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Seasonal and intraseasonal changes of African monsoon climates in 21st century CORDEX projections

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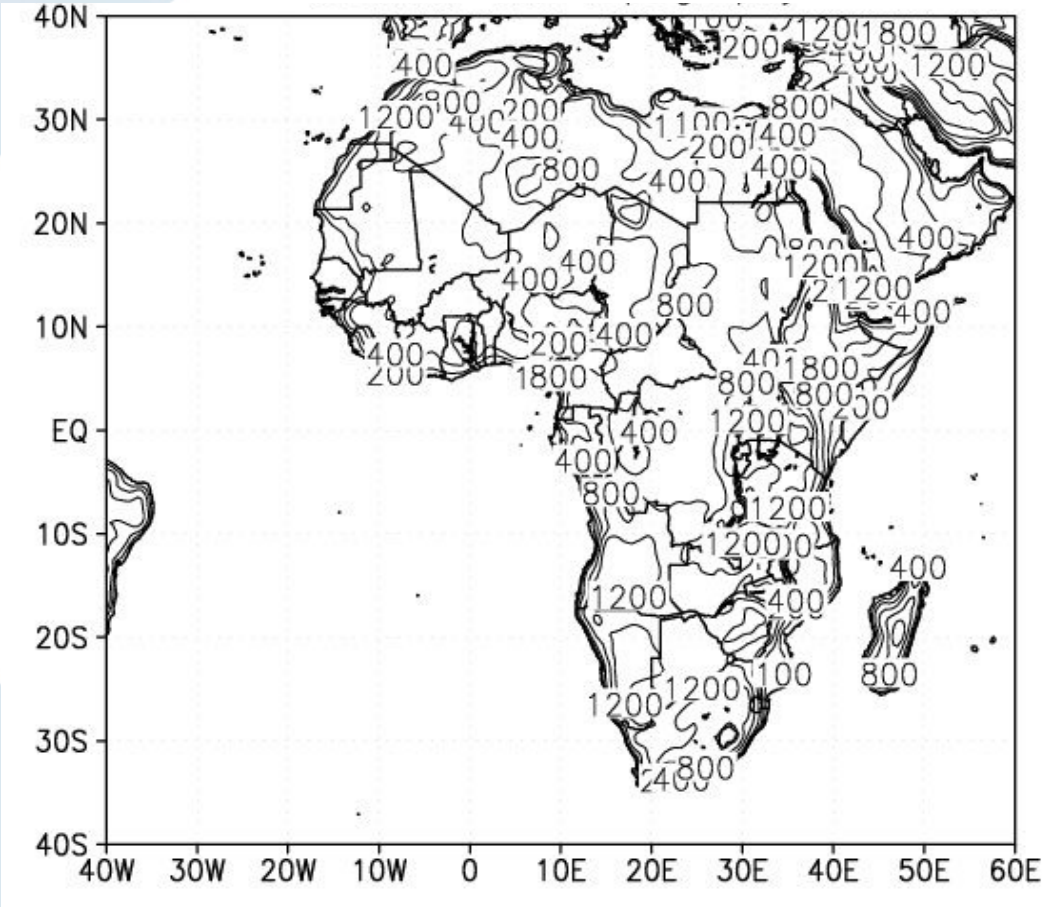
The Abdus Salam International Centre for Theoretical Physics
50th Anniversary 1964 - 2014

Table of contents

CORDEX Africa domain and topography



X grid 240 ; Y grid 250

spatial resolution of 50 km

3 scenario simulations

from 1970 up to 2100

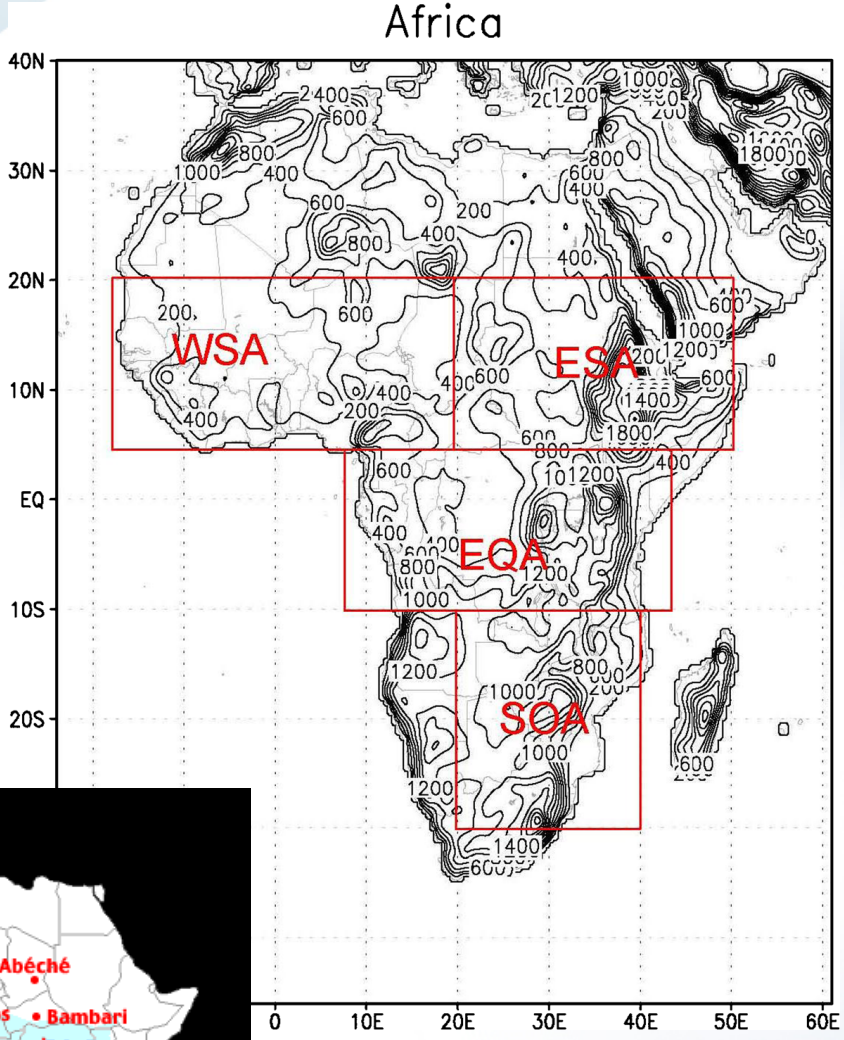
- **MPI-GCM RCP8.5**
- **Hadgem-GCM RCP4.5**
- **Hadgem-GCM RCP8.5**

