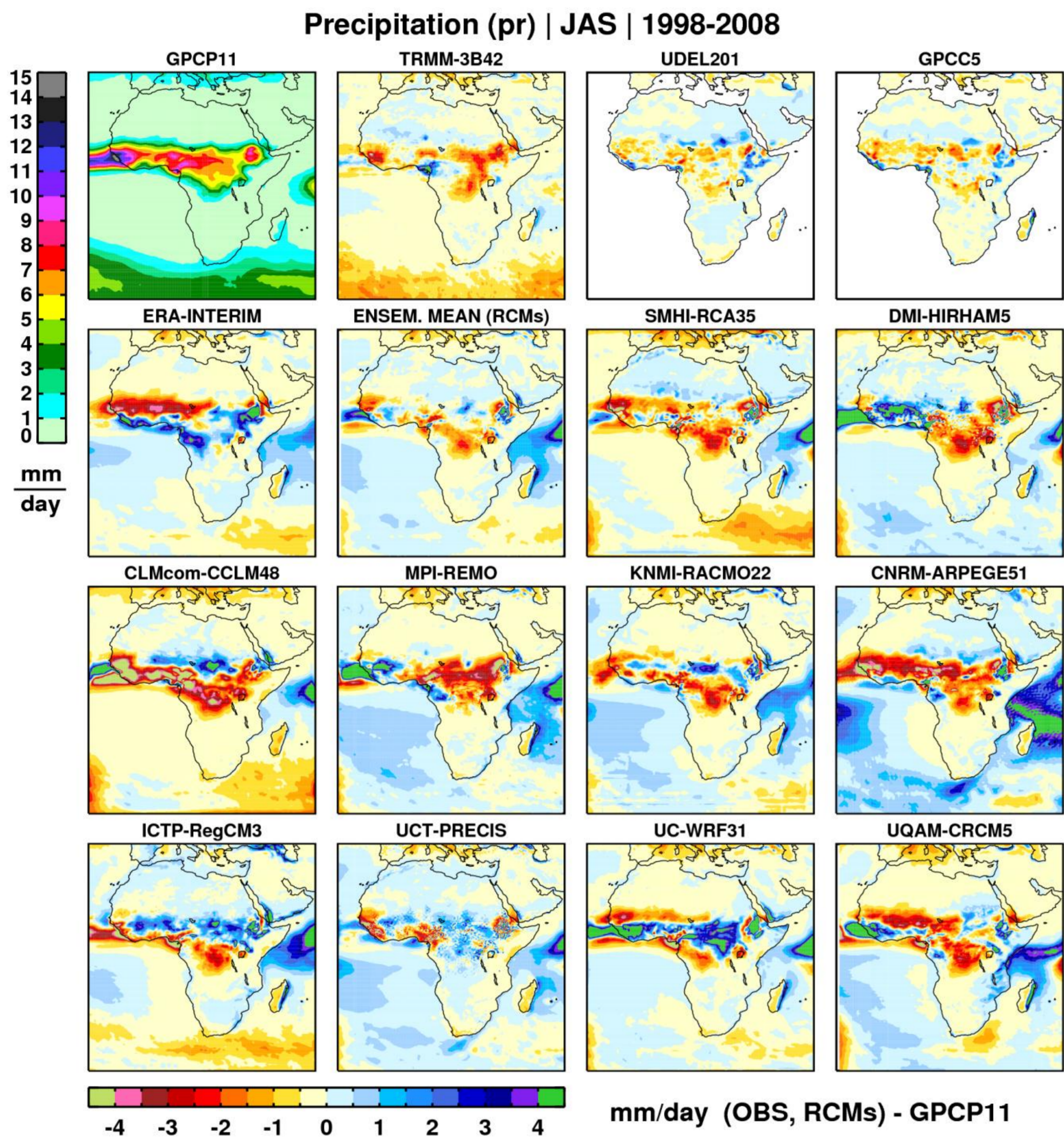


## Objectives

to document ability of 10 RCMs to simulate various aspects of the observed precipitation climate over Africa (Nikulin et. al. 2011. Precipitation Climatology in an Ensemble of CORDEX-Africa Regional Climate Simulations, in review, *J. Climate*)

