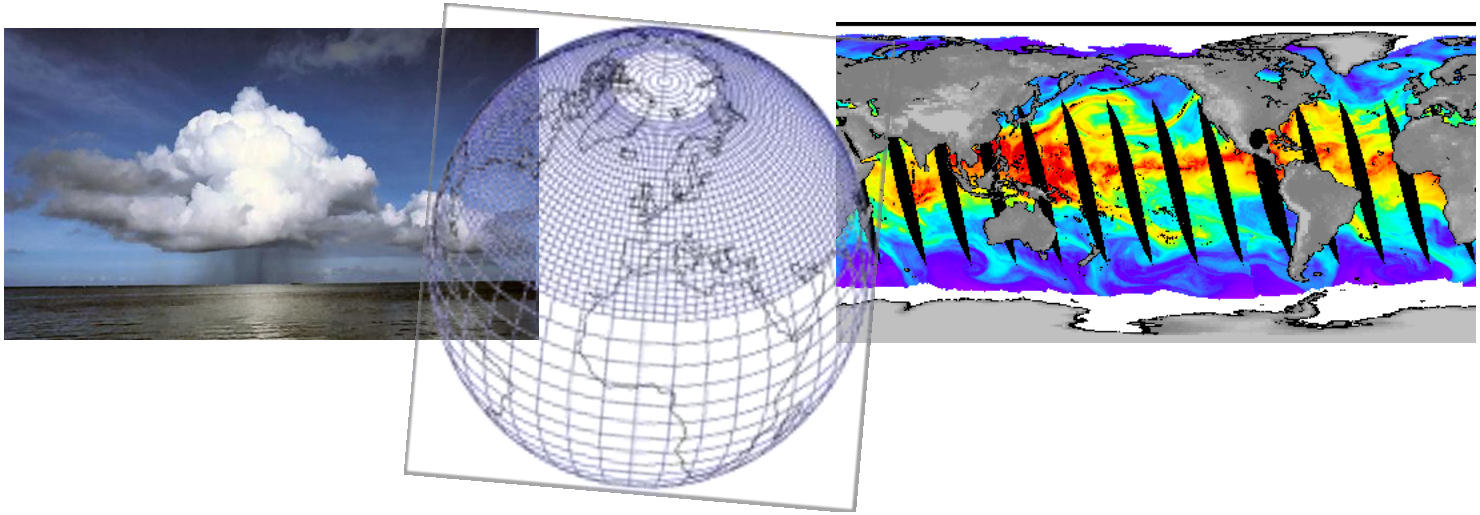

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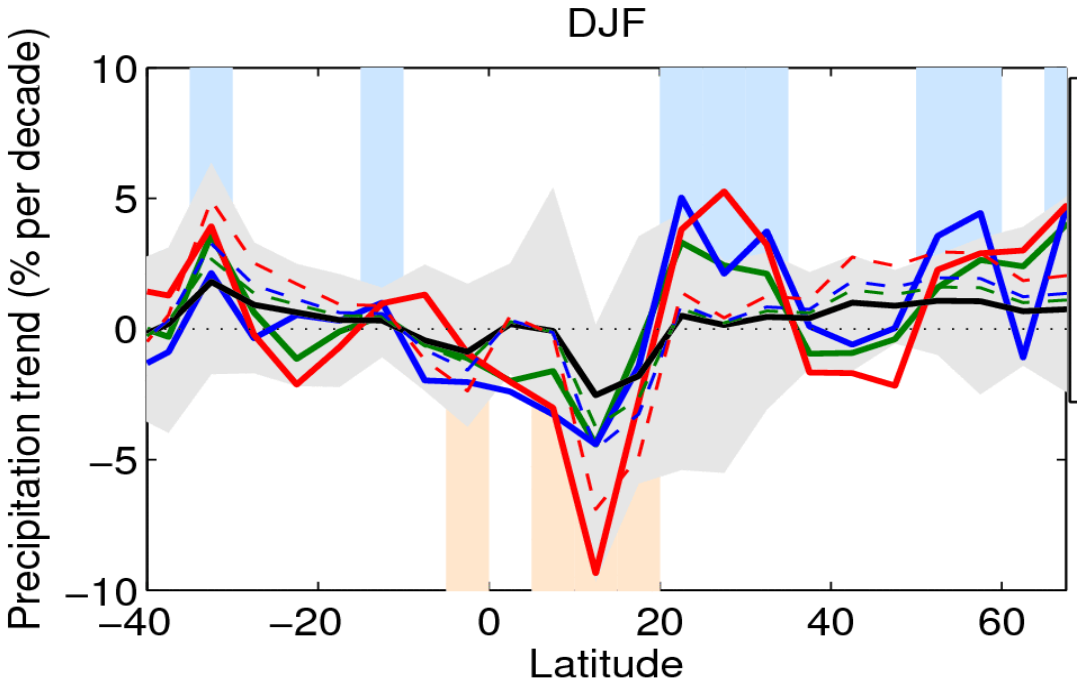
HydrOlogical cYcle Understanding via Process-bAsed GlObal Detection, Attribution and prediction