Reference period (1976-2005)

2 RCMs (CLM, BATS, Conv)

Table of contents

CORDEX Africa domain and sub-regions



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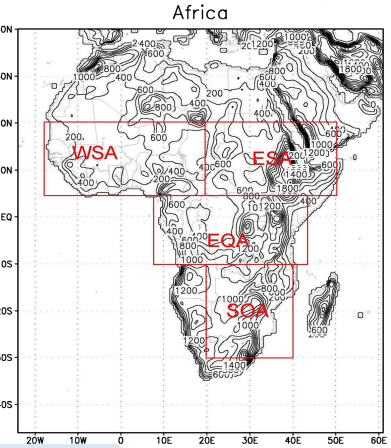
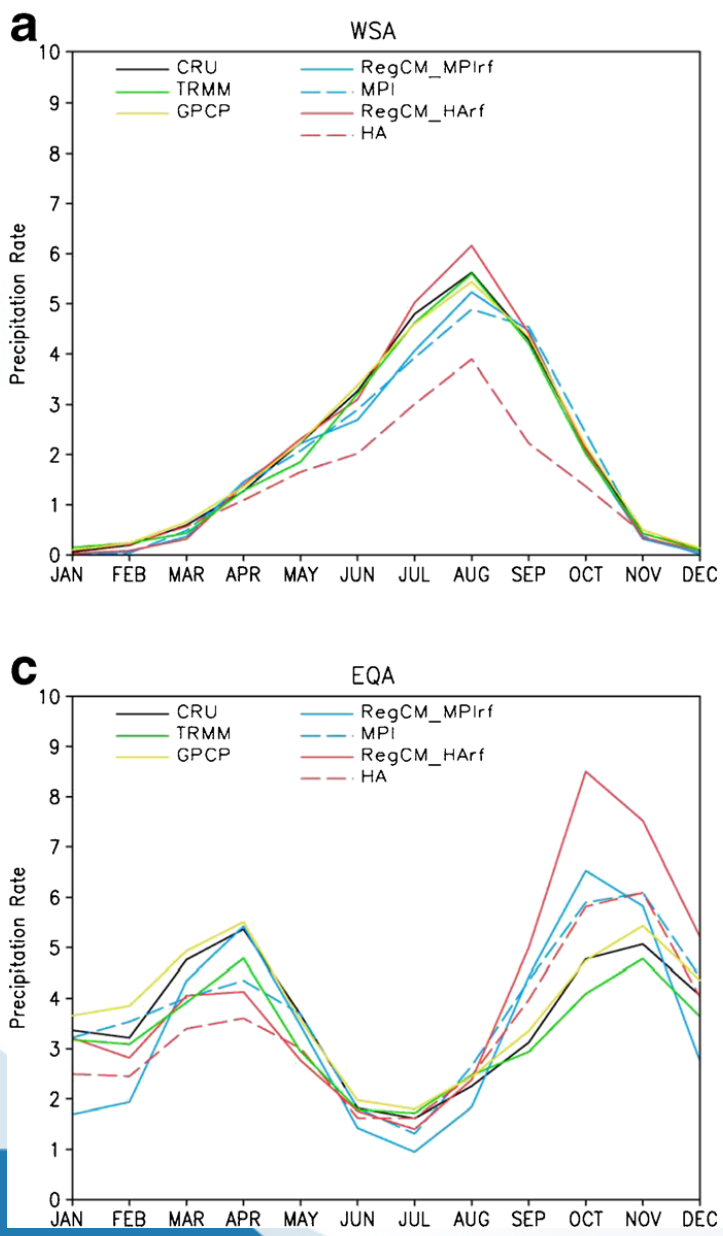
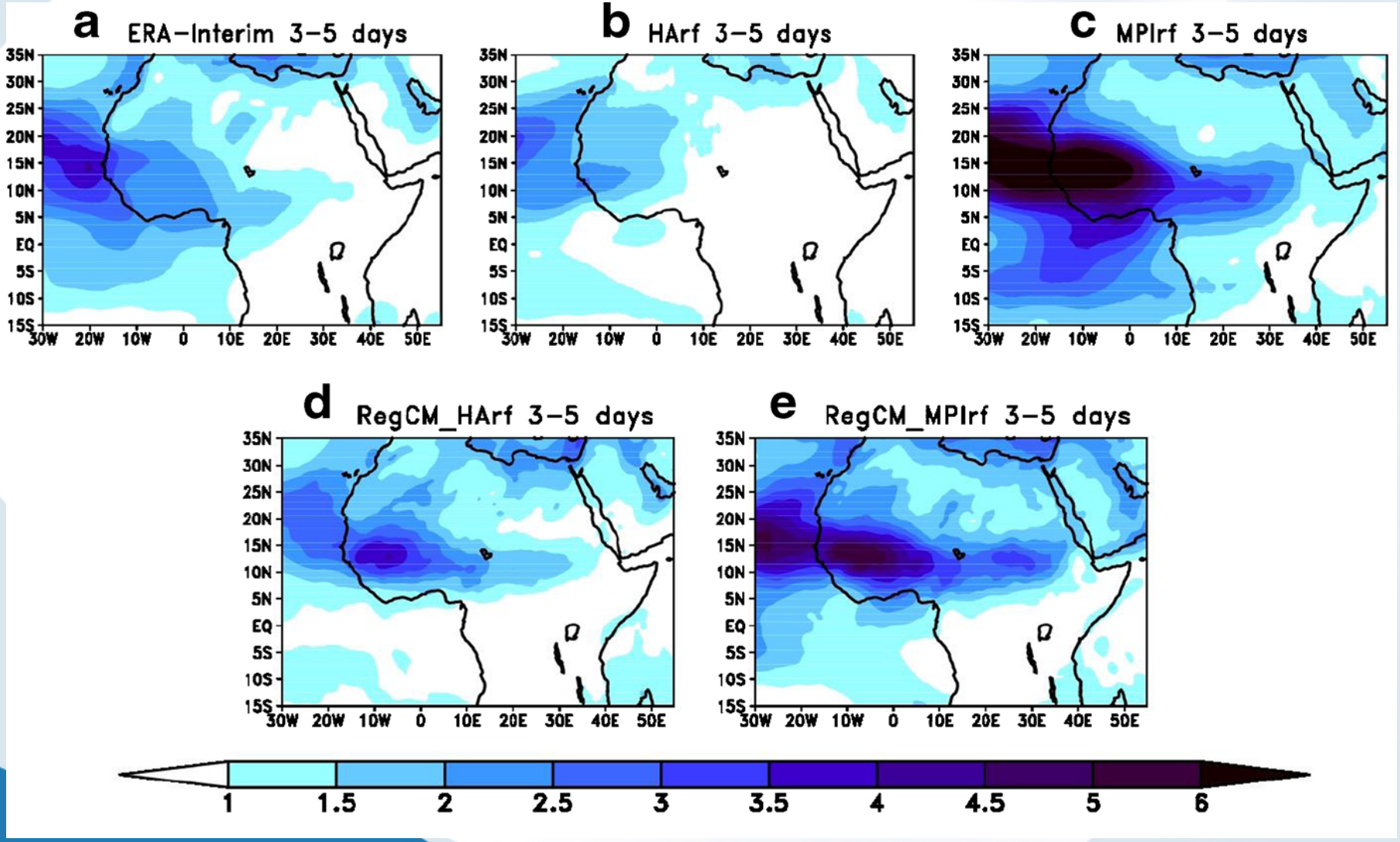
Precipitation annual cycle (Ref: 1976-2005)





