WAMME West African Monsoon Modeling and Evaluation

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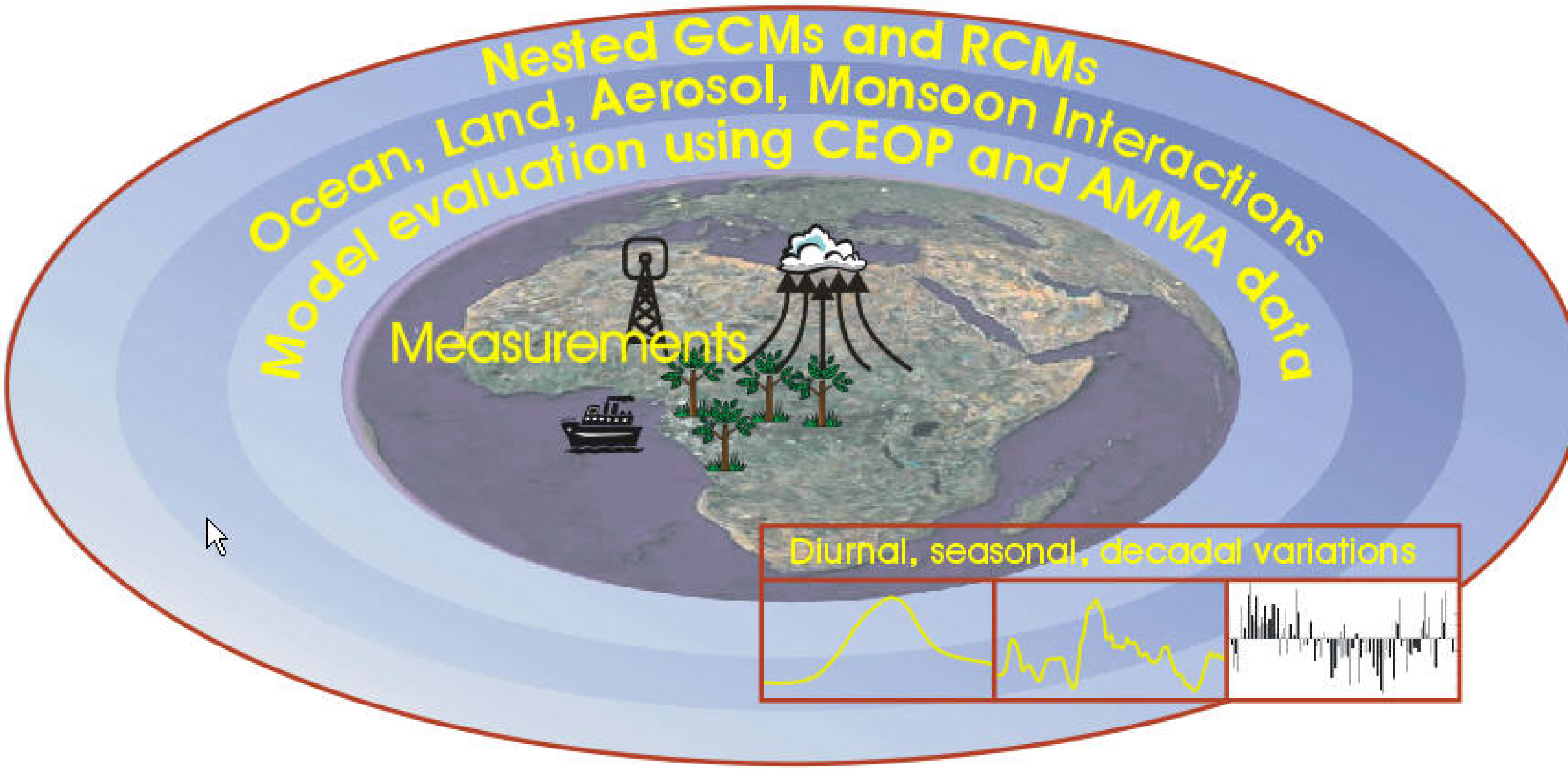
WAMME Related:

- CEOP
- AMMA International
- AMMA US
- UCAR Africa Initiative
- ALMIP



WWW.WAMME.Geog.ucla.edu

http://data.eol.ucar.edu//project=WAMME

The West African Monsoon Modeling and Evaluation project (WAMME) and its first experiment

Yongkang Xue, W. K-M Lau, K. H. Cook, D. Rowell, A. Boone, J. Feng, F. De Sales, A. Konare, T. Bruecher, P. Dirmeyer, L. M. Druyan, A. Fink, M. Fulakeza, Z. Guo, S. M. Hagos, K.-M. Kim, A. Kitoh, V. Kumar, P. Lonergan, M. Pasqui, I. Poccard-Leclercq, N. Mahowald, W. Moufouma-Okia, P. Pegion, I. S. Sanda, S. D. Schubert, A. Sealy, W. Thiaw, A. Vintzileos, E. K. Vizy, S. Williams, M.-L. C. Wu

WAMME started in the 2005 Pan WCRP Monsoon workshop, is a CEOP/GEWEX initiative and a test bed for different WAM mechanisms

* Scientific Issues in interactions between West African monsoon , ocean, land, and aerosol
* Challenges in their modeling

WAMME Objectives

•To Evaluate the ability of GCMs & RCMs in simulating fundamental characteristics of West African monsoon (WAM) at different scales (Diurnal, intraseasonal, annual, interdecadal).