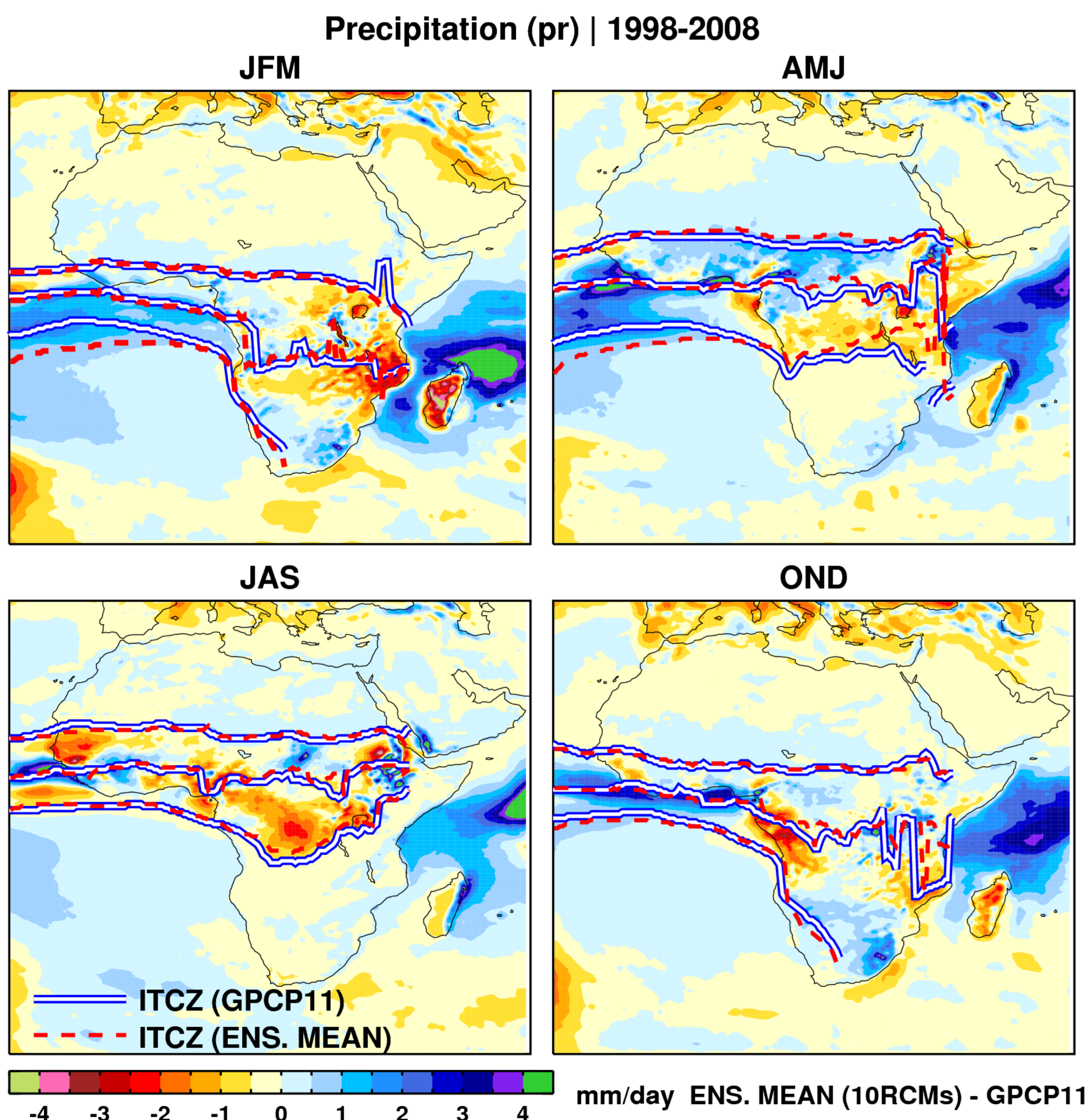
### 1 Seasonal mean precipitation (JAS)



GPCP mean JAS precipitation and differences compared to GPCP

- RCMs have larger biases than the spread across GPCP, UDEL and GPCC
- the RCM ensemble average outperforms nearly all the individual models (cancellation of opposite signed biases)
- many RCMs have more accurate precipitation than the ERA-Interim data
- the ensemble mean substantially improves the ERA-Interim precipitation

