

Changes in the seasonal cycle, intensity and frequency of precipitation under global warming

Chao-An Chen

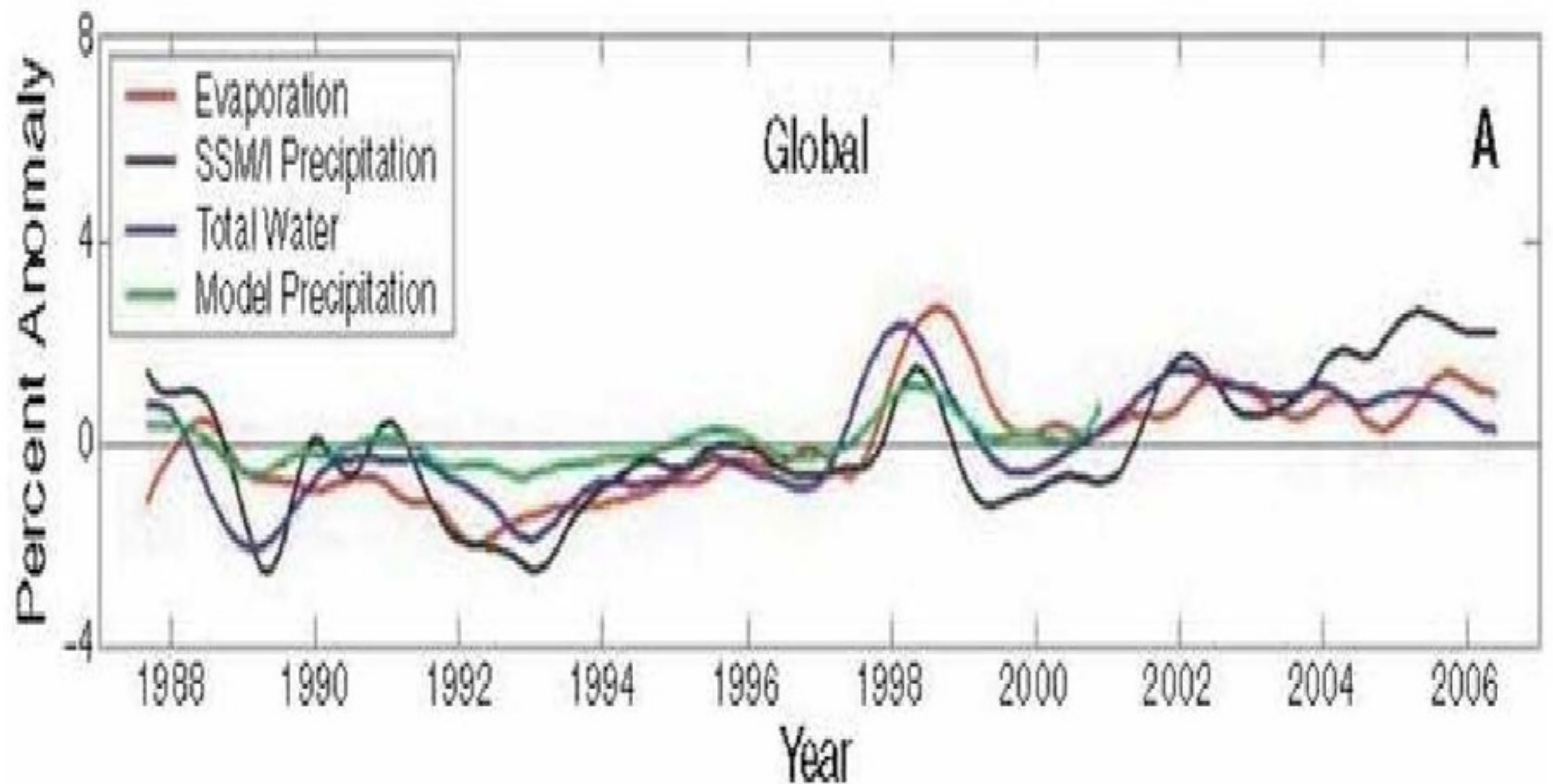
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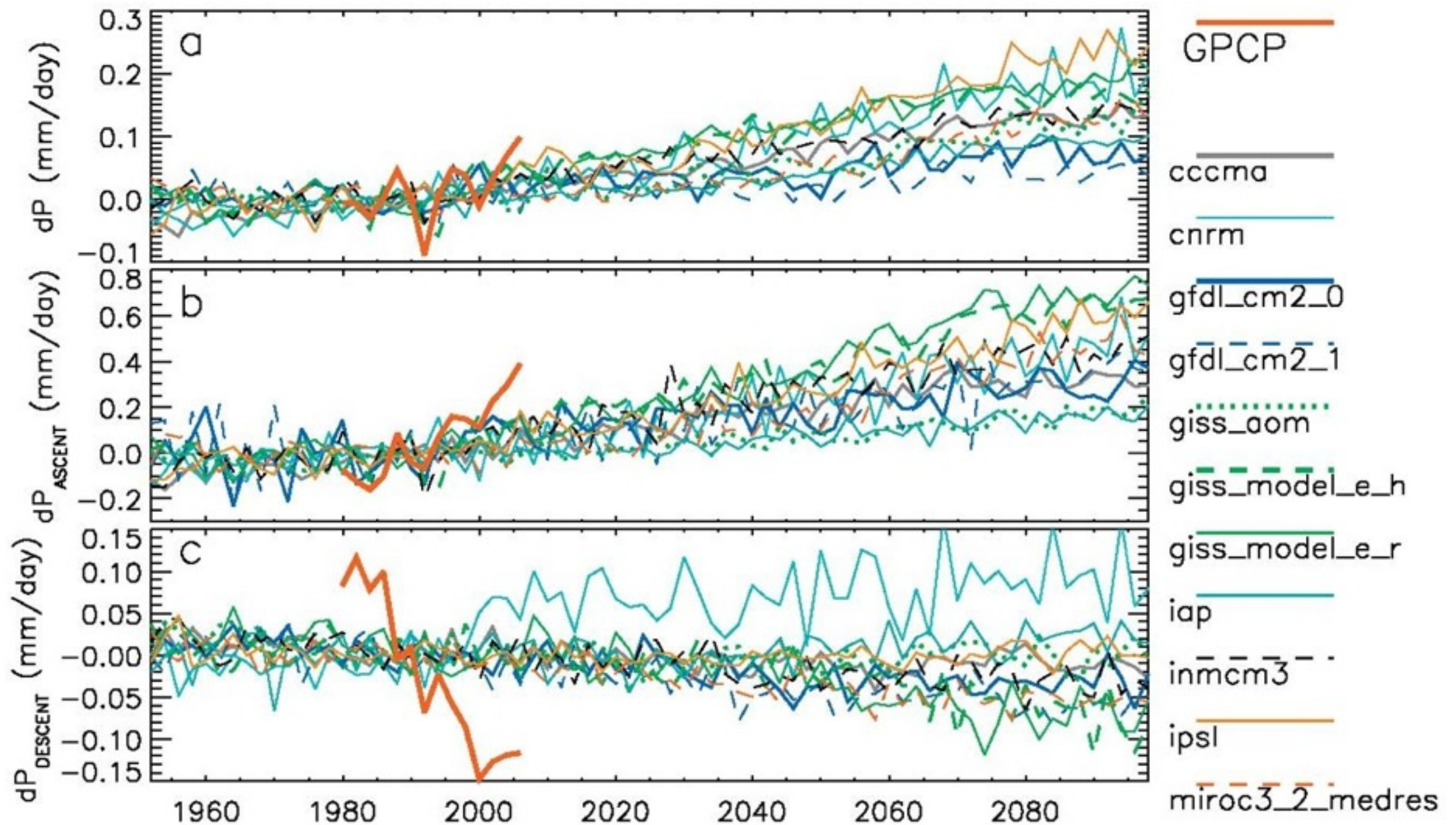
RCEC, Academia Sinica

