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# Severe Weather Forecasting Demonstration Project (SWFDP)

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ECMWF**

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# WMO Members – a reality check

## *WMO Operational weather forecasting*

- WMO's World Weather Watch System (Obs, Telcom, Forecasting)
- Numerous advanced NWP Centres
- Many low-capacity NMHSs in developing and least developed countries

## *Role of National Meteorological Hydrological Services*

*Daily forecasts, weather warnings, information*

*Delivery of meteorological services (routine, specialized)*

*Delivery of authoritative warnings - general public, disaster managers, civil protection authorities, important societal sectors (e.g. transportation)*



# Severe Weather Forecasting Demonstration Project (SWFDP)

## *Vision for improving severe weather forecasting and warning services in developing countries (Cg-XV, 2007)*

*“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.”*

## *WMO Strategic Thrusts*

### *✓ Improved Service Quality and Service Delivery*

- ✓ Improved delivery and access to high quality weather, water, related environmental predictions, information, and services
- ✓ Reduced risks and potential impacts of hazards

### *✓ Strengthening Capacity Building*



# Severe Weather Forecasting Demonstration Project (SWFDP)

## *SWFDP Main Goals*

- ✓ Improve Severe Weather Forecasting
- ✓ Improve lead-time of warnings
- ✓ Improve interaction of NMHSs with users, including media, disaster management and civil protection authorities, and user communities in the various socio-economic sectors (e.g. agriculture, fisheries, etc.)

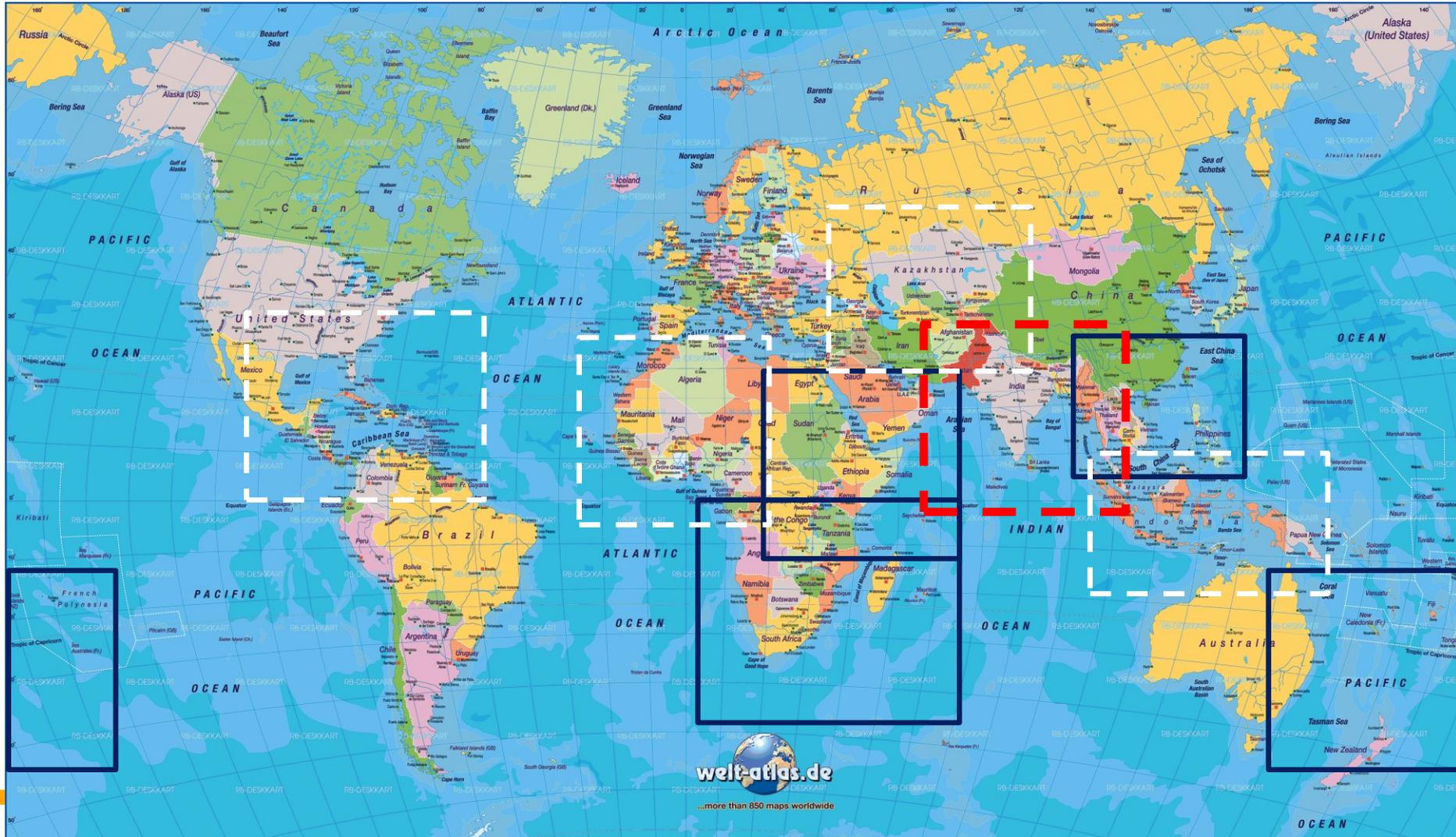
*SWFDP provides a practical and beneficial platform for preparation and dissemination of multi-hazard, early warnings*

