Department of Meteorology

University of Reading

EVALUATION OF DECADAL VARIABILITY

APPLICATIONS OF SATELLITE CLIMATE DATA RECORDS IN NUMERICAL MODELING , CMSAF/EUMETSAT workshop, ECMWF

Richard Allan r.p.allan@reading.ac.uk @rpallanuk

National Centre for Earth Observation
NATURAL ENVIRONMENT RESEARCH COUNCIL

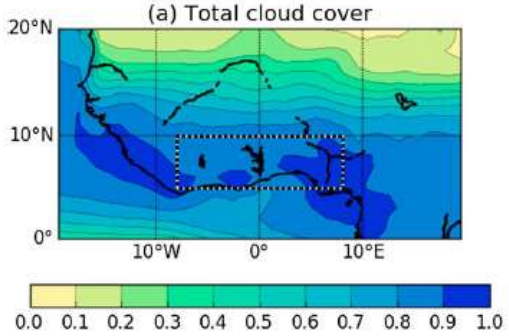
National Centre for Atmospheric Science
NATURAL ENVIRONMENT RESEARCH COUNCIL

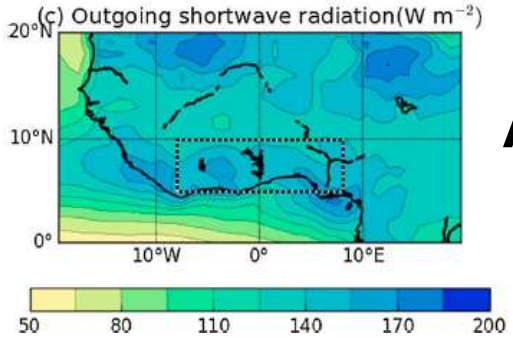
NERC SCIENCE OF THE ENVIRONMENT

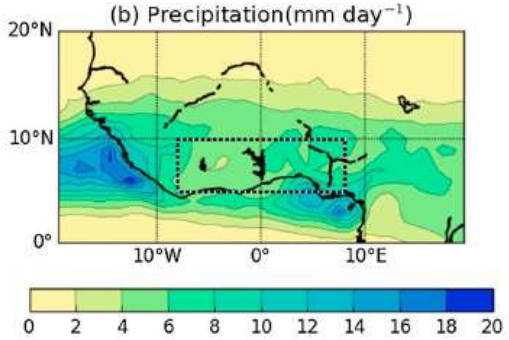
Met Office

MULTIPLE ROLES OF SATELLITE DATA

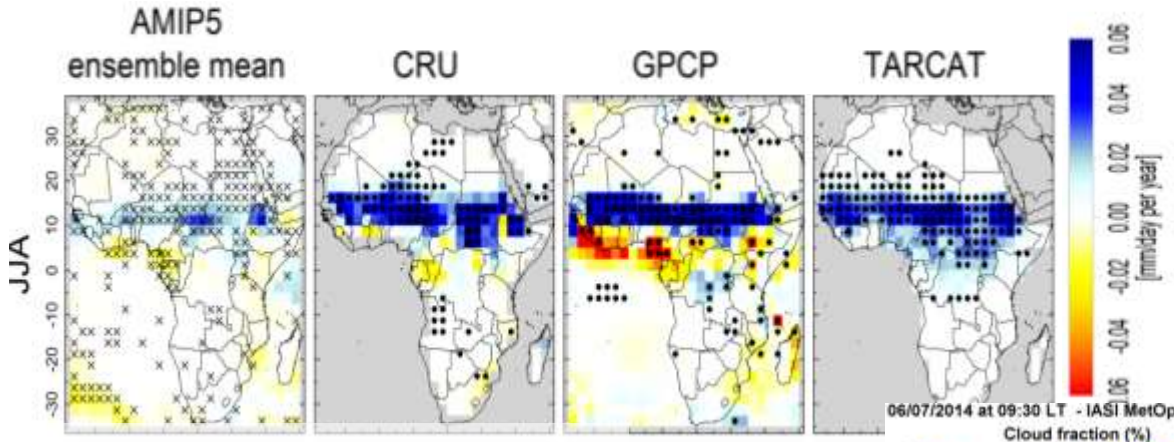
University of Reading







e.g. Hill et al. 2016 JGR



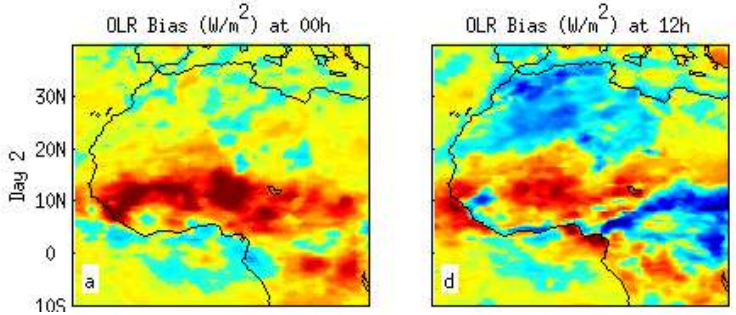
Maidment et al. (2015) GRL

Above: Interpreting climate change

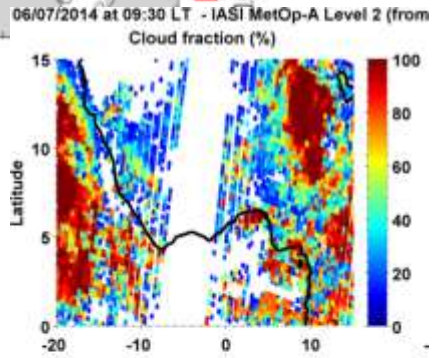
Field Campaign context →

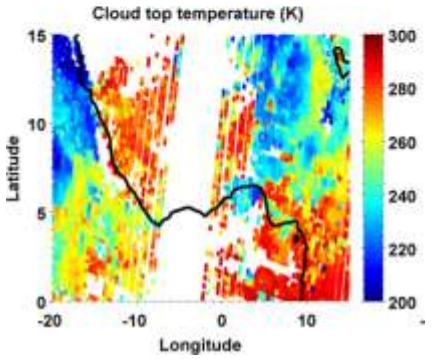
