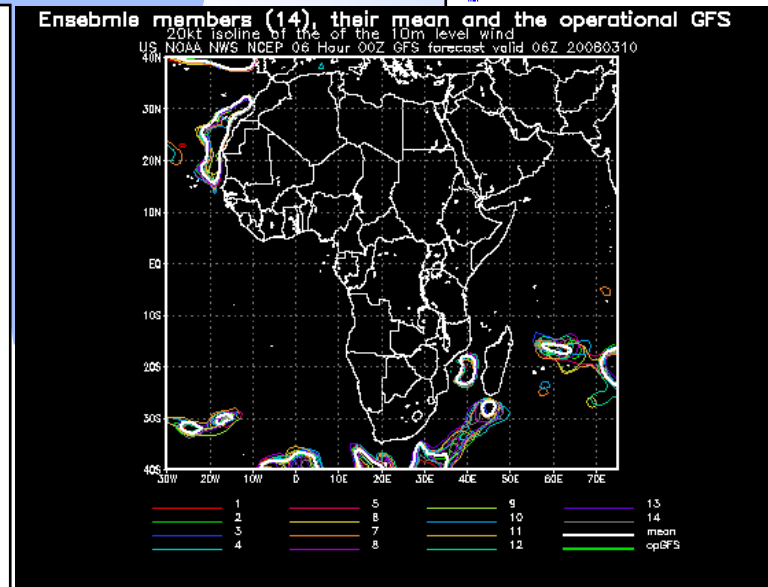
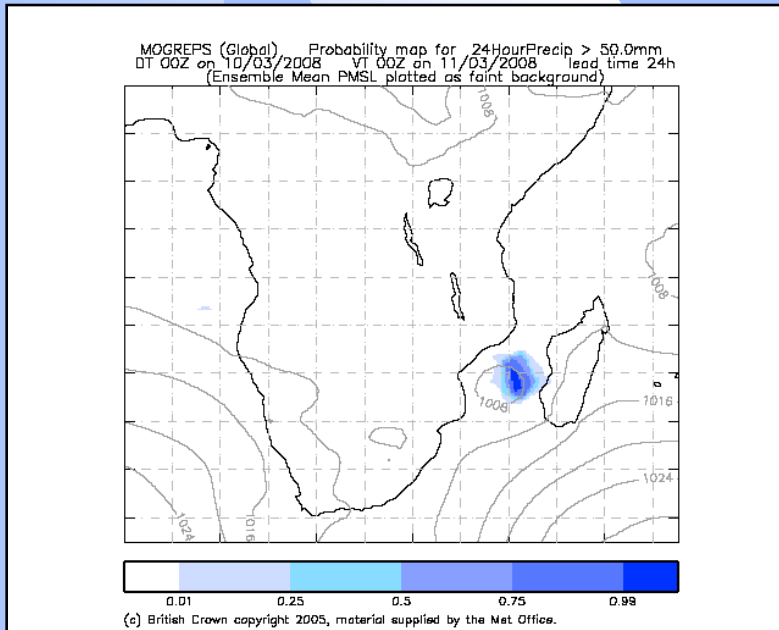
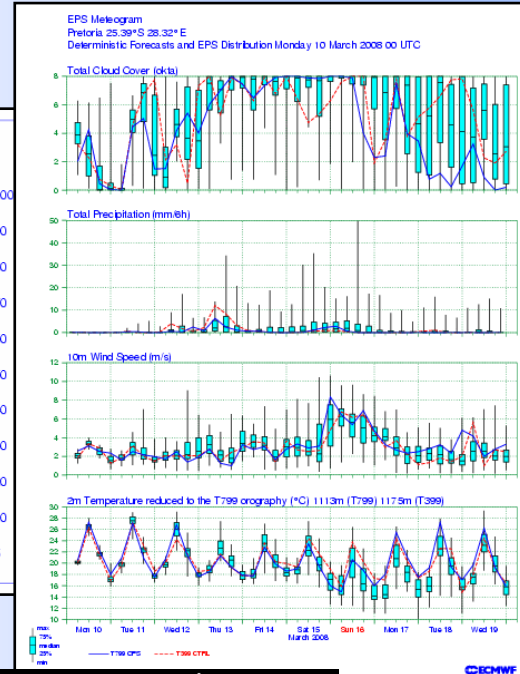
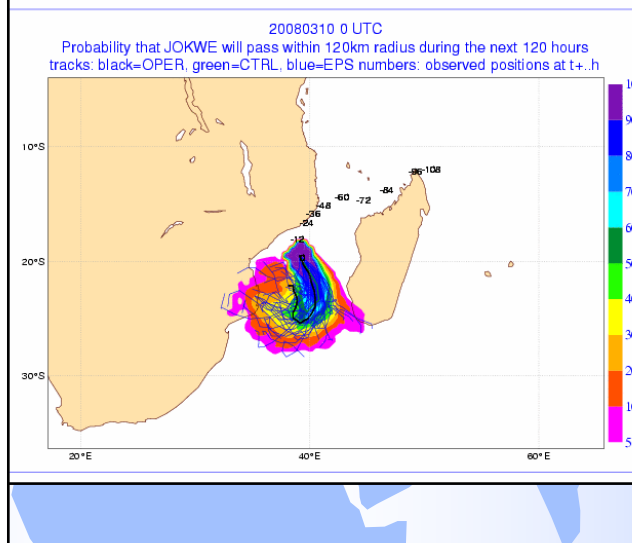
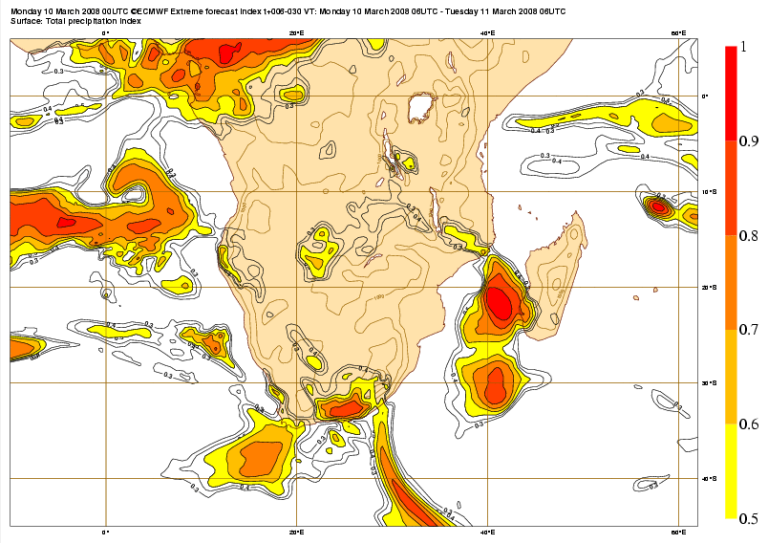
# Commission for Basic Systems Programme of GDPFS