## *SWFDP Regional Subprojects*

- ✓ Southern Africa (ongoing; 16 countries; RSMC Pretoria)
- ✓ South Pacific Islands (ongoing; 9 Island States; RSMC Wellington)
- ✓ Southeast Asia (in development, 4 countries; possible start-up 2011)
- ✓ Eastern Africa (in development, 6 countries; start-up Sept. 2011)
- ✓ Bay of Bengal (in development, 6 countries)



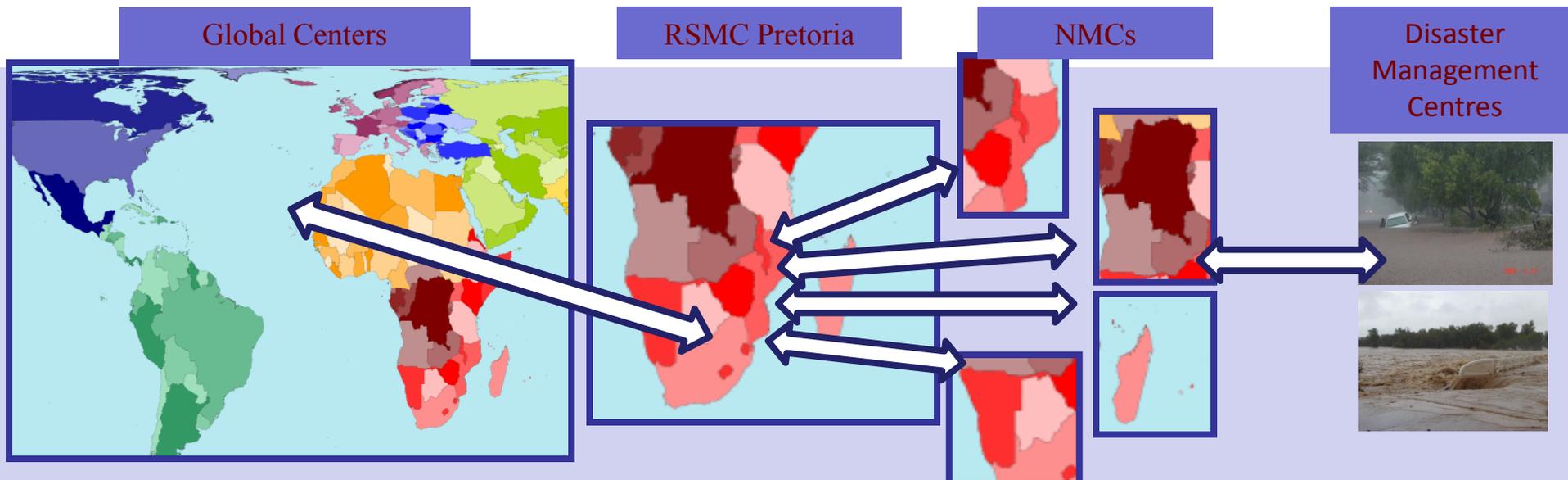
# SWFDP Regional Subprojects





# SWFDP Cascading Forecasting Process

- Global NWP centres to provide available NWP and EPS products, including in the form of probabilities, cut to the project window frame;
- Regional centres to interpret information received from global NWP 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 Disaster Management, 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.