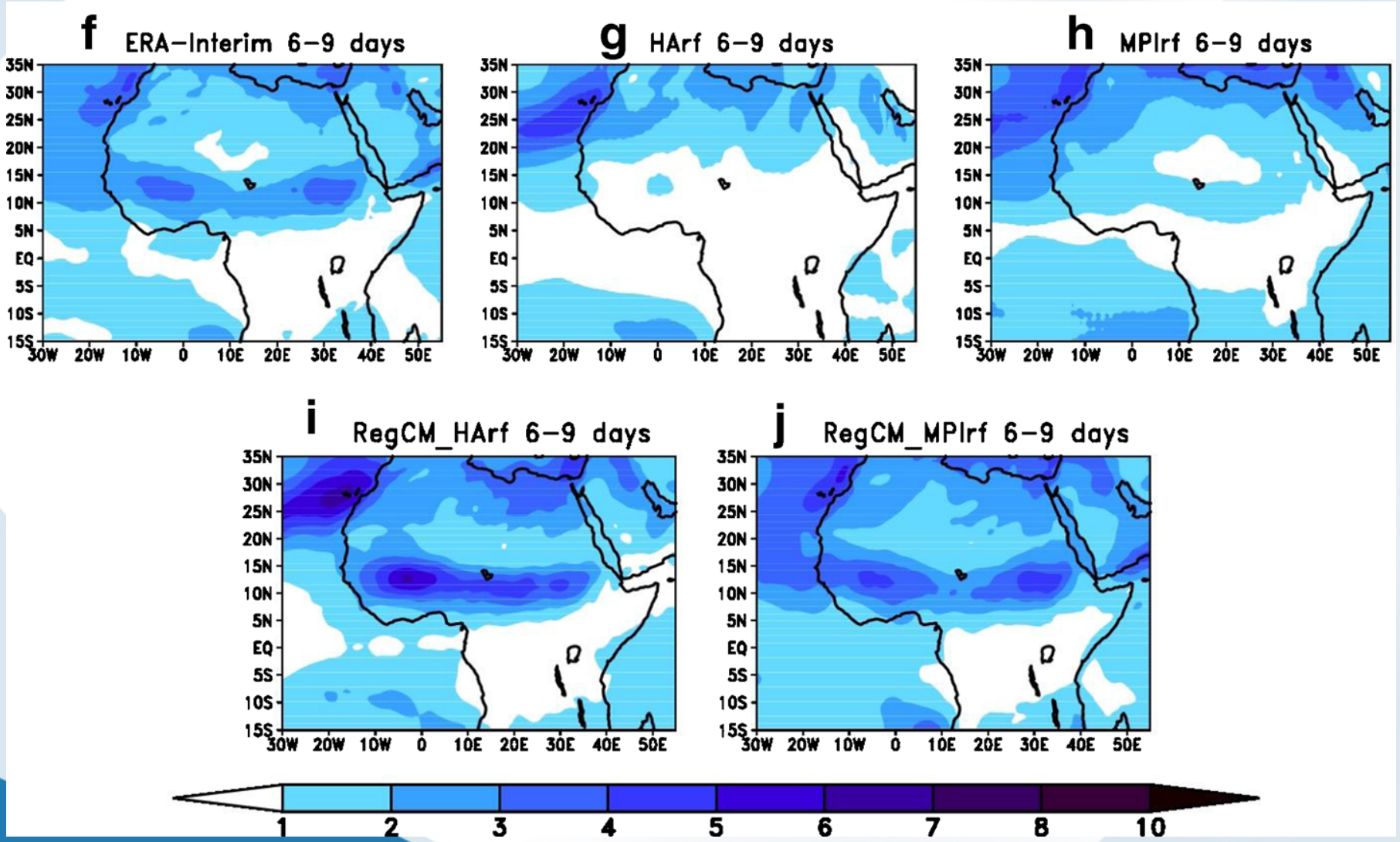
AEWs activity (Ref: 1976-2005)