Richard Allan, Emily Black, Chunlei Liu
Department of Meteorology/NCAS Climate, University of Reading

Lead PI: Pier Luigi Vidale (Reading/NCAS Climate)
Consortium between: Reading, Edinburgh, Exeter, Met Office, Southampton

Detection & attribution of zonal mean trends in precipitation



Noake et al 2011 GRL.

Work at Edinburgh and Reading to analyse CMIP3 and CMIP5 model simulations and land-based gauge observations

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Process Understanding: Influence of resolution on moisture transports

University of Reading

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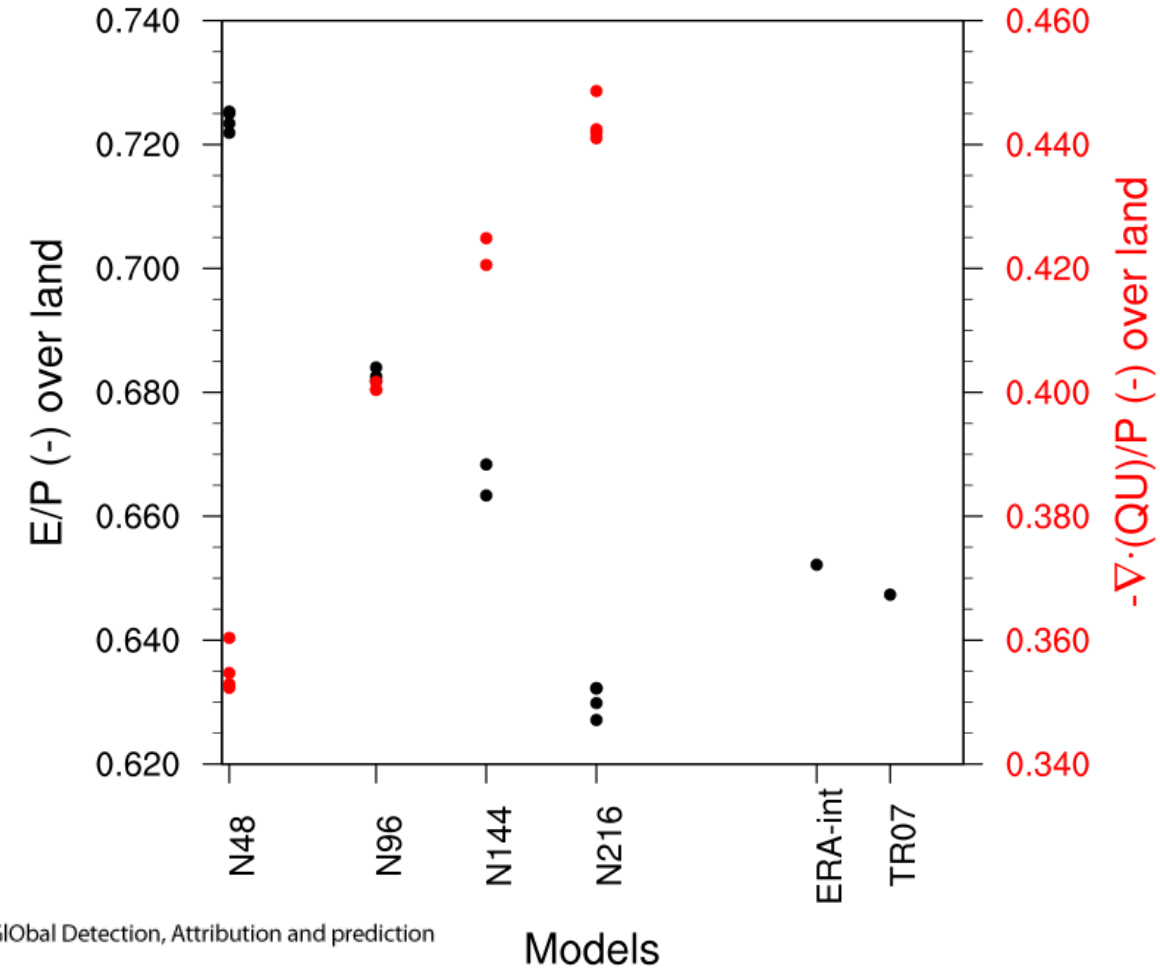
Changing water cycle

