Testing of Tiedke scheme and aerosols over West Africa

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Outline

Model configuration

Preliminary results :
- Summer rainfall and temperature distribution

- Seasonal cycle of rainfall

- Horizontal and vertical distribution of dust

Conclusion

Objectives

This study aims to test the sensitivity of West african climate to Tiedke scheme :

- To test the sensitiveTiedke parameters in the aim to better represent the rainfall and Temperature distribution : cprconv (Coefficients for determining conversion), entrpen (entrainment rate for penetrative convection) and cmtcape (CAPE adjustment Timescale parameter)

- Use of the aerosol module with the Tiedke scheme

Model Configuration

Surface scheme : BATS

LBC : from Era-Interim and SST is OISST

Large scale precipitation : SUBEX

Boundary layer scheme : Holstag PBL

Ocean flux schemel : Zeng

Cumulus convection scheme : Tiedke

Resolution : 60 km

Length of simulation : 1 year (2005)

5 experiments are presented

Different Experiments

- First run : default Tiedke parameter (entrpen=1, cmtcape=40 and Cprconv=1)

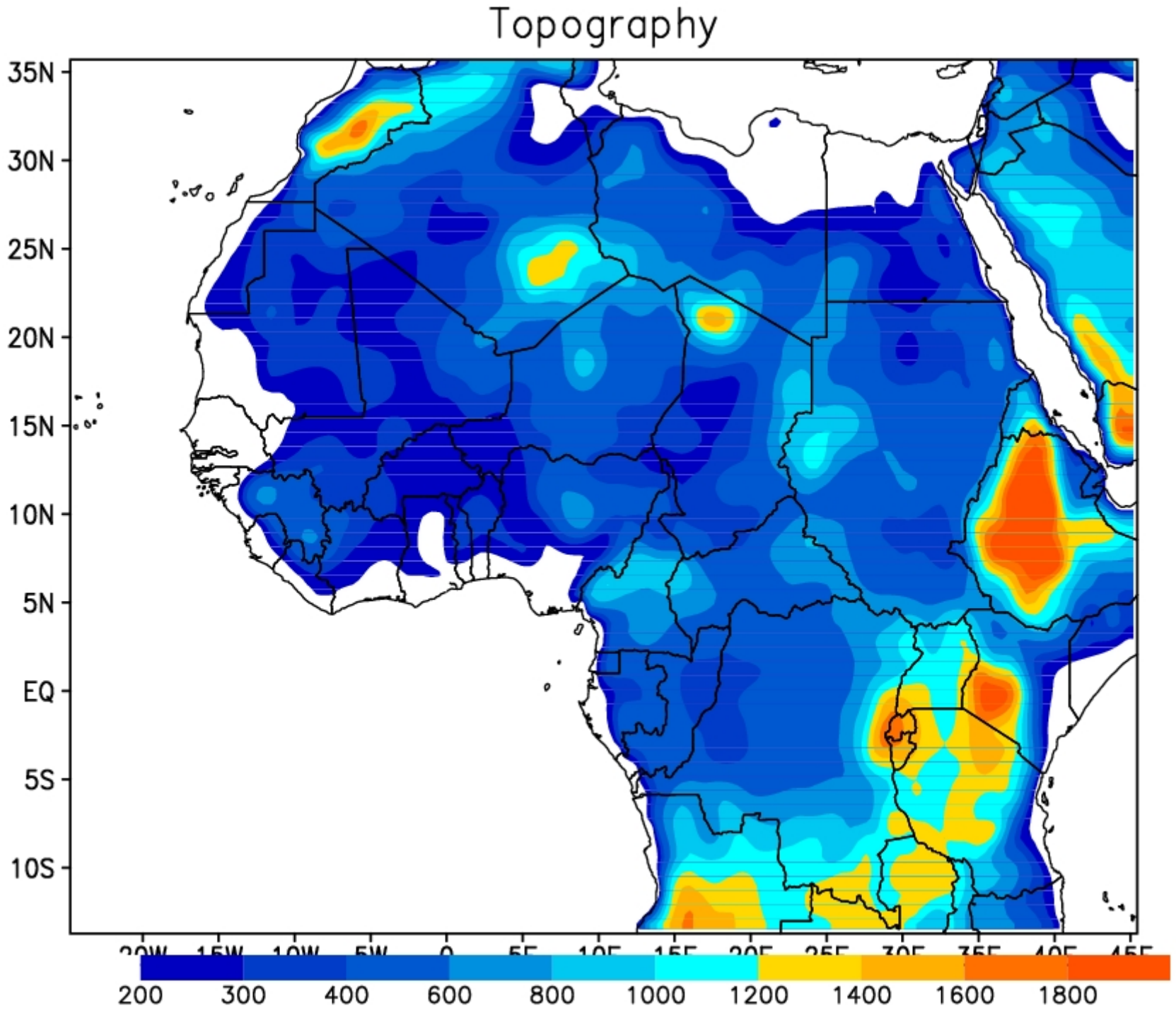
We did 3 other runs playing with the relevant Tiedke sensitive parameters in the aim to reduce wet biais