### 2 Seasonal mean precipitation and ITCZ location



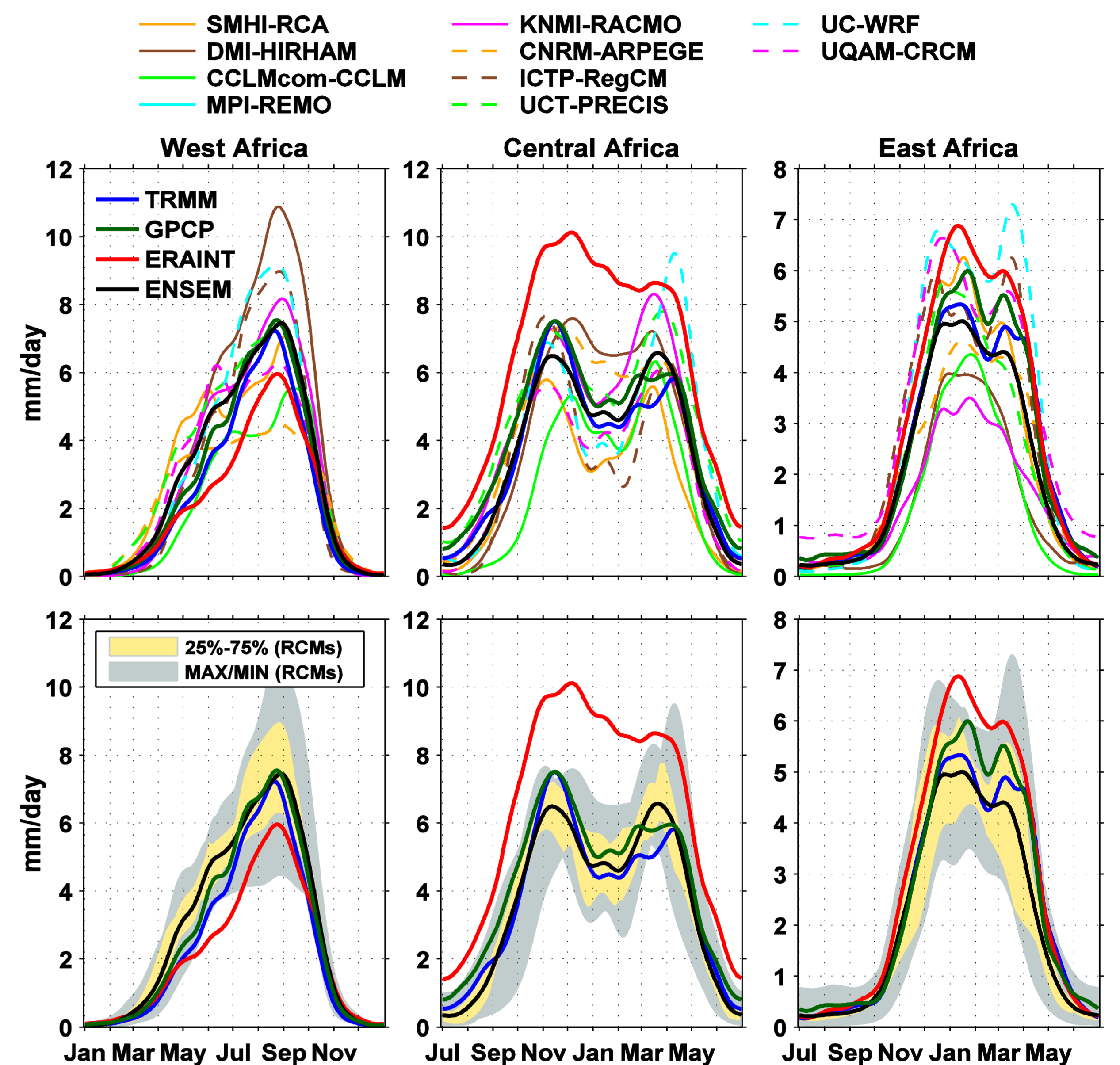
The RCM ensemble mean bias relative to GPCP and the approximate position of the ITCZ (maximum precipitation in the centre of the rain belt and 1 mm/day on its flanks)

- Individual RCMs have localized placement errors
- through cancellation of these errors the RCM ensemble mean has extremely accurate estimate of the location of the ITCZ in all four seasons

