The Asian summer Monsoon in ERA40 driven CLM simulations*

A. Dobler and B. Ahrens, Institute for Atmospheric and Environmental Sciences, Goethe-University, Frankfurt am Main, Germany

Acknowledgements:
A. Dobler is funded by the EC project BRAHMATWINN (Contract No. 036592 (GOCE)). Support of the CLM model by the COSMO consortium and the CLM community.
Contact: dobler@iau.uni-frankfurt.de

INTRODUCTION

Many ERA40 driven regional climate simulations with the COSMO-CLM model (www.clm-community.eu) have been successfully carried out for European simulation domains. To test the model for transferability, we have applied it in a South Asian domain using a grid resolution of 0.44° for the time period 1958-2001. The CLM performs good in simulating precipitation during the Monsoon season (JJAS) over a large area (e.g., the Tibetan Plateau), but also shows an overestimation at the Indian west coast and an underestimation at the Himalayan foothills (Fig. 1). The objective of this presentation is to discuss the representation of the monsoonal system in the CLM and its relationship to the realized precipitation fields.

METHODS

Three indices for the South Asian summer Monsoon in the months JJAS are considered. The CLM simulations are compared to observations, ERA40 and NCEP re-analysis data. The spatial patterns of the fields involved are analyzed to find possible reasons for the CLM deficiencies in simulating the Monsoon precipitation.

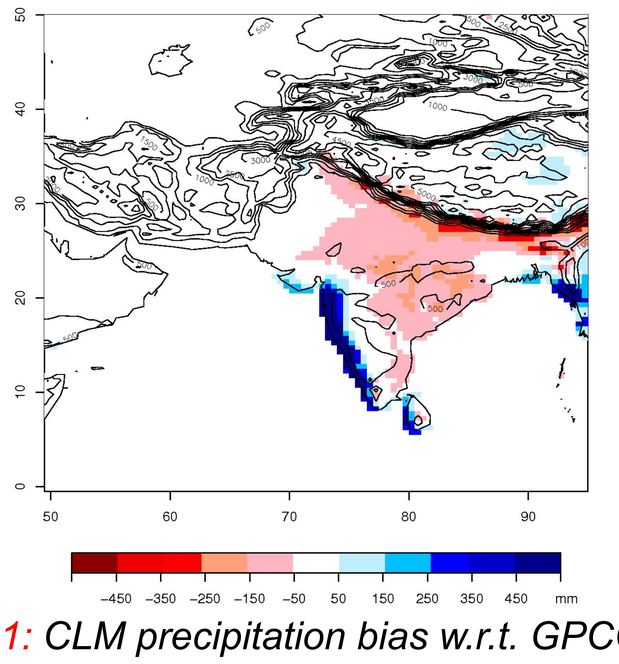

Fig. 1: CLM precipitation bias w.r.t. GPCC data.

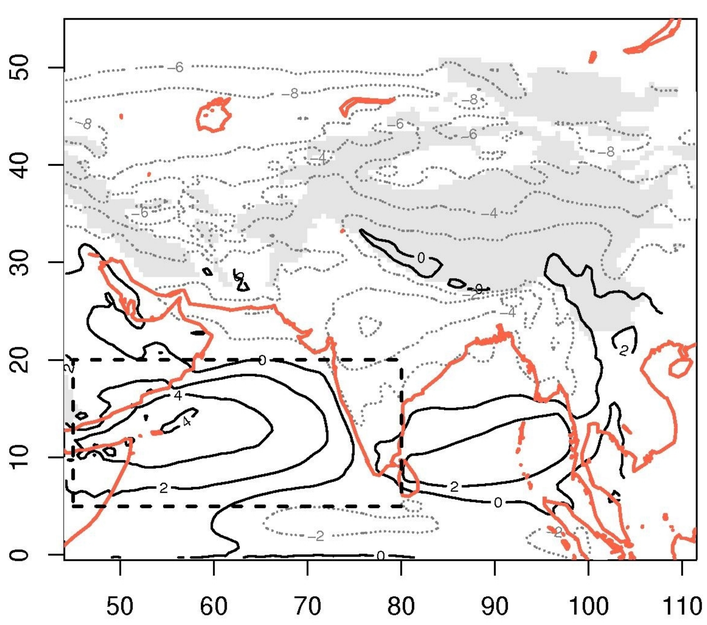

Fig. 4: CLM zonal wind shear bias (m/s) w.r.t. ERA40 data, index region (dashed) and area with 850hPa surface below ground (shaded).