Variance in 700hPa meridional wind, JJA, 3-5 day filter

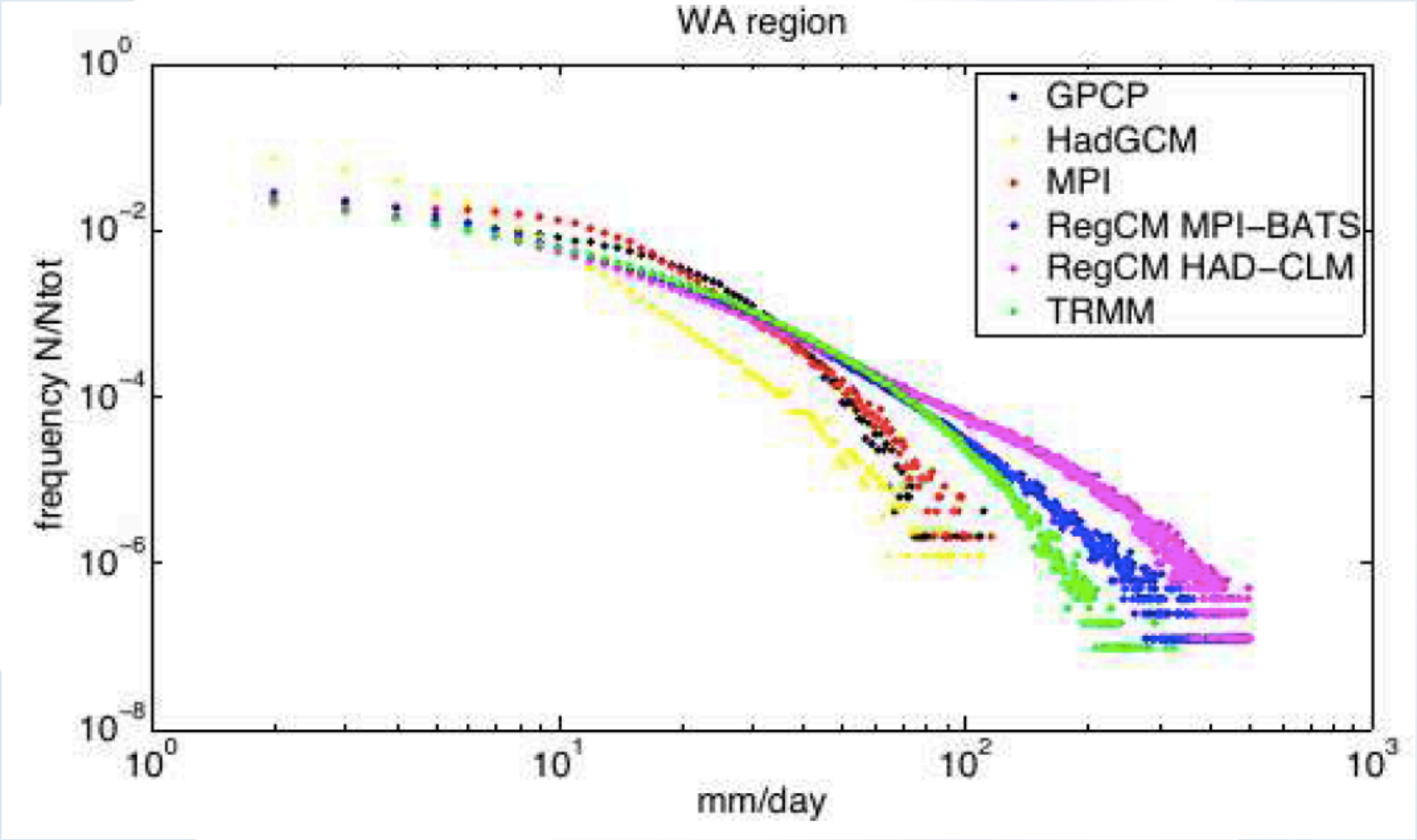


AEWs activity (Ref: 1976-2005)