Collaborators: Chia-Wei Lan, Kwan-Ting Chen, Jien-Yi Tu, Pei-Hua Tan

Global mean

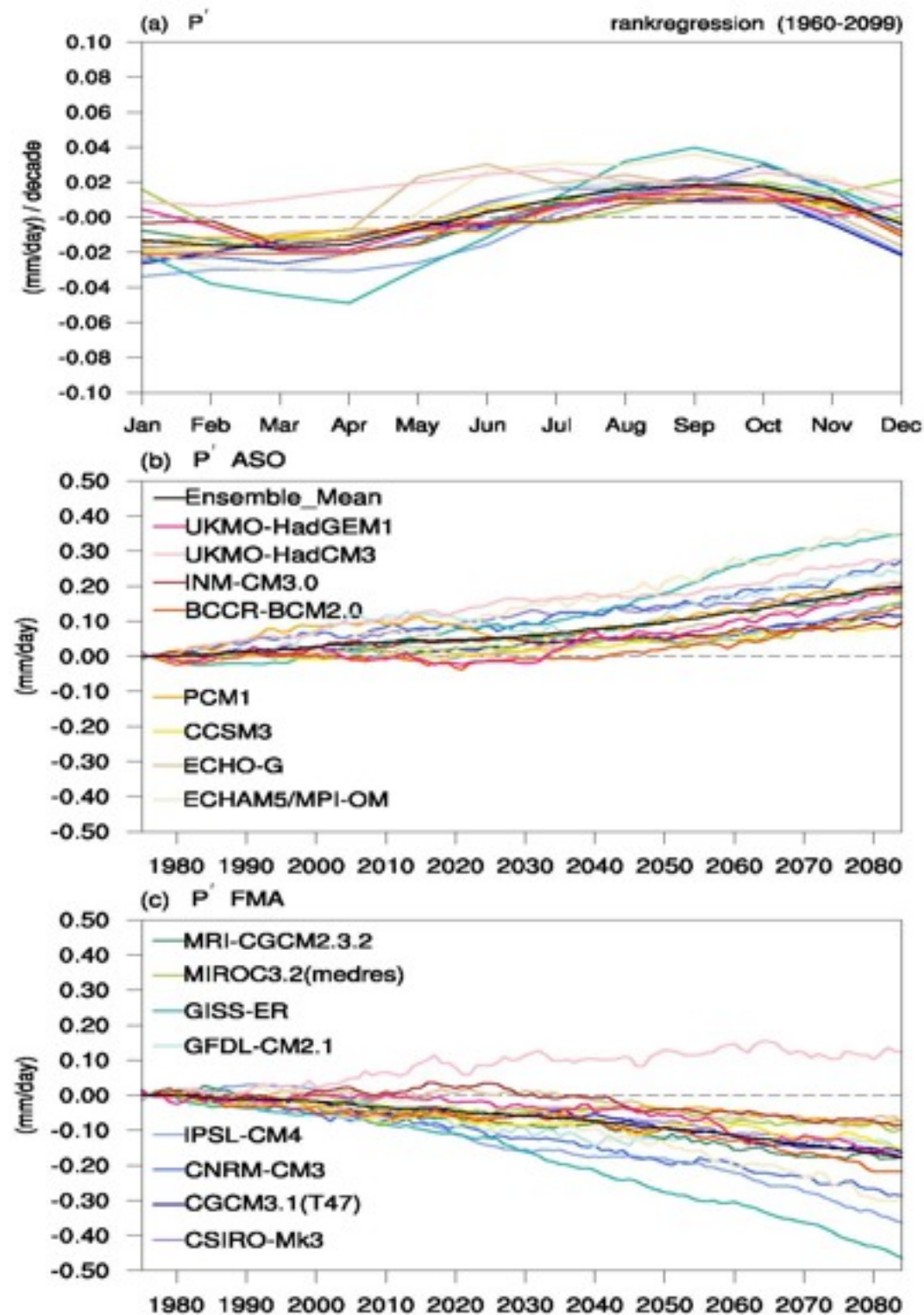


Wet (dry) regions get wetter (drier)



Allan and Soden 2007

Hemispheric asymmetry



(from Chou et al. 2007)

Changes in the seasonal cycle

Annual range of precipitation

Annual range of precipitation

Definition: Precipitation differences between wet
and dry season

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➡ Wet and dry seasons: fixed in time and space
e.g., JJA and DJF

Annual range of precipitation

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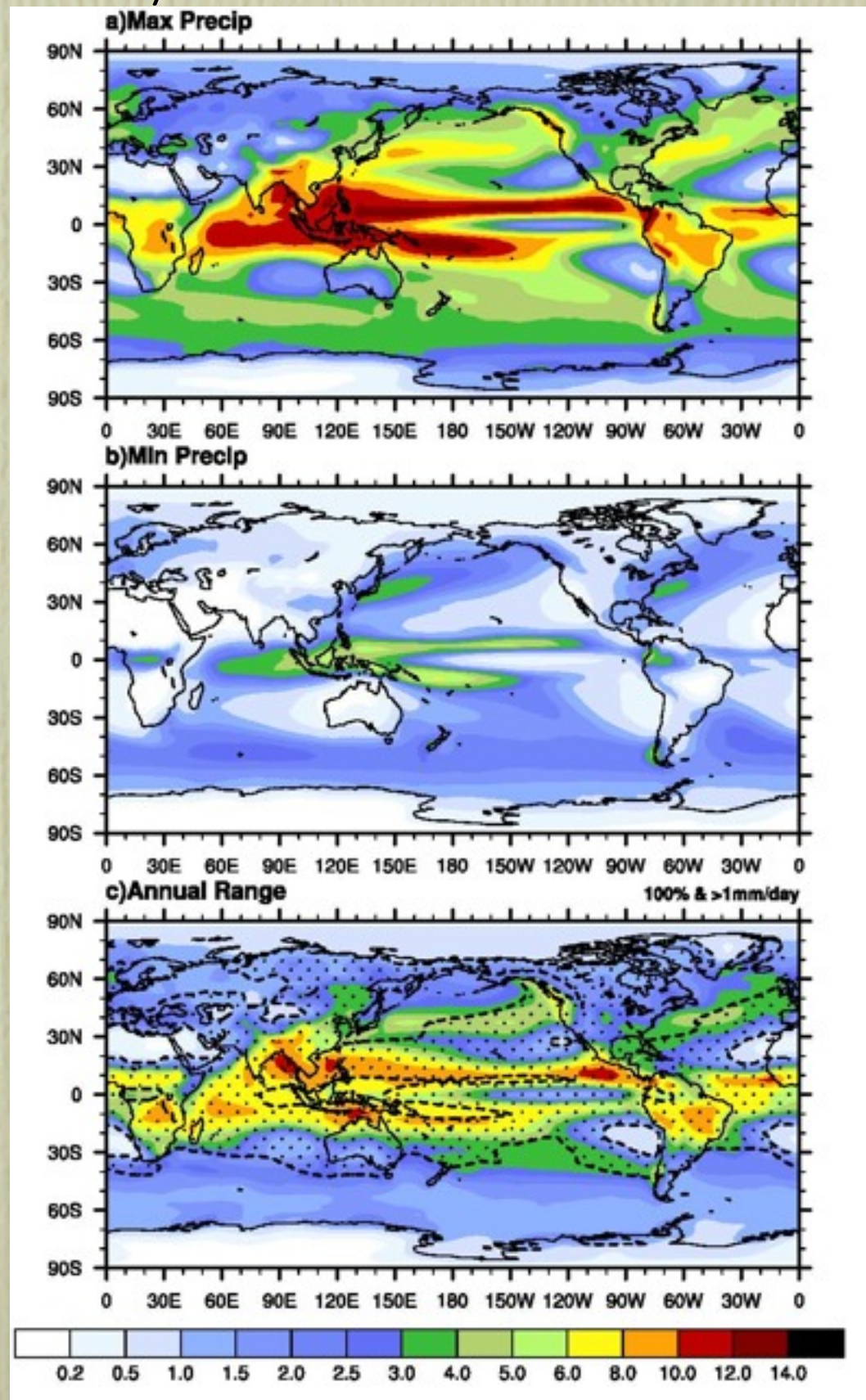
- ➡ Wet and dry seasons: fixed in time and space
e.g., JJA and DJF
- ➡ Wet and dry seasons: fixed in time, but not in space

Annual range of precipitation

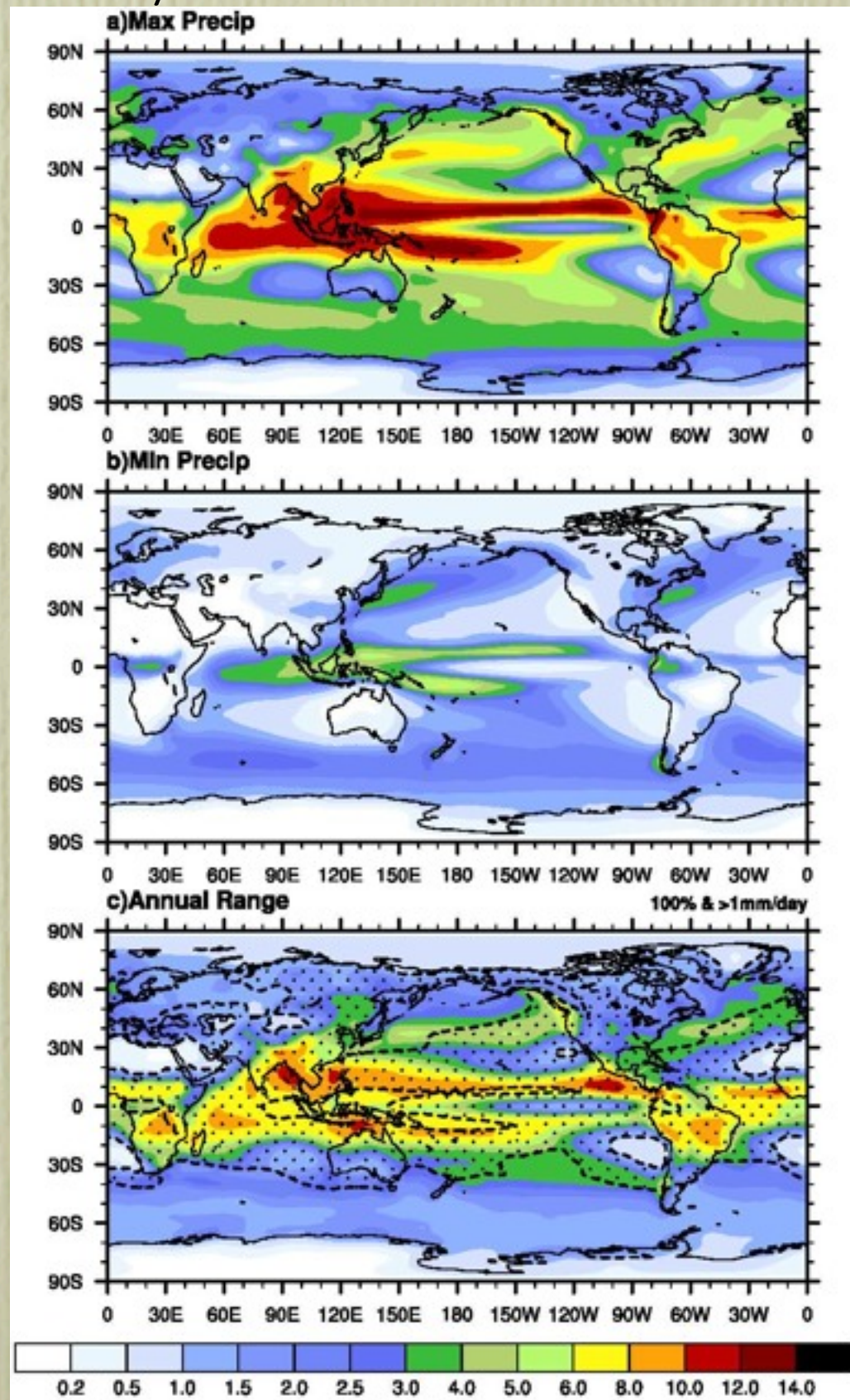
Definition: Precipitation differences between wet and dry season