Resolution leads to:

- Stronger moisture transport from ocean to land with resolution
- Change in partitioning of moisture sources for precip over land

Work at Reading: Demory et al., in preparation



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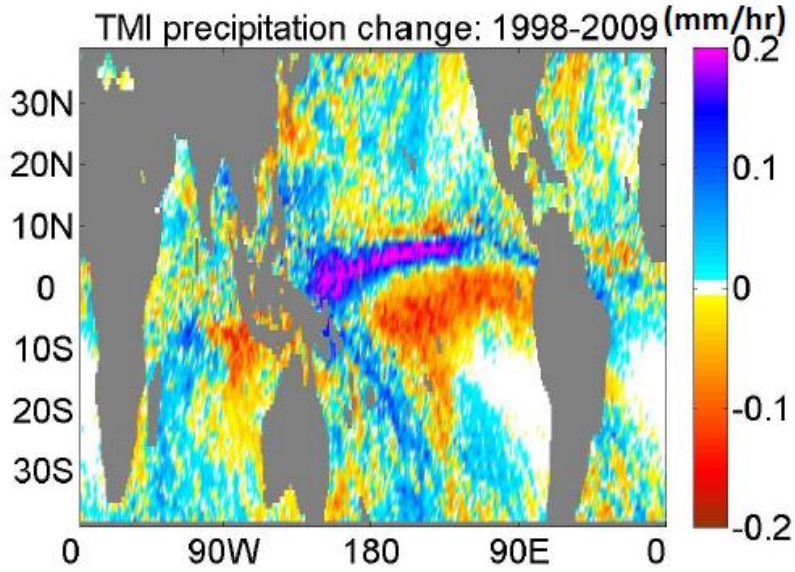
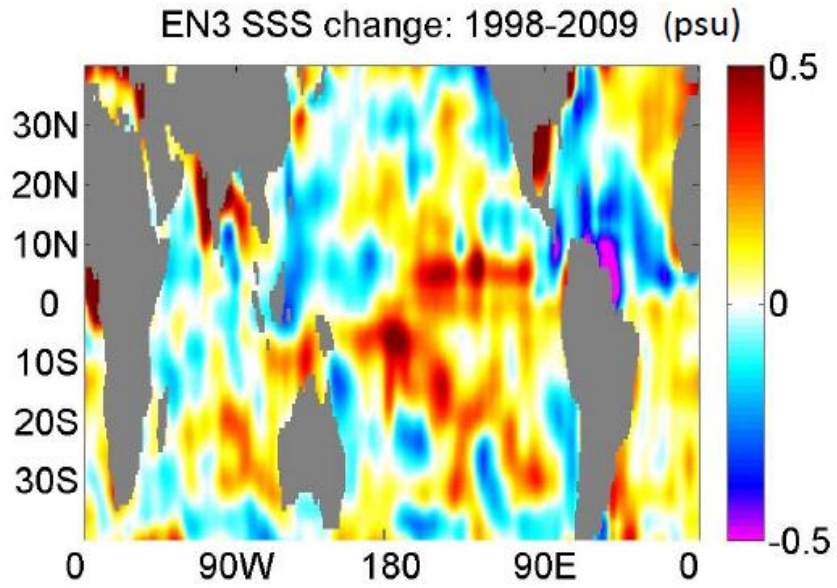
Trends in P-E and Surface Salinity





