



World Meteorological Organization

Weather • Climate • Water

Future of GDPFS and SWFDP Expansion in Africa

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WMO

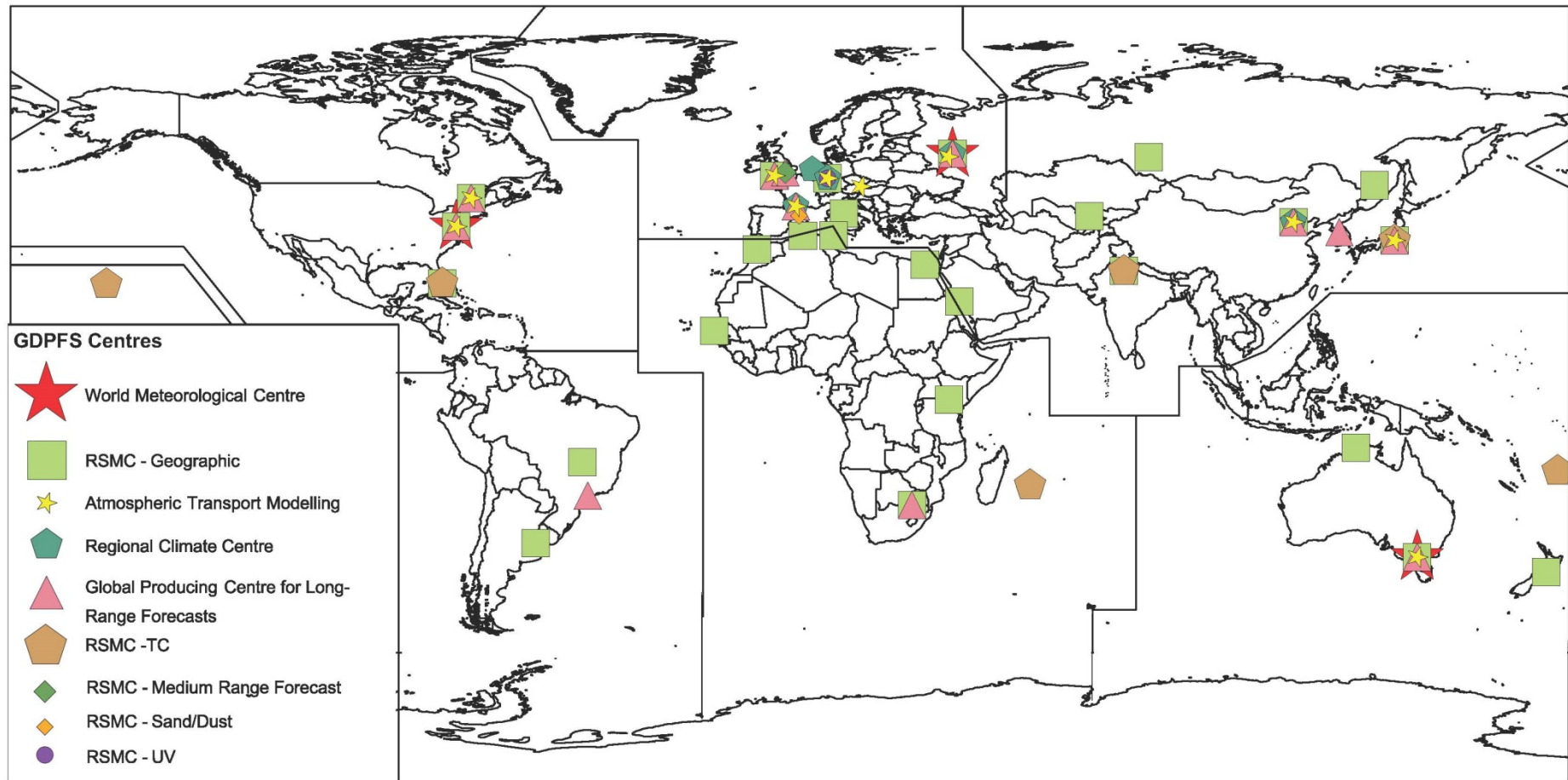
Praia (AMCOMET) - 10-02-2015

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 and GTS 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**



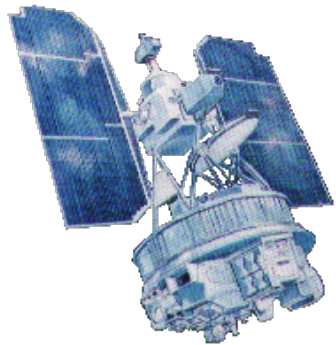
The GDPFS today...