- ➡ Wet and dry seasons: fixed in time and space
e.g., JJA and DJF
- ➡ Wet and dry seasons: fixed in time, but not in space
- ➡ Maximum minus minimum precipitation:
varied with time and space

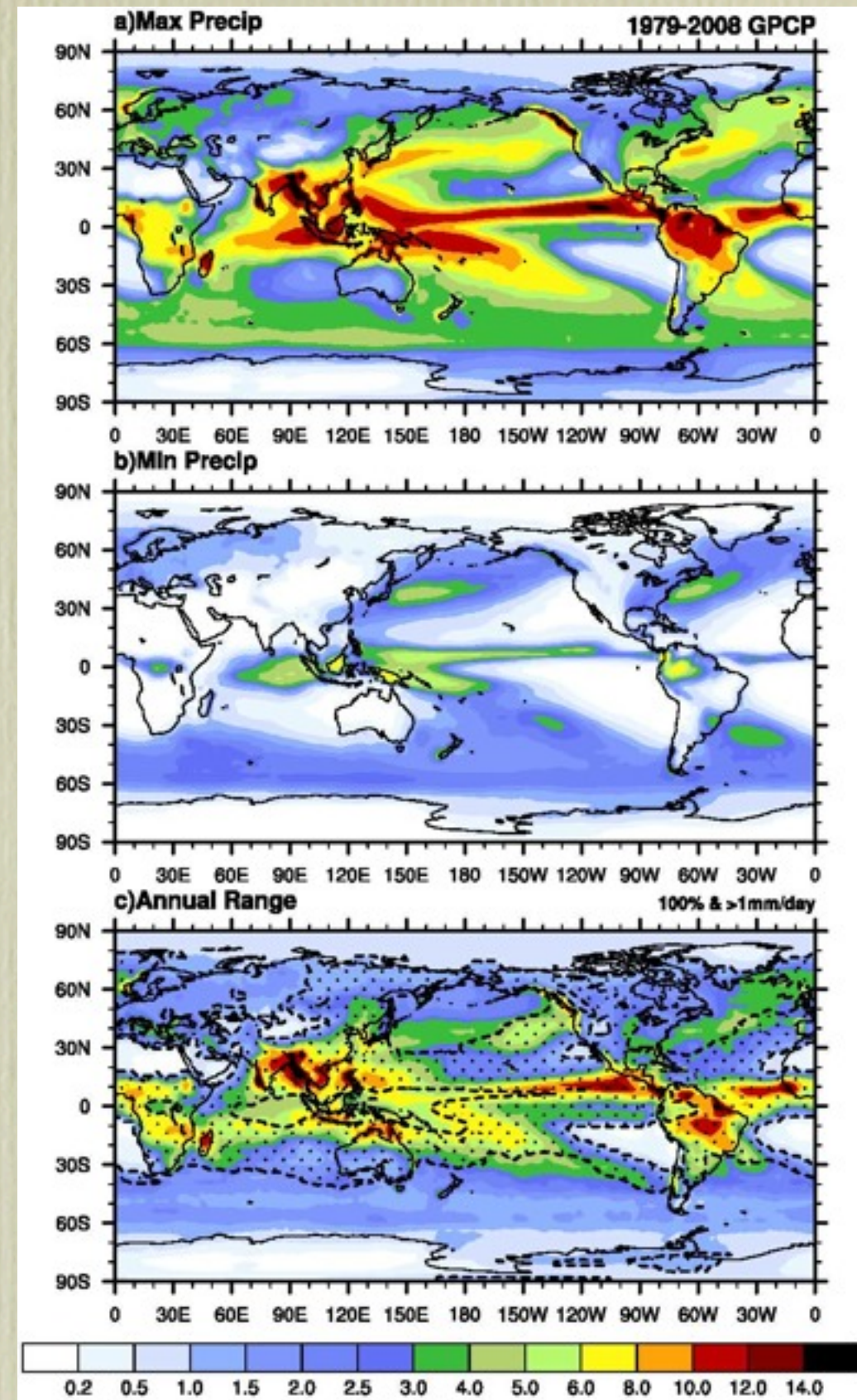
Annual range of precipitation (17 model ensembles)



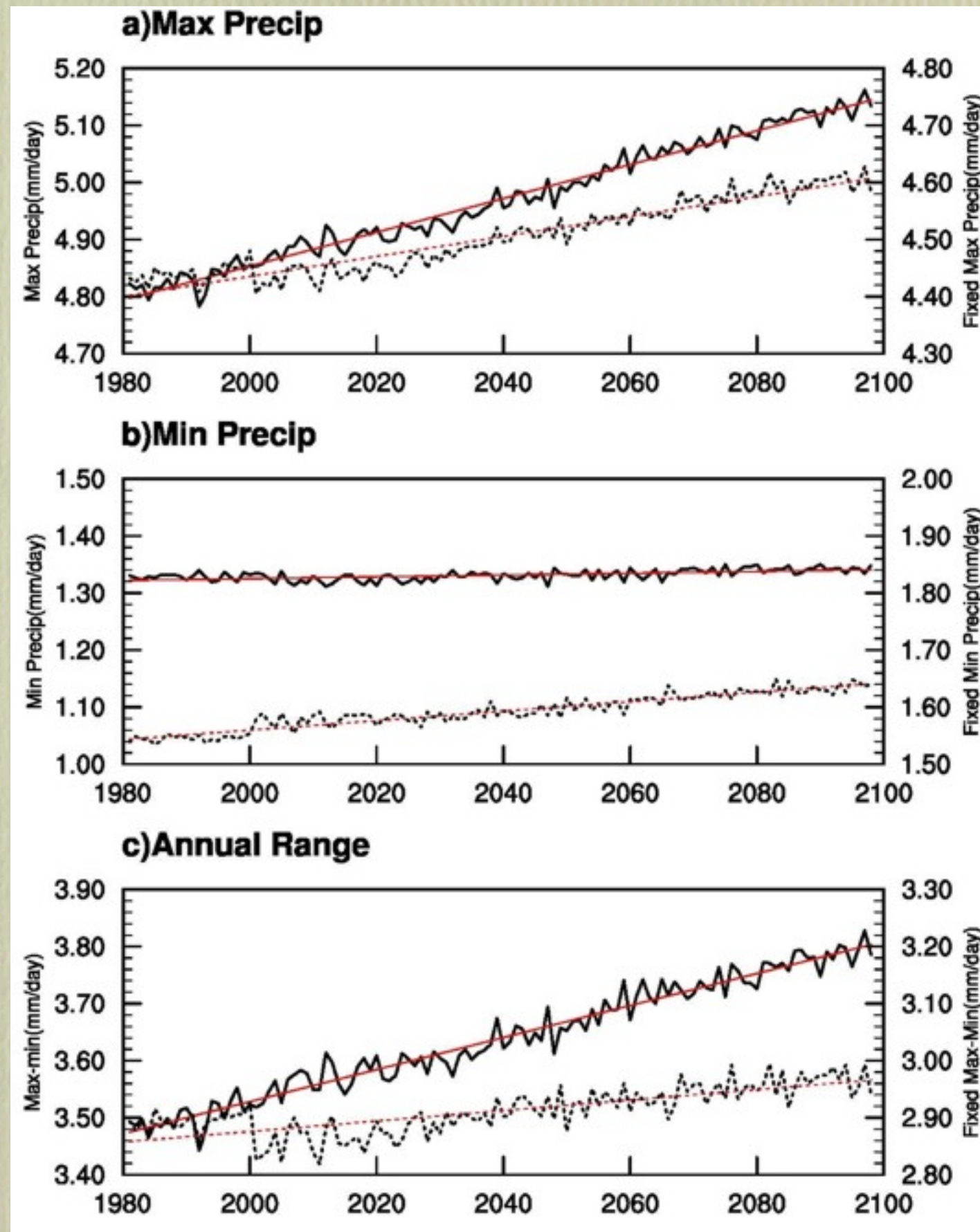
Annual range of precipitation (17 model ensembles)