## **Weather forecasting:**

- *Routine weather forecasts (e.g. daily: temps, wx, vv, sky...), public, aviation, marine, air quality, fire wx, etc.*
- *Severe weather forecasting (production of alerts, advisories, warnings; critical thresholds)*
- *Probabilistic forecasting and ensemble prediction systems and applications*
- *Extended- and Long-range forecasting (monthly, seasonal)*
- *NWP forecast verification*
- *Infrastructure of NWP*
- *Forecast standards and recommended practices*



# Examples of EPS Products – from GDPFS: ECMWF, UKMO, NCEP-USA



# Exchange of Products among WMO Members

- *WMO Global Telecommunication System (GTS), evolving to the WMO Information System (WIS)*
- *Satellite Broadcasts*
- *Internet – Web sites, FTP sites*
- *E-mail and facsimile transmission*
- *Bi-lateral, Multi-lateral arrangements*







## **Forecasting at the National Meteorological Centres...**

- ◆ Using powerful data-processing systems, numerical models and outputs: forecasters monitor conditions, follow a forecasting process, especially for severe weather events (*lead-times... reliability?*)
- ◆ Forecasters apply knowledge and experience to use wide range of observational data and prediction products
- ◆ Forecasters know usefulness of observational data and NWP outputs, and their limitations
- ◆ Forecasters verify products, and provide feedback to NWP Centres and developers to improve predictions (especially severe weather)
- ◆ Tailored to the needs of users



# Meteorological services to support humanitarian contingency planning and response: *some considerations*

- ◆ Public info vs. support to decision making
- ◆ Open-source vs authoritative information
- ◆ 24/7 real-time services vs “morning news”
- ◆ Routine vs specialized forecasts
- ◆ National vs regional forecasts
- ◆ Guidance vs predictions vs warnings
- ◆ Coordination vs operational services
- ◆ Planning vs implementation and testing
- ◆ Arrangements, commitment, and quality assurance



***Thank You!!***

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