- Can we reconcile observed changes in P-E & sea surface salinity (SSS)?
- What are the main drivers of current trends in P and SSS?

Southampton & Reading

Plot courtesy of Nikolaos Skliris (NOCS)

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Observed and Simulated responses in extreme Precipitation

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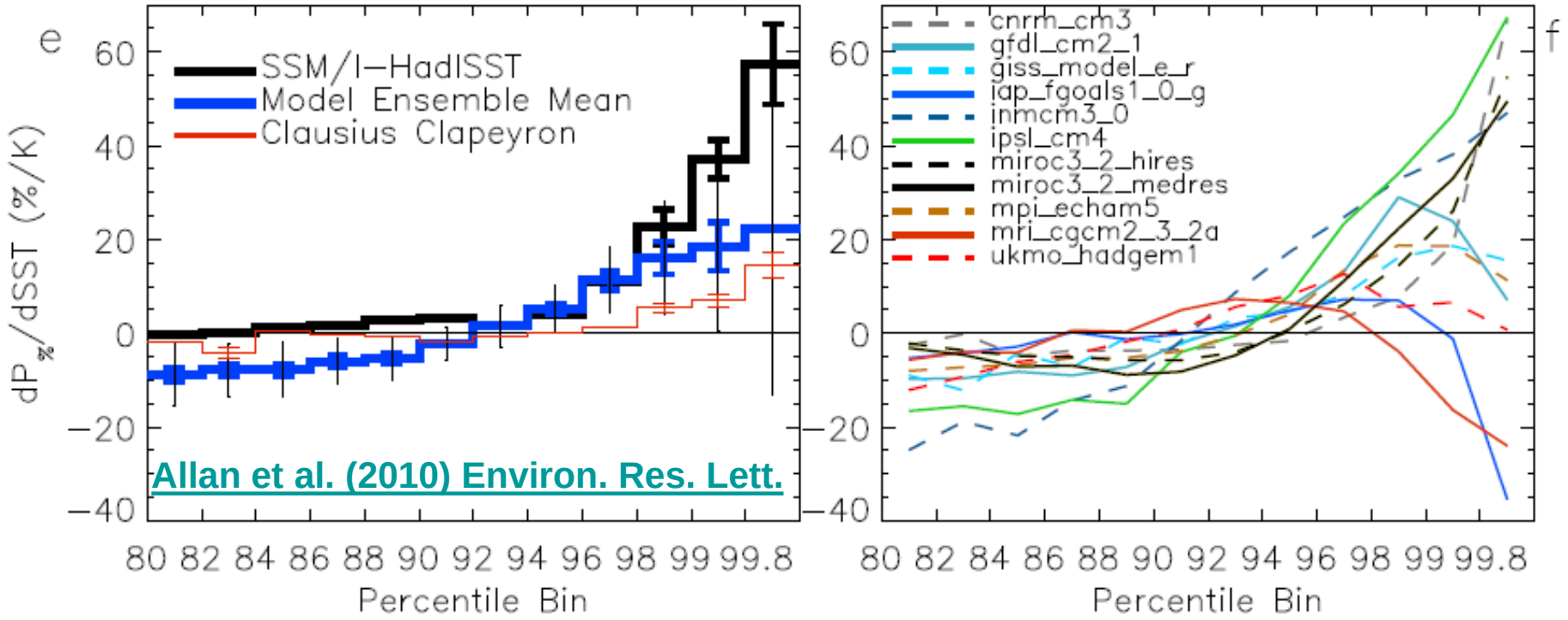
- Increase in intense rainfall with tropical ocean warming
- SSM/I satellite observations at upper range of models