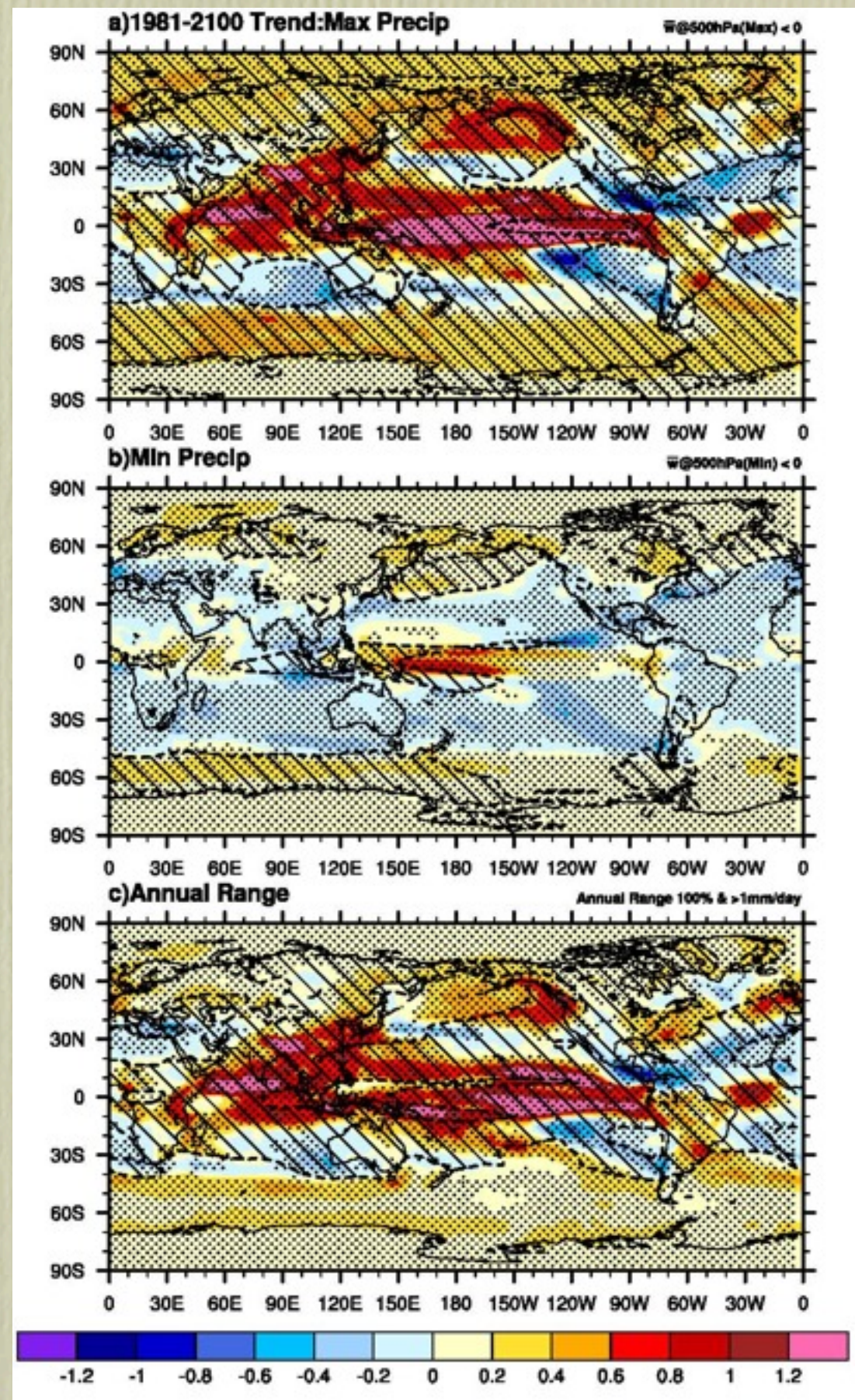
Annual range of precipitation (GPCP observation)



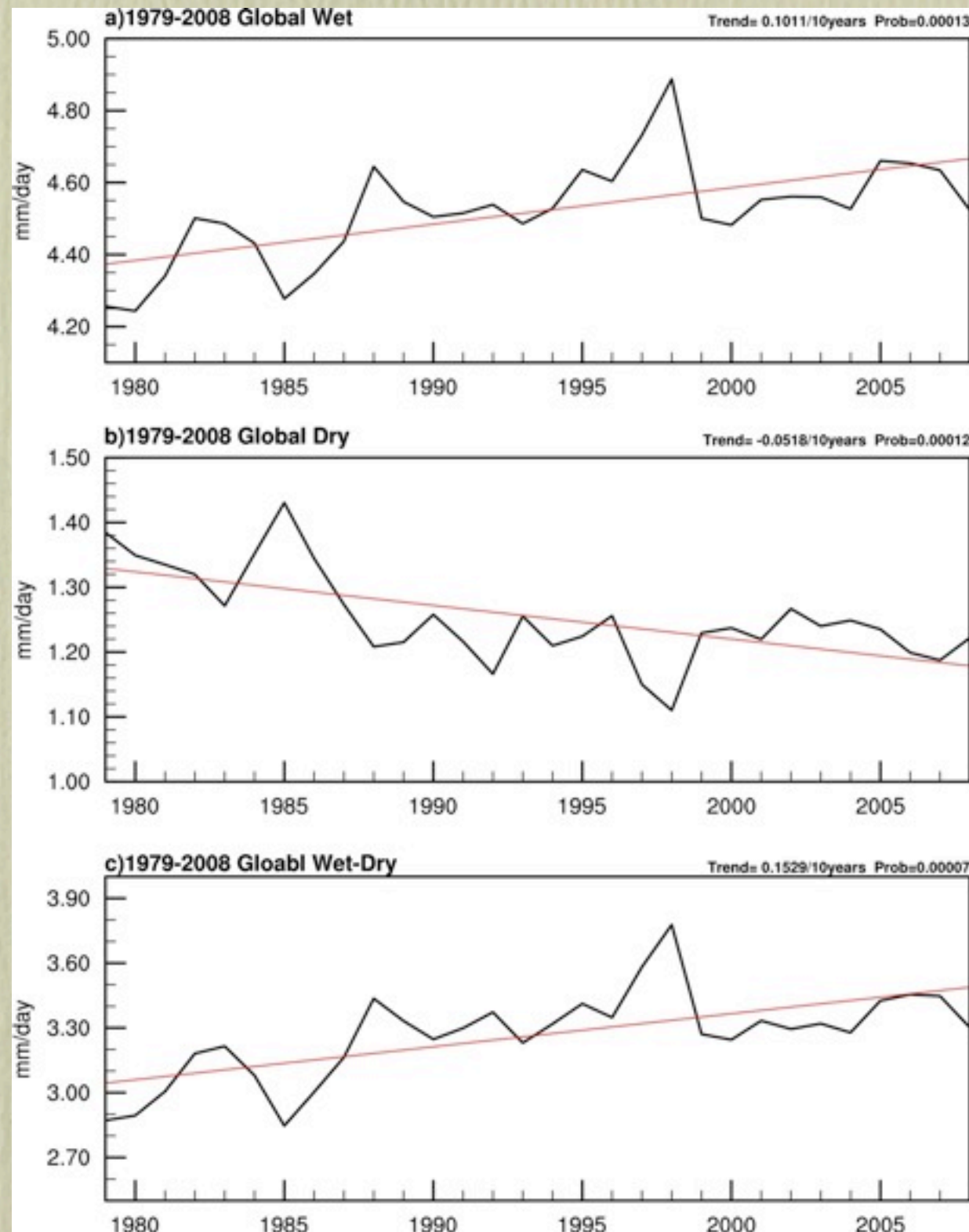
Annual range of precipitation



Annual range of precipitation



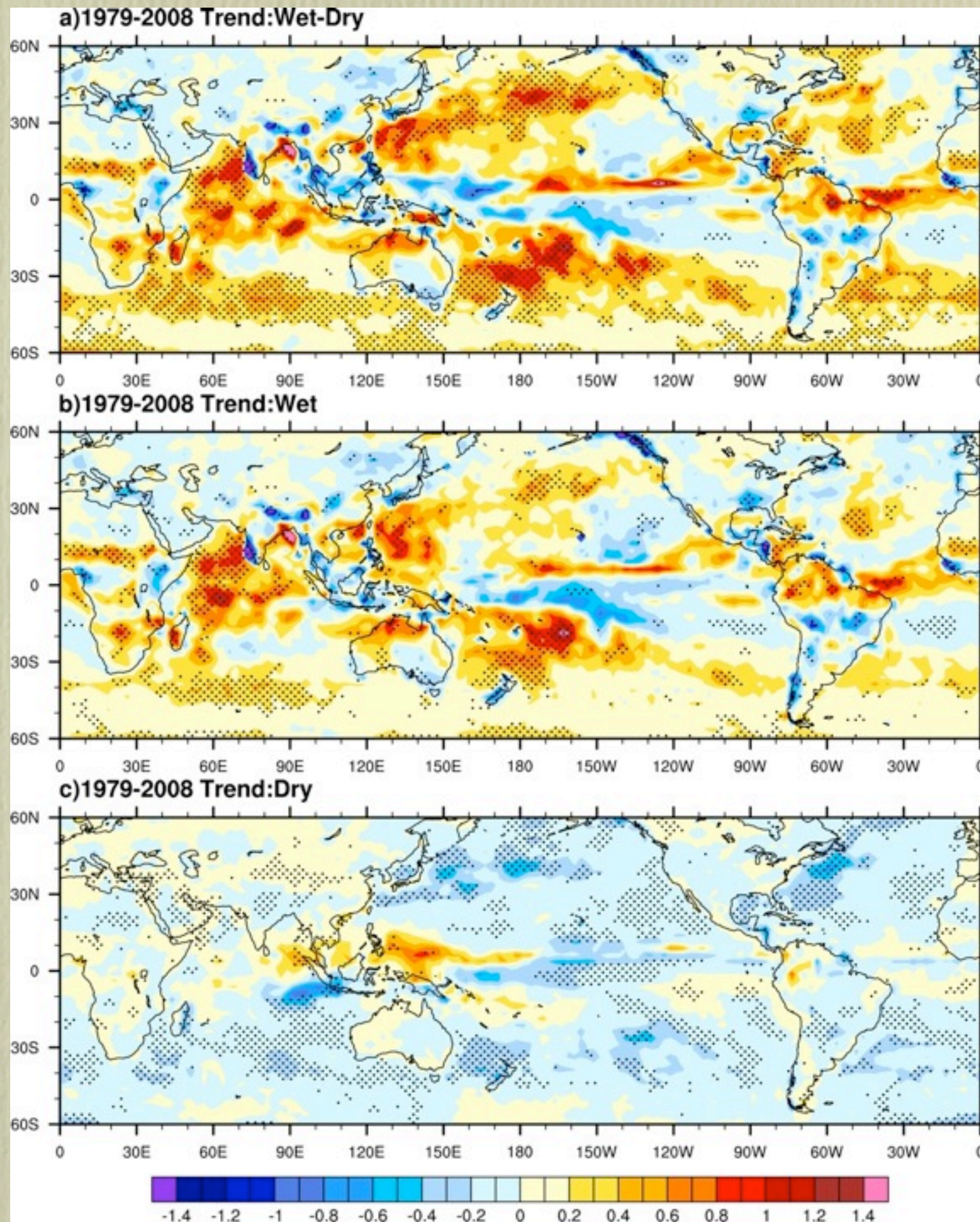
雨季與乾季降雨的變化(觀測資料)



