World Meteorological Organization

Working together in weather, climate and water

WMO

WMO Strategy for
Improving Severe Weather Forecasting and Warning Services in Developing Countries

Severe Weather Forecasting Demonstration Project (SWFDP)

Lessons and opportunities

By

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Overview of the Severe Weather Forecasting Demonstration Project (SWFDP)

- Vision – Strategy – Goals – Planning
- SWFDP « primer »
- Lessons and opportunities

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)*

- ***From: "Atmospheric Modeling, Data Assimilation and predictability" Cambridge University Press, 2003, 5th printing 2009***

Improving Severe Weather Forecasting in Developing Countries

Vision

"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."

(Cg-XV, 2007)

SWFDP – 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

SWFDP MAIN GOALS

Weather Forecasting (GDPFS) and Service Delivery (PWS) Programmes

- Improve severe weather forecasting
- Improve lead-time of warnings
- Improve interaction of NMHSs with media and disaster management and civil protection authorities

- Identify areas for improvement
- Improve the skill of products from GDPFS Centres through feedback

GDPFS – Global Data-Processing and Forecasting System
PWS – Public Weather Services

From CBS (2005, 2006, 2009)

SWFDP

Planning and execution : 4-step cycle

1. **Establish regional partnership**
   - focus on severe weather forecasts and warnings in developing countries (heavy rain, strong winds)

2. **Plan and develop prototype demonstration project**
   - develop an implentation plan

3. **Implement demonstration project**
   - generally, 1 year duration
   - tracking, continuous evaluation, reporting

4. **Broaden and sustain successful prototypes**
   (return to step 1)

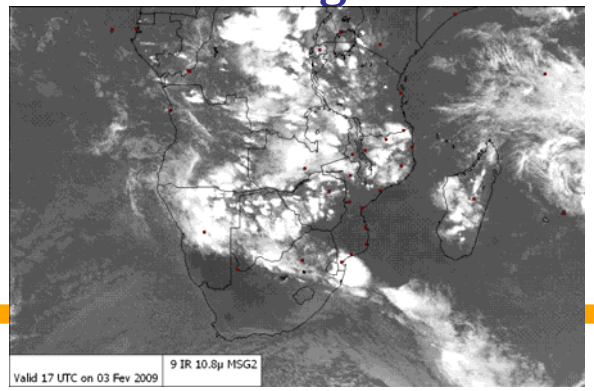
SWFDP

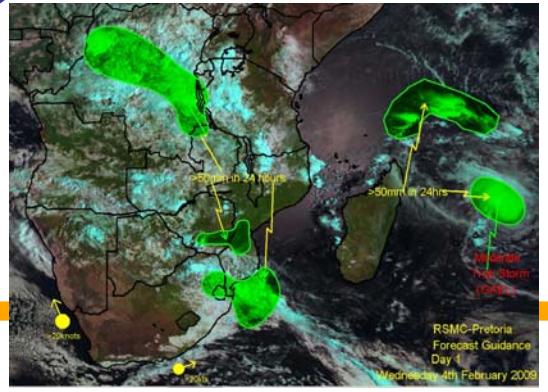
Concept of Operations – Cascading Forecasting Process:

> **GLOBAL NWP => RSMC and NMCs (daily)**

> **RSMC: hi-res limited-area NWP for project region; prepares, distributes severe weather forecasting guidance bulletin to NMHSs (daily, to day-5)**

