Short, medium range and seasonal Forecasts verification Methods For the AMMA-EU Project.

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AMMA_EU WP 5.1 :
Weather and climate forecasting
(Verifications&Demonstrations)

-Purpose

- Description of datasets and methodologies for forecasts verification from daily to seasonal timescale for the African monsoon.

- The operational implementation of the concept of seamless suite of forecasts rely upon verification and demonstration of an integrated suite of weather and climate forecasts.

-Purpose

-Initiate strategic partnersship with operational modeling centers (ECMWF, NCEP, Meteo-France, UK Metoffice, BoM, Japanese Met agency, …) to prepare routine verification plots that will help develop models interpretation and use techniques over the monsoon region of Africa.

High impacts events in West Africa :

1- Droughts

2- Floods, particularly in the dry season

3- Late onsets of the rains

4- Early or late withdrawals of the rains

5- prolonged dry/wet spells

6- prolonged Cold snaps in the dry season, dust storms etc…

Forecasting these events requires an integrated forecast strategy with:

-Seasonal outlooks to determine significant departure of the average weather behavior from normal
(predictions of drought rely significantly on seasonal products)

-Intraseasonal / monthly forecasts that provide expected deviations from weekly, biweekly or monthly averages (Dry or wet spells, onsets and withdrawals of the rains, heat and cold waves fall within this time scales).

- Medium Range and short term forecasts give more precise information several days in advance on the expected weather (flooding day, hot and cold day)

- Analysis of the meteorological data from daily to seasonal timescale with up to date diagnostic and prediction systems is now possible within

WMO COPES, THORPEX-TIGGE, CLIVAR, AMMA .

To Build the best methodologies and techniques and make a seamless suite of forecasts, verification activities should cover daily to seasonal forecasts ranges.

This is the major motivation for this presentation.

Verification of short and medium range forecasts:

Data

- AMMA-SOP Observations

-Operational analysis and AMMA reanalysis from each deterministic global forecasting system (ECMWF, NCEP, Meteo-France, UK UM, …)

-NCEP-NCAR Reanalysis or ERA-40 (reference climatology)

- Direct model outputs from the above models up to 10 days

Key parameters

Mslp, TPW, RH850 and 700 hPa,, winds in the lower, middle and upper troposphere, Tmax

Verification schemes

Anomaly correlation coefficient measures the skill with climatology as benchmark forecast.

1- The ACCs plots against lead times from D+1 to D+10. Periods JJA and JAS, over two domains 20W-20E on the latitude bands 0-25N and 8-25 N

Parameters (mslp, RH850 and 700 hPa, TPW)

2-D maps of ACCs for D+1 to D+4, Period JJA and JAS over grid points of the sub Region (0-25 N; 20W-20E)

Verification schemes

Percent correct forecast skill score
(a distance between the percent correct for the reference forecasts and the percent correct for a perfect forecast.)

- The benchmark forecast for global centers can be a combination of climatology and persistence with equal weight.

- For African regional applications centers or NMSs, the forecaster's guidance can be used as benchmark.

- Parameters (mslp, RH, TPW, winds speed and direction at 925, 850, 700, 200 hPa, precip)

The MJO, Intraseasonal variability and Predictability

- Modulates intraseasonal Precipitation variability over the tropics
- Breaks and burst in the monsoons
- A trigger of ENSO
- Sometimes contribute to trigger onset or withdrawal of monsoon.

The MJO is operationally used for Monitoring and prediction at intraseasonal timescales.

It is a potential joint AMMA, CLIVAR, THORPEX endeavour to further verify forecasting systems for the MJO .

