Global evaluation of the RSM simulated precipitation through transferability studies during CEOP

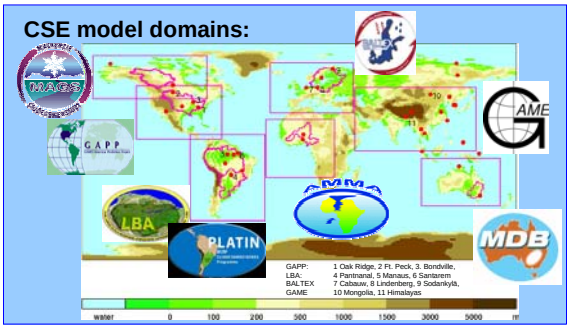
Insa Meinke, John Roads, Masao Kanamitsu
Experimental Climate Prediction Center, Scripps Institution of Oceanography,
email: imeinke@ucsd.edu, jroads@ucsd.edu, mkanamitsu@ucsd.edu

Objective:
- The aim of this study is to conduct a global evaluation of the RSM simulated precipitation.
- ➢ This is achieved by transferring the RSM to the various CSE domains impacted by different meteorological conditions.

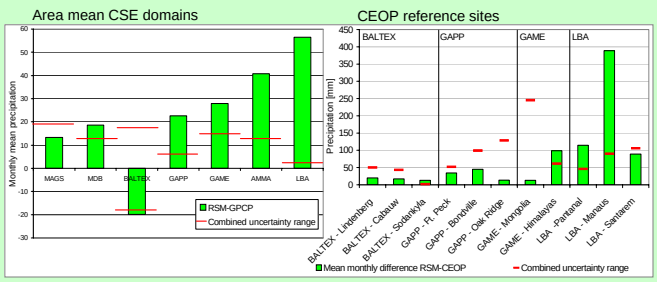
RSM features:
- RSM is a hydrostatic regional spectral model.
- RSM physics are similar to NCEP SFM physics.

Model setup:
- Simulation period: 07/1999 - 12/2004. Incl. 3 CEOP phases.
- Horizontal resolution: About 50 km.
- Forcing data: NCEP re-analysis 2.
- First 2 years are for spin-up, esp. equilibration of the soil moisture.
- Model setup (numerics / physics) are same for all domains.

CSE model domains:



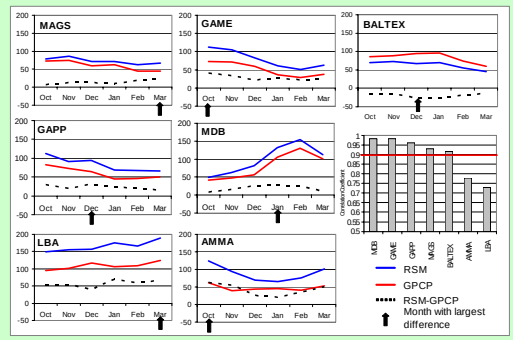
Differences in precipitation amount



Excessive precipitation is predicted in most CSE domains.
Largest bias over AMMA and LBA.
MAGS has no deficiency.

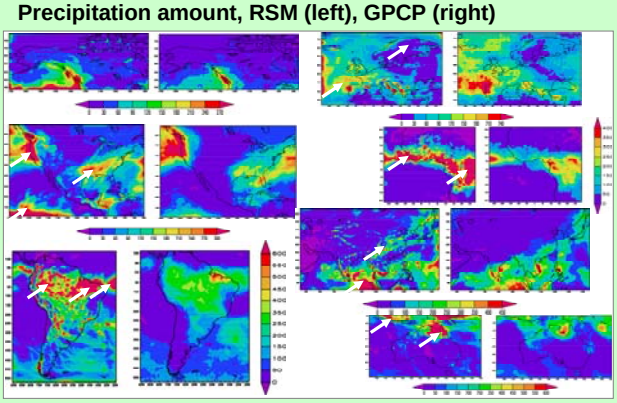
CEOP reference sites show spatial variations.
Every domain has reference sites where precipitation prediction has no deficiency (Meinke et al. 2006).

Annual cycles, differences and correlations



Amplitude of the GPCP annual cycle is largest for MDB and GAME and smallest for LBA and AMMA.
Correlation of the annual cycle is mostly above 90%, except for AMMA and LBA.

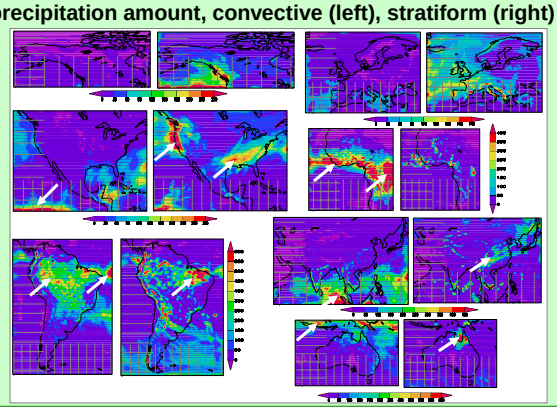
Precipitation amount, RSM (left), GPCP (right)



Spatial distribution of RSM precipitation is good for all domains.
Prediction of excessive precipitation is connected with:
1. the ITCZ,
2. the NE-Monsoon over SE-Asia,
3. steep orography.

Over BALTEX deficient precipitation is predicted over Scandinavia and the Atlantic Ocean.

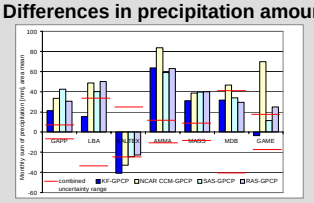
RSM precipitation amount, convective (left), stratiform (right)



Prediction of excessive precipitation is caused by:
1. ITCZ convection
2. Monsoon convection and
3. stratiform precipitation caused by forced lifting of air masses at steep orography (Meinke et al. 2006).

Sensitivity tests with four different convection schemes:
1) Kain Fritsch Scheme (KF)
2) Simplified Arakawa Schubert Scheme (SAS)
3) NCAR Community Climate Model (NCAR CCM)
4) Relaxed Arakawa Schubert Scheme (RAS)

Differences in precipitation amount



Precipitation amount

Summary of the test results

	Convection scheme recommended	Focus of further analyses
GAPP	KF	ITCZ
LBA	SAS	ITCZ, annual cycle
AMMA	SAS	ITCZ, annual cycle
BALTEX	SAS	None
MAGS	KF	None
MDB	KF, SAS	None
GAME	KF	None

Outlook
1. Identification of conditions and reasons for best performance of the convection schemes.
2. Development of a more universally applicable convective parameterization.

Reference
Meinke, I., Roads, J., Kanamitsu, M.: Global evaluation of the RSM simulated precipitation through transferability studies during CEOP. Submitted to JMSJ, CEOP special issue, 2006.