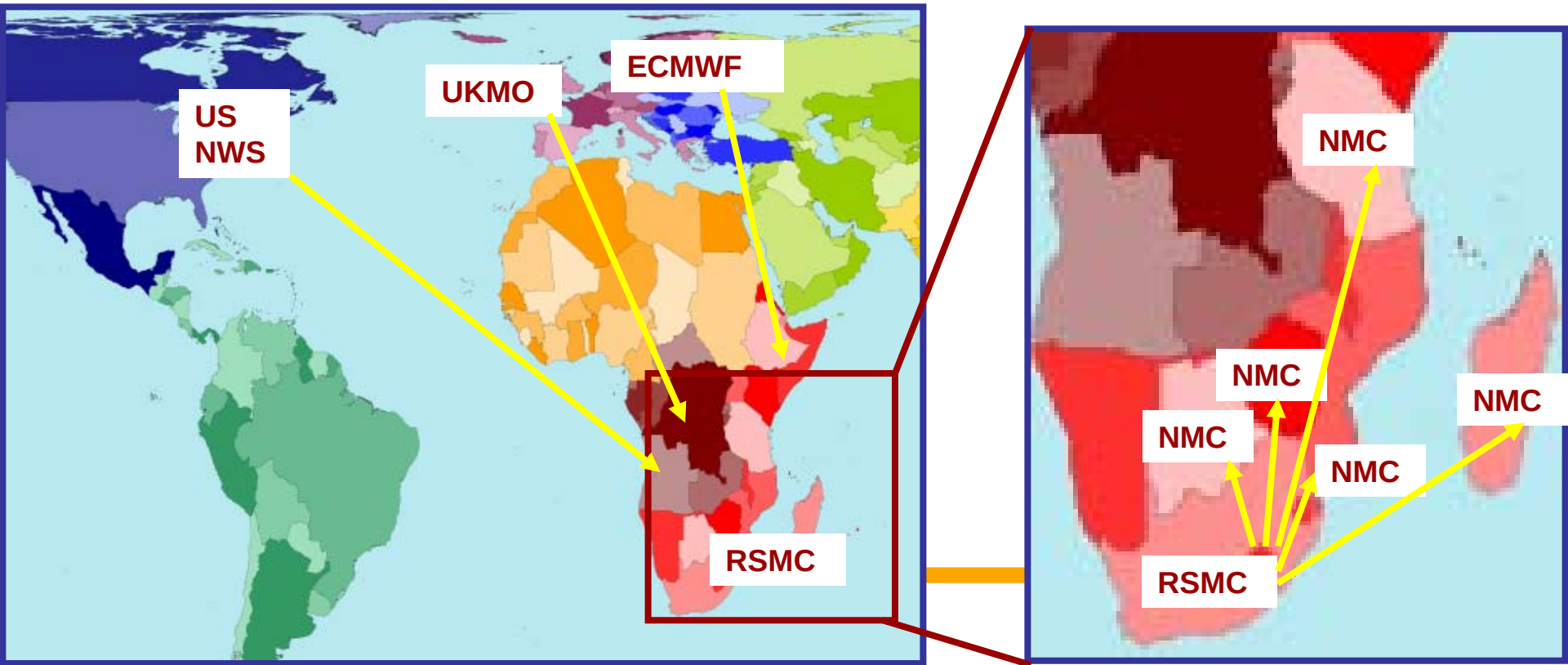
> **NMCs use guidance, forecast severe weather, issue warnings, and deliver services to public, media, and disaster management and civil authorities (24/7)**





SWFDP – South-eastern Africa (2006-2007)
Cascading Forecasting Process

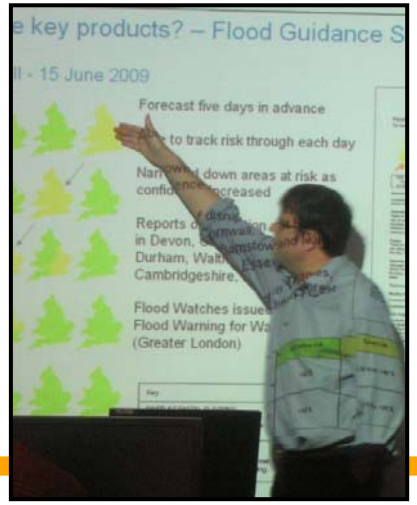
- Global products cut to project window frame
- RSMC guidance bulletin: short-range (d1-2), med.-range (d3-5) for NMCs
- NMCs use guidance, prepare and issue warnings to public, media, disaster management
- Expanded to all 16 Members in southern Africa (2008 – present)



SWFDP

What's needed to participate?

- > One RSMC to play central SWFDP regional role
- > Focused Training: NWP/EPS and dissemination and communication of warnings
- > Internet access to dedicated RSMC Website and portal
- > Project accountability for all participating centres (commitment)



Under the guidance of the CBS Steering Group on SWFDP

SWFDP Regional Subprojects

ON-GOING

Southern Africa:

- **Southeastern Africa – 2006 to 2007 (5 countries)**
- **Southern Africa expansion – 2008 to 2011 (16 countries)**
- **RSMC Pretoria**

South Pacific Islands:

- **Pilot – Nov. 2009 to Nov. 2010 (4 SIDS)**
- **Full demonstration – Nov. 2010 to 2011+ (9 SIDS)**
- **RSMC Wellington**

IN-DEVELOPMENT

Southeast Asia:

- **Project development in progress**
- **Cambodia, PDR Lao, Thailand, Viet Nam**
- **CMA, JMA, KMA, RSMC New Delhi, RSMC Tokyo, HKO**
- **Possible start-up May 2011**

Eastern Africa:

- **Successful development workshop, Nairobi, 4-8 Oct. 2010**
- **Introductory training, Dar Es Salaam, 18-29 Oct. 2010**
- **Kenya, Tanzania, Uganda, Burundi, Rwanda, Ethiopia**