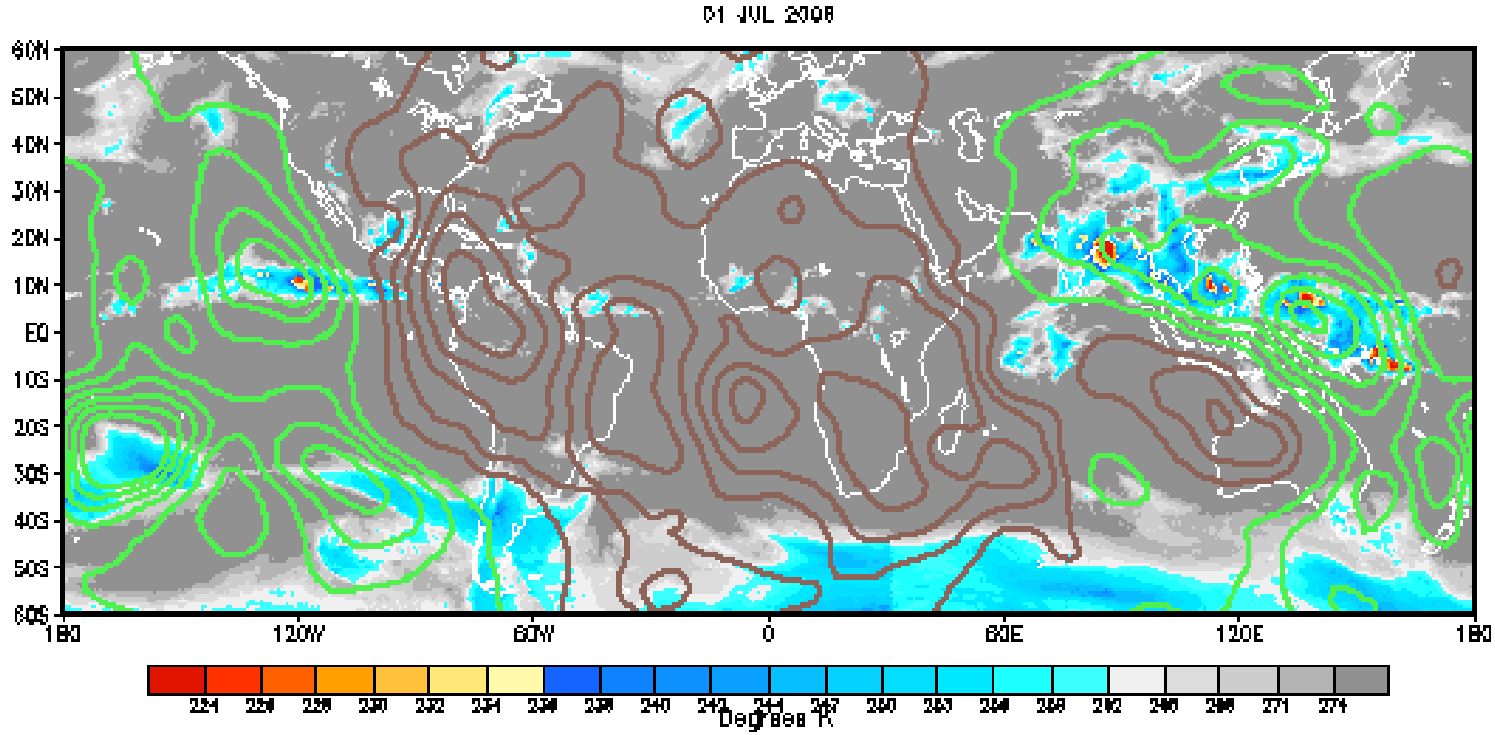
Verification of the MJO for intraseasonal monitoring and forecasting

Data (1971-2000)

velocity potential analyses and forecasts + IR brightness temperatures from geostationary satellites