•To identify the common discrepancies, provide better understanding of fundamental physical processes in WAM, and improve WAM prediction .

* To understand roles of oceanic, land, and aerosols in WAM variations at seasonal, interannual, and interdecadal scales, decadal anomalies, as well as WAM onset and withdrawal.

•to demonstrate the utility and synergy of CEOP and AMMA field and assimilation data and remote sensing data in providing a pathway for model physics evaluation and improvement.

•WAMME uses both GCMs and regional climate models (RCMs). WAMME will evaluate the nested RCMs’ ability of downscaling West African regional climate simulations.

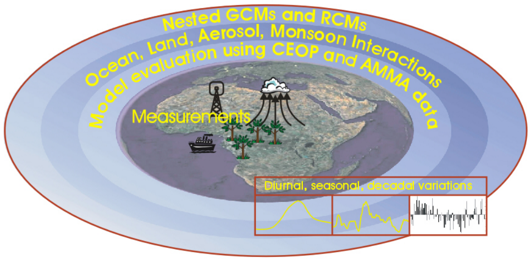


Table 1: LIST OF WAMME GCMs

Model	Resolution		Model	Resolution
COLA GCM	T62L28		NCEP CFS (AOGCM)	T62L64 (Atmos) 1°x0.3-1°(meri), 40 levels (Ocean)
Cornell/NCAR CAM/CLM3.0*	T42L26		NCEP GFS AGCM	T62L64
MRI/JMA AGCM, Japan	TL959L60		MOHC HadAM3, UK	2.5°x3.75°x19
NASA GMAO/NSIPP1	2.0°x2.5°x34		UCLA AGCM	2.5°x2.5°x17
NASA GSFC FVGCM*	2.0°x2.5°x55		UCLA MRF GCM	T62L28
Cologne ECHAM5 / SVege, Germany	T63L31			

- With Aerosol Package

Table 2: LIST OF WAMME RCMs

Model	Resolution	Model	Resolution
CNR-IBIMET, RAMS, Italy	60 Km, 32 levels	MOHC HadRM3P, UK	0.44°x0.44° 19 Levels
Cornell MM5	50km, 24 levels	Abdus Salam ICTP, Niger RegCM	50km, 18 levels
NASA CCSR/GISS RM3	50km, 28 levels	Univ. of Cocody, Ivory Coast RegCM*	50km, 18 levels
UCLA Eta	50x50 km, 28 levels		

- With Aerosol Package

The Design for simulation:

Year: 2000, 2003, 2004, 2005, 2006

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Regi ... :