雨季

乾季

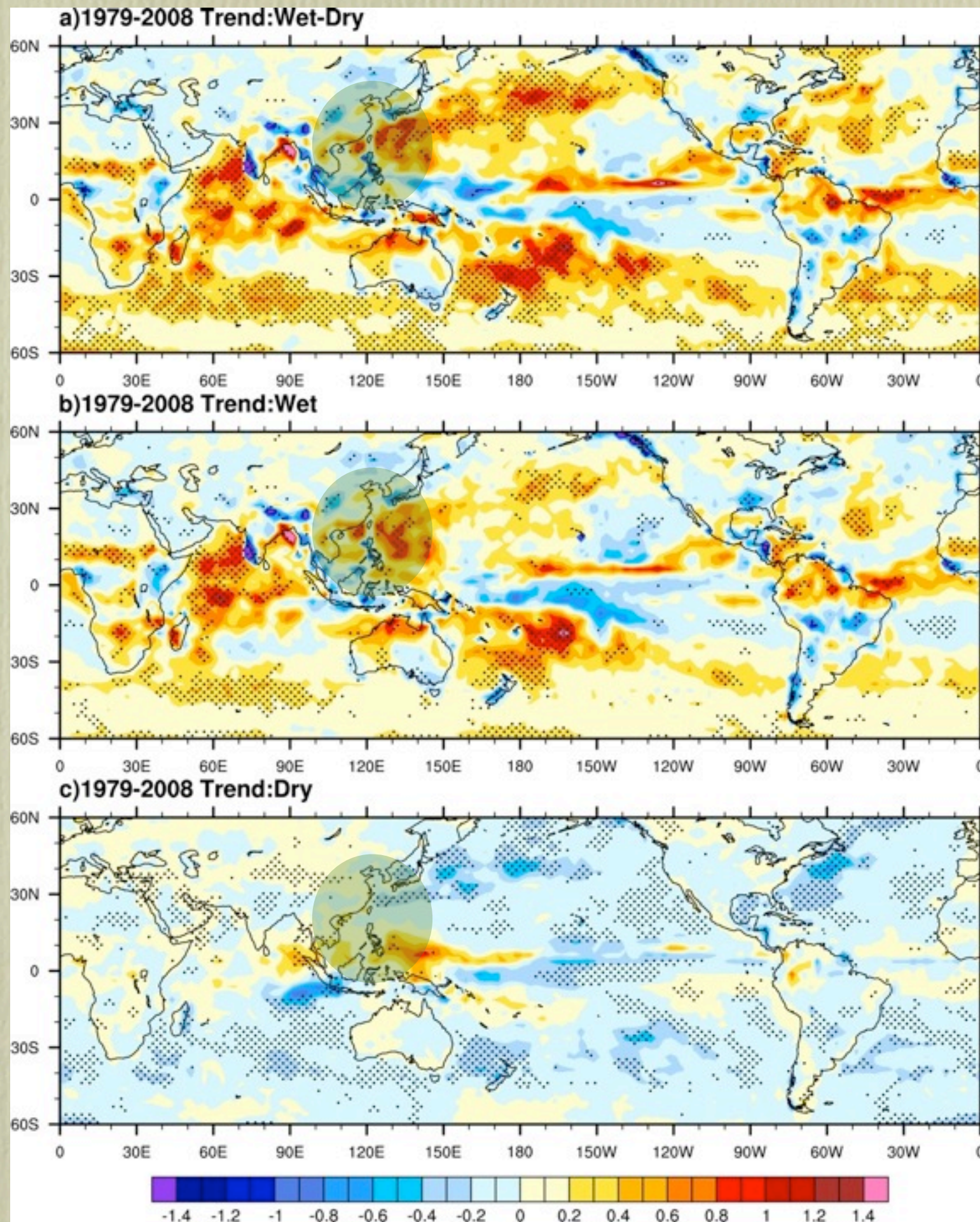
兩極化



兩極化

雨季

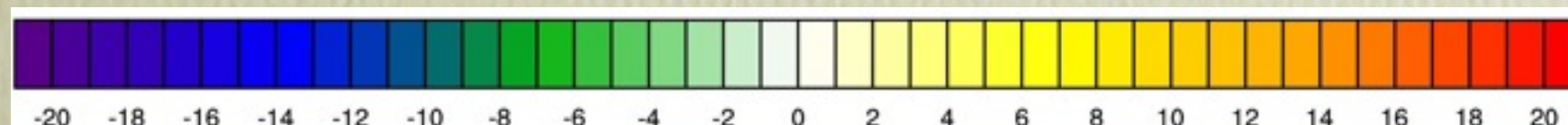
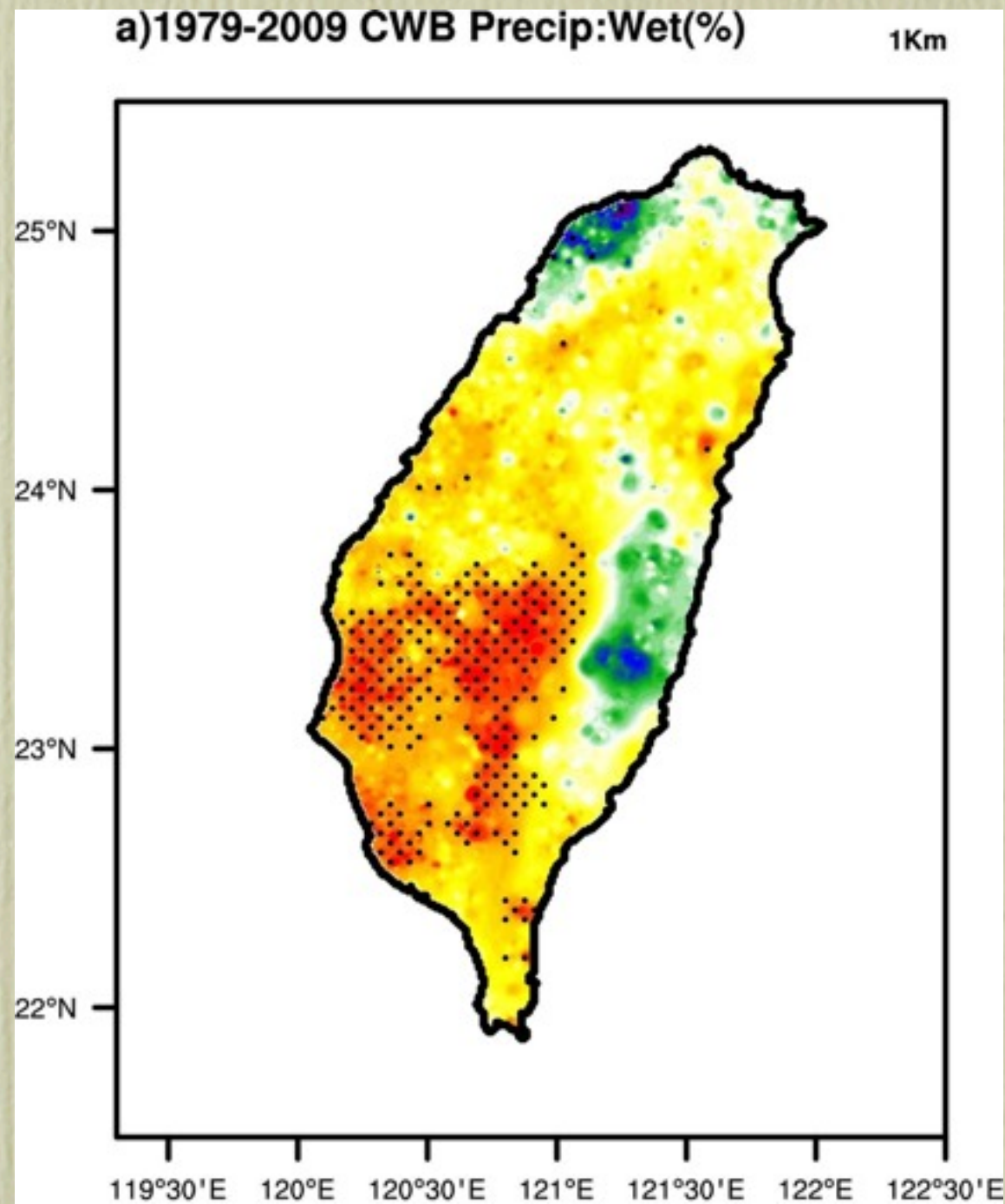
乾季