Methods

Visual verification and Hövmoller diagrams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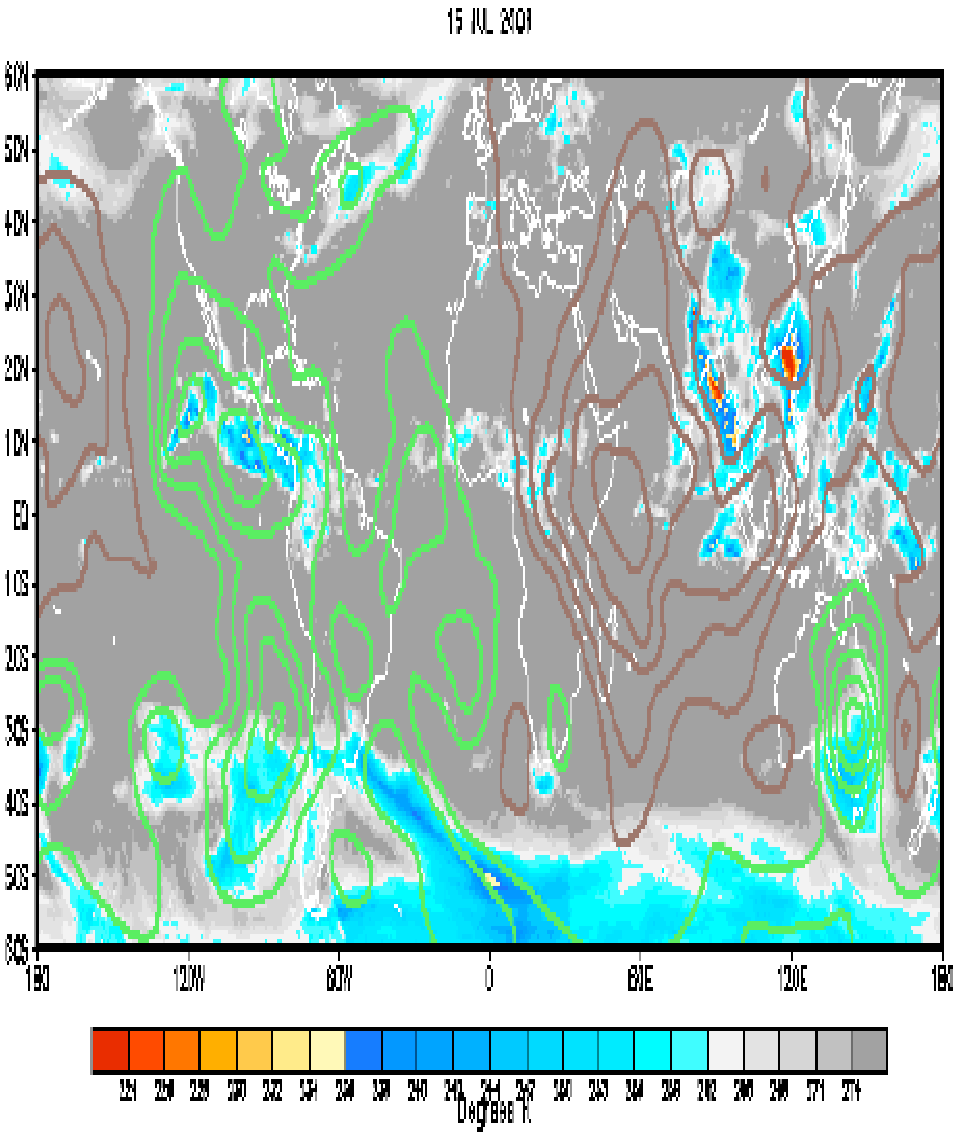


ECMWF Monthly Forecasting System

Velocity potential at 200 hPa (1.E6 m**2/s)