Latera ... EP/DOE

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Sea Su ... SST/Sea-

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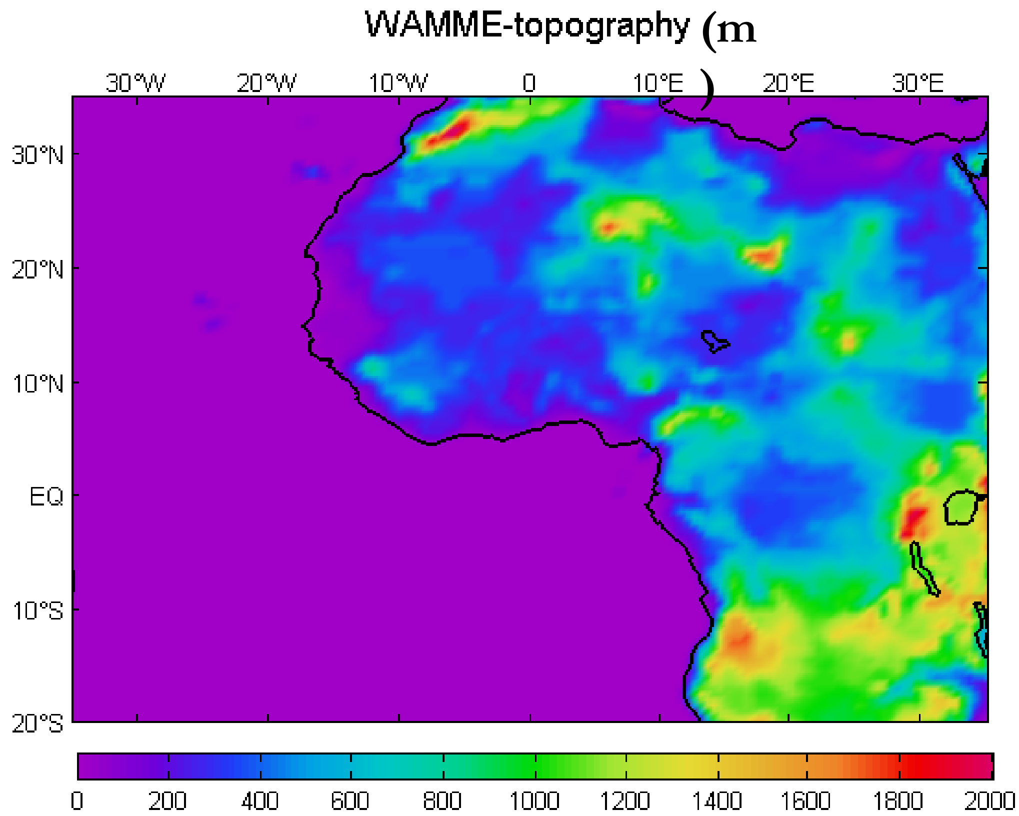
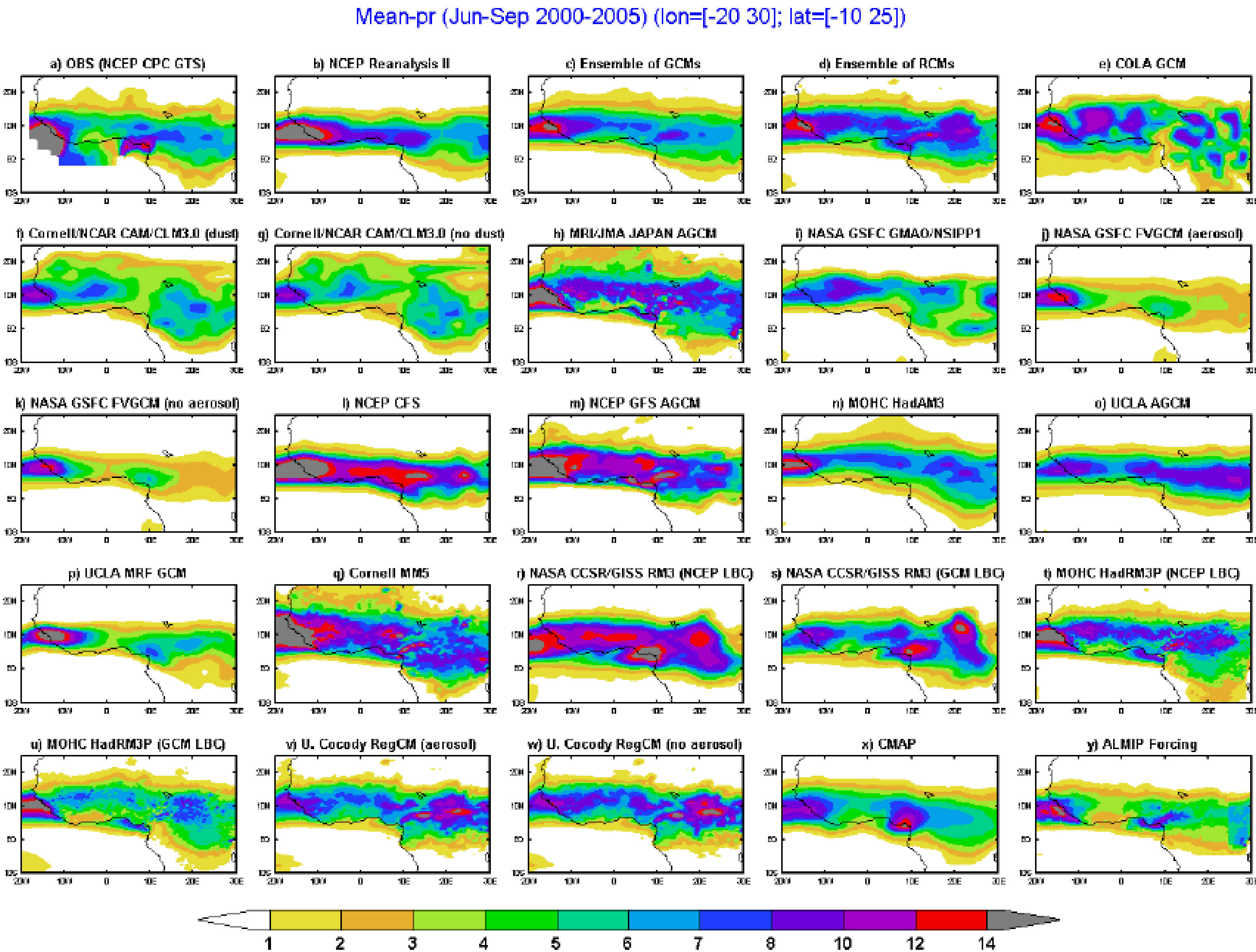
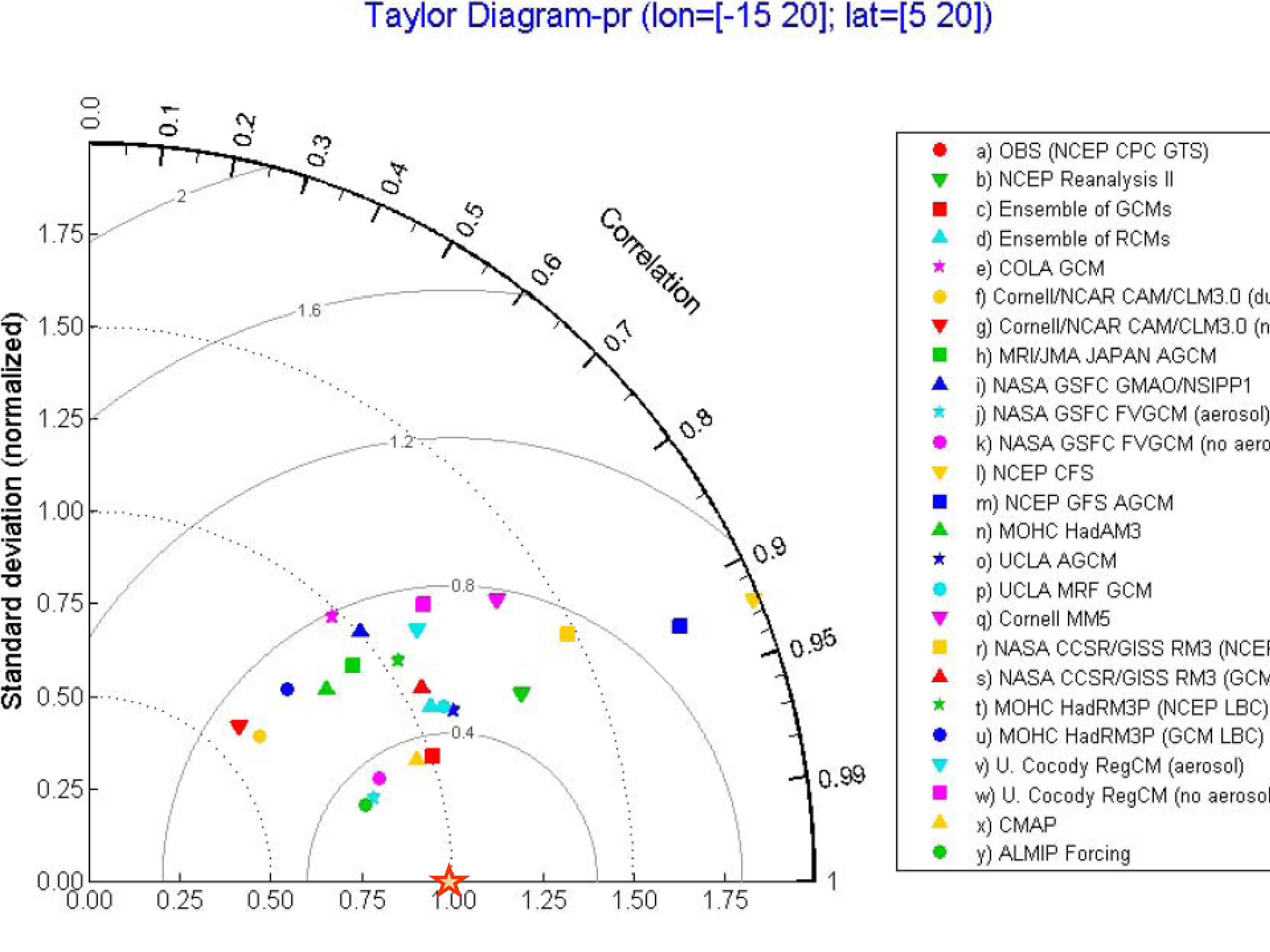
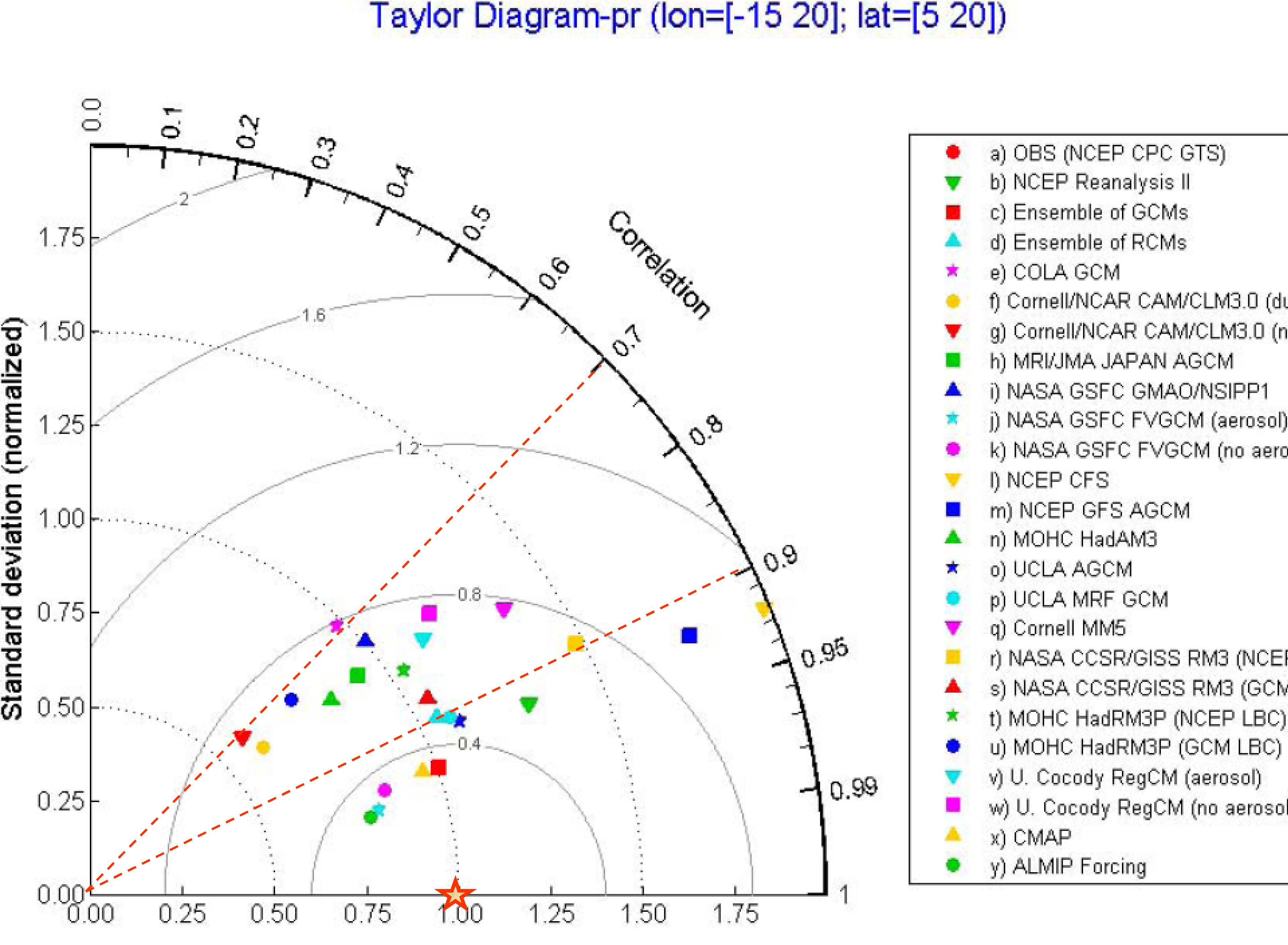