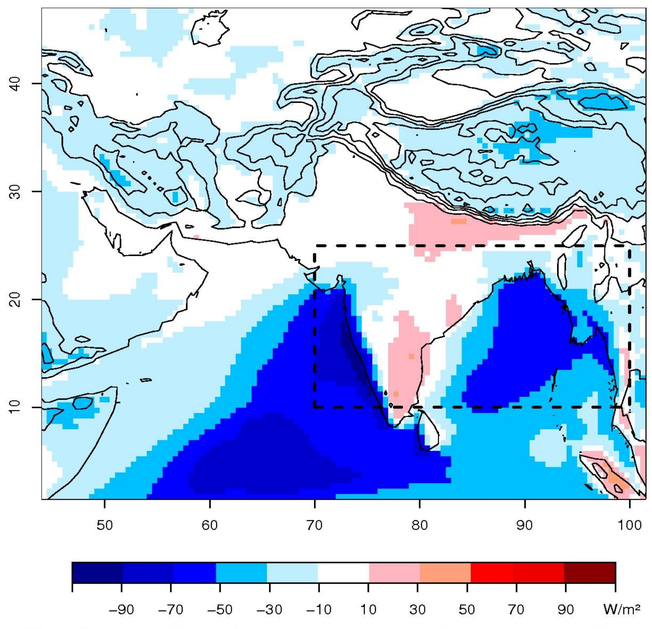

Fig. 7: CLM OLR bias w.r.t. GEWEX/SRB data and index region (dashed) .

RESULTS

All India Rainfall:

- Acceptable agreement in the climatology (Fig. 2)
- Spatial correlation with GPCC data similar to ERA40 and NCEP (Fig. 3)
- Large overestimation of spatial variability (Fig. 3)

Zonal wind shear (U850-U200):

- (Small) overestimation over Arabian Sea and Bay of Bengal (Fig. 4) due to overestimation of 850hPa (not shown) and 10m winds (Fig. 5)
- Good agreement in spatial correlation and variability (Fig. 6)

Outgoing long-wave radiation:

- Large underestimation at Indian west coast, over Bay of Bengal and overestimation at Himalayan foothills (Fig. 7)
- Lack of agreement in spatial correlation and variability (Fig. 8)

•Correlation of wind shear and rainfall index close to reference (Fig. 9)

•Overestimation of variability difference (Fig. 9) due to underestimation in variability of rainfall index (not shown)

CONCLUSIONS

•Dynamical contribution to AIMR better represented than in ERA40 and NCEP

•Overestimation of convection and low level winds over the Indian west coast and Bay of Bengal

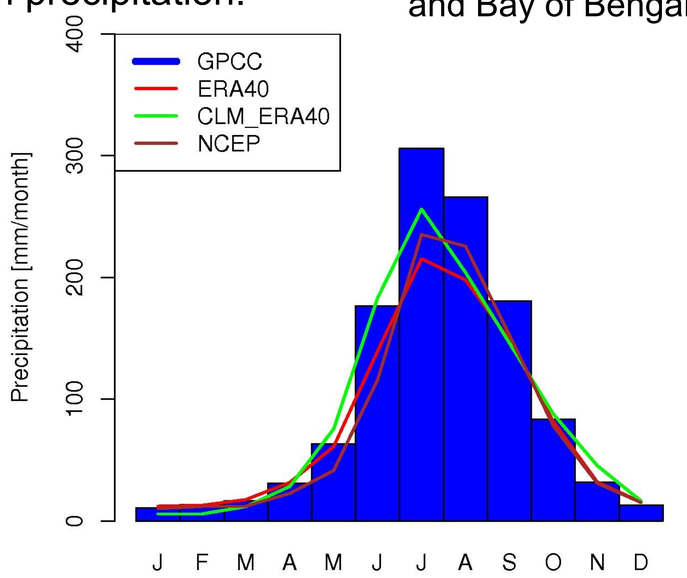

Fig. 2: All India rainfall climatologies.