- Second run (double entrpen): entrpen=2, cmtcape=40 and Cprconv=1

- 3th run (double cmtcape): entrpen=1, cmtcape=80 and Cprconv=1

- 4th run (half cprconv): entrpen=1, cmtcape=40 and Cprconv=0.5

- 5th run : default Tiedke with dust


Topography
35N
30N
25N
20N
15N
10N
5N
EQ
5S
10S
200
300
400
600
800
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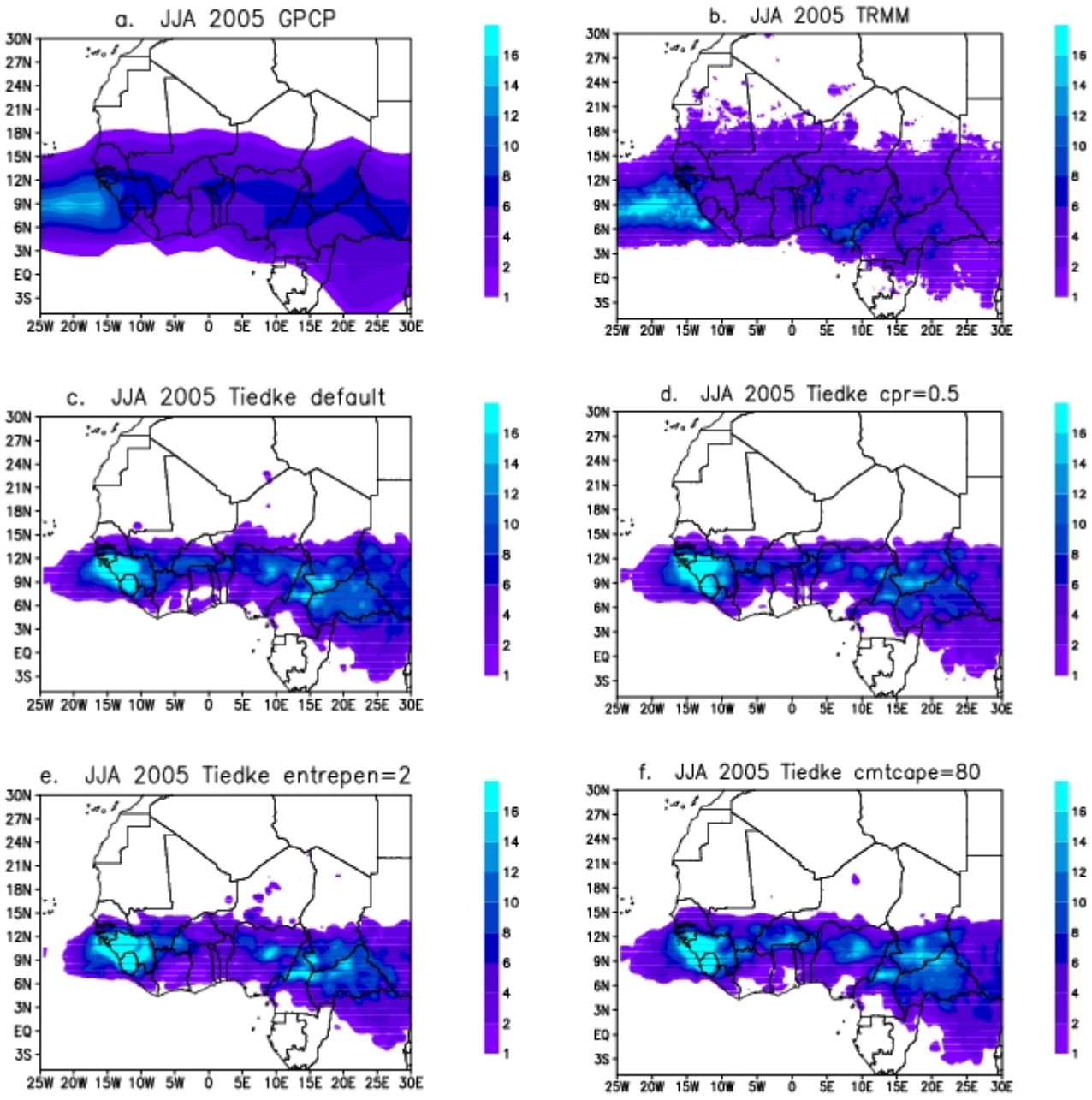
1200
1400
1600
1800