Variance in 700hPa meridional wind, JJA, 6-9 day filter



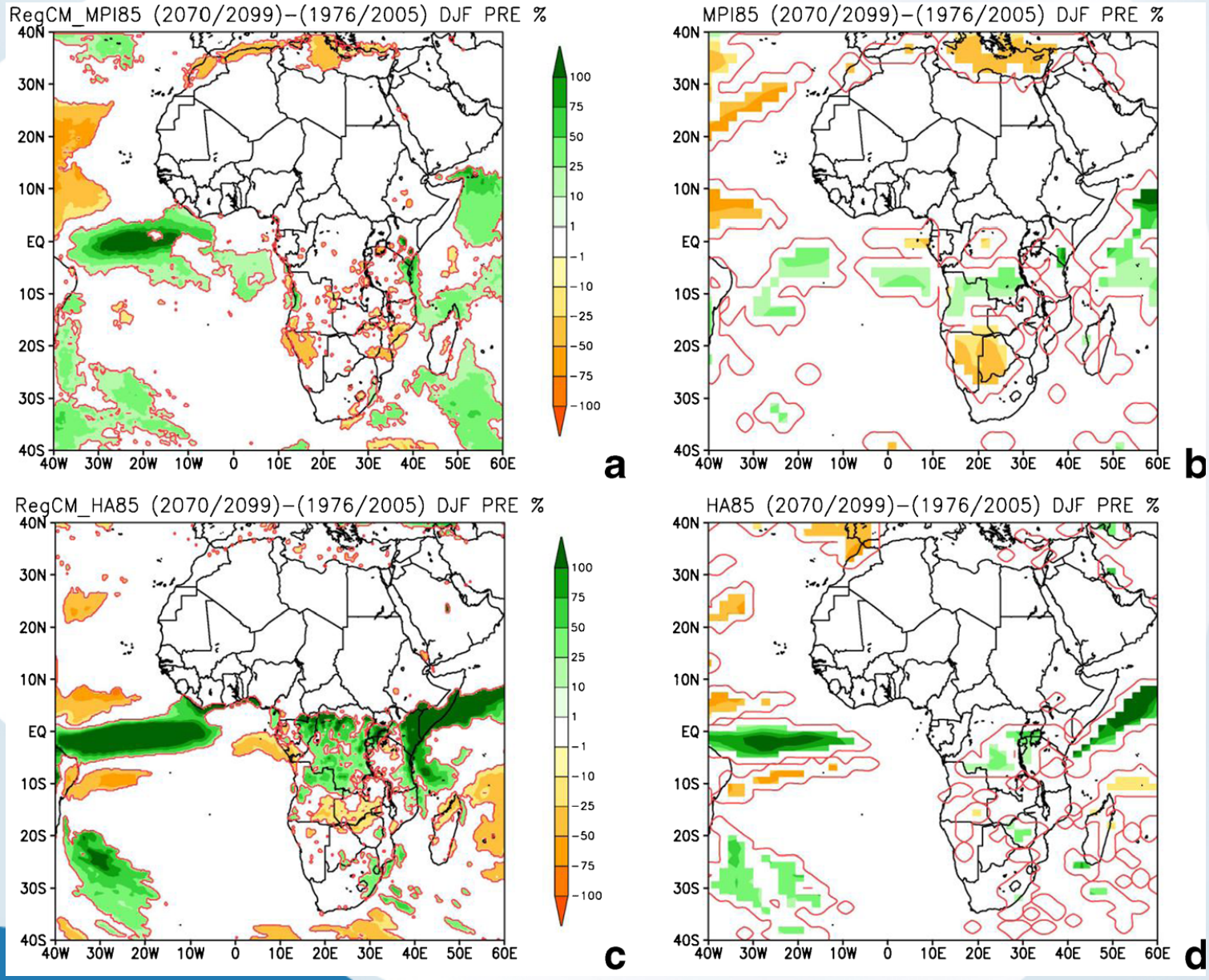
Extremes Daily precip PDFs over West Africa