Forecast start reference is 08-07-2006

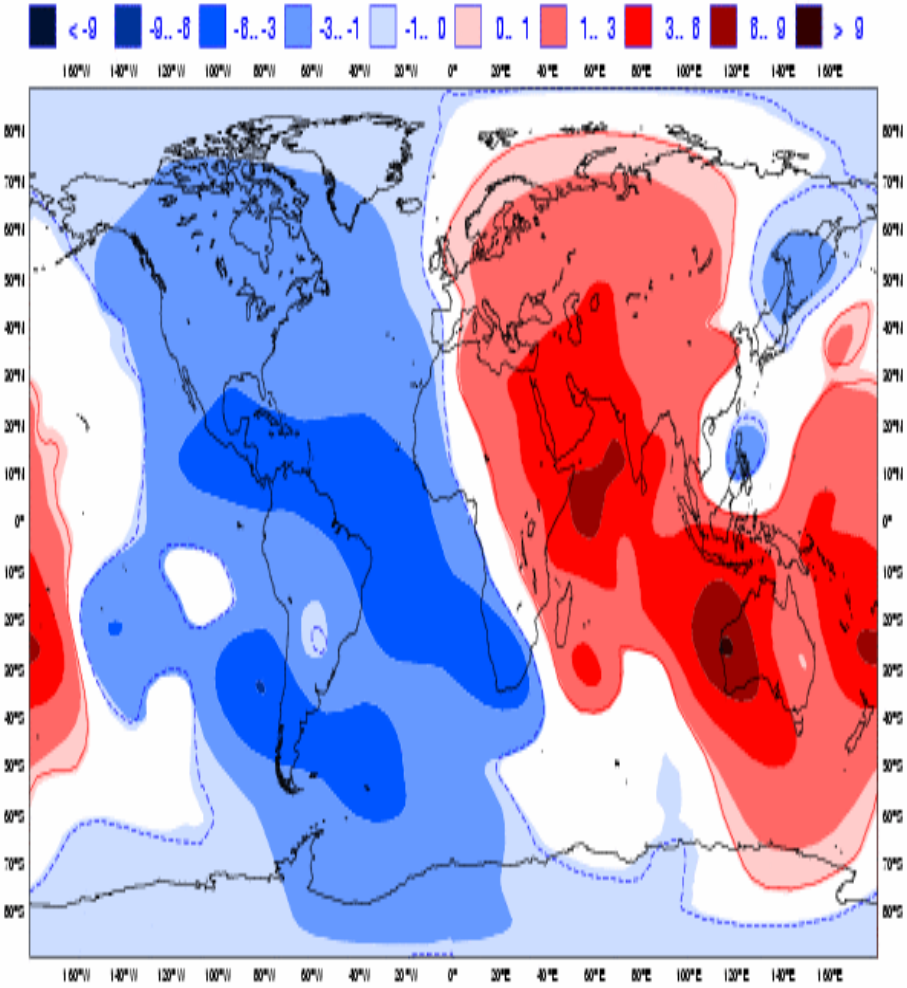
ensemble size = 51 ,climate size = 60

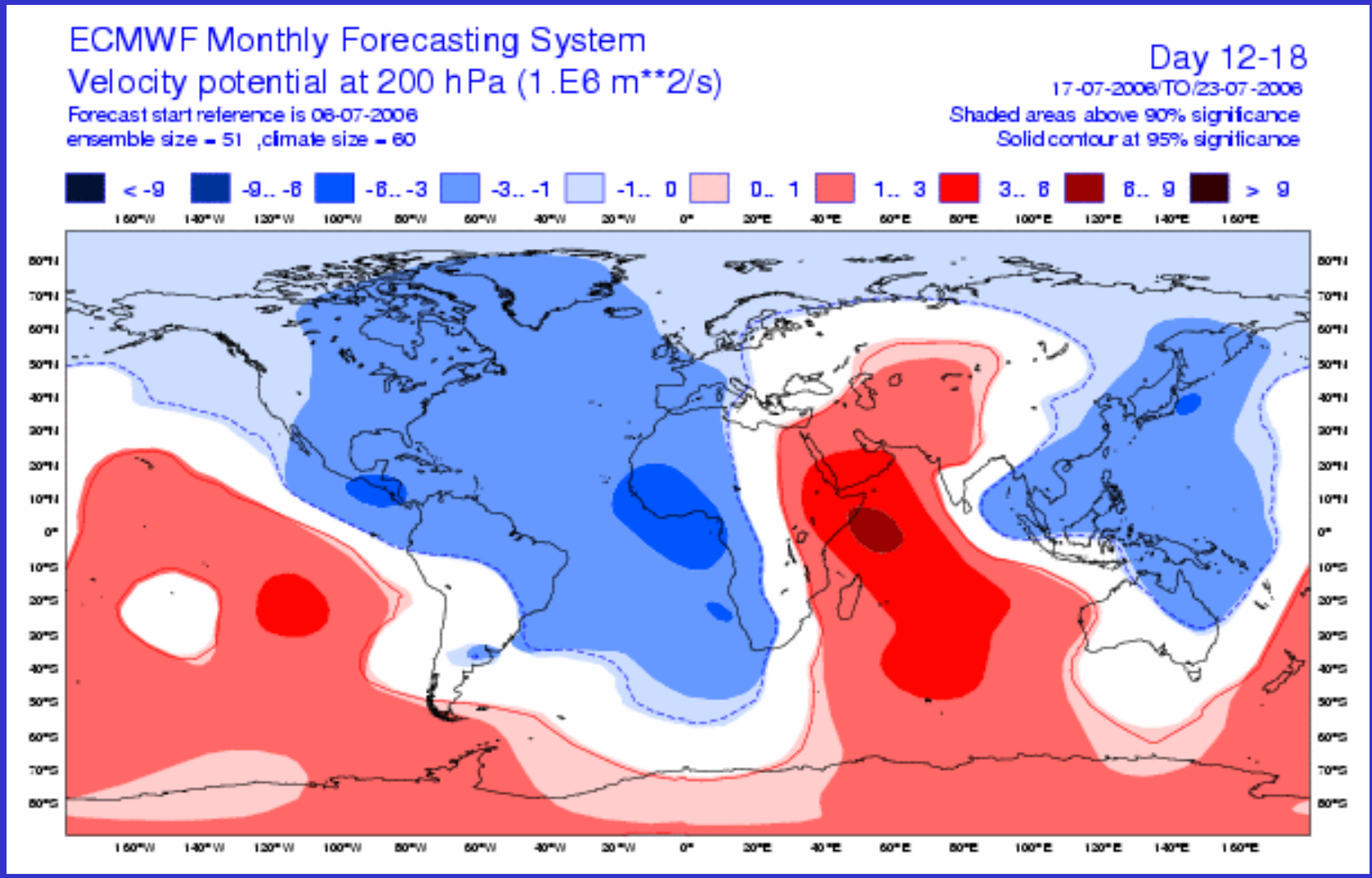
Day 5-11

10-07-2006/TO/16-07-2006

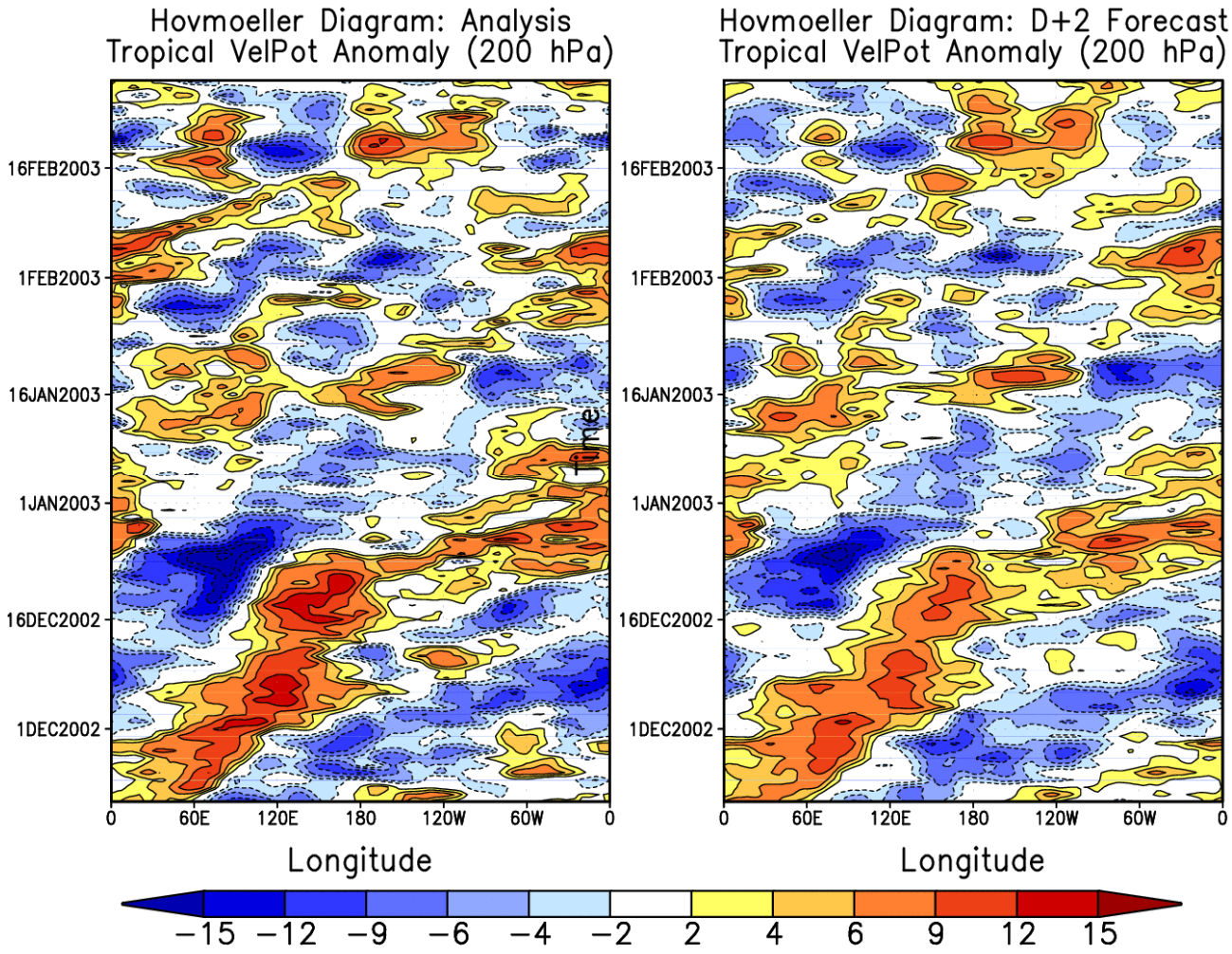