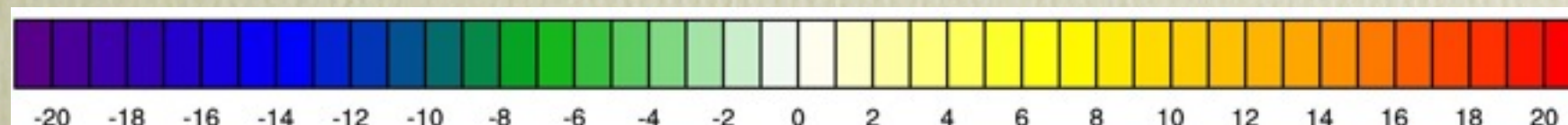
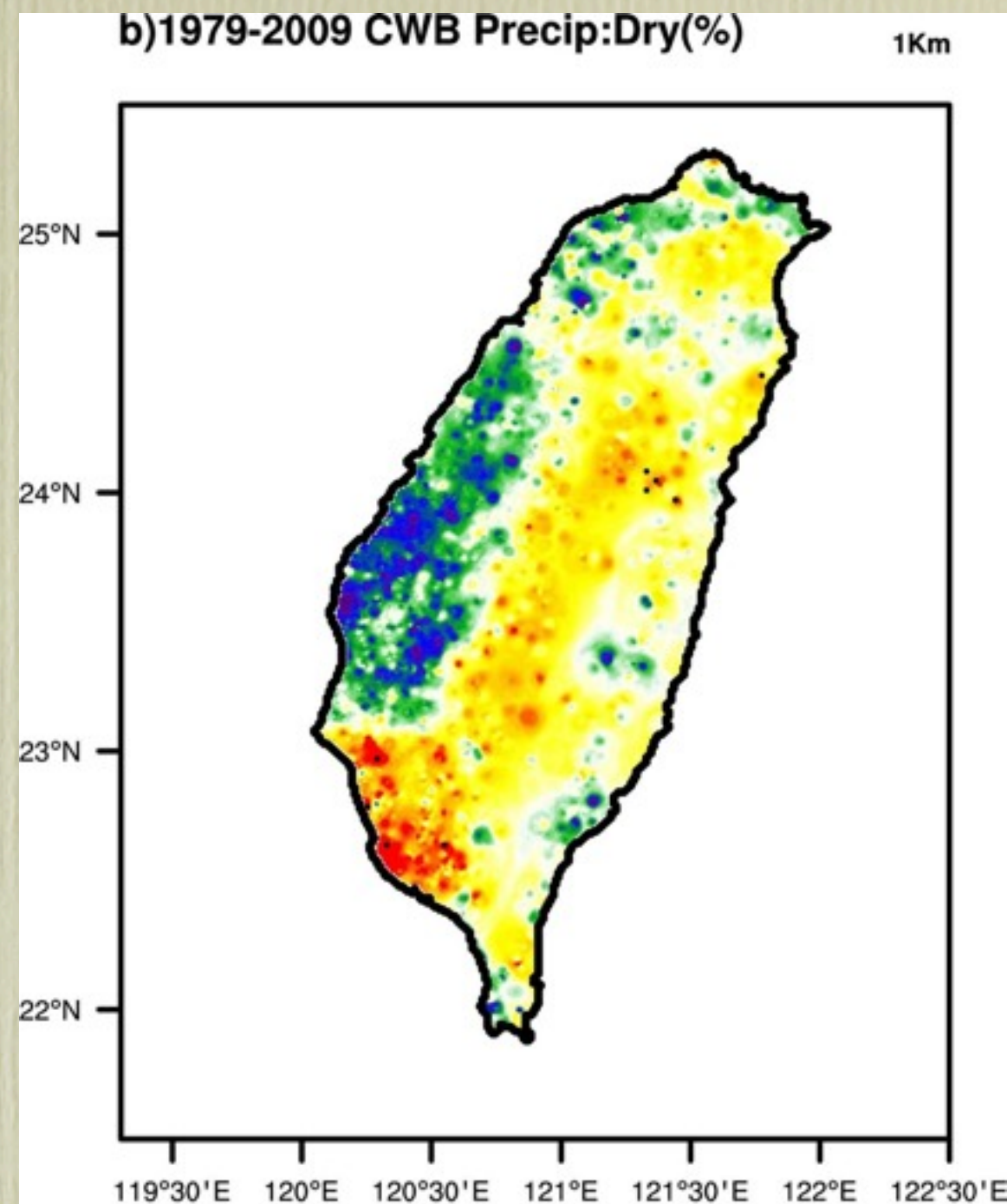
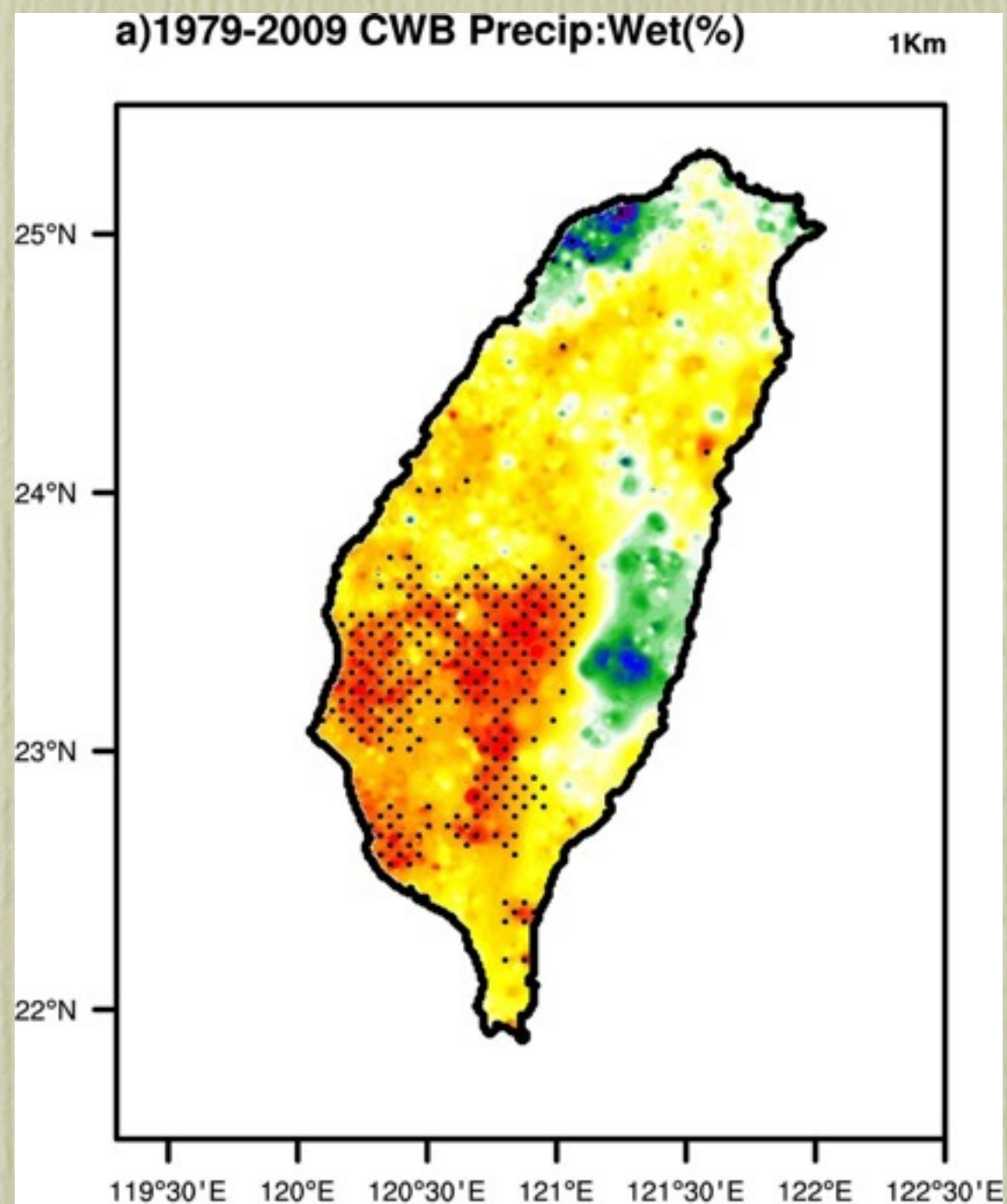