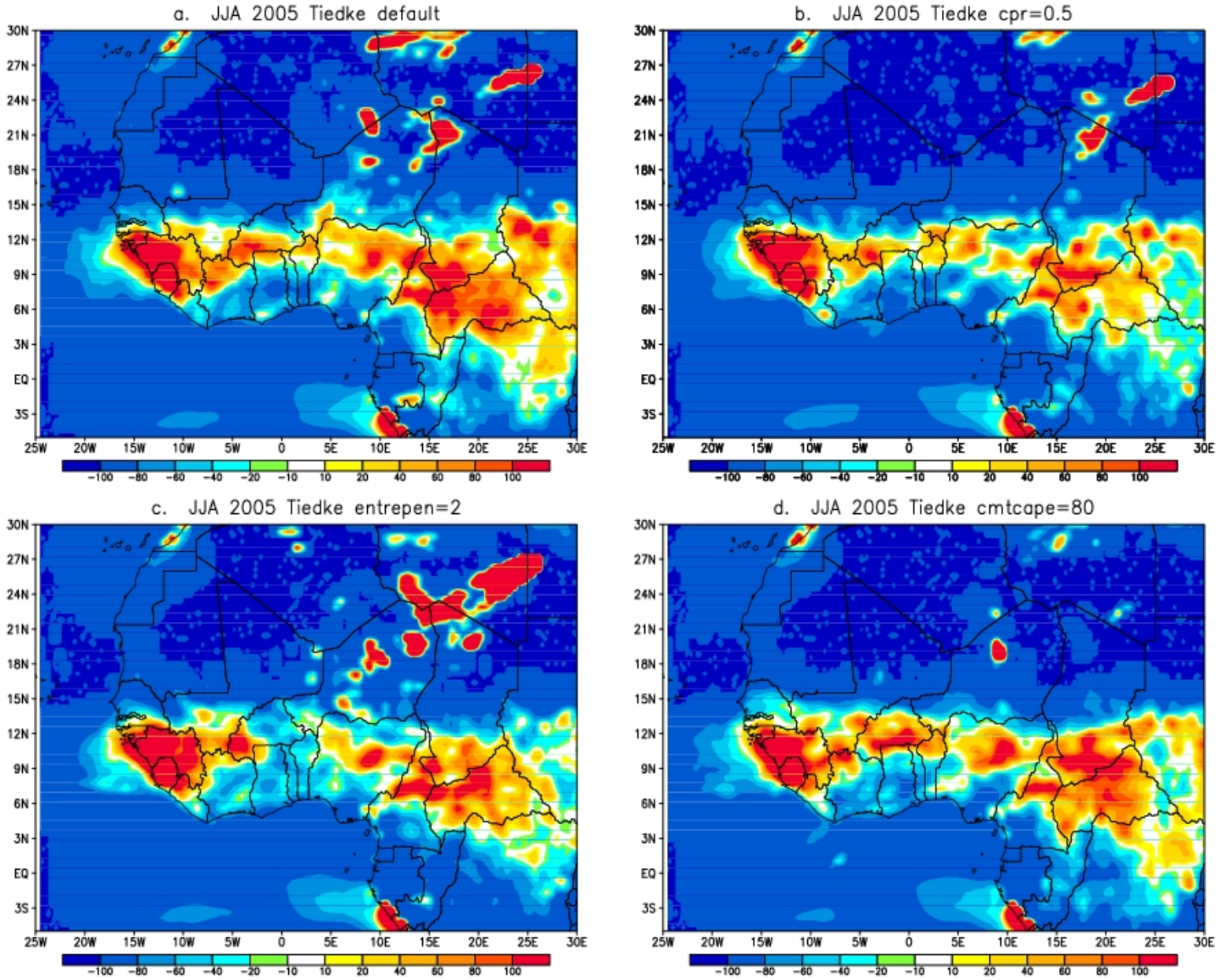
Rainfall distribution



RegCM4 : Thinner high rainfall band Compared to TRMM and GPCP Observations. ITCZ is placed southward