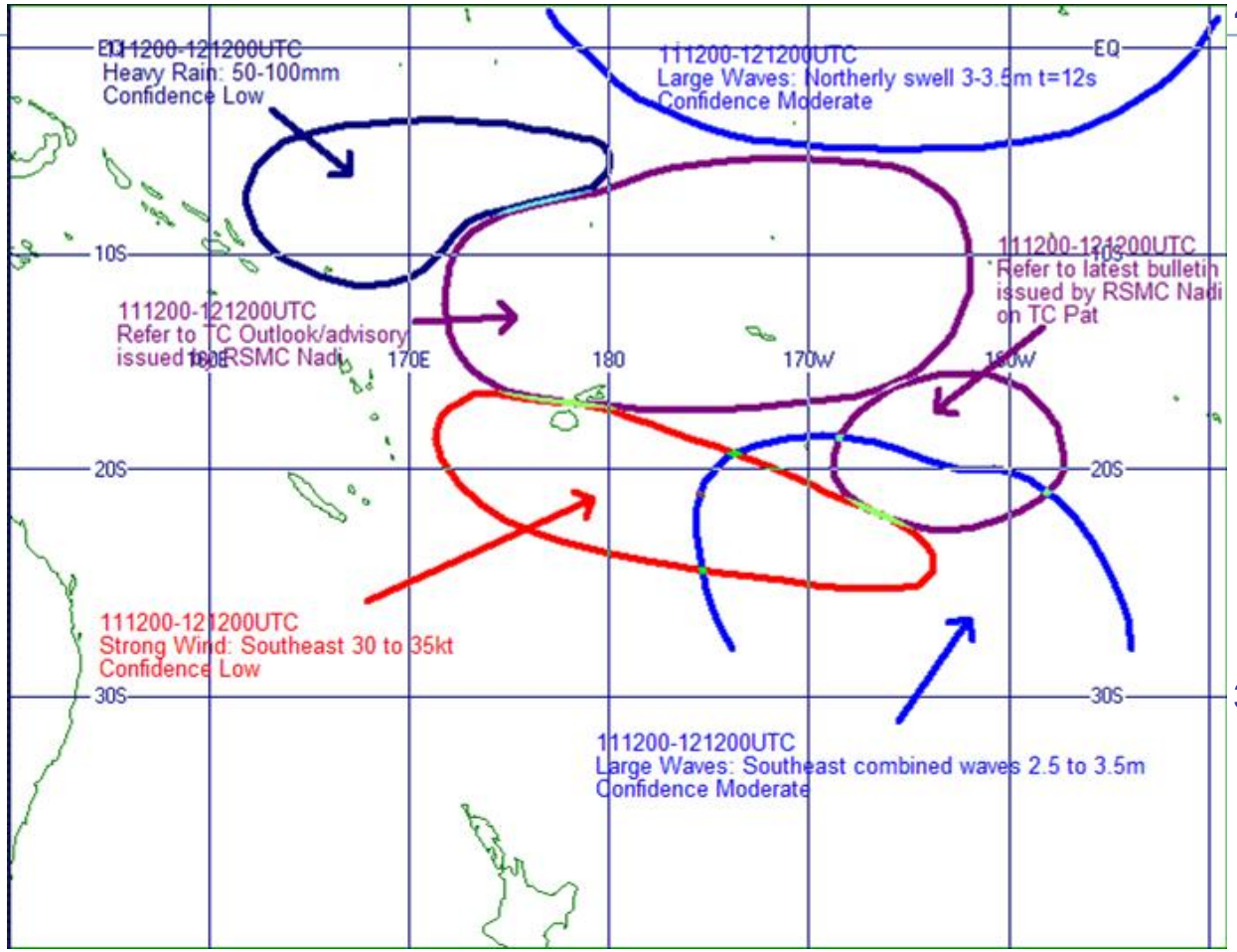
- *LDCs involved (Oct. 2010):*

Angola, Comoros, DR Congo, Lesotho, Madagascar, Malawi, Mozambique, Tanzania, Zambia; Samoa, Solomon Islands, Vanuatu;

- *(tentatively): Kiribati, Tuvalu, Cambodia, and Lao PDR)*
- *Burundi, Ethiopia, Rwanda*

SWFDP – South Pacific Islands

RSMC Wellington « MetConnect Pacific »



Pilot: Fiji, Samoa, Solomon Islands, Vanuatu

+ (full demo): Kiribati, Tuvalu, Tonga, Niue, Cook Islands

SWFDP – evolution

Developmental sequence :

