Report from THORPEX Africa WG Meeting (Geneva, May 8-10 2012)

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THORPEX DAOS WG 5th meeting

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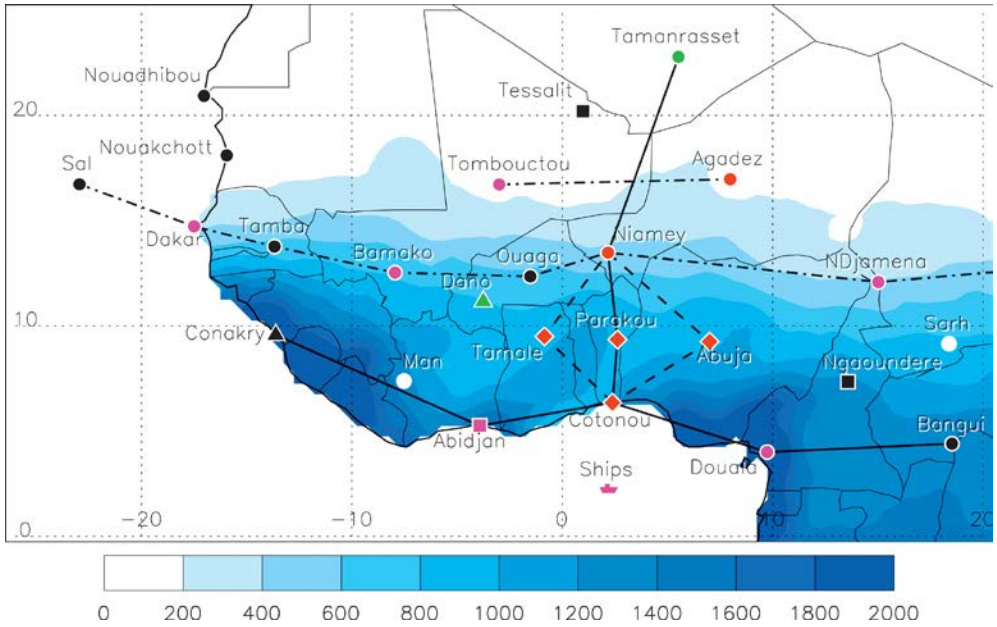
Background

- Mid-2000s: AMMA enabled enhanced observational network (mostly radiosondes)
- 2009: THORPEX Africa Science & Implementation Plans
- Radiosonde network deteriorating to pre-2005 levels



Meeting Summary

- Recognized need to leave a legacy for THORPEX Africa by end 2014
  - 4 case studies in N/E/S/W Africa
  - Short-medium range forecasting of heavy precipitation events
  - Encouraged tighter collaboration across African countries, between academia and forecast offices, and across THORPEX WGs (PDP, DAOS, TIGGE)

DAOS Perspective

- Primary questions related to observing systems, DA and observing strategies listed in THORPEX Africa Science and Implementation Plan are complex; largely been unaddressed.
- Main foci were
  - Design of an optimal, adaptable observational network
  - Exploit non-conventional observing systems