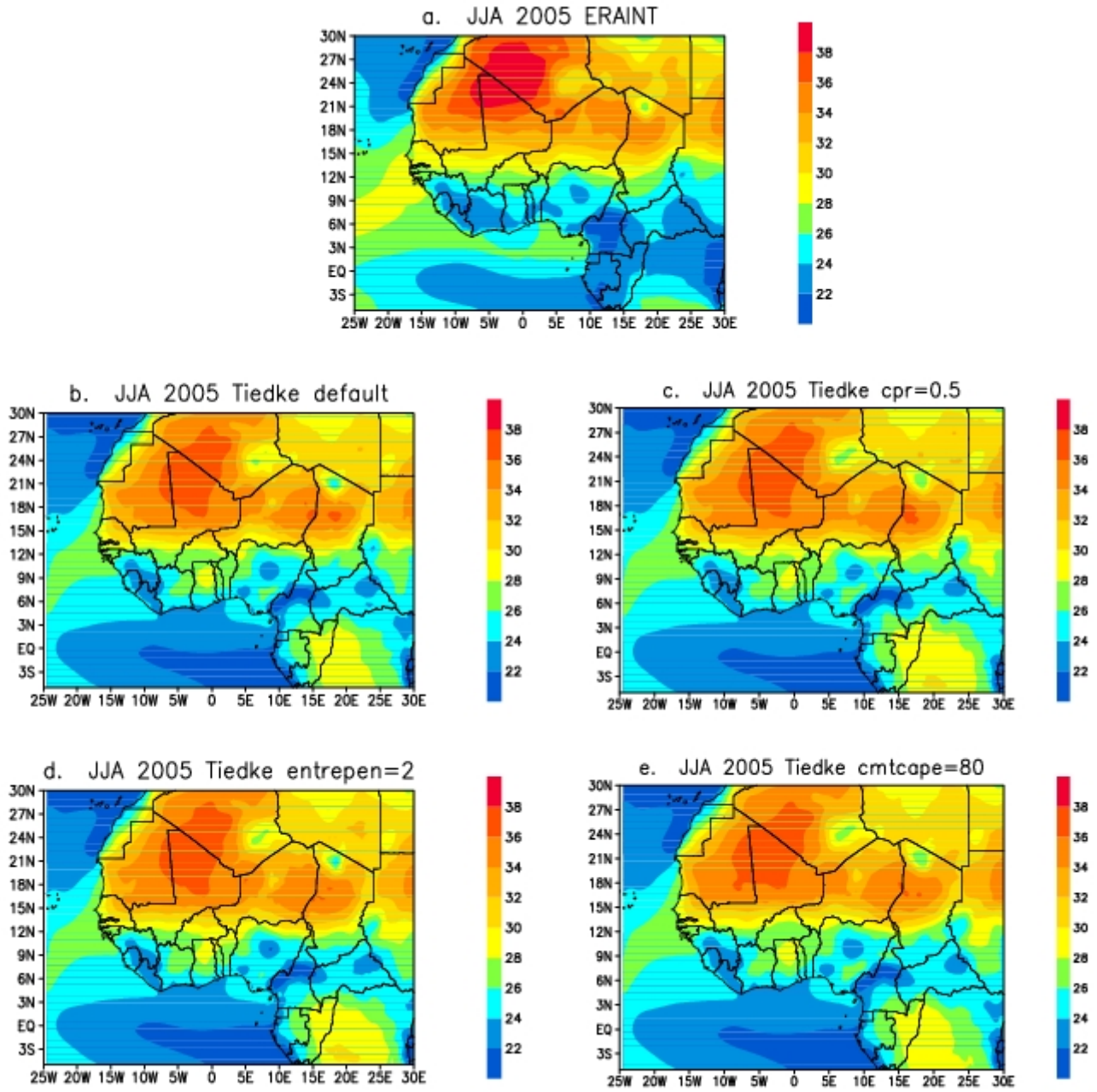
- A substential difference does not Exist Between differents tunnings of Tiedke scheme

Rainfall biais (with respect to GPCP as %)



RegCM4 underestimates the rainfall over Northern Sahel as the consequence of the thinner Rainfall band and mainly overestimates it from the Guinea highlands to central Africa.