- 3 WMCs
- 43 RSMCs with Geographical and/or Activities Specialization
- 12 GPCs (LRF)
- 6 RCCs (incl. RCC hosted at CIIFEN and at ACMAD – new)

The Role of the GDPFS in creating weather services –

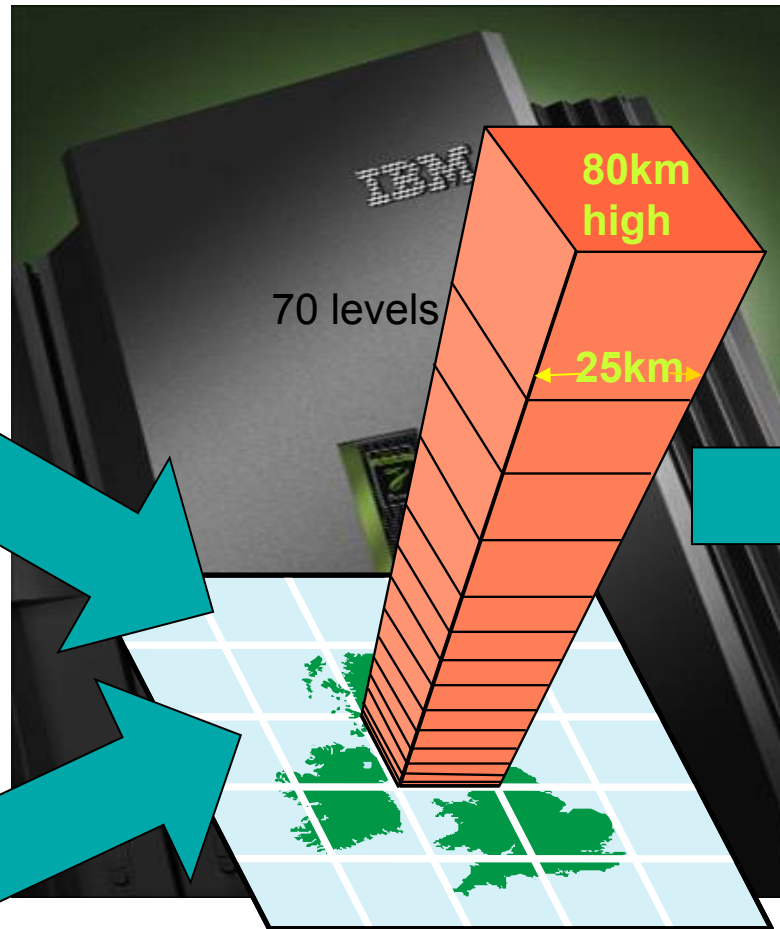
GDPFS = Global
Data Processing
and Forecasting
System



Observations

$$\frac{du}{dt} = \frac{\partial p}{\partial x} - fv$$
$$\frac{dv}{dt} = \frac{\partial p}{\partial y} + fu$$
$$p = RT$$
$$\rho$$

Knowledge



Forecast Model



Interpretation,
Risk Analysis &
Communication



National Met Centres and the GDPFS

- Each WMO Member (country) is required to have a National Meteorological Centre
- A key NMC Function is preparation of **National Severe Weather Warnings** for protection of lives and property, as required by the Member.
- To achieve this, NMCs should:
 - Be staffed and equipped to participate in the WWW (World Weather Watch)
 - be linked to the WIS (WMO Information System)
 - have capacity to exploit GDPFS products
- Some NMCs have difficulty in this...