Figure 1. JJAS 2000, 2003-2005 mean precipitation (mm day^{-1}). (a) NCEP CPC GTS data; (b) NCEP Reanalysis; (c-w) WAMME simulations; (x). CMAP; (y) ALMIP forcing.





Taylor Diagram-pr (lon=[-15 20]; lat=[5 20])
Standard deviation (normalized)
Correlation
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0.95
0.99
1
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2
1.6
1.2
0.8
0.4
a) OBS (NCEP CPC GTS)
b) NCEP Reanalysis II
c) Ensemble of GCMs
d) Ensemble of RCMs
e) COLA GCM
f) Cornell/NCAR CAM/CLM3.0 (du
g) Cornell/NCAR CAM/CLM3.0 (n
h) MRI/JMA JAPAN AGCM
i) NASA GSFC GMAO/NSIPP1
j) NASA GSFC FVGCM (aerosol)
k) NASA GSFC FVGCM (no aero
l) NCEP CFS
m) NCEP GFS AGCM
n) MOHC HadAM3
o) UCLA AGCM
p) UCLA MRF GCM
q) Cornell MM5
r) NASA CCSR/GISS RM3 (NCEI
s) NASA CCSR/GISS RM3 (GCM
t) MOHC HadRM3P (NCEP LBC)
u) MOHC HadRM3P (GCM LBC)
v) U. Cocody RegCM (aerosol)
w) U. Cocody RegCM (no aerosol
x) CMAP
y) ALMIP Forcing



Taylor Diagram-pr (lon=[-15 20]; lat=[5 20])
Standard deviation (normalized)
Correlation
0.0
0.1
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w) U. Cocody RegCM (no aerosol
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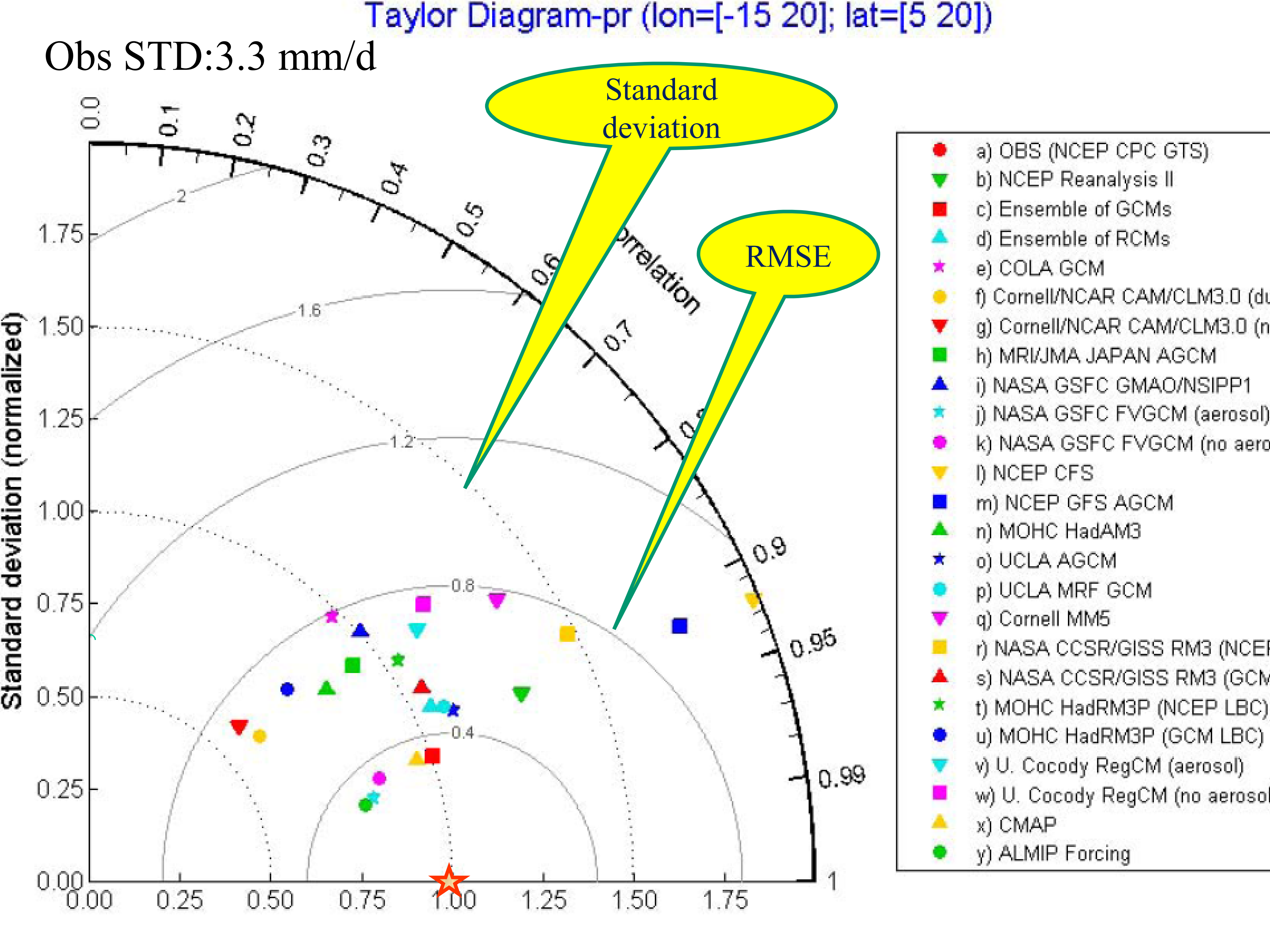