← Climatological context

Below: Process level evaluation

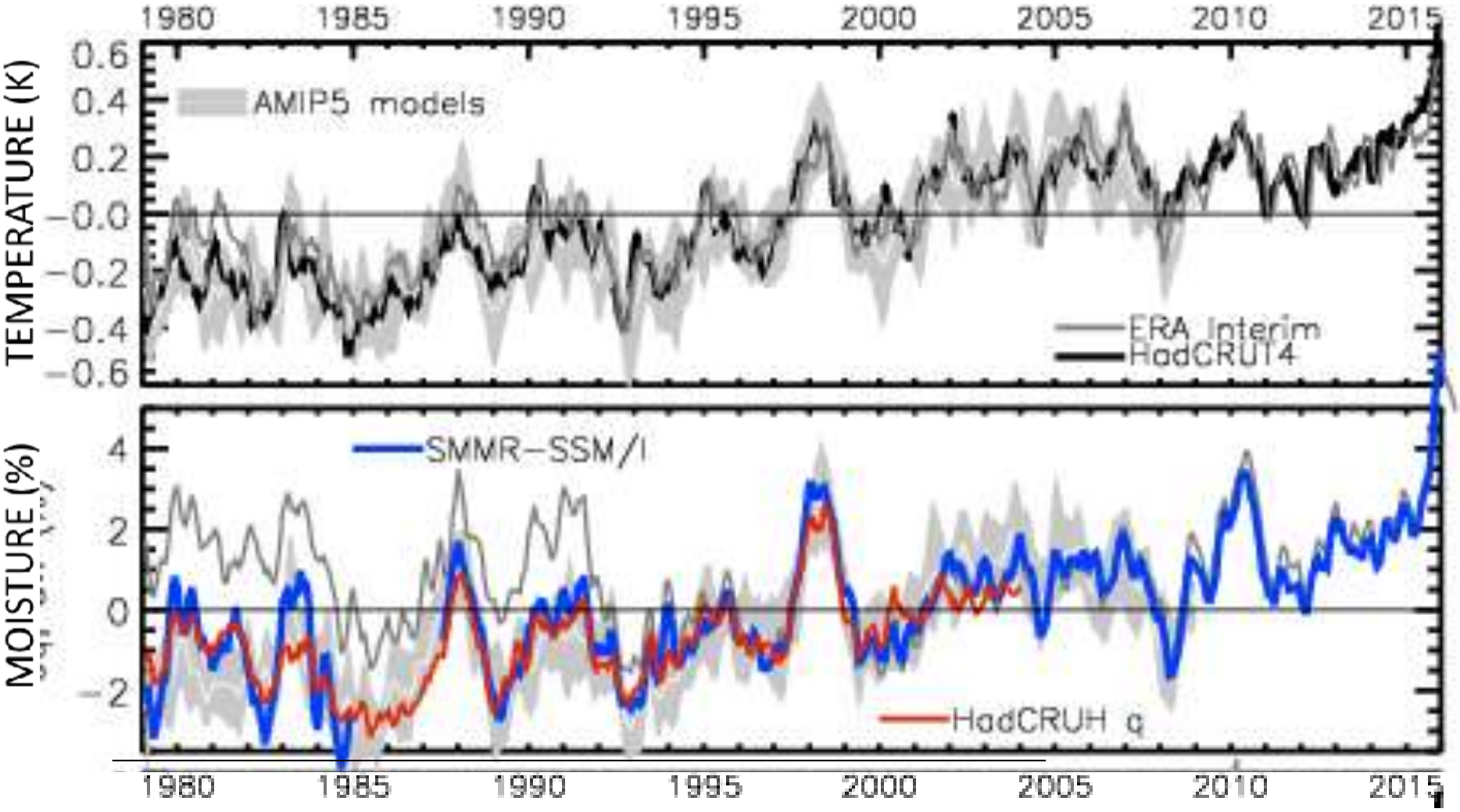


Liu et al. (2014) JAMC



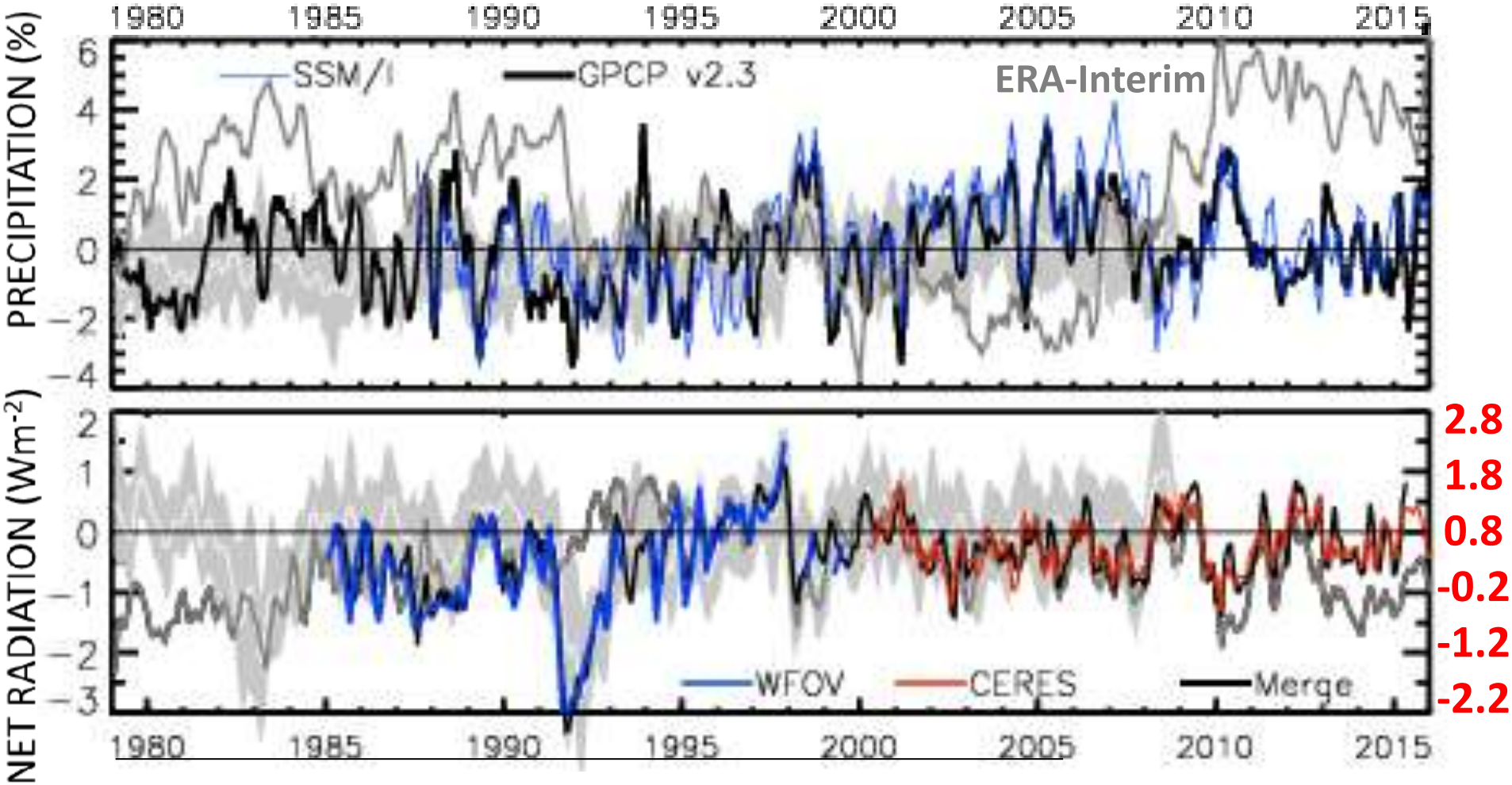


MONITORING CURRENT CLIMATE CHANGE



Update from: [Allan et al. (2014) Surv. Geophys](#)

MONITORING CURRENT CLIMATE CHANGE



Update from: Allan et al. (2014) Surv. Geophys & Allan et al. (2014) GRL

ASSESSING FEEDBACKS ON INTERNAL CLIMATE VARIABILITY