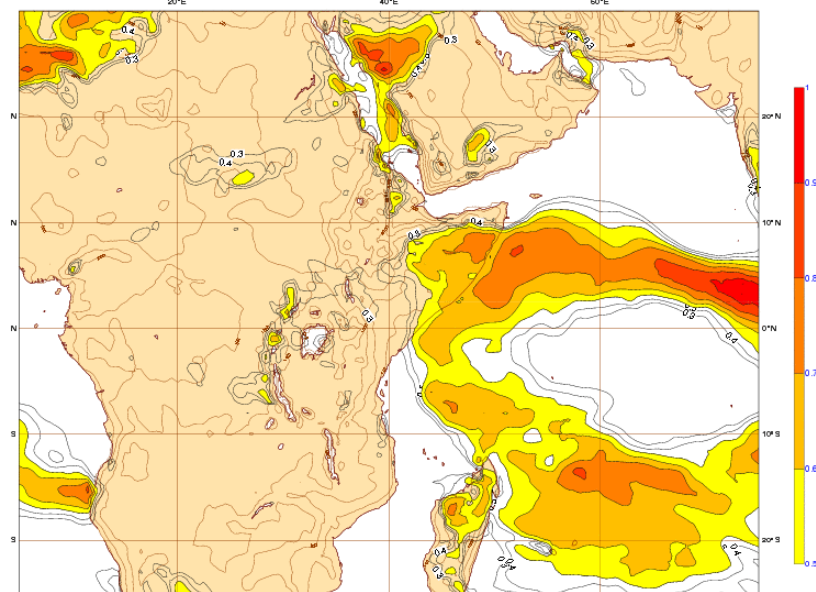


Status of Global Models

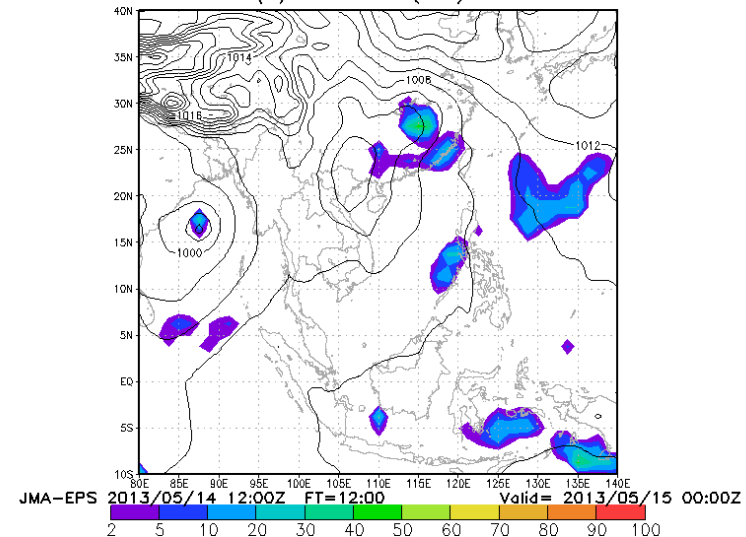
- Deterministic global models now running at c. 16-45km grid-lengths
- Ensembles at c. 40-100km
- Global coverage
- Up to 15 days range (EPS)
- Approaching resolutions of recent regional models
 - Capable of capturing much severe weather
 - Ensembles provide the probability part of “risk”



Wednesday 15 May 2013 00 UTC GECMWF Extreme forecast index 4-000-024 VT: Wednesday 15 May 2013 00 UTC - Thursday 16 May 2013 00 UTC
 Surface: 10 metre speed index



Probability of 6-hour accumulated precipitation exceeding 25mm threshold value (%) with MSLP (hPa) of ensemble mean