Shaded areas above 90% significance

Solid contour at 95% significance

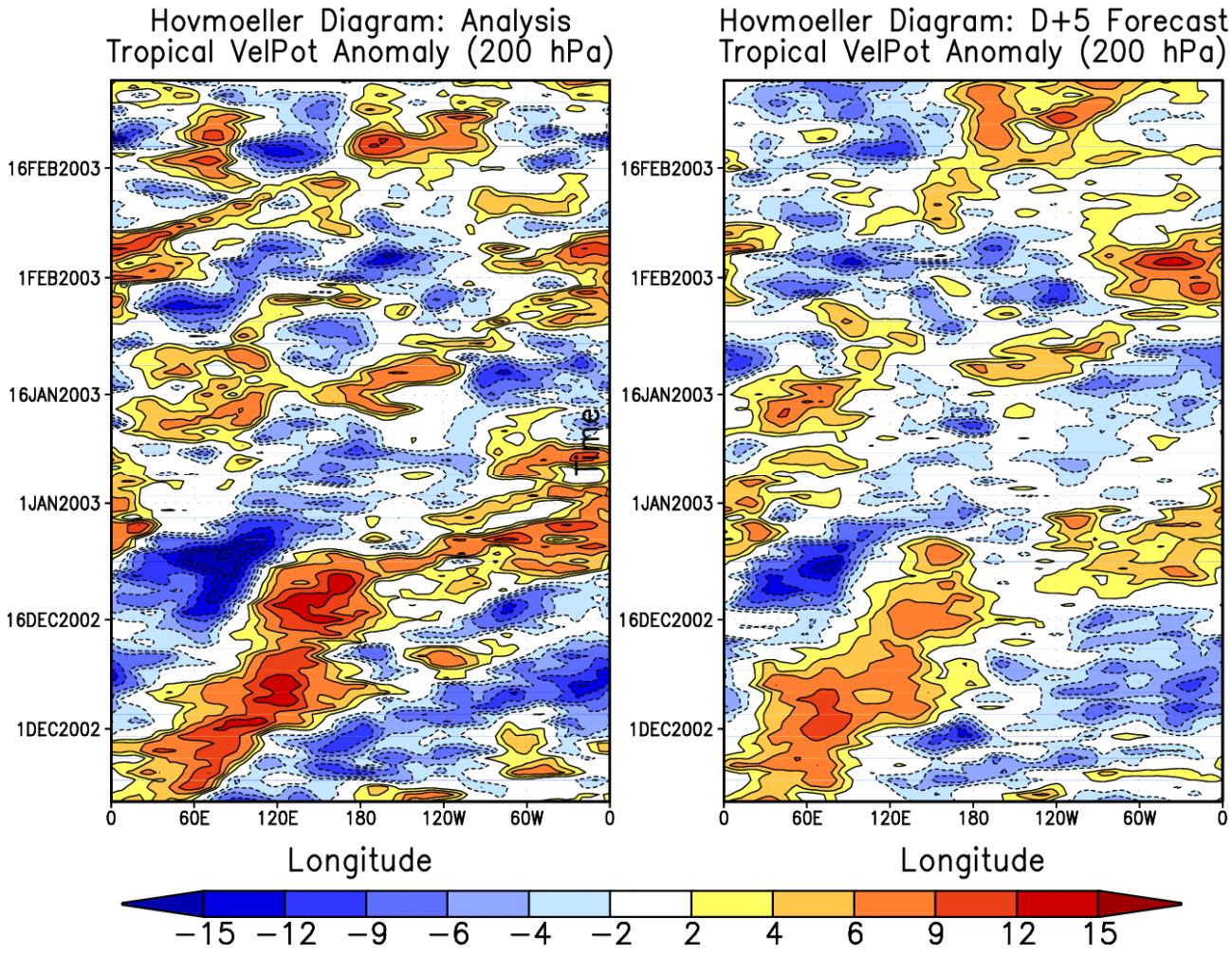



ECMWF Monthly Forecasting System
Velocity potential at 200 hPa (1.E6 m**2/s)
Forecast start reference is 06-07-2006
ensemble size = 51 ,climate size = 60
Day 12-18
17-07-2006/TO/23-07-2006
Shaded areas above 90% significance
Solid contour at 95% significance
< -9
-9.. -6
-6.. -3
-3.. -1
-1.. 0
0.. 1
1.. 3
3.. 6
6.. 9
> 9