Taylor Diagram-pr (lon=[-15 20]; lat=[5 20])
Obs STD:3.3 mm/d
Standard deviation
RMSE
Correlation
Standard deviation (normalized)
a) OBS (NCEP CPC GTS)
b) NCEP Reanalysis II
c) Ensemble of GCMs
d) Ensemble of RCMs
e) COLA GCM
f) Cornell/NCAR CAM/CLM3.0
g) Cornell/NCAR CAM/CLM3.0
h) MRI/JMA JAPAN AGCM
i) NASA GSFC GMAO/NSIPP1
j) NASA GSFC FVGCM (aerosol)
k) NASA GSFC FVGCM (no aero
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m) NCEP GFS AGCM
n) MOHC HadAM3
o) UCLA AGCM
p) UCLA MRF GCM
q) Cornell MM5
r) NASA CCSR/GISS RM3 (NCEF
s) NASA CCSR/GISS RM3 (GCM
t) MOHC HadRM3P (NCEP LBC)
u) MOHC HadRM3P (GCM LBC)
v) U. Cocody RegCM (aerosol)
w) U. Cocody RegCM (no aerosol
x) CMAP
y) ALMIP Forcing

Figure 3. Temporal evolution of the 5-day mean precipitation (mm day^{-1}) averaged over 10°W-10° E from May through October. (a) NCEP CPC GTS; (b) NCEP Reanalysis 1; (c-w) WAMME simulations; (x) CMAP; (y) ALMIP forcing.