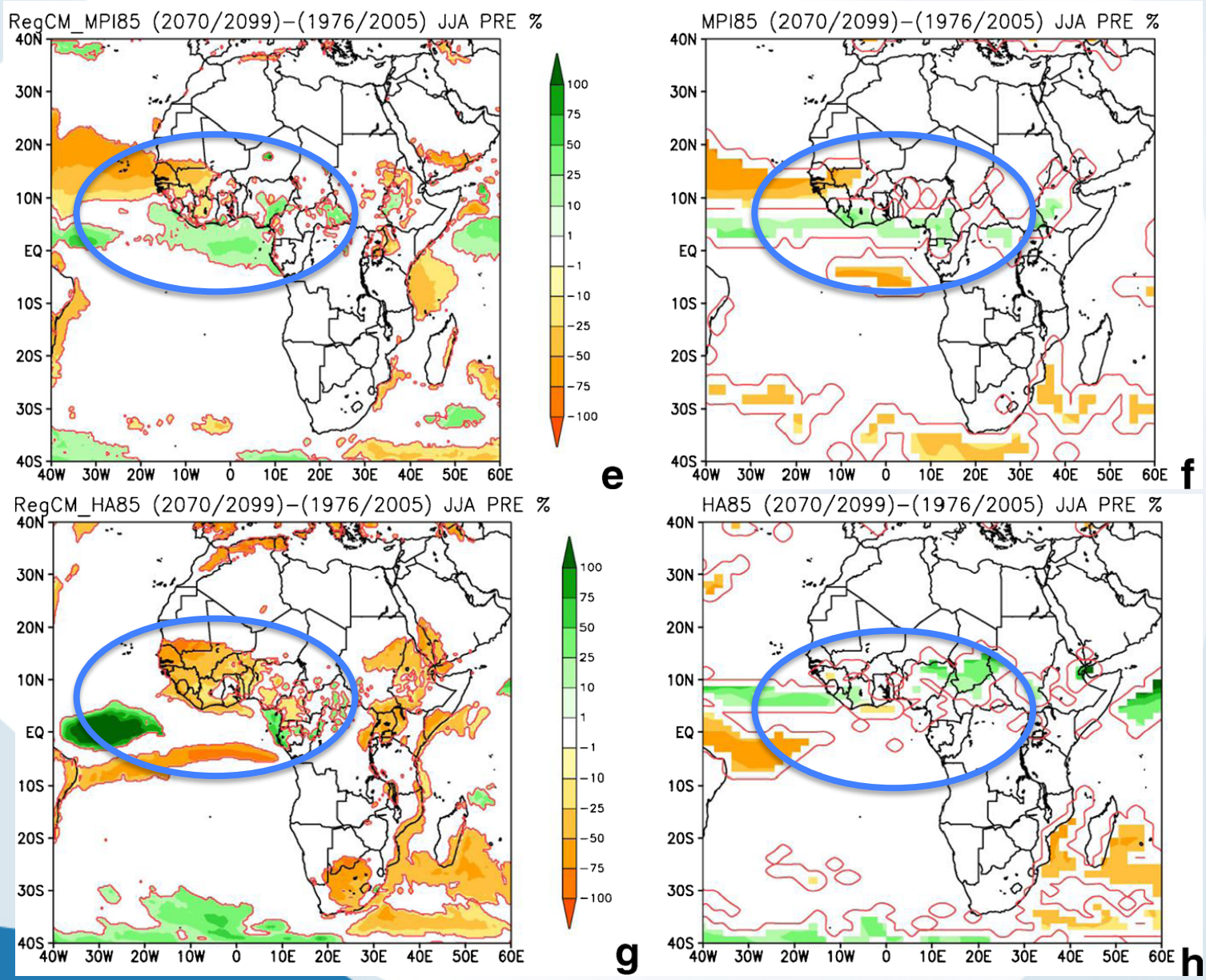
The GCM is close to the coarse resolution data, the RCMs to the high resolution data
This is what we expect from a downscaling exercise