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### 3 Annual cycle

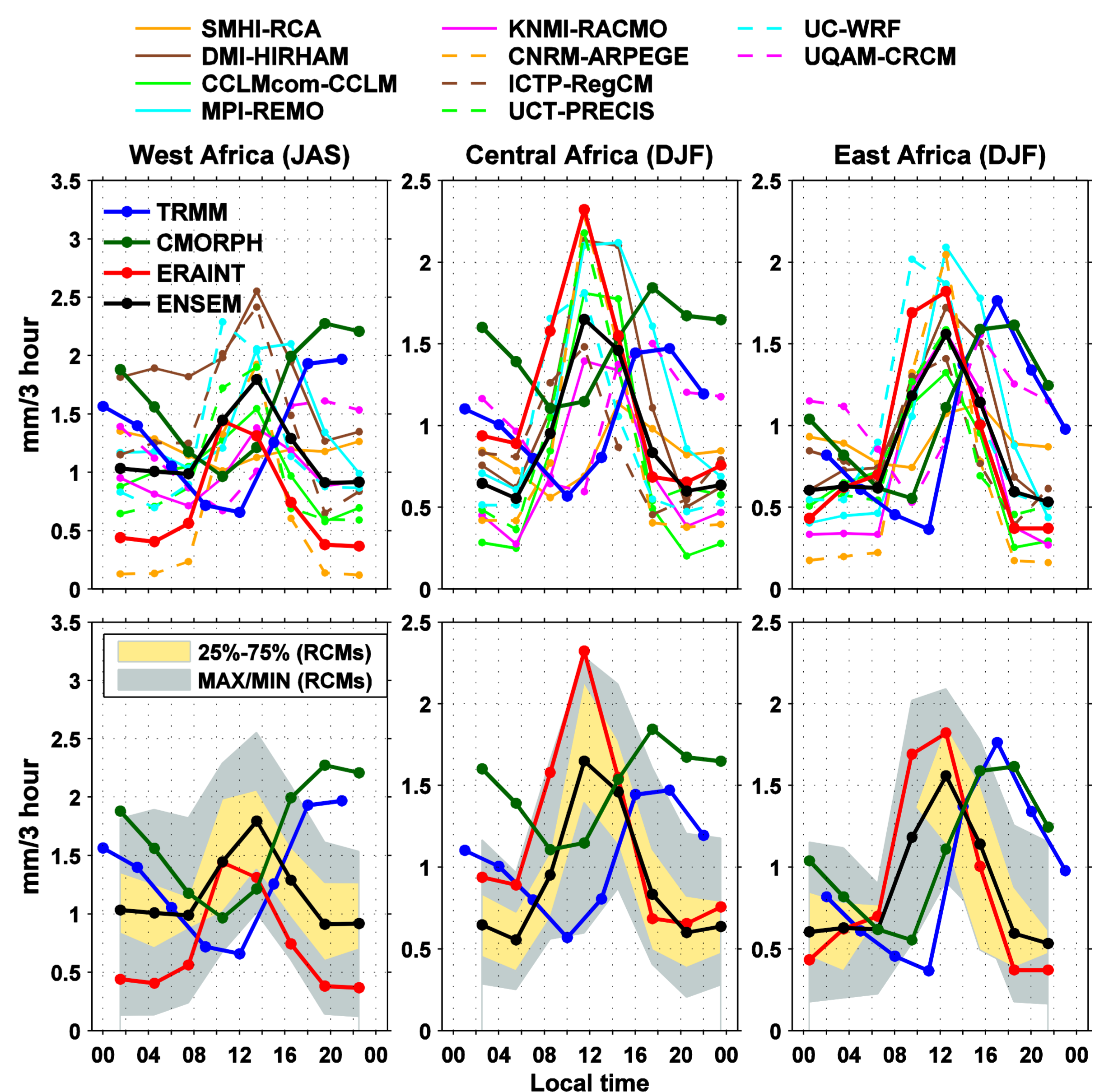
**OBSERVATIONS:** GPCP11, TRMM-3B42, CMORPH, GPCC5, CRU30, U. Delaware 2.01  
**RCMs:** ARPEGE5.1 (CNRM), HIRHAM5 (DMI), RegCM3 (ICTP), CCLM4.8 (CLMcom), RACMO2.2b (KNMI), REMO (MPI), RCA35 (SMHI), PRECIS (UCT), WRF3.1.1 (UC), CRCM5 (UQAM); **RESOLUTION:** about 50 km; **LBC:** the ERA-Interim (1989-2008)



Annual cycle of the 50-day low-passed precipitation (1998-2008) averaged over West Africa (10°W-10°E, 7.5°-15°N), Central Africa (10°-25°E, 10°-0°S) and East Africa (30°-40°E, 15°-0°S)

- RCMs show a wide spread around the observed annual cycle
- the ensemble mean accurately represents the observed annual cycle (again error cancellation across the individual RCMs)
- several RCMs and the particularly the ensemble mean improve ERAINT

### 4 Diurnal cycle



Diurnal cycle of precipitation (2003-2008) averaged over West, Central and East Africa

- both TRMM and CMORPH indicate rainfall maxima late afternoon
- ERAINT and the majority of RCMs precipitate too early
- only RCA35 and CRCM5 (Kain-Fritsch convection scheme) capture to some degree the observed phase although WRF (KF as well) precipitates too early
- the ensemble mean can partly correct the amplitude but not the phase

### Summary

- most of the RCMs capture the main features of the precipitation climate, although individual models do exhibit substantial biases (regions, seasons)
- many of RCMs improve the precipitation climate compared to ERAINT
- the ensemble average generally outperforms the individual models
- the majority of RCMs and ERAINT simulate a diurnal cycle of precipitation completely out of the observed phase and the ensemble mean can improve the amplitude but not the phase of the diurnal cycle