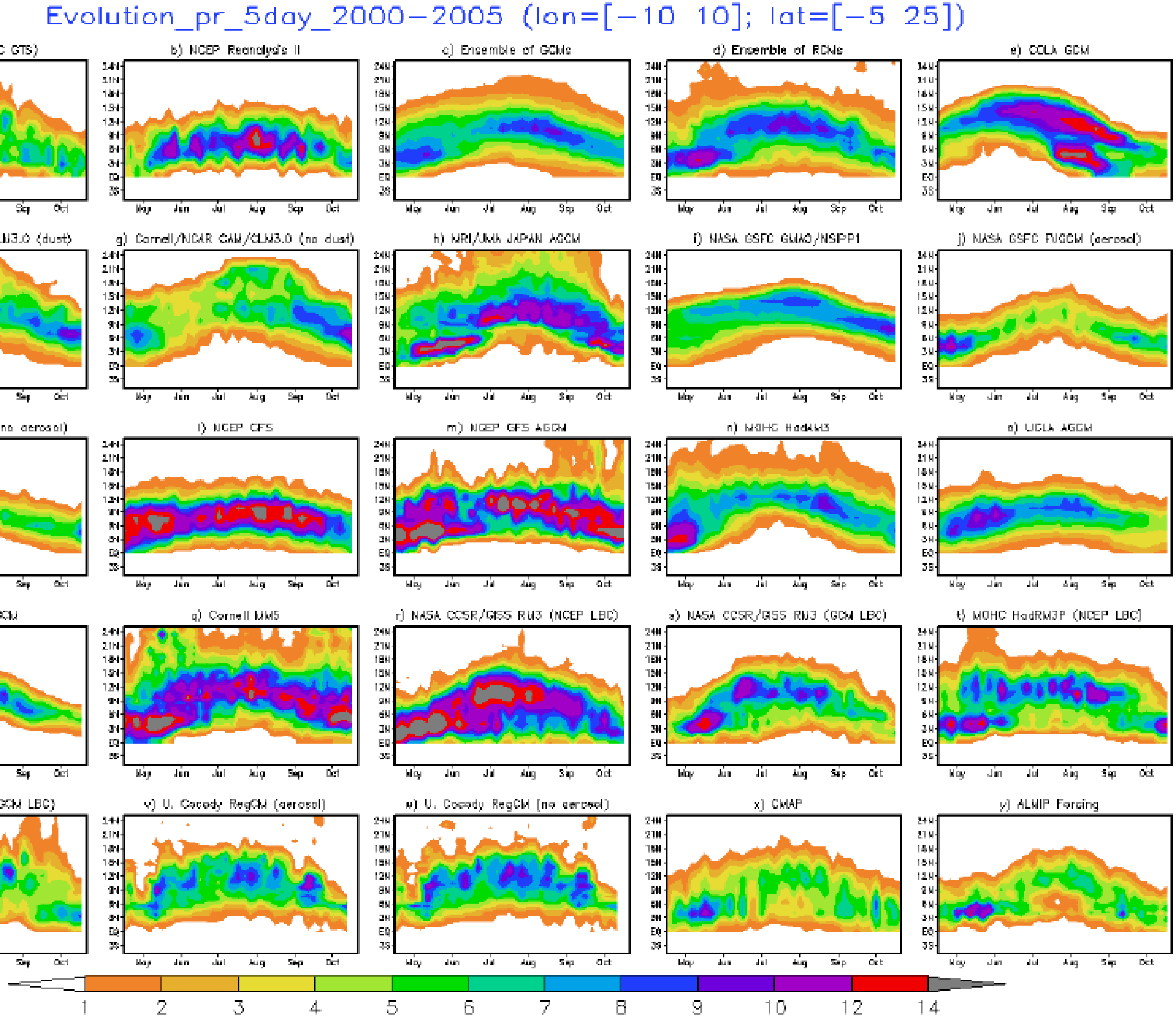
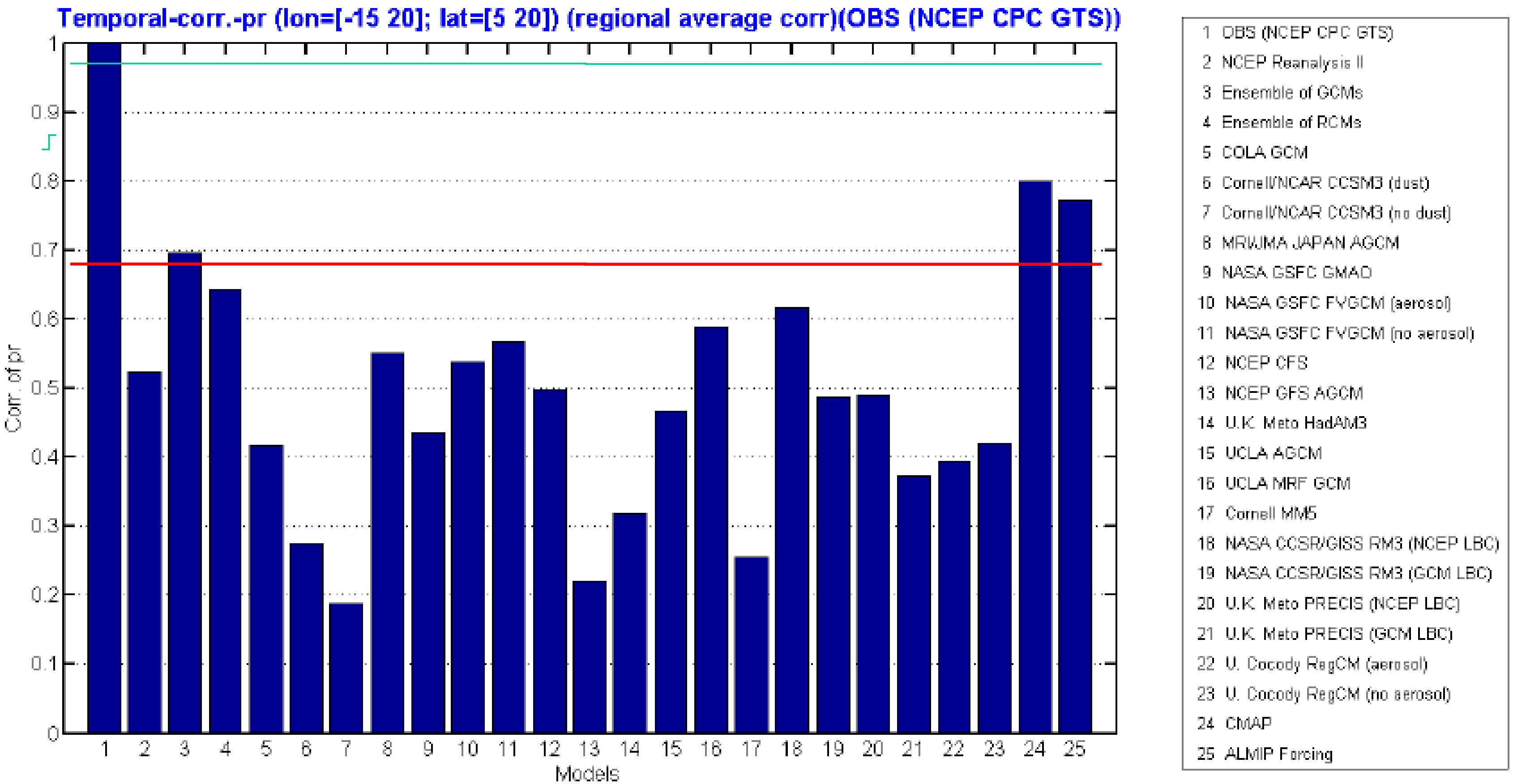


Figure 4. Temporal correlations between observed monthly mean precipitation and WAMME simulations, Reanalysis II, CMAP, and ALMIP.