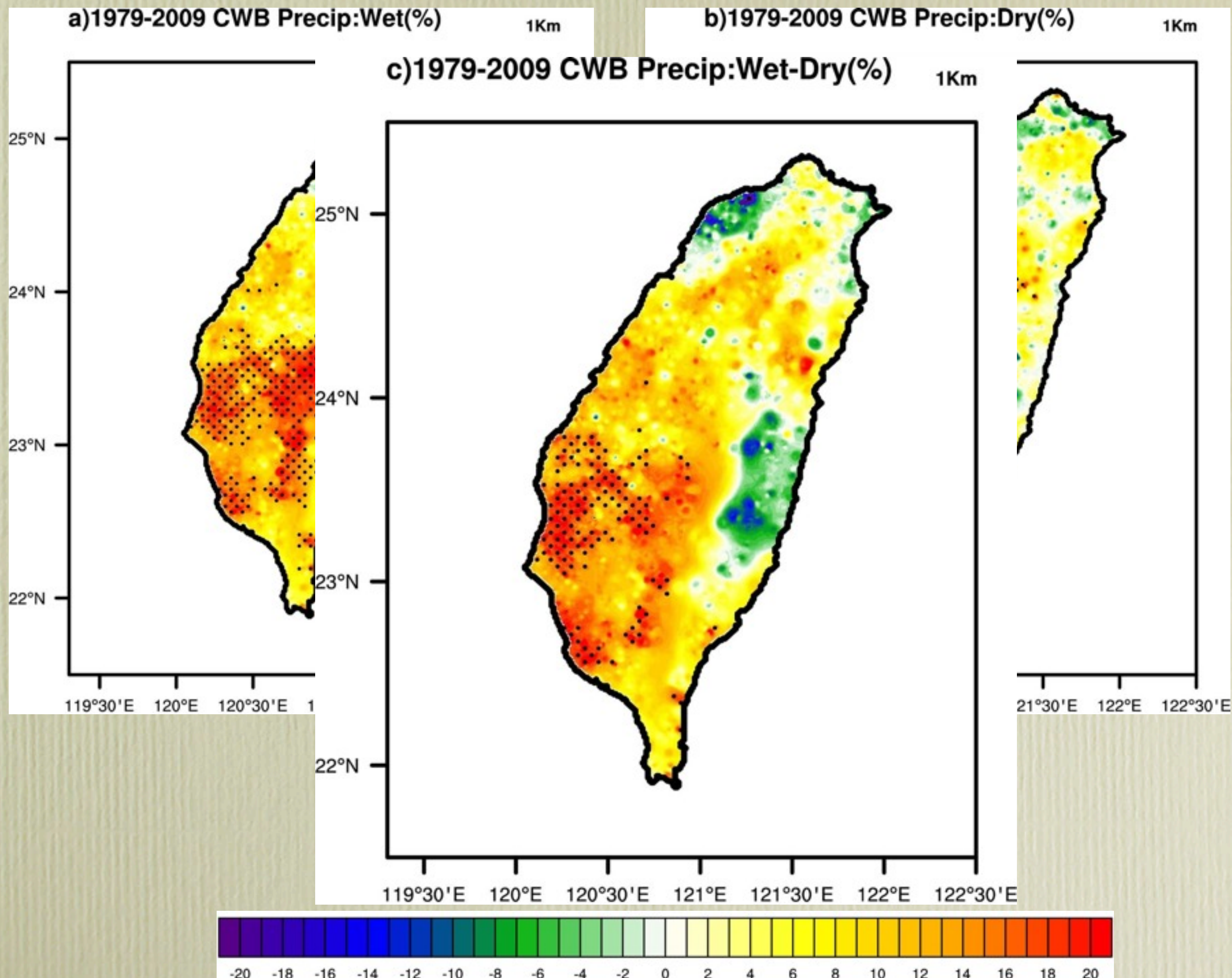
兩極化

雨季

乾季





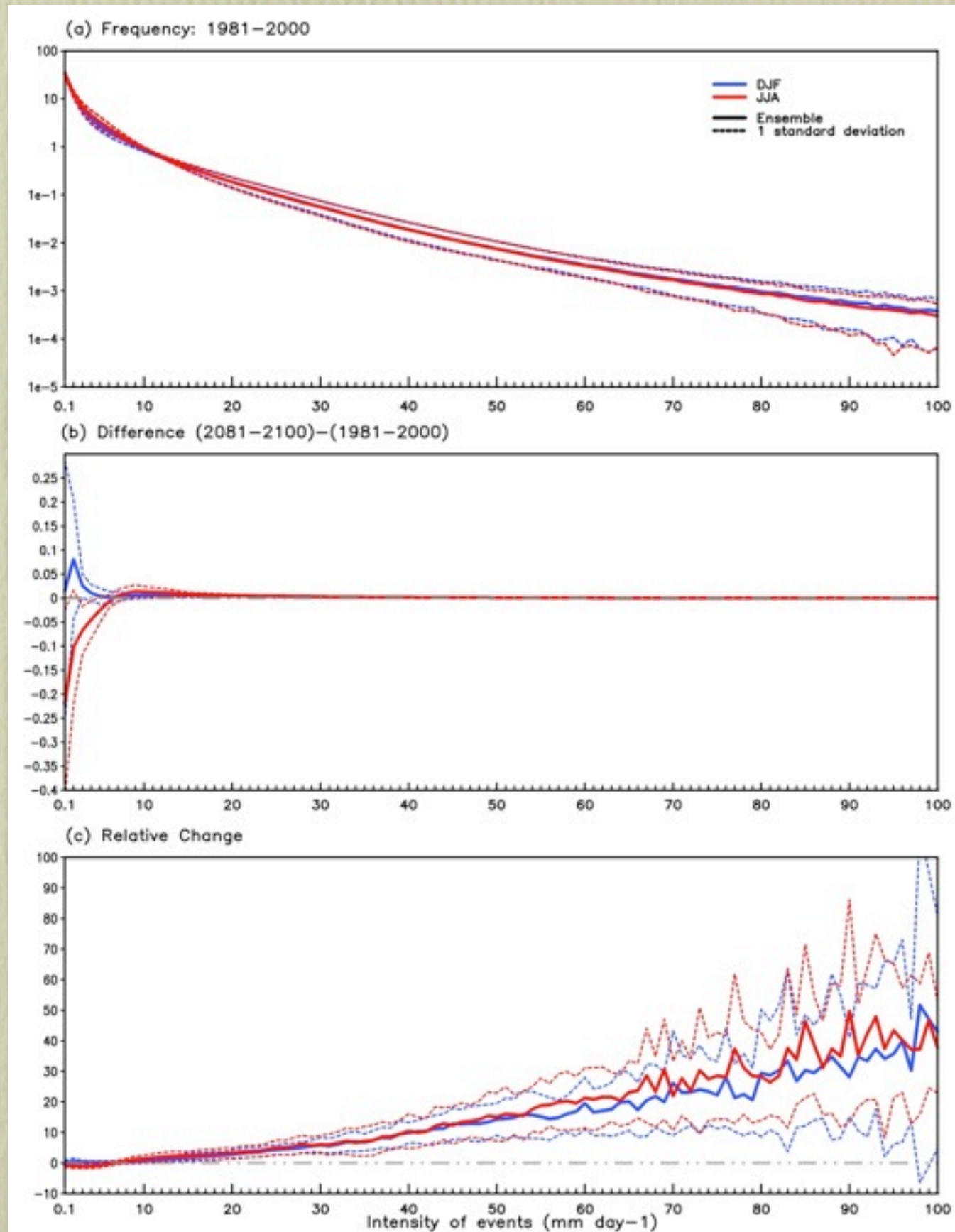


Precipitation is determined by
frequency and intensity

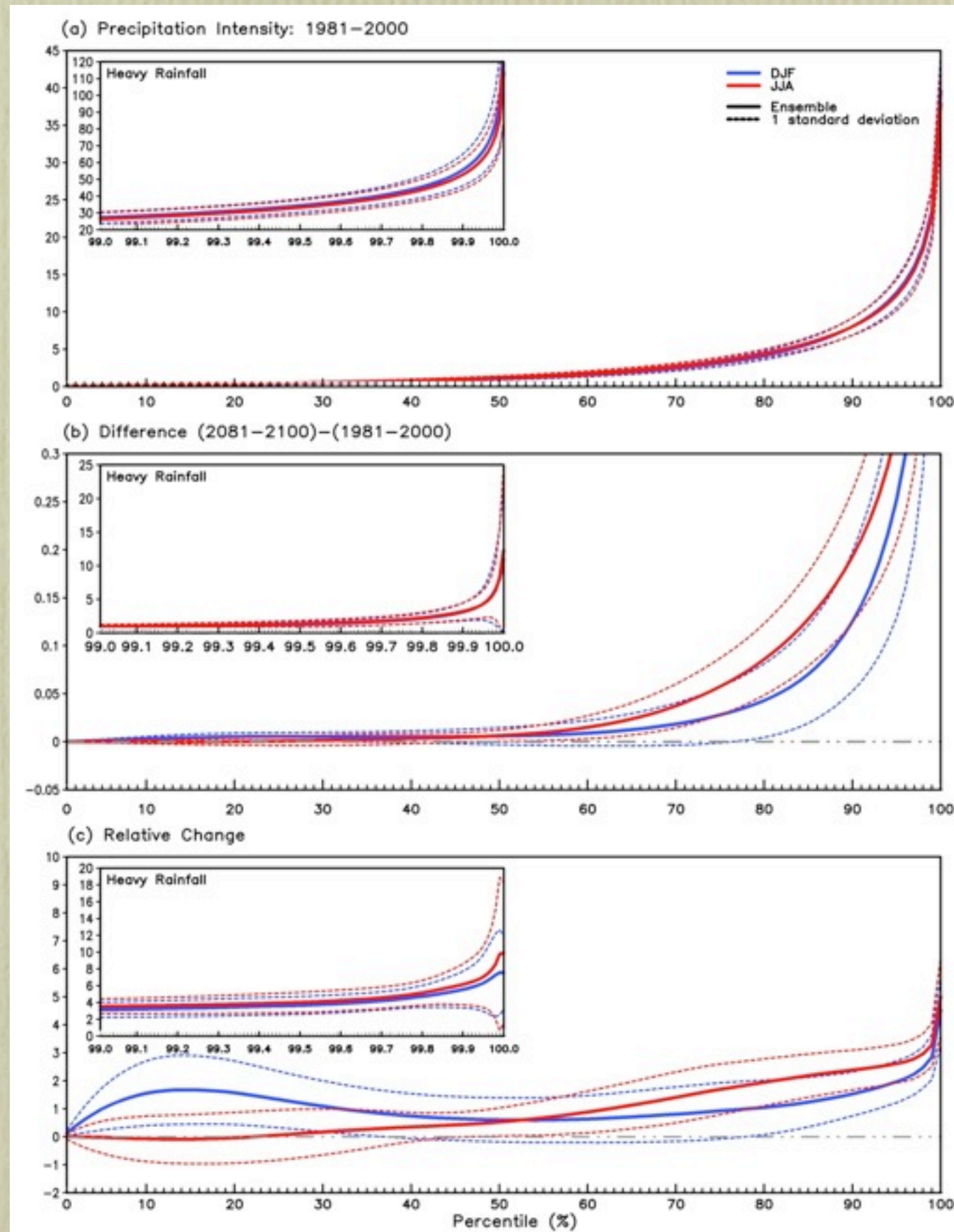
Precipitation is determined by
frequency and intensity