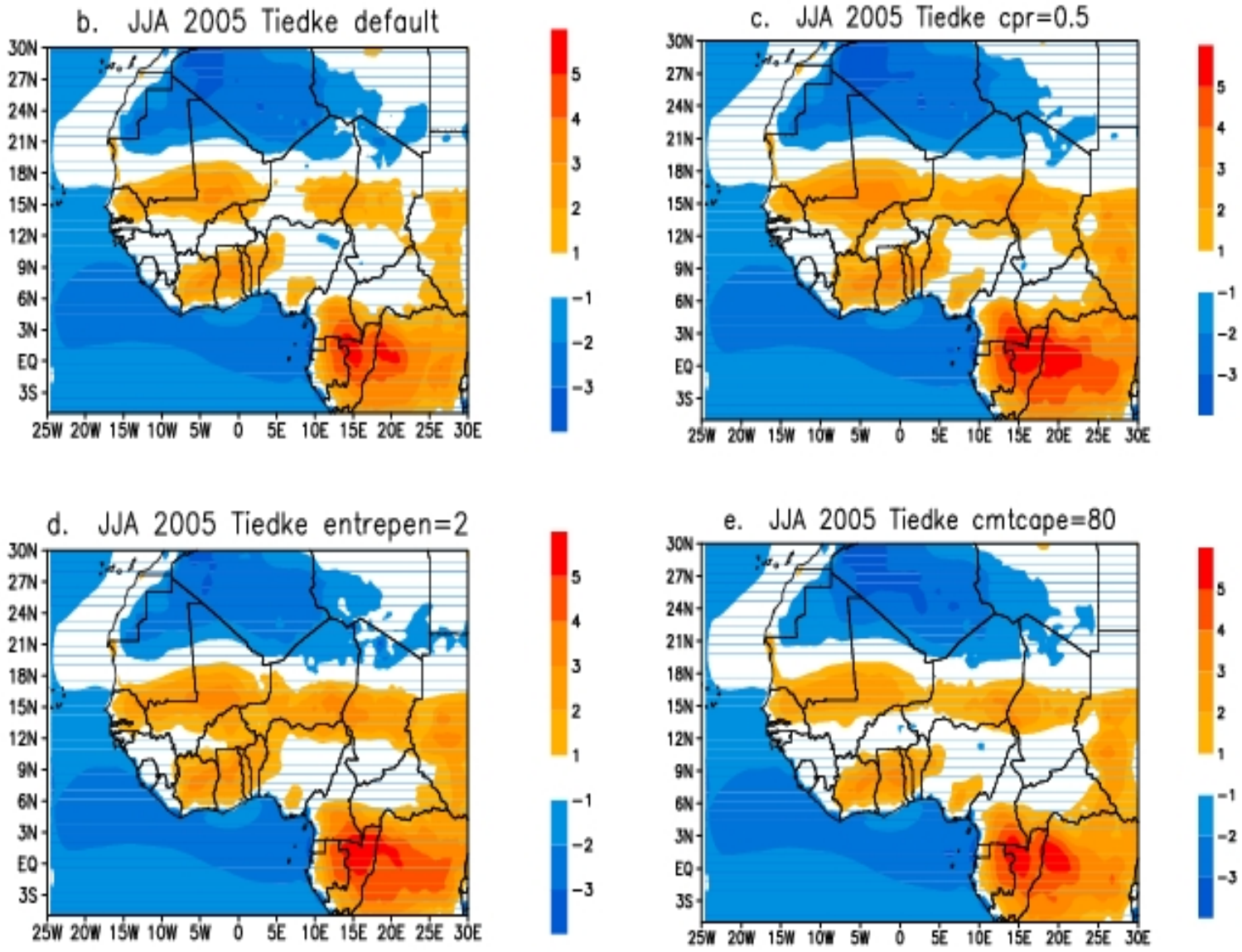
Temperature distribution



Temperature distribution is well simulated with maxima (minima) over the Sahara (Gulf of Guinea and orographic regions).