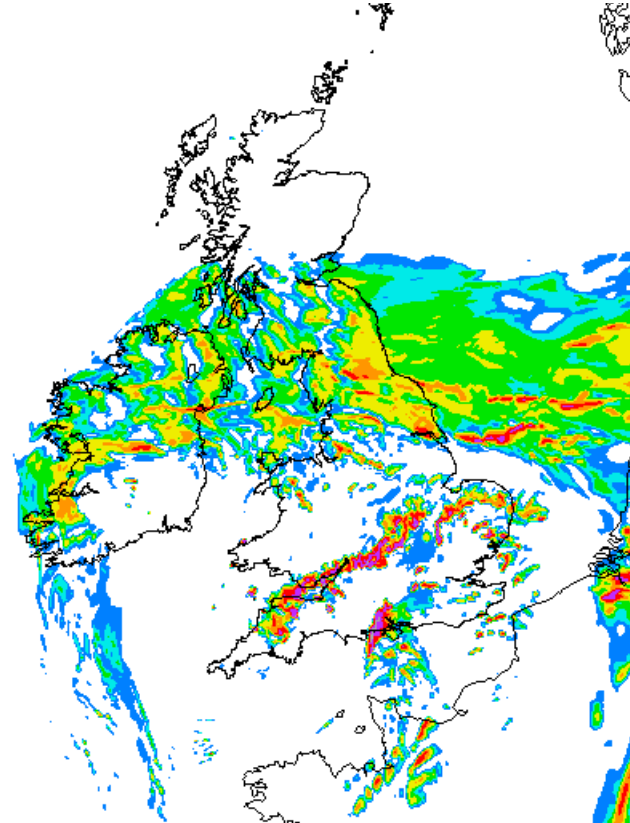
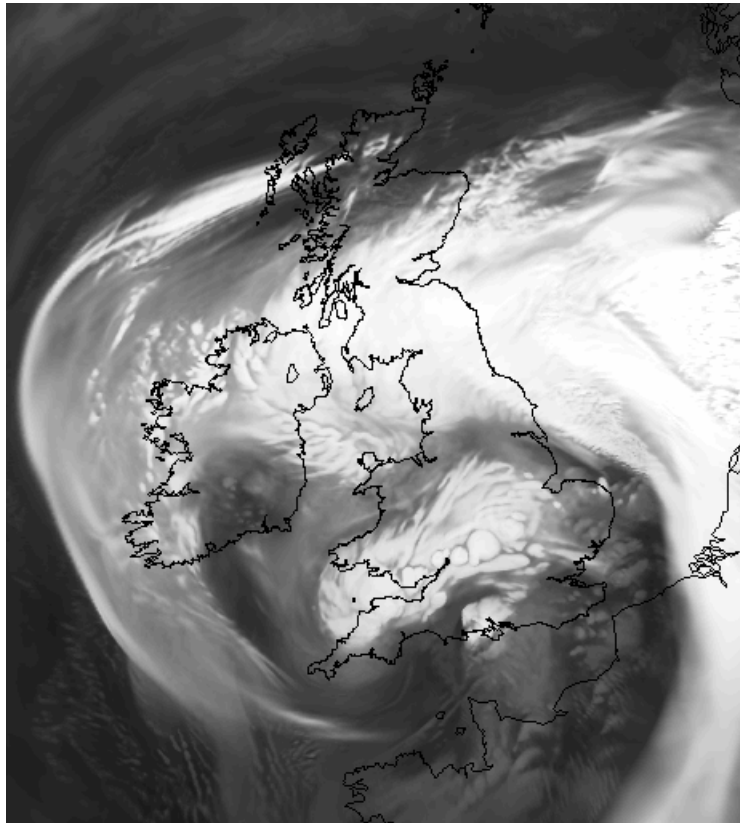
Core Foundation Systems of the GDPFS

- Nowcasting – up to ~6h forecasting
- Global NWP (numerical weather prediction)
 - Deterministic – single best guess forecast
 - Ensemble – probabilistic forecast for risk estimation
 - Resolution now ~16-45km - increasing
- Limited area NWP
 - Convection-permitting – high resolution, local area
 - Deterministic & Ensemble
- Coupled Seasonal and climate models
- Numerical ocean wave and storm surge prediction