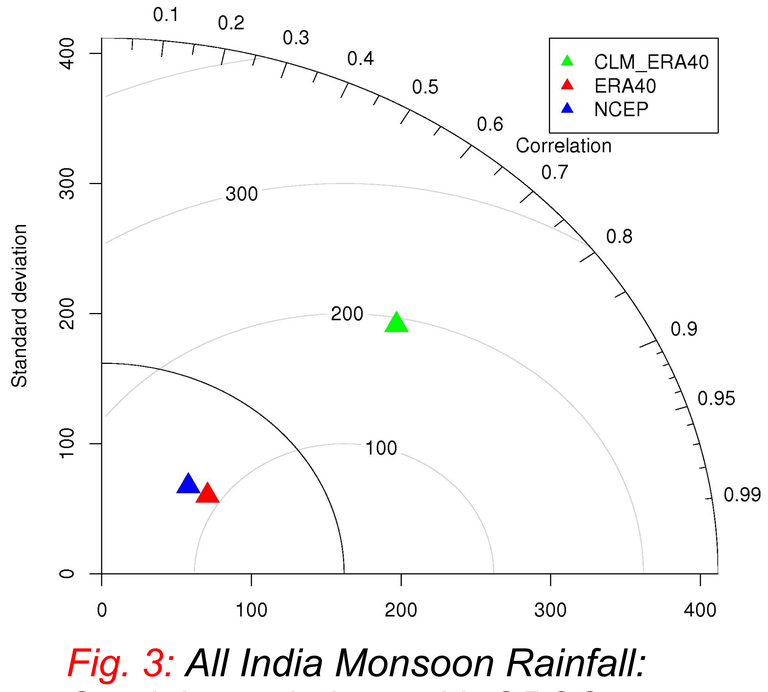

Fig. 3: All India Monsoon Rainfall: Spatial correlations with GPCC .

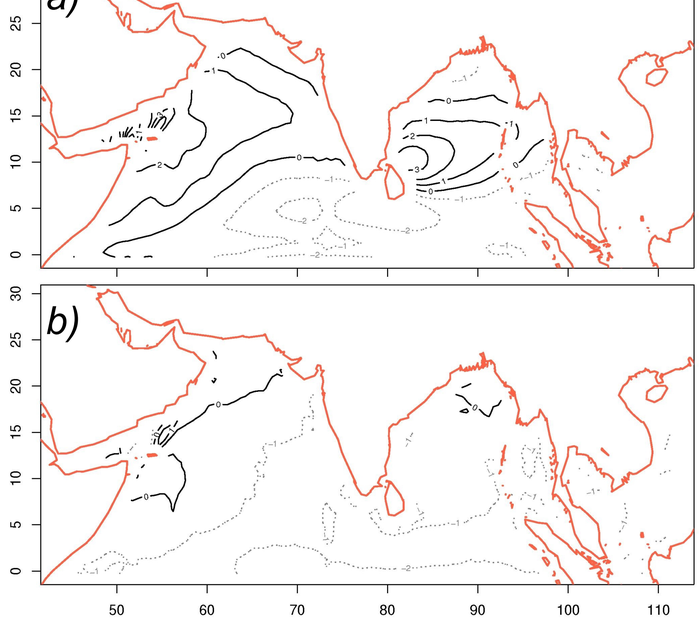

Fig. 5: CLM (a) and ERA40 (b) 10m wind speed bias w.r.t. HOAPS data.

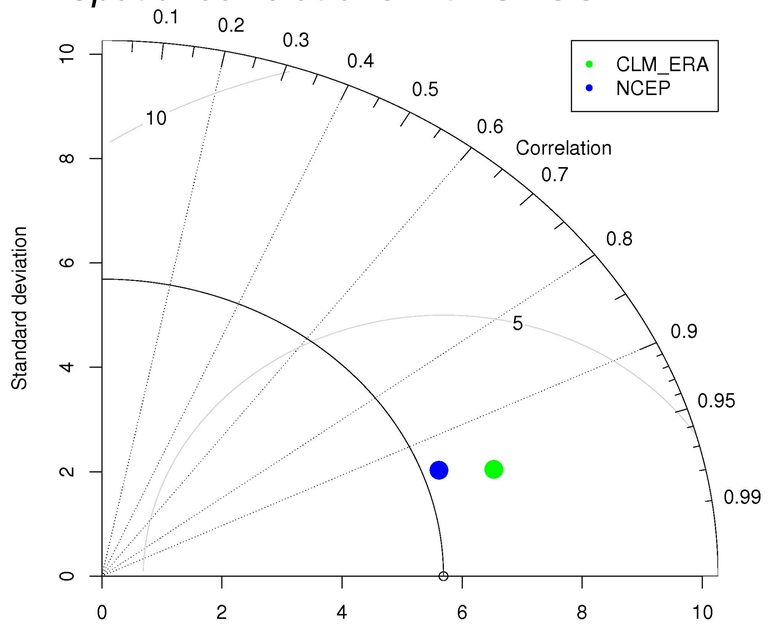

Fig. 6: Zonal wind shear: Spatial correlations with ERA40 in the index region.