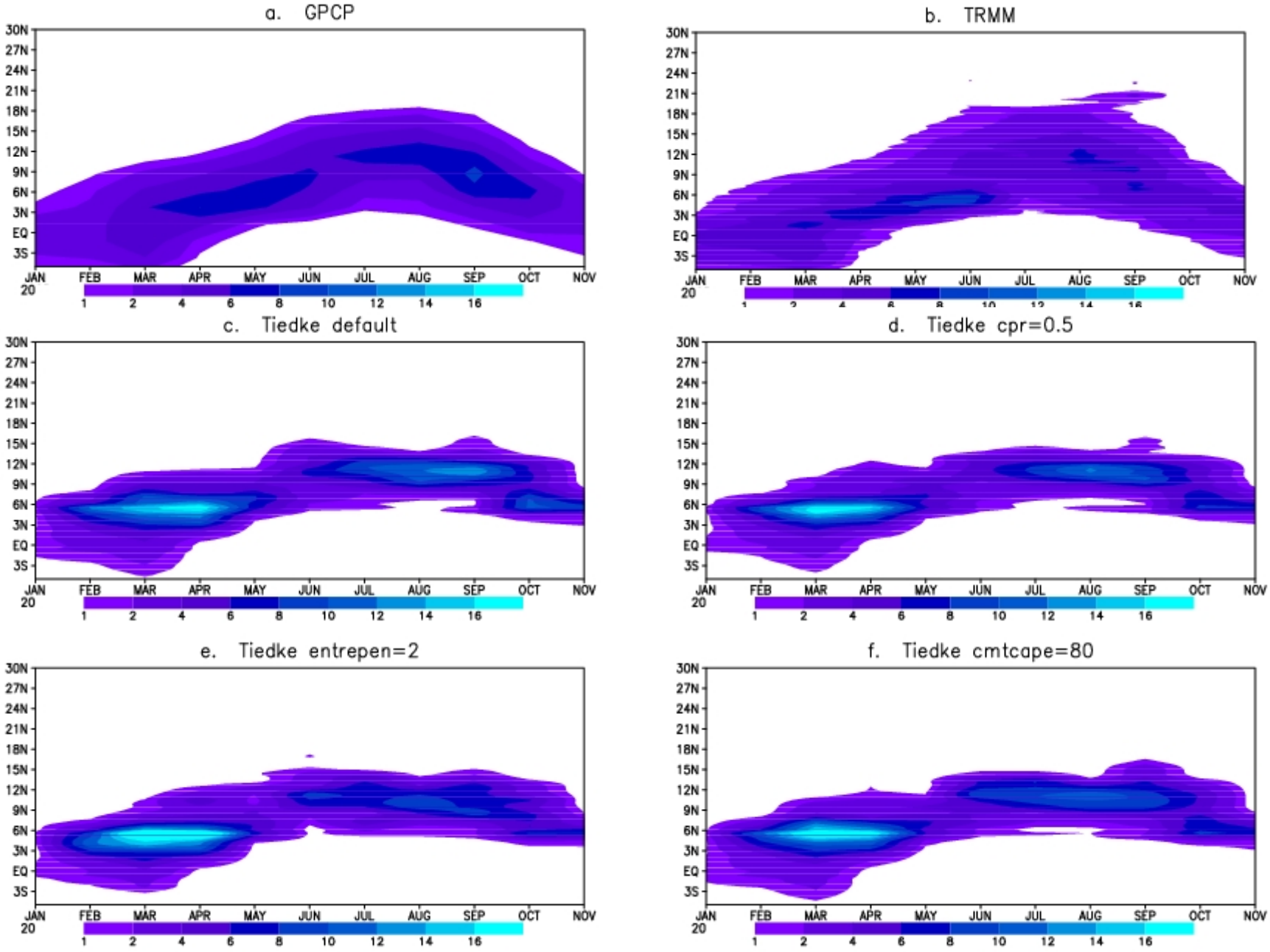
Similar distribution are considered when considering the different Tiedke settings

Temperature biais



Biais are overall weak but strong positive biais exist over the central Africa (Congo) as well as a Negative one is present over the Northern Sahara