Table of contents

Precipitation change DJF

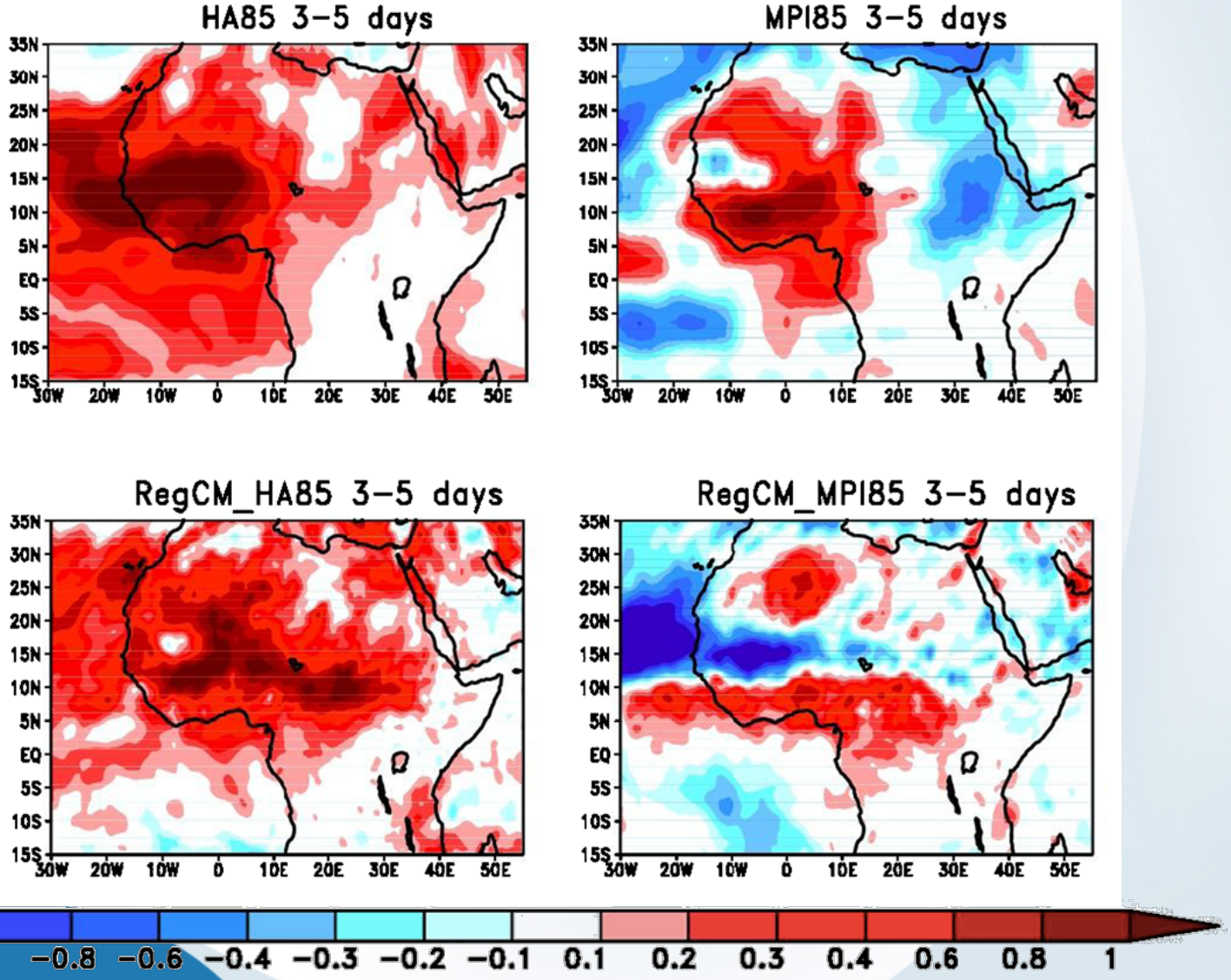


Precipitation change JJA



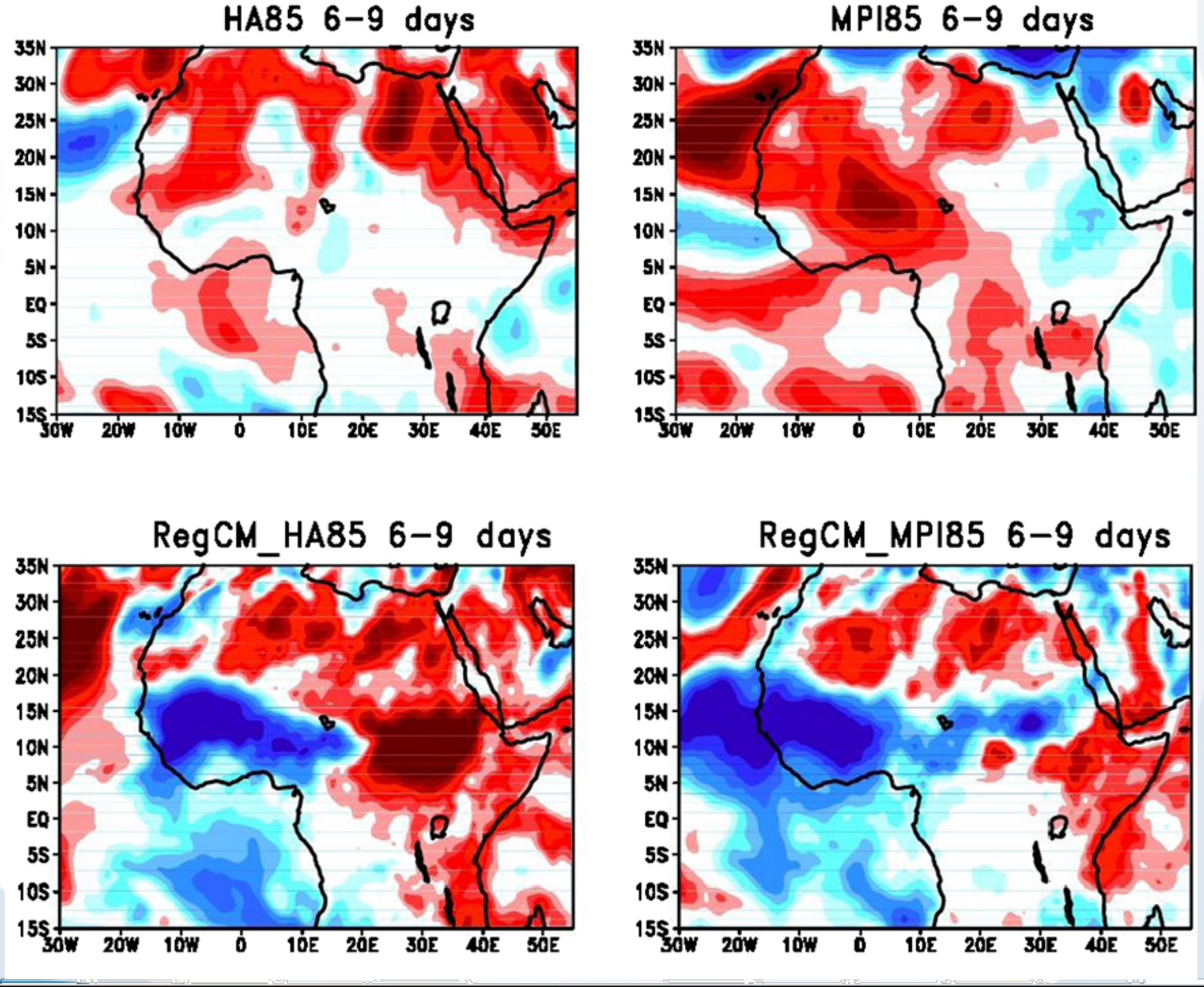
Change AEWs activity

Variance in 700hPa meridional wind, JJA, 3-5 day filter



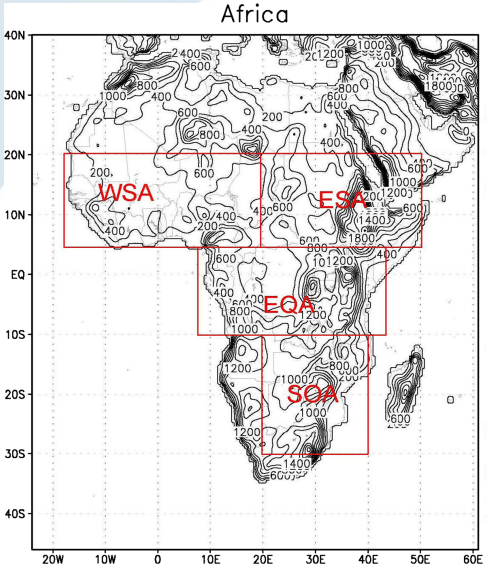
Change AEWs activity

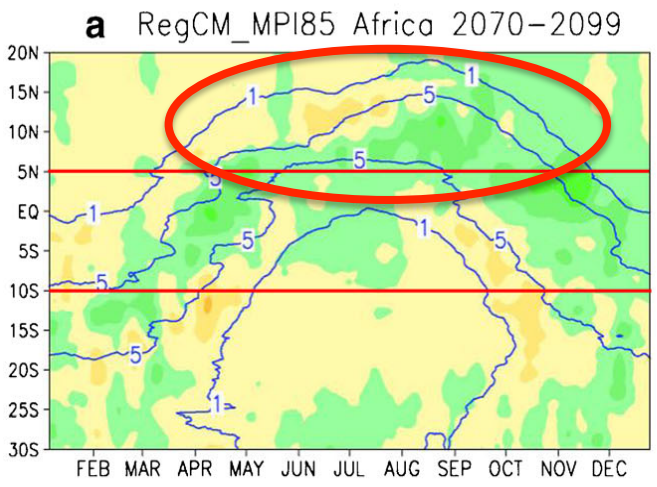
Variance in 700hPa meridional wind, JJA, 6-9 day filter

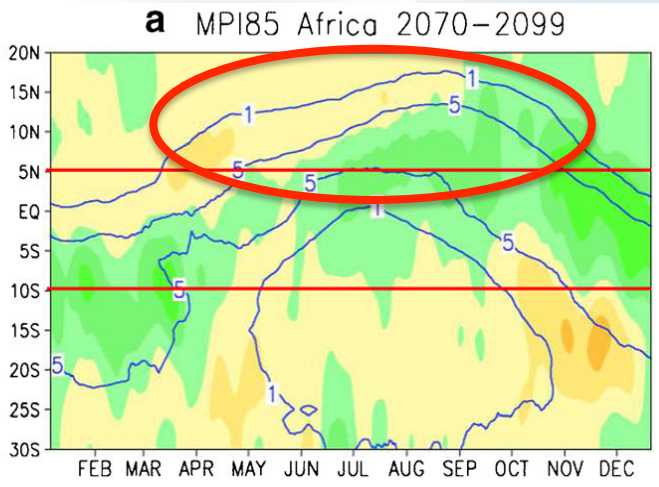


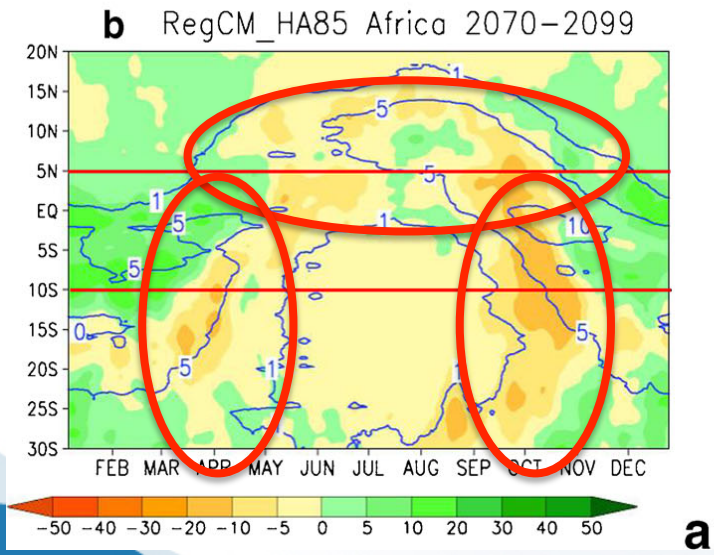
Change signal in monsoon patterns

Hovmöller diagram









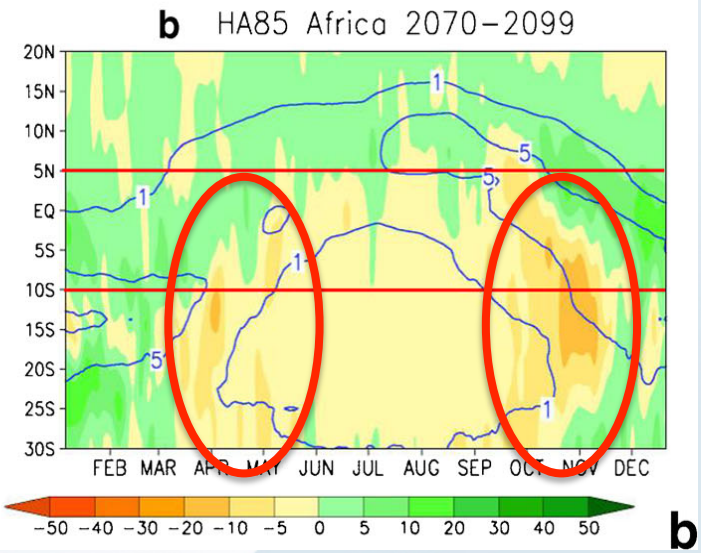


Table of contents

Conclusions

- A set of 21st century projections has been conducted over the Africa CORDEX domain driven by the HadGEM and MPI GCMs for the RCP8.5 and RCP4.5 GHG concentration scenario.
- The models simulate realistic monsoon seasonal evolution and patterns of wave activity associated with monsoon rain, with the regional model improving considerably the pattern of AEWs activity compared to the driving GCMs.
- Over West Africa and the Sahel the MPI GCM simulates a forward shift of the monsoon season, while the HadGEM has a more mixed change signal.

  The nested RegCM4 also simulates this shift (when driven by MPI) but also projects a more widespread decrease in precipitation throughout the monsoon season mostly associated with a reduction of AEWs activity in the 6–9 days regime and to the soil-precipitation feedback discussed by Mariotti et al. (2011).
- South of the equator the most pronounced signal is a tendency for an extension of the dry season associated with a narrowing and strengthening of the ITCZ precipitation band in the equatorial and southern Africa regions.

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