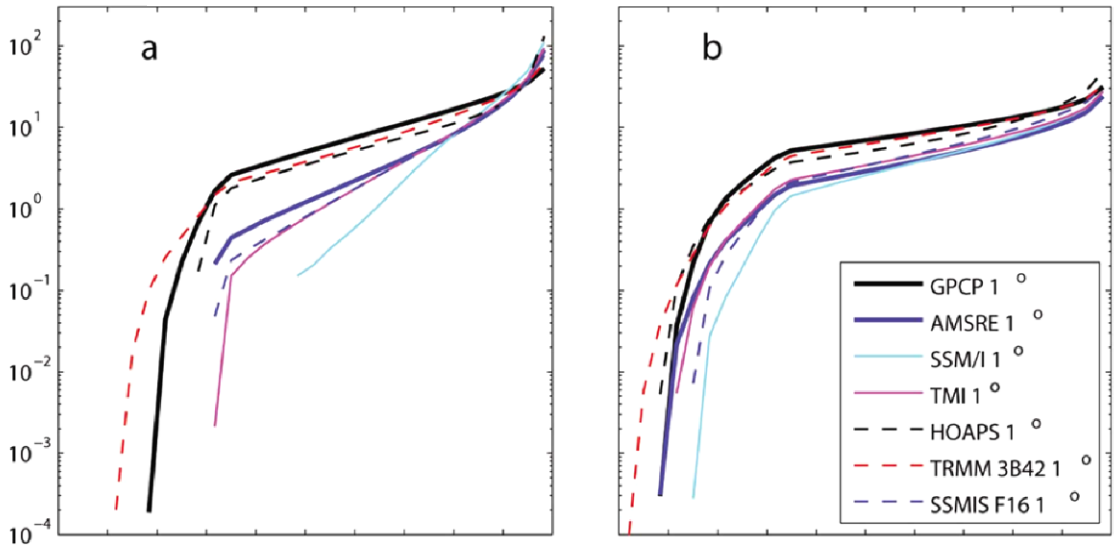
Tropical response uncertain: O'Gorman and Schneider (2009) PNAS….