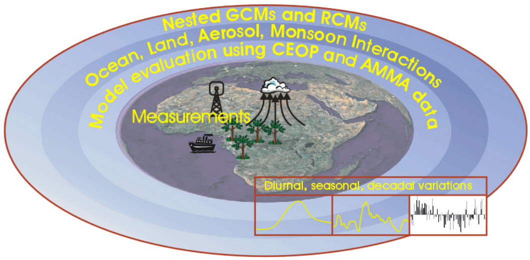
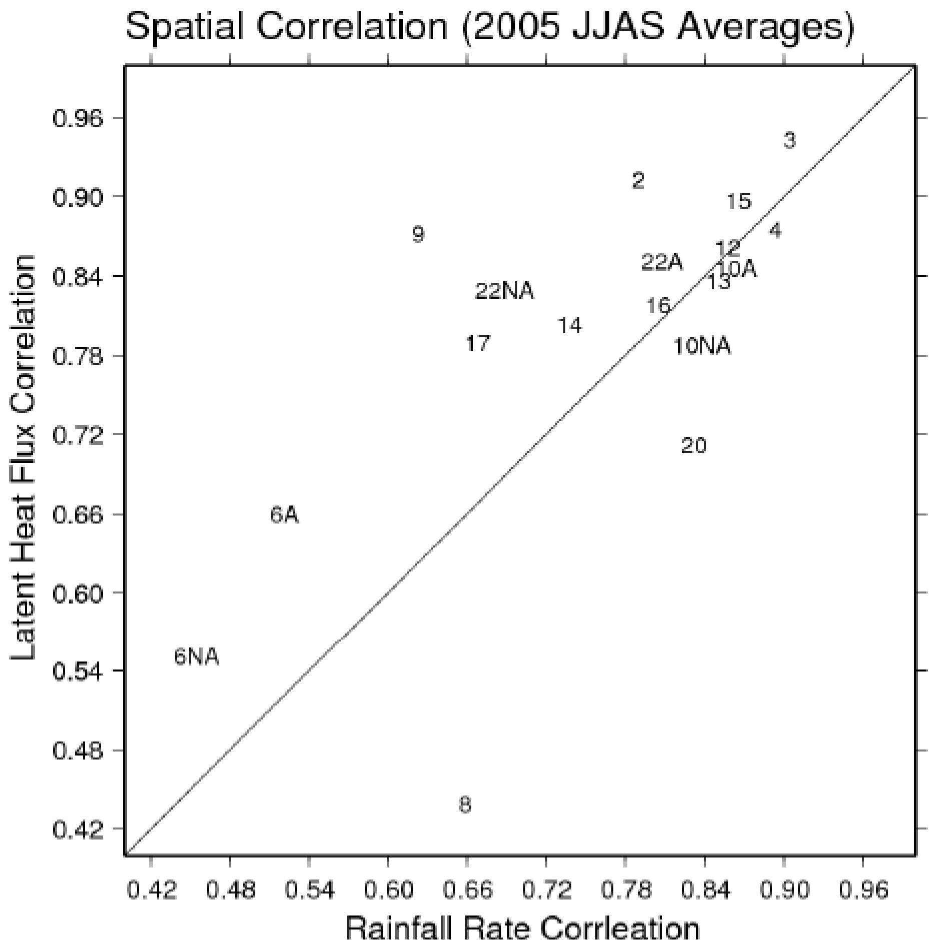


Figure 10. Comparison of spatial correlations of 2005 JJAS precipitation between observation and WAMME simulations and 2005 JJAS evaporation between the ALMIP estimation and WAMME simulations.

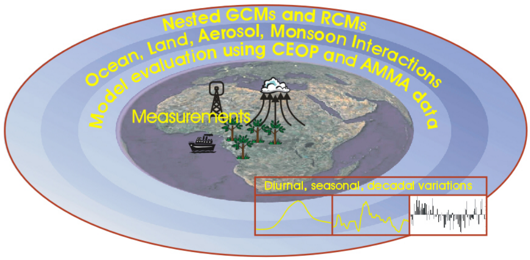


Summary

1). The WAMME is the first project consisting of state-of-the-art GCMs and RCMs to collectively investigate their ability to simulate WAM climatology and the WAM/external forcing feedbacks.

2). Models with specified SST generally have reasonable simulations of the spatial distribution of WAM precipitation but more deficiencies in simulating seasonal WAM evolution; they generally fail to produce proper daily precipitation frequency distribution.

3). WAMME multi-model ensembles produce good WAM precipitation spatial distribution, intensity, and seasonal evolution, better than Reanalysis II in many aspects.



4).GCMs produce smooth development of a monsoon season. Only RCMs and a high resolution GCM are able to produce WAM onset jump.

5). The first experiment demonstrates strong influence of ocean, land, and aerosol on WAM precipitation. But it reveals that ensemble means produce weak correlation between SST and WAM precipitation, discrepancies in simulating land/atmosphere interaction, and large uncertainty in simulating aerosol effects. Further experiments will be designed to further investigate these issues.