Fig. 7: CLM OLR bias w.r.t. GEWEX/SRB data and index region (dashed) .

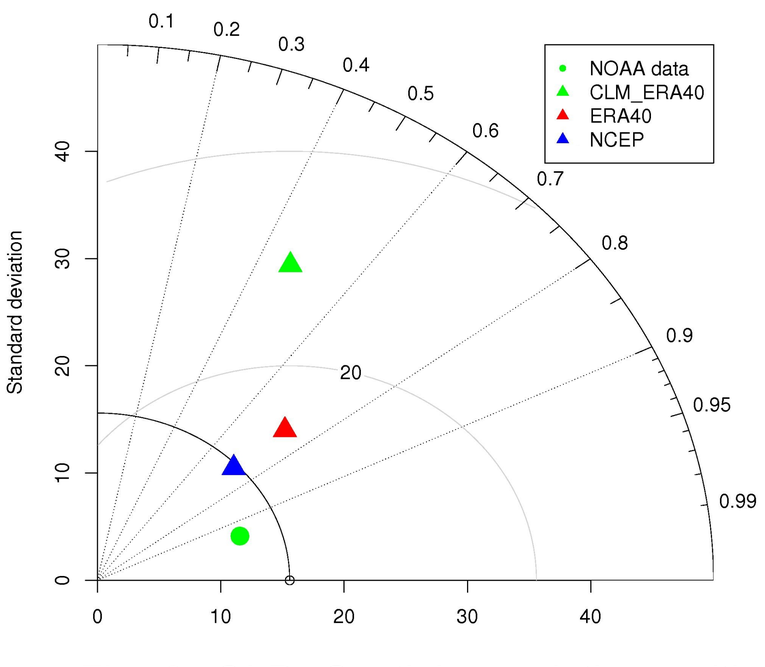

Fig. 8: OLR: Spatial correlations with GEWEX /SRB data in the index region.

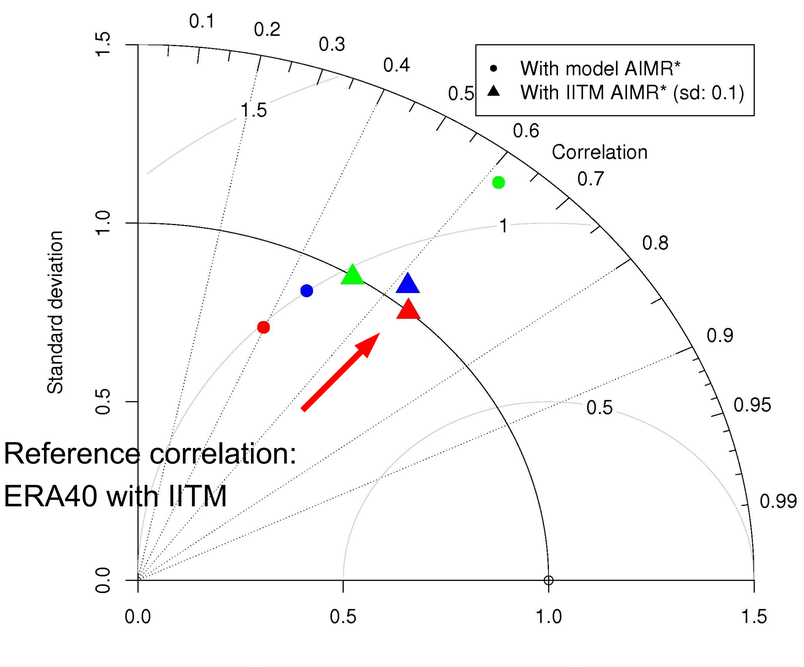

Fig. 9: Zonal wind shear: Temporal correlations with AIMR.

* presented at the 2nd Lund Regional-scale Climate Modelling Workshop, 2009