# ECMWF support to SWFDP (as global centre)

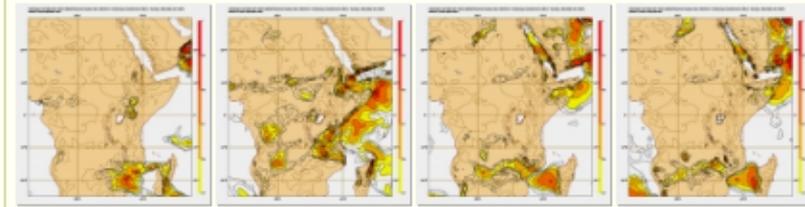
- Specific set of products for each SWFDP on special pages on the ECMWF website (login and password needed)
- ECMWF guide to use of products for WMO Members
- Annual training course at ECMWF “Use and Interpretation of ECMWF Forecast Products for forecasters from WMO Member States”

[Africa \(SWFDP\)](#) > Ensemble Prediction System>

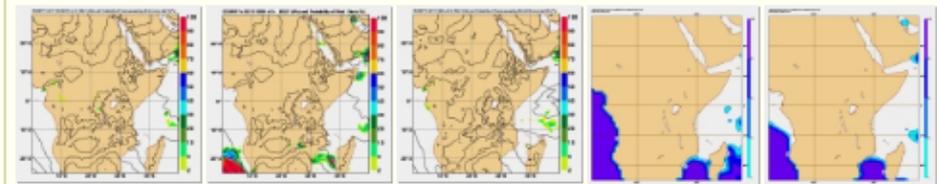
## Ensemble Prediction System

- Epsgrams: [Kenya](#) [Tanzania](#) [Burundi](#) [Uganda](#) [Ethiopia](#) [Rwanda](#)
- [Tropical Cyclones](#)

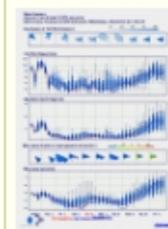
## Extreme Forecast Index



## Probabilities



## Wave products





# SWFDP – Southern Africa

- 16 countries, RSMC Pretoria, RSMC La Réunion,
- Met Office UK, NCEP USA, ECMWF



**World Meteorological Organization**

**Regional Specialised Meteorological Center (RSMC) Pretoria**

**Designated to**



South African Weather Service

<p><b>Guidance Products</b></p> <p>NWP &amp; EPS Products</p> <p><b>Regional Models</b></p> <ul style="list-style-type: none"> <li>• <a href="#">UM SA12</a></li> <li>• <a href="#">UM Africa LAM</a></li> <li>• <a href="#">Aladin La Reunion</a></li> </ul> <p><b>Global Products</b></p> <ul style="list-style-type: none"> <li>• <a href="#">NOAA: GFS</a></li> <li>• <a href="#">ECMWF: EPS</a></li> <li>• <a href="#">Met Office: EPS</a></li> <li>• <a href="#">NOAA: EPS</a></li> <li>• <a href="#">SAWS: EPS (SAWS)</a></li> </ul> <p><b>Training Website</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Met-eLearning</a></li> </ul> <p><a href="#">RSMC Guidance Archive</a></p> <p><a href="#">Contact RSMC</a></p> <p><a href="#">Logout</a></p>	<p><b>Guidance Products</b></p> <p><b>Short-range (1-2 Days)</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Map Day 1</a></li> <li>• <a href="#">Map Day 2</a></li> <li>• <a href="#">Risk Tables</a></li> <li>• <a href="#">Discussion</a></li> </ul> <p><b>Medium-range (3-5 Days)</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Map Day 3</a></li> <li>• <a href="#">Map Day 4</a></li> <li>• <a href="#">Map Day 5</a></li> <li>• <a href="#">Prob Tables</a></li> <li>• <a href="#">Discussion</a></li> </ul> <p><b>SWFDP Evaluation Form</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Click Here</a></li> </ul>	<p><b>Regional and International Centers</b></p> <ul style="list-style-type: none"> <li>• <a href="#">ECMWF</a></li> <li>• <a href="#">NCEP</a></li> <li>• <a href="#">UK Met Office</a></li> <li>• <a href="#">WMO</a></li> <li>• <a href="#">RSMC - Reunion</a></li> <li>• <a href="#">ACMAD</a></li> </ul> <p><b>SADC Countries</b></p> <ul style="list-style-type: none"> <li>• <a href="#">SADC Countries National Meteorological Services</a></li> </ul> <p><b>Other Services and Products</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Short-range</a></li> <li>• <a href="#">Long-range (Seasonal)</a></li> </ul>		
<p style="text-align: center;"><b>Satellite-based 0-12 Hour Products</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> <p><b>Satellite-Based Rainfall</b></p> <p><b>Hydro-Estimator Rainfall Totals</b></p> <p>• <a href="#">1hr</a> • <a href="#">3hr</a> • <a href="#">6hr</a> • <a href="#">24hr</a></p> <p><b>Hydro-Estimator Rainfall Totals In Days</b></p> <p>• <a href="#">10 Days</a> • <a href="#">30 Days</a></p> </td> <td style="width: 50%; border: none; vertical-align: top;"> <p><b>Convective Thunderstorm Forecasts</b></p> <p><b>Probability of Convective Thunderstorms</b></p> <p>• <a href="#">CII</a></p> <p>• <a href="#">Description of Product</a></p> </td> </tr> </table>			<p><b>Satellite-Based Rainfall</b></p> <p><b>Hydro-Estimator Rainfall Totals</b></p> <p>• <a href="#">1hr</a> • <a href="#">3hr</a> • <a href="#">6hr</a> • <a href="#">24hr</a></p> <p><b>Hydro-Estimator Rainfall Totals In Days</b></p> <p>• <a href="#">10 Days</a> • <a href="#">30 Days</a></p>	<p><b>Convective Thunderstorm Forecasts</b></p> <p><b>Probability of Convective Thunderstorms</b></p> <p>• <a href="#">CII</a></p> <p>• <a href="#">Description of Product</a></p>
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Since 2006