Convection-Permitting Models

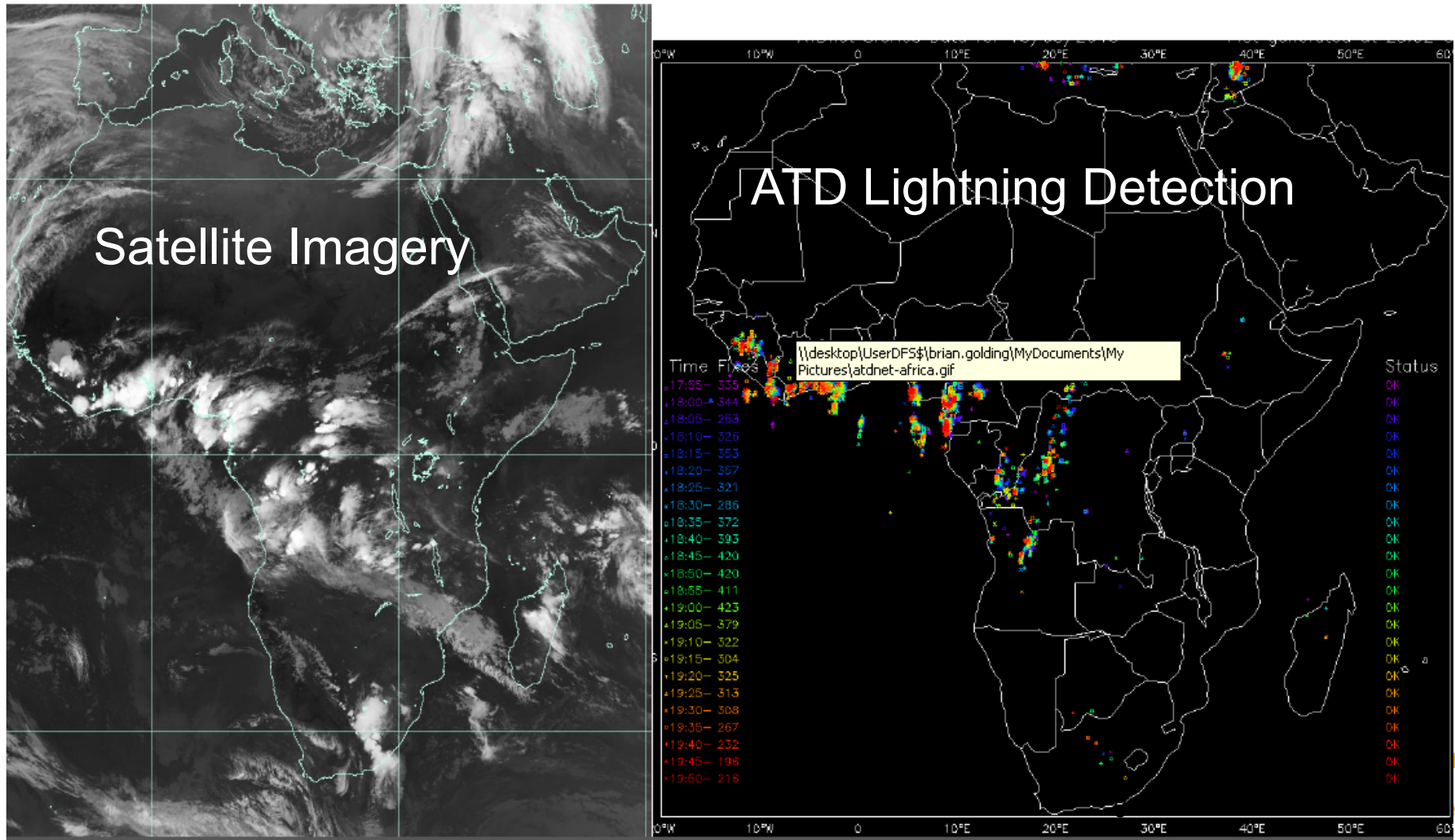
Rapidly replacing the old regional models



With grid-lengths of 4km or less modern regional models partially resolve convection and give far better forecasts for convective severe weather ... which dominates Tropical severe weather

Global Remote Sensing

- Observation systems provide basis for nowcasting



Technical Requirements for operational NWP

- Running *effective* regional NWP requires:
 - Large (expensive and power-hungry) supercomputer
 - Convection-permitting resolution (~4km or better) required to add benefit to today's global models
 - Complex, reliable and high-bandwidth telecoms
 - import boundary conditions and observations
 - Advanced data assimilation
 - Hi-resolution observations
 - Large team of expert scientists and computer scientists for implementation, maintenance and upgrades
 - Expensive to recruit and difficult to retain once experienced
- May be best Concentrated in few Global/Regional Centres for the benefit of many NMCs



Specialized Activities of the GDPFS

- Forecasting hydrometeorological hazards
- Seasonal to sub-seasonal Climate prediction
- Tropical cyclone forecasting
- Volcanic ash advisory services
- Response to environmental emergencies
 - Nuclear & non-nuclear incidents
 - Marine pollution incidents
- Sand and dust storm forecasting
- Non-real-time verification and testing



Emerging Issues and Pressure on GDPFS...