➡ Changes in mean precipitation:
changes in frequency and intensity

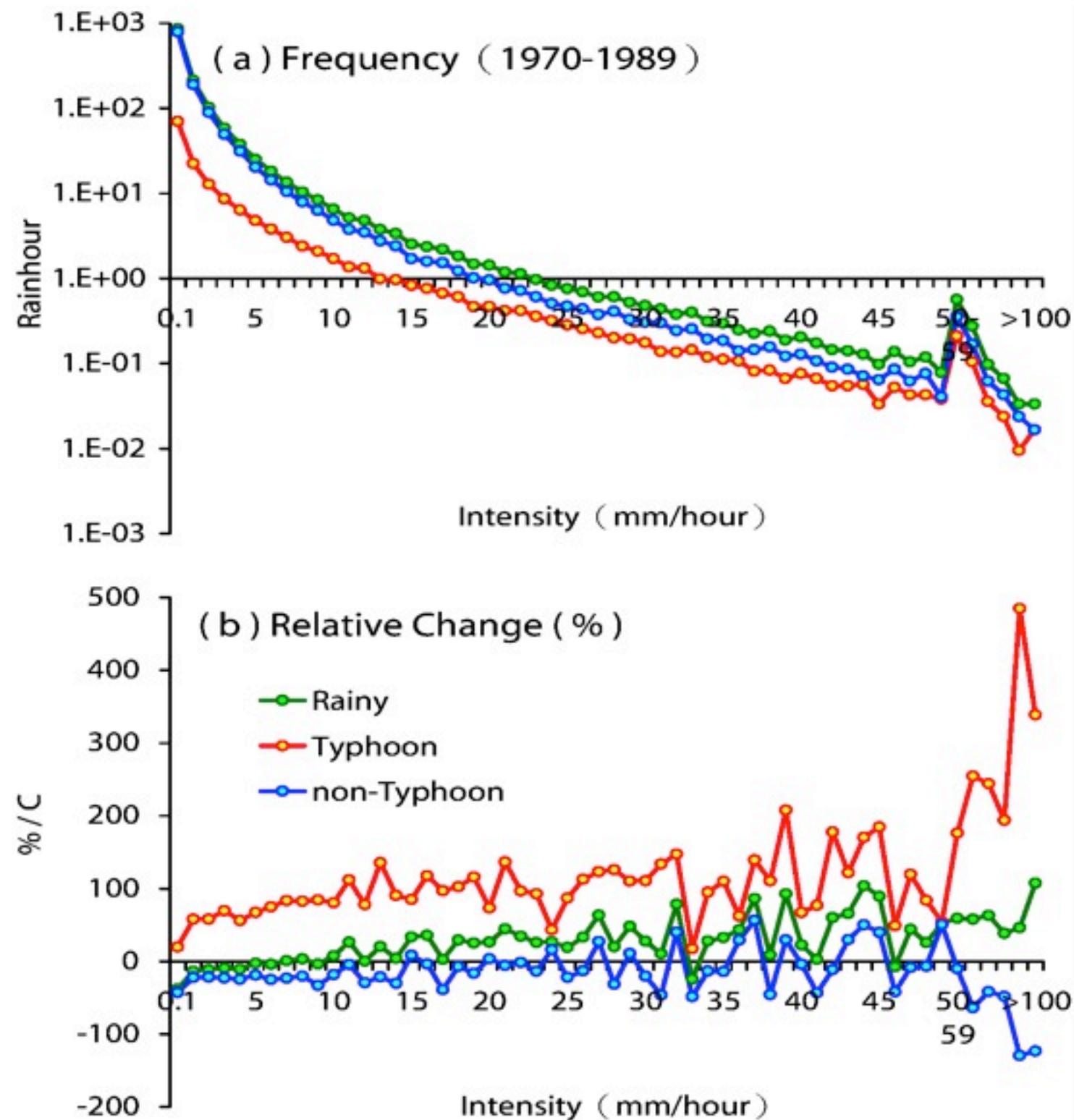
Precipitation Frequency



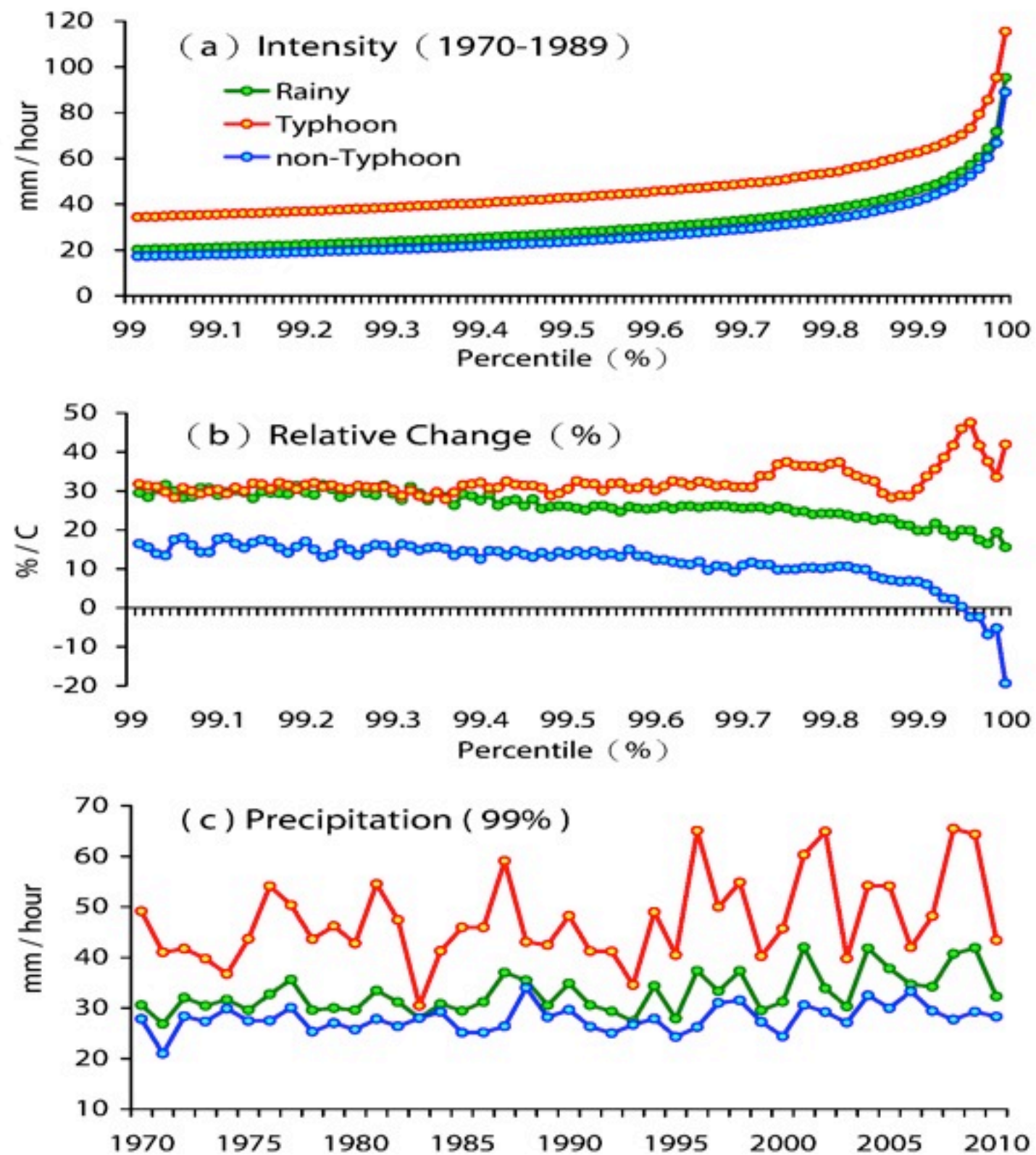
Precipitation Intensity



降雨頻率



降雨強度



Conclusions

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- Widening in the annual range of precipitation

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- Widening in the annual range of precipitation
- Precipitation: more frequent
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- Models underestimate the changes

Thank you