# SWFDP – Southeast Asia



WMO  
World Meteorological Organization

## Regional Specialised Meteorological Center (RSMC) Ha Noi



NCHMF  
National Center for Hydro  
Meteorological Forecasting

Logout

Note: The webpage is under-developing and some materials are testing

### Guidance Products

Short-range (1-2 days)

Medium-range (3-5 days)

### Satellite-based 0-24 Hour Products

Global NWP Products

Global EPS Products

Regional NWP Products

Regional EPS Products

Tropical Cyclone Products

Training Website

RSMC Guidance Archive

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Issue Date:

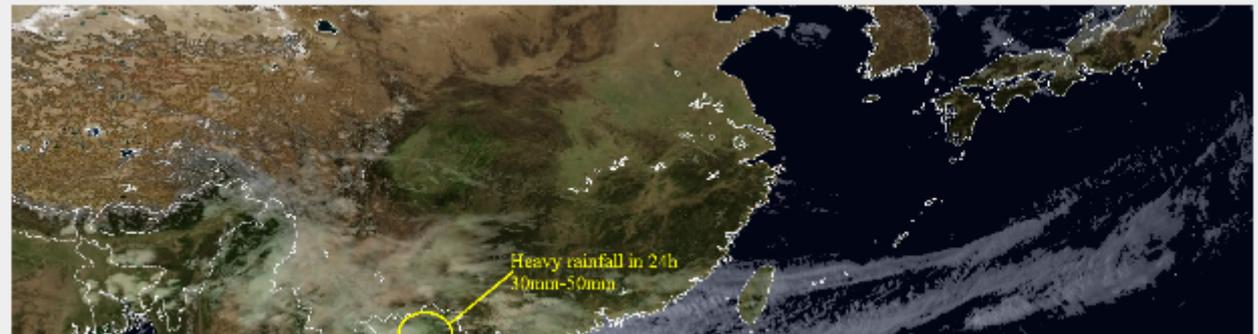
Reload

1st Map

2nd Map

Risk Tables

Discussion





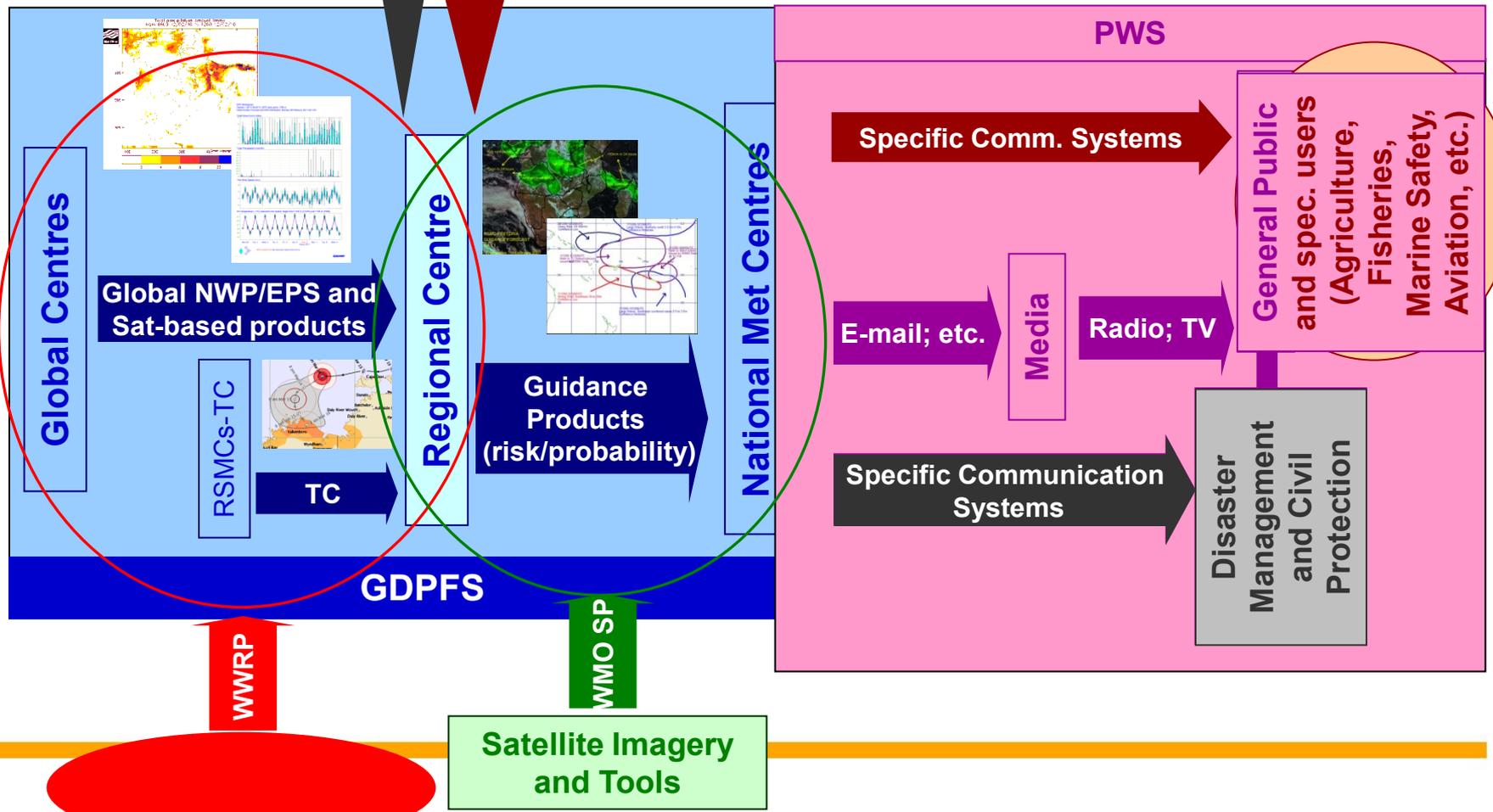
# Proposed SWFDP – Eastern Africa – Lake Victoria (status/progress)

- ✓ Development in progress
- ✓ Focus on:
  - ✓ Strong winds
  - ✓ Heavy precipitation
  - ✓ Hazardous waves (Indian Ocean and Lake Victoria)
  - ✓ Dry spells
- ✓ Users: **general public, disaster management, media, agriculture and fisheries**
- ✓ Domains:
  - ✓ 5E – 55E; 30N – 25S  
*(for monitoring, analyzing, predicting and verifying the various severe weather events)*
  - ✓ 31E – 36E; 2N – 4S  
*(for the Lake Victoria)*
- ✓ Global Centres: ECMWF, UKMO, NOAA/NCEP (NWP guidance material)
- ✓ MSG satellite products (EUMETSat products)
- ✓ Regional Centre: RSMC Nairobi, supported by TMA, UKMO and DWD
- ✓ National Met. Centres: Kenya, Tanzania, Uganda, Burundi, Rwanda and Ethiopia
- ✓ Start-up September 2011