- Requirement to move to Impact-Based Forecasting and Risk-based Warning: GDPFS needs 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 restraints



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 Coastal: Wave, Storm Surge; Air Quality and Sand and Dust Storm; Natural resources and Energy sectors , Tourisme, Transports, etc.)



So, why is this important for Africa?

- Most of advances will be made in GPCs and Global NWP Centres (GNC) in Developed Countries
- Many Centres are committed to supporting the SWFDP – GPCs are required to share their information as per the Manual on GDPFS
- Hi Res Global models capable of resolving convection would allow scarce resources to be used for core function of issuing warnings and communicating with civil protection agencies for efficient decision-makings
- The SWFDP, **through its Cascading** approach, would allow RA I Members to take advantage of progress made in advanced Centres with minimum cost. *The SWFDP is an important vehicle for realizing the Strategic Priorities of the Integrated Africam Strategy on Meteorology – It supports all Five Strategic Pillars .*



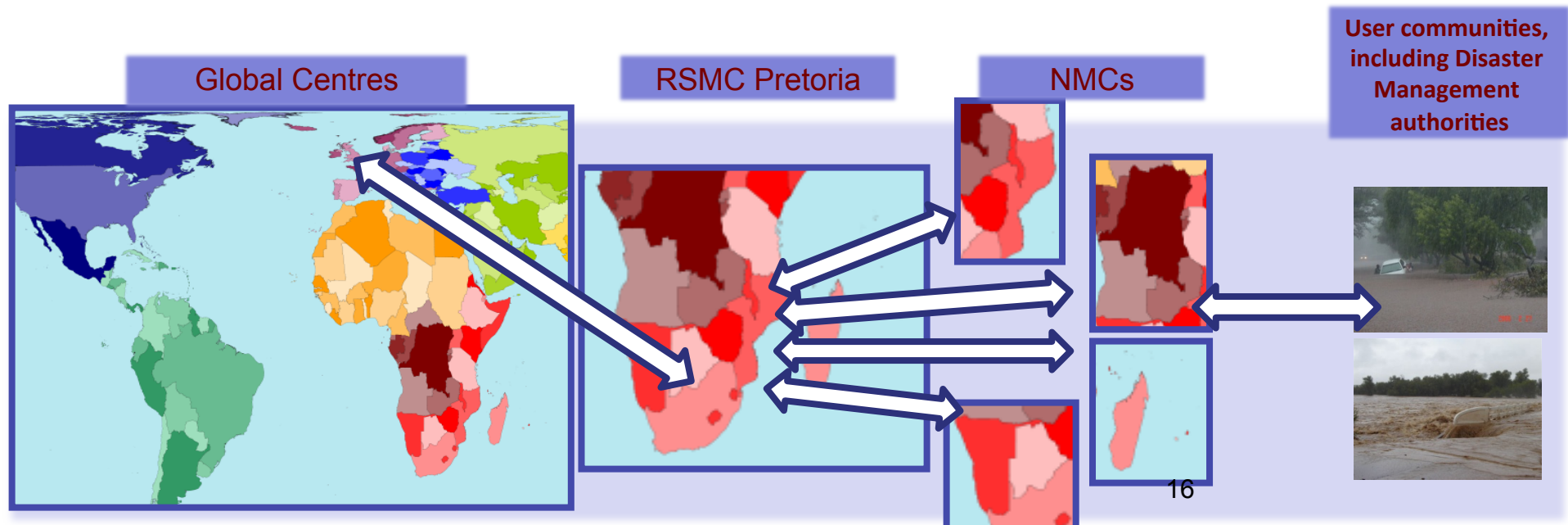
What is needed from you?