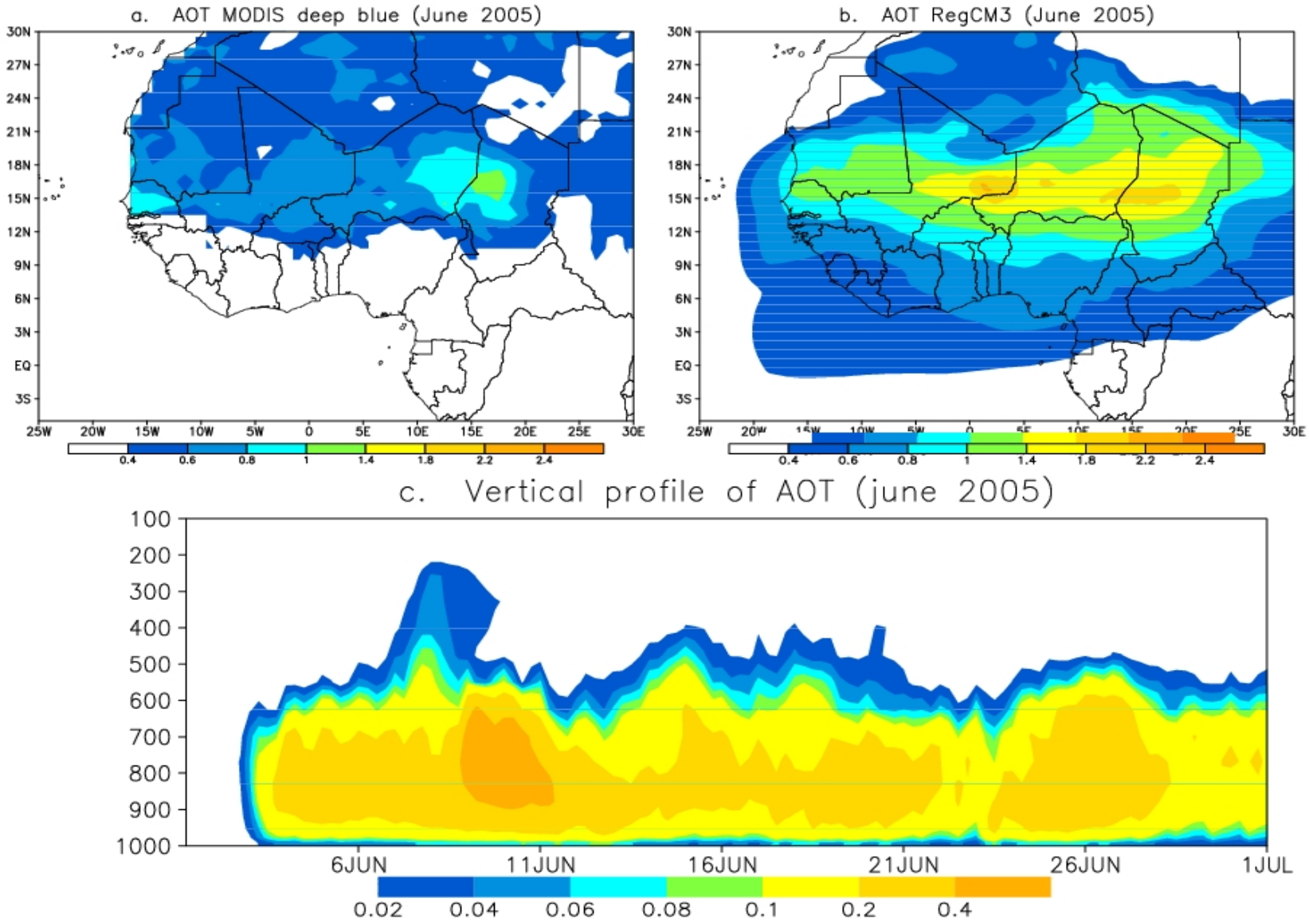
Seasonal cycle of rainfall



RegCM4/Tiedke is able to capture the monsoon jump but the Guinea and Sahel maxima
Are overestimate by all Tiedke settings

Dust vertical and horizontal distribition – Aerosol Optical depth (2006)

– (CARB and all aerosol runs have been done !!)



-RegCM4 overestimates the dust loading over West Africa.

- Dust events are simulated and aerosols are transported up to the mid levels

CONCLUSION

For these very very short runs :

- RegCM4/Tiedke cumulus scheme simulates an ICTZ placed southwardwith a strong overestimation around Guinea highlands

-The temporal distribution of temperature is well simulated with positive (negative) biais located over North Sahara (around central Africa)

- The monsoon jum is well captured

- the run with dust show that RegCM4 overestimates the dust loading

Thanks for your attention