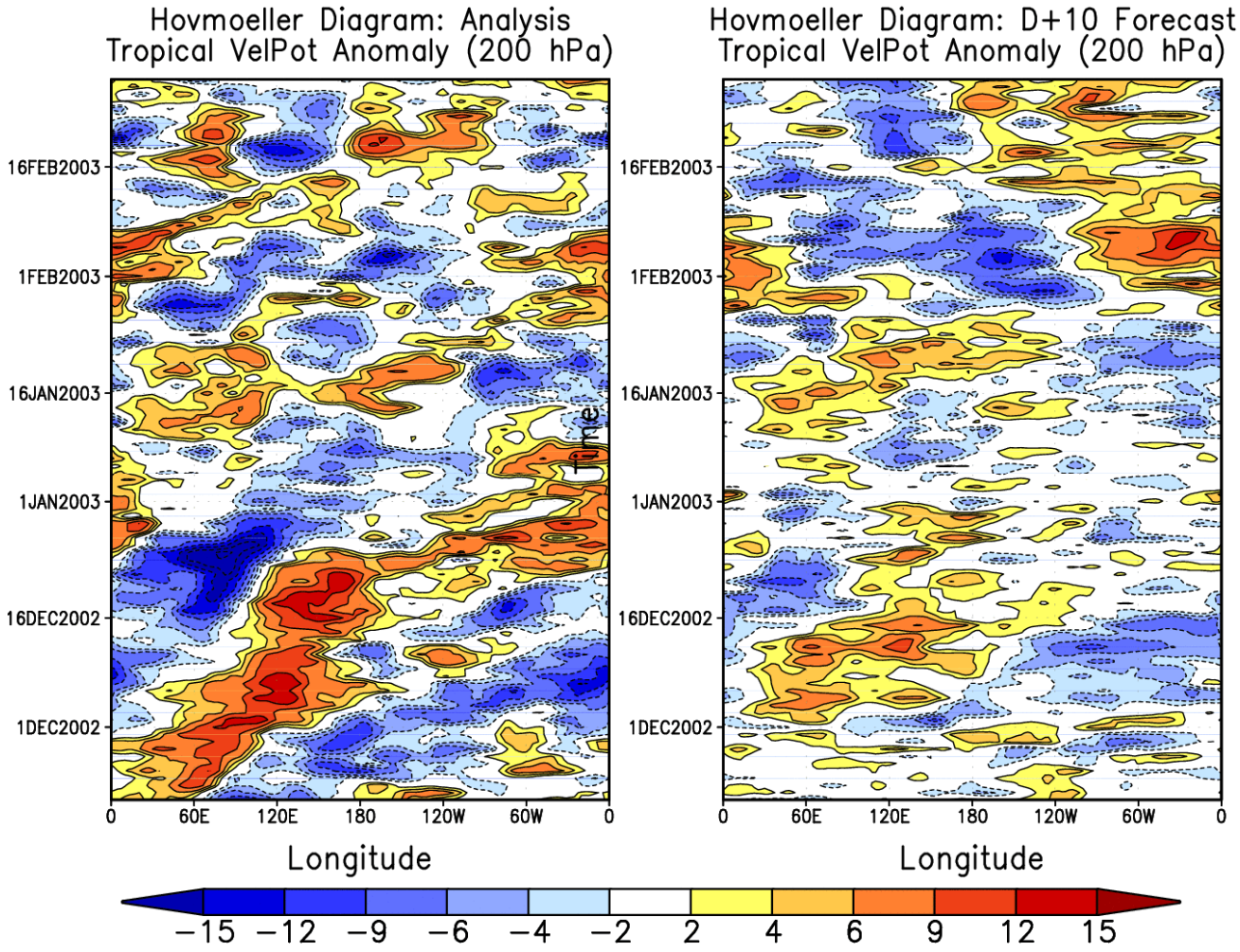
MJO ECMWF T511 (DJF 02/03): D+2 vs AN



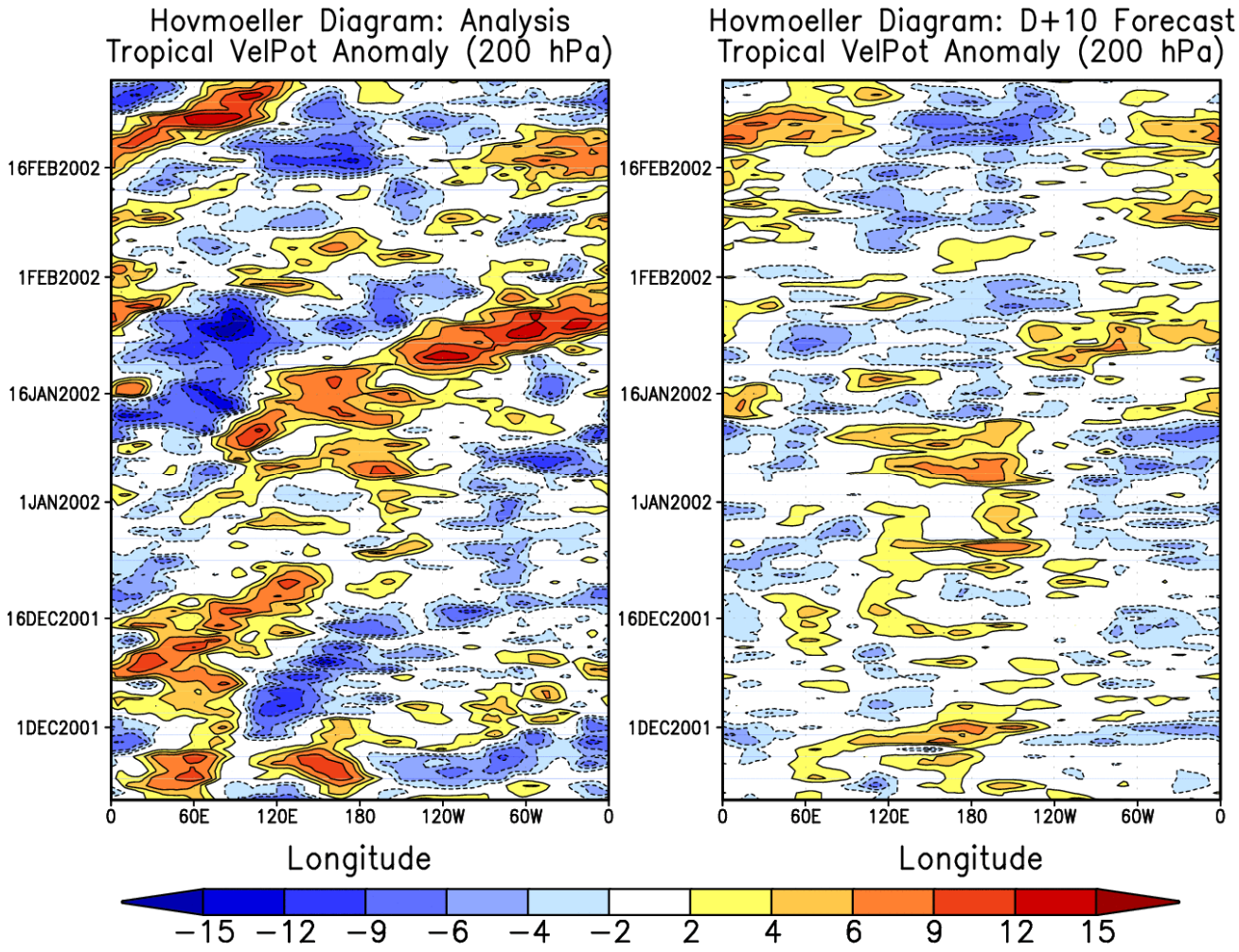
MJO T511 (DJF 02/03): D+5 vs AN



MJO T511 (DJF 02/03): D+10 vs AN



MJO T511 (DJF 01/02): D+10 vs AN



Verification of Seasonal forecasts

Data sets

-1971-2000 GCMs or statistical model rainfall simulations using observed SSTs

-1971-2000 retrospective rainfall forecasts with prescribed SSTs using the strategy of SST prediction of a real time operational forecast system

-1998-2006 operational forecasts made by each participating Global center for COFs organized by ACMAD

-CMAP, University of East Anglia, CAMS, NMSs precipitation Datasets

DEMETER and ENSEMBLE may provide part of this dataset. Formal Agreement probably needed between AMMA, ENSEMBLE and THORPEX-TIGGE

Methods

- Given the probabilistic nature of seasonal forecast, the verification methods may consider forecasts probabilities of all categories in computing errors.

- The rank Probability Skill Score (RPSS) and the Relative Operating Characteristic Skill Score

(ROCSS) are schemes proposed to facilitate assessments of model predictive capacity

(potential and operational) and related interpretation and use techniques.

Activities

Tobuild new forecasters training materials and techniques for better forecasts in Africa

1- Document available cases studies

2 - Document up to date scientific findings and Develop related forecasting techniques for Met Services

3- Basic research where better understanding of phenomena is important for applications (tropical convection and squall lines, …)

4 - demonstrations on developed techniques

5 - build training materials and training sessions

6 - Evaluate improvements in the forecasts with questionnaires for users

CONCLUSION

« A chain is always as strong as its weakest link. »

High impacts events in Africa cover daily to seasonal timescales.

Let's go seamless for verification and demonstrations to effectively increase the value of forecasts.

Thanks !!!!