but see also: Lenderink and Van Meijgaard (2010) ERL; Haerter et al. (2010) GRL

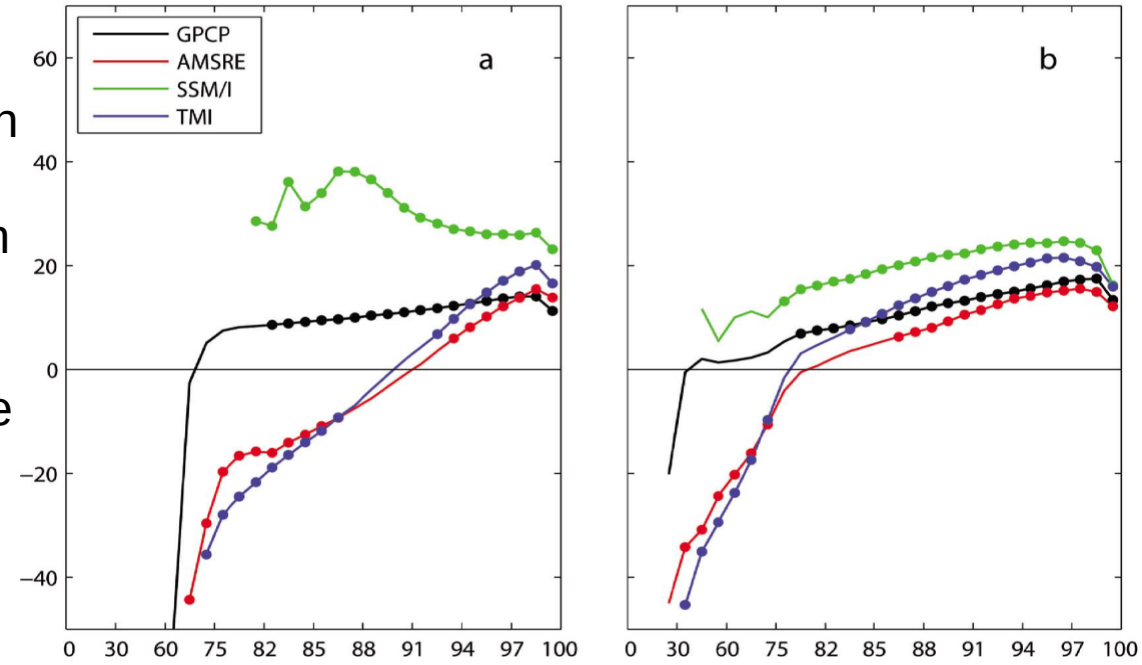
1 day

5 day

Precipitation intensity (mm/day)



Precipitation intensity change with mean surface temperature (mm/day)



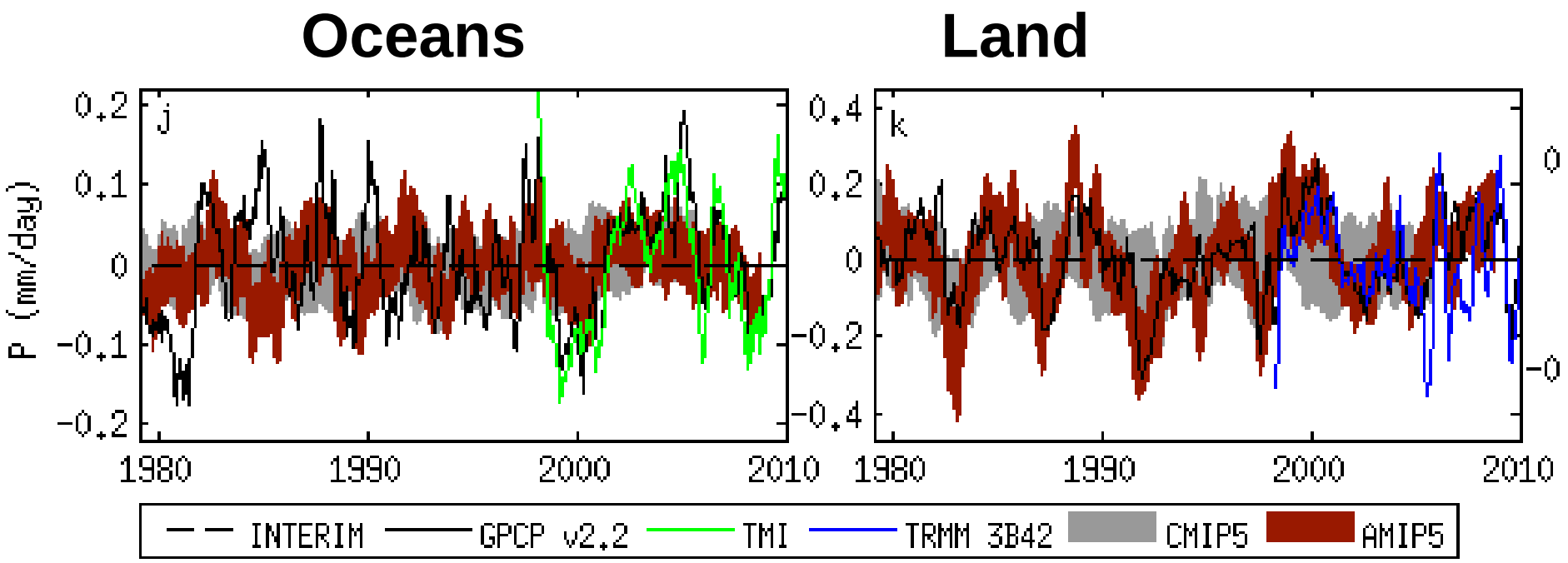
Precipitation intensity percentile (%)

Precipitation intensity distributions & responses between datasets (tropical oceans)