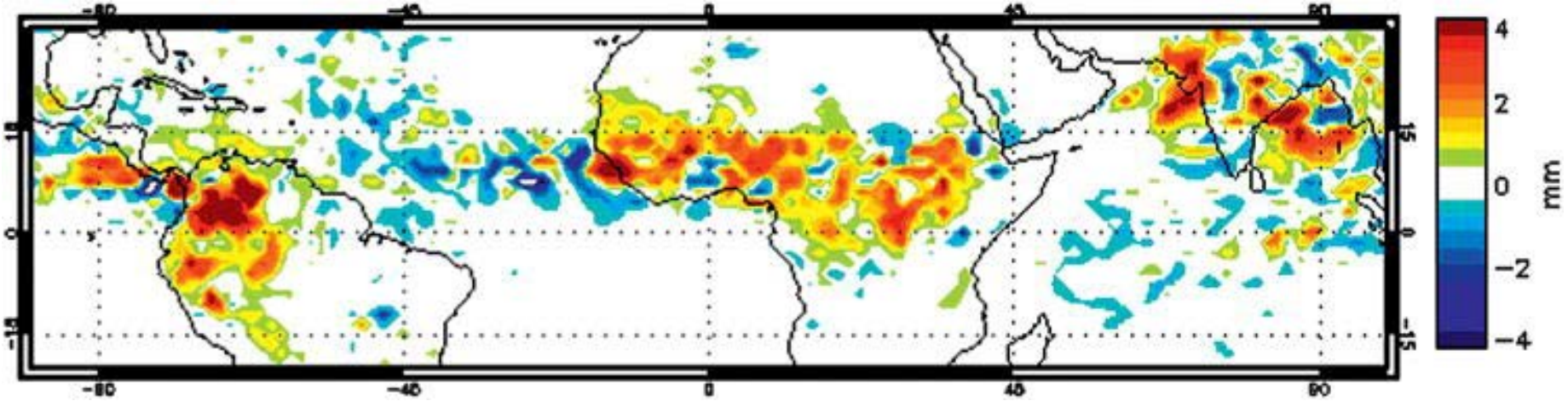
Main DAOS-related accomplishments

- AMMA radiosonde observations have a significant impact on the ECMWF analyses
- Unfortunately, the influence on the forecast is very short lived due to large model biases (low-level T, cloud cover, precipitation)
- Similar results at Meteo-France.

- (Agusti-Panareda et al. 2010, Faccani et al. 2010, WAF)

Example (Météo France): Low-level Satellite Microwave Observations

Average of the 24-h forecast cumulative rain-rate difference between 1 Aug–14 Sep 2006, due to assimilation of AMSU-B data.



"The forecast scores with respect to ECMWF analyses have been found to be positive for geopotential and temperature for forecast ranges up to 72 h. These results are very encouraging and suggest that it is possible to take advantage of the information content of the surface-sensitive observations over land if an adequate modeling of the emissivity and/or skin temperature is introduced."

(Karbou et al. 2010, WAF)

DA efforts in Africa

- Only DA study presented:
  - 3d-Var assimilation of conventional observations in a French regional model by the Moroccan weather service.
  - The data assimilation proved to be effective in improving the prediction of a very high precipitation event over Morocco.

In-situ data requirements

Surface station data and upper-air information from radiosondes remain an essential source of information over land for weather forecast models

- Large volume of satellite data limited to cloud-free pixels;
- Satellites provide indirect information, coarse vertical resolution;
- Limited use of satellite channels with peak sensitivity in lower troposphere;
- Low-level vertical profiles of T, q and **u** are necessary.

(From Fink et al. 2010)

- **Main GCOS Cooperation Mechanism (GCM) donors**: Japan, Switzerland, KNMI (Netherlands), USA, Germany, Spain, Canada, UK.
- **Renovation projects for radiosondes / telecommunications**
  - Mauritius, Tanzania, Sudan, Angola, Madagascar, DR Congo, Zambia, Sierra Leone

Remote Sensing Capabilities

- EUMETSAT
- Better defined moisture: AMSU-B/MHS and IASI/AIRS
- SEVIRI radiances
- AMVs
- Coastal; Fire; “Green” monitoring (soil / vegetation)
- Radar network
- UK Met Office (used by S. Africa) and ECMWF
  - Assimilation of aerosol optical depth, using SEVIRI and MODIS aerosol retrievals
  - Assimilation of soil moisture using ASCAT, validation using SMOS satellite

Challenges

- Biases in radiosondes
- Biases in modeling systems
- Unsuccessful bids for resources

→ **need to exploit satellite data further**

- **Data impact** experiments expensive, dependent on modeling/DA system, difficult to generalize.
- Lack of **event-based** verifications … type of modeling required?

Actions for DAOS WG

- The action items listed below are in the context of the following action item from the 9th ICSC session in September 2011:

- *Decision/Action ICSC9 (15): Request all the THORPEX WGs to examine how they can further develop activities to assist the Africa RC (e.g. case studies/demonstration projects, training, capacity building, data etc.)*

Actions for DAOS WG

1. Can DAOS contribute to the African case studies?

- THORPEX Africa Regional Committee will provide dates.
- Archived data-impact studies that report on observations that were important for analyses and forecasts over Africa?
  - 4 high-impact events
  - Over a month or a season?
- Is it possible to take some archived outputs and verify them specifically for Africa?
- Are any sensitive area calculations available for African cases?

Actions for DAOS WG

2. **Are there studies on African DA, impact of obs on African weather besides those reported?**

3. **Would DAOS be able to offer suggestions on the types of assimilation scheme and numerical model that would maximize the benefit to NWP?**
    - Global versus regional frameworks?
    - Resolution?
    - 4d-Var versus EnKF?

Actions for DAOS WG

4. **What new observing systems (e.g. new satellite platforms, AMDAR) are expected to be particularly useful to African NWP in the future?**

    - Consider in context of a sparse radiosonde network, thus a crucial lack of high-resolution coverage in the lower troposphere.

5. **What is the status of land surface DA, and is there scope for schemes to be applied in Africa?**