- A resolution will be introduced at Cg17 for the development of an «Integrated and Seamless Data Processing and Forecasting System»...a new Vision for GDPFS.
- GOS and GTS were repositioned for the future and became WIGOS and WIS respectively for efficiency. GDPFS needs also to evolve.
- **Your support is required for Congress approval for the required work**



SWFDP Cascading Forecasting Process – efficient delivery of GDPFS

- Global NWP centres to provide available NWP/EPS and sat-based products, including in the form of probabilities, cut to the project window frame;
- Regional centres to interpret information received from global centres, prepare daily guidance products (out to day-5) for NMCs, run limited-area model to refine products, maintain RSMC Web site, liaise with the participating NMCs;
- NMCs to issue alerts, advisories, severe weather warnings; to liaise with user communities, and to contribute feedback and evaluation of the project;
- NMCs have access to all products, and maintained responsibility and authority over national warnings and services.



Vision

- WMO Cg-15 (2007) & Cg-16 (2011) provided the vision for improving severe weather forecasting and warning in developing countries:
- *“NMHSs in developing countries are able to implement and maintain reliable and effective routine forecasting and **severe weather warning programmes** through enhanced use of NWP products and delivery of timely and authoritative forecasts and early warnings, thereby contributing to **reducing the risk of disasters** from natural hazards.”*



Realizing the Vision...

- Through Collaboration between GDPFS Centres and involvement of Public Weather Service Program and;
- Through the Severe Weather Forecasting Demonstration Project (SWFDP), that uses the 'Cascading Forecasting Process'



The SWFDP Implementation Requirements

- **Strong Commitment of a Regional Body and Countries (RSMC and NMCs) and of Global NWP Centres**
- **Availability of funds (Donors)**
 - **The World Bank and Norway were the main contributors for Africa SWFDP the past few years**
- Establish regional partnerships
 - Regional management teams: focus on short to medium-range forecasting and warning services
- Plan and develop a prototype demonstration project
 - Regional project-specific IP for which the management team is accountable. IP describes team members' responsibilities, project activities and milestones
- Implement demonstration project
 - Tracking, continuous evaluation, training and reporting
- Broaden and sustain successful Severe weather forecasting "Programme" – Phase 4
 - Continuous training; sharing knowledge, expand partnerships



SWFDP Expansion to the rest of Africa

- RA-I XVI (2015) requested the expansion of SWFDP to WRN Africa and then to the rest of Africa
- Plan is to start SWFDP in Western Africa this year
- Some seed funds have been identified to initiate the project in Western Africa this year. Thanks to the Republic of Korea
- We need to start small 4 to 6 Countries and expand later
- Be mindful of Language requirements



Your help is needed to ...

- Identify Countries that are willing and able to be part of the 4 to 6 ones to begin the project
- Identify the Regional Org to assume Management responsibility in phase 4 (Transition from Demonstration to full operational programme)
- Ensure RSMC Dakar is willing/able to play the role of RSMC for SWFDP Western Africa?
- Identify other contributing Global NWP Centres to the Project
- Identify Countries focal points



Phase 4 Ongoing non-operational Activities requiring funding and support

- Regional ownership (ie MASA, EAEC)
- Strategic leadership
 - Includes responsibility for funding
- Management meetings every 2 years
 - Probably in conjunction with other meetings
- Training – at least every 2 years
 - Supplemented by e-learning facilities
 - On-site training may be less frequent
- IT development incl website and product upgrades
- Monitoring, evaluation and reporting – annually
- Country-specific support
- Administrative and logistics support for meetings and training
- Resource mobilization



Mechanism to Strengthen Op Centres

- Following the recommendation by EC-66 for describing a mechanism to strengthen operational centres, CBS reviewed a concept paper and adopted the [draft Recommendation 4.4/1 \(CBS-Ext.\(2014\)\) – Proposed Mechanism to Strengthen Operational Centres, Built Upon the Lessons Learnt through the SWFDP](#)
- There will be a Resolution to Cg17 to endorse the Mechanism. **Your support will be required for this endorsement**





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Thank you for your attention

DISCUSSION