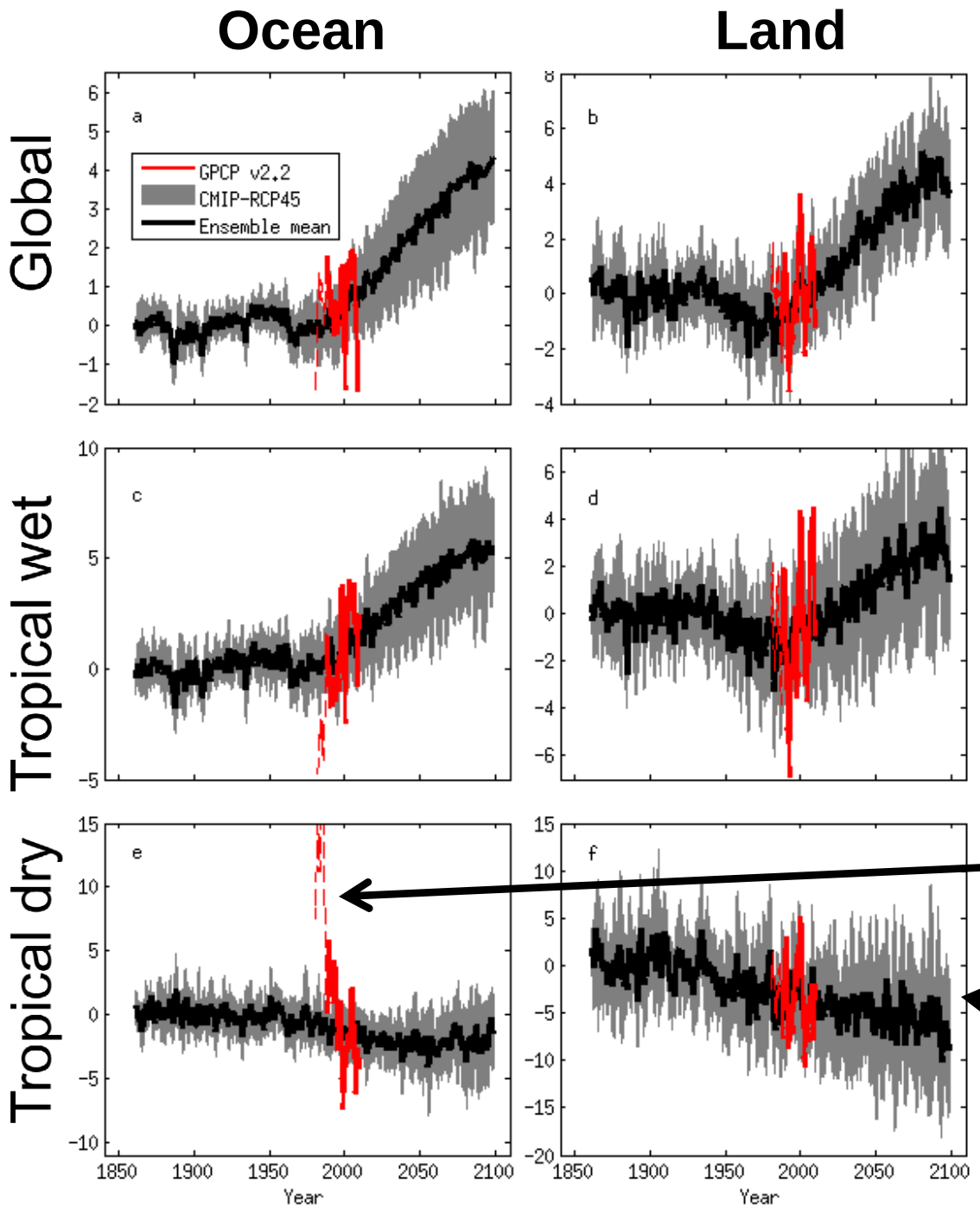
Liu and Allan (2012) JGR

Current changes in tropical precipitation in CMIP5 models & satellite-based observations

Note realism of atmosphere-only AMIP model simulations



Liu and Allan in prep…



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Changing water cycle

CMIP5 simulated & projected % changes in precipitation

Pre 1988 GPCP ocean data does not contain microwave data

Robust drying of dry tropical land

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