WEATHER FORECASTING IN WEST AFRICA USING NWP MODELS
State of the Art, Needs & Perspectives

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Weather Forecasting in West Africa Using NWP Models (State of the Art)

Some Problems Associated with Weather Forecasting In West Africa

- Lack of data especially upper air data
- Lack of adequate forecasting systems
- Difficulties in forecasting isolated convection
- Difficulties inherent to the weather systems
- Difficulties in simulating atmospheric processes
- Lack of "appropriate" forecast verification exercises (?)
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Forecasting convective systems and associated weather (TS, GF, Dust, RR)

- Inter Tropical Discontinuity (ITD) & ITCZ
- Pressure systems: Position and intensity
  - Heat low
  - Dynamic highs
  - Libyan high
  - Other secondary highs and lows
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- **Monsoon Flux**
  - Monsoon depth, strength and inland penetration:
    - 925 hPa for isolated convection (especially in the Sahel)
    - 850 hPa for organised convection
  - Monsoon flow organisation

- **Easterly waves (700hPA)**
- **AEJ (700hPa) & TEJ (200hPa)**
- **Mid-level dry air intrusion**
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- Div, VV and vorticity fields
- Relative Humidity (700 hPa)
- Precipitable water, CAPE-CIN, Theta Prime W
- Vertical X-sections of RH, VV, wind etc.
- Instability indices
- Satellite images (also used for an "eyebrow" verification of model analysis/forecast
- Radar where & when available (very few)
Vertical X-section across a deep convective area (North Mozambique Channel)
Date: 29 Nov 2007
Forecast range: 18 hours

NWP Products can be used by forecasters to infer areas of organised convection.
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EXAMPLE OF A SYNTHESIS FORECAST vs OBSERVATIONS

WASF 01-08-06 0600Z
Base: 30-07-06 0000Z

WASA 01-08-06 0600Z
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Forecasting Heavy Dust Spells

- Pressure field and tendency
- Low level and surface winds
- Satellite images (Mainly day time, RGB are better but not operationally available)

Heavy dust spell over Niger on 28-02-2007
Weather Forecasting in West Africa
Using NWP Models (State of the Art)

Some Systematic Behaviour of NWP Models Over West Africa

- Weak skill to predict convection;
- Erratic behaviour of models during transition periods;
- Lack of westward propagation in the convection;
- Dynamical structures are better forecasted
  - AEJ-TEJ-STJ acceleration are often well catch
  - AEJ acceleration well correlated with MCS occurrences
- Weaker surface winds (friction?)
Weather Forecasting in West Africa Using NWP Models (Needs)

• More training required on:
  – NWP Models, Models output interpretation and use
  – Typical signatures of models convection

• More investigation on model behaviour:
  – Know the systematic behaviour of the model for different parameters, especially in the ABL
  – Documentation of systematic behaviour of NWP models by forecasters

• Availability of evaluation results in operational forecast centres for consideration by forecasters

• Feedback from forecast users
Weather Forecasting in West Africa Using NWP Models (Needs)

• Improve the accessibility to NWP products in operational Centres by
  - Providing products at appropriate ranges
  - Providing products at appropriate levels
  - Adding other needed products to what is already available

• Close collaboration between research institutions and forecast centres for
  - Operational application of research results
  - Better integration of operational needs in research
Weather Forecasting in West Africa Using NWP Models (Needs)

• Further investigation on conditions favourable for convection
  - Initiation
  - Organisation
  - Propagation and
  - Dissipation

  Forecasts to play a major role by documenting these conditions for case studies

• Improving forecast systems by introducing systematic forecast verification programmes
• Explore the use of other available NWP products
• Acquisition, restoration, upgrade of weather radars
Weather Forecasting in West Africa Using NWP Models (Perspectives)

- Consolidate the AMMA forecast achievements
- AMMA an opportunity for a better understanding of atmospheric processes
  - More process studies with AMMA data
  - Opportunity for a close collaboration between research institutions and universities (within Africa and abroad)
- Use of "poor man ensemble" approach knowing the strengths and weaknesses of each model
- NMHSs should encourage, training, research and development
THANK YOU