- ✓ Strengthen the “forecasting engine” (GDPFS)
- ✓ Strengthen Warning Services (PWS)
- ✓ Account for country/regional DRR analyses

- ✓ Add “micro-projects” (e.g. verification, statistical post-processing, warnings exchange, public surveys, contingency planning and exercise)

- ✓ Add multi-hazard components

SWFDP – resources

(FP 15)

Regular Budget :

- ✓ GDPFS and PWS
- ✓ Education and Training
- ✓ WWRP

Extra-budgetary from participating Members :

- ✓ Donated funds, in-kind
- ✓ RSMCs

Surplus (from FP 14)

Human resources:

- ✓ Various Members
- ✓ Secretariat

Results from SWFDP, so far…

- Southern African countries highlighted:
  - **Successful recipe - real benefits to developing countries**
  - **High impact, cost effective**
  - **Visible operational results in improved early warnings**
  - **Forecasters increased confidence in their warnings**
  - **Some NMHS feel improving relations with civil protection authorities**

- South Pacific Islands:
  - **early inclusion of "damaging waves"**
  - **Similar benefits realized during Pilot phase**

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

SWFDP - General Lessons

Extracted from CBS-XIV (2009)

- Accelerated technology transfer of NWP/EPS tools into developing countries

- **Continuous learning by forecasters**

- Tight cycle of demonstration, adapting to regional and national needs, evaluation, and implementation

- **Contributing to learning practical probabilistic forecasting methods**

- Increased visibility, credibility, and value of meteorological services

- **New role for WMO regional centres (RSMC) in severe weather forecasting for the region**

SWFDP - General Lessons

personal perspective

- Regional partnerships: collective needs, motivation, buy-on, ownership, champion(s)

- SWFDP "Cascading" process - an after-burner for technology transfer, creating and boosting results

- Introduction of probabilistic forecasting to extend the lead-time and usefulness of predictions, especially of severe and high impact weather phenomena

- Predicting severe weather needs technical tools in the very short-range (< 12 hours)

- Performance of NWP could be improved for region-specific needs, through feedback, verification, and documented case studies

SWFDP – Opportunities

Project development :

- ✓ more countries, new regions
- ✓ Improved tools for predicting tropical convection
- ✓ all weather hazards, and flooding (public and marine warnings)
- ✓ Prediction services in sector-specific hazards (e.g. frost, fires, health/air quality)
- ✓ Contingency planning and exercise
- ✓ Beyond day-5 (outlook)

SWFDP – Opportunities

Strategic :

- ✓ Multi-hazard, early-warnings
- ✓ Capacity building for LDCs *(managing the "gap")*
- ✓ Introducing promising R&D outputs (e.g. TIGGE)
- ✓ Cross-programmes, Results focused
- ✓ Beyond meteorological hazards
  - ✓ Industrial disasters (Emergency Response)
- ✓ Suitable synergies (w-i-m-s)
- ✓ Service driven
- ✓ Adaptation to climate variability and change

w-i-m-s = where it makes sense

SWFDP – Opportunities

Flash Flood Guidance (CBS-CHy):

- ✓ Most important hazard related to heavy rain
- ✓ FFG MoU: WMO, US/NWS, USAID, HRC
- ✓ FFG – a diagnostic tool for assessment of potential for flash flooding (NWP first guess & satellite-based data)
- ✓ Southern Africa, Haïti/Dominican Republic
- ✓ Synergy with SWFDP (same forecasting system?)
- ✓ Future development
  - ✓ Improve NWP "first guess"
  - ✓ Improve calibration
  - ✓ Prediction (QPF, QPE inputs)

SWFDP – Opportunities

Storm surge and wave forecasting:

- ✓ Develop storm surge watch schemes (in TC regions)
- ✓ Involve RSMCs (TC forecasting)
- ✓ RSMC Miami already provides storm surge guidance within Hurricane Committee region
- ✓ TCP/JCOMM Regional Workshop on Storm Surge and Wave Forecasting (Dominican Rep., Dec 2010), in an ongoing series (6th since 2000)
- ✓ Synergy with SWFDP (same forecasting system?)
- ✓ Similar goals (improving warning services)

SWFDP:

- Southern Africa
- South Pacific Islands
- Southeast Asia
- Eastern Africa

" … next decade will continue to bring improvements, especially in … detailed short-range forecasts, using storm-scale models able to provide skillful predictions of severe weather;

…

"… improvement in the usefulness of medium-range forecasts, especially through use of ensemble forecasting;"

…

- Eugenia Kalnay (2009)

Tell us how to fish

Show us how to fish

Fish with us

Thank you!

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