# SWFDP links and synergies





# *SWFDP Framework :* **realizing the benefits**

- Cascading Forecasting Process
- Ongoing evaluation and feedback (near real-time, quarterly reporting on progress)
- Training and consultations
- Project Evaluation at “end” of demonstration

## **4 Phases:**

- *I – overall project planning (basic constructs)*
- II – Regional Subproject Implementation Plan development and execution
- III – Regional Subproject Evaluation and Conclusion
- Phases II and III activities - carried out within Regional Subproject, in consultation with the Steering Group
- *Phase 4 – matured projects (CBS => RA management)*



# *SWFDP Southern Africa* Evaluation (1)

- Improving forecasting of severe weather
  - Very positive impact, increased skill and confidence
  - Probabilistic products very significant, helpful
- Improving leadtime of warnings
  - Significant for advisories & warnings issued





# *SWFDP Southern Africa*

## **Evaluation (2)**

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- Improving interaction of NMHSs with DMCPAs
    - Progress made
    - relations with media and disaster management organizations were developed and improved in some countries
    - in other countries, assistance is still needed to develop improved working relations
-



# *SWFDP Southern Africa*

## **Evaluation (3)**

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- Identifying areas for improvement
    - Predicting convective weather (strong winds/gusts, heavy precipitation)
    - Shortage of surface observations
    - Getting feedback from users (media, DMCPAs)
  - Improving products from NWP Centres through feedback
    - No feedback in “realtime”
    - Need to better define the feedback required
  - More effort on verification is needed
-



# SWFDP – improving forecasts and warnings

- Severe weather: heavy rain, strong winds, forecast range: up to day-5 (increased lead-time)
- Forecasting (*GDPFS*) and warning services (*PWS*)
- High-impact focus (flash-flooding, wind damage, near-shore damaging waves), and applications (*e.g. AgMet*)
- Forecast verification
- Climate change adaptation
  
- Forecasting gaps:
  - Tropical convection, rapid on-set, localized events
  - Lack of forecasting tools in the very-short-range (< 12h)
  - Little or no radar coverage, few real-time observations
- Warning services gaps:
  - Relations with disaster management, civil protection, media
  - Warning criteria, SOP, reach, cultural practices, quality assurance
  - Inadequate monitoring, verification
  - Overall management of warnings programme



## SWFDP – training activities

- Forecasters have wide range of education, basic skills, motivation, participation
- Annual joint GDPFS (forecasting) and PWS training targeted for SWFDP needs (Srn-Africa, Ern-Africa, Se-Asia)
- In-Country touring training team-of-2 (South Pacific Islands)
- SWFDP candidates at WMO collaborated training (e.g. ECMWF, DWD, Verification Methods)
- Severe weather
- Probabilistic forecasting

Hong Kong Observatory July 2011





# SWFDP – Cooperating with Research

*... incorporating promising research outputs into real-time  
SWFDP demonstrations ...*

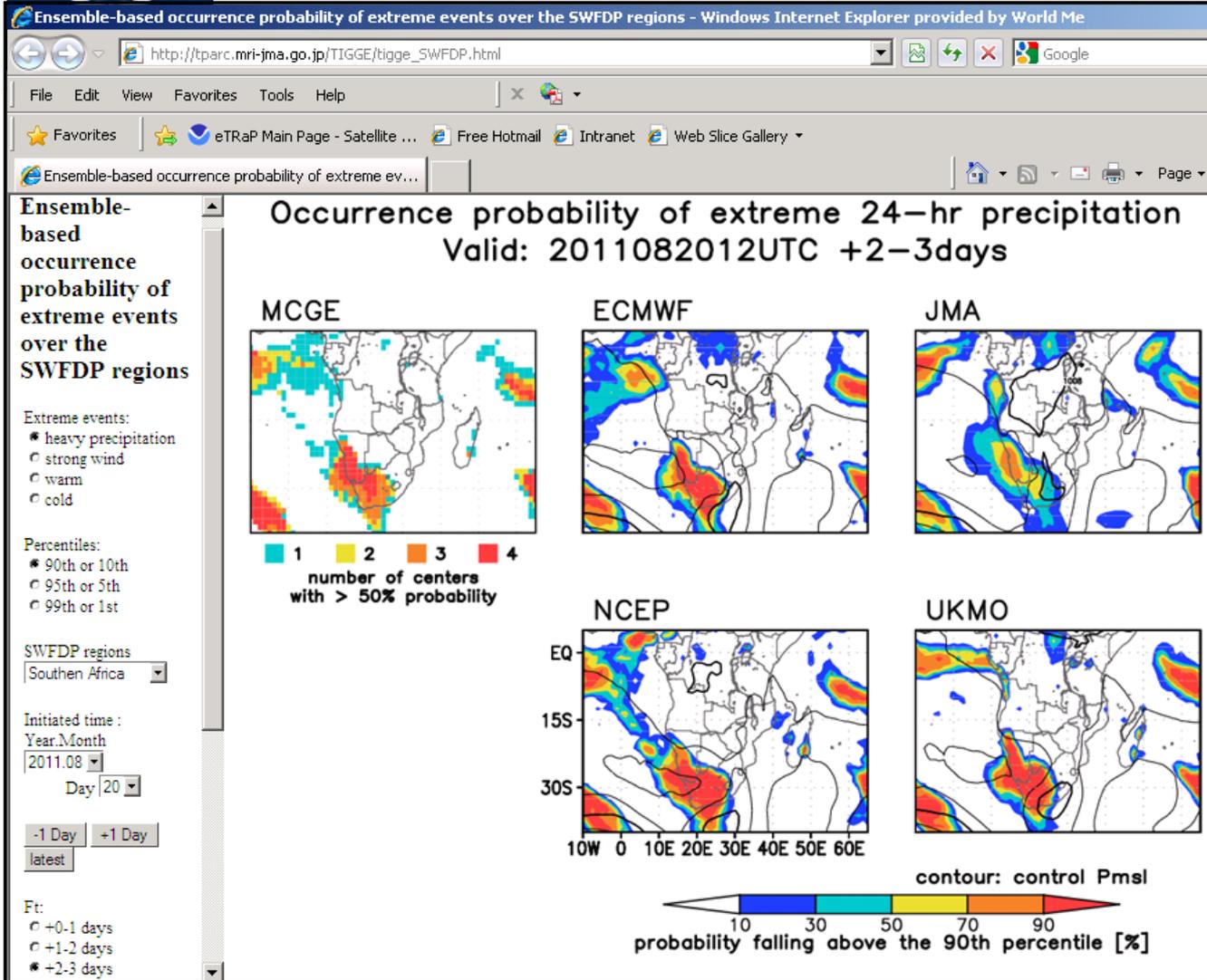
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## World Weather Research Programme

- GIFS - TIGGE - Tropical Cyclone track; extreme events (wind, precip, temps; *48-hour delay from real-time*)
  - Forecast Verification Research
  - Nowcasting Research – very short-range forecasting (< 12h)
  - Sub-seasonal forecasting (monthly to seasonal)
  - Public weather services & DRR, with WG SERA
-



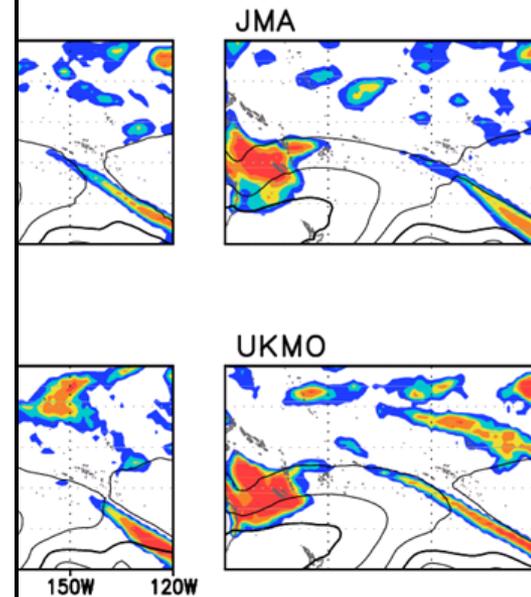
# TIGGE/GIFS products for SWFDP (MRI-JMA)



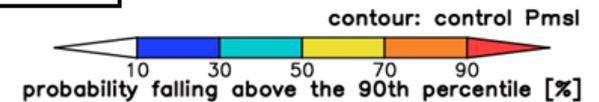
## SWFDP:

- Southern Africa
- Eastern Africa
- Southwest Pacific
- Southeast Asia

## Extreme 24-hr precipitation 2011082012UTC +2-3days



Ft:  
 o +0-1 days  
 o +1-2 days





# *SWFDP - Improving severe weather forecasting and warning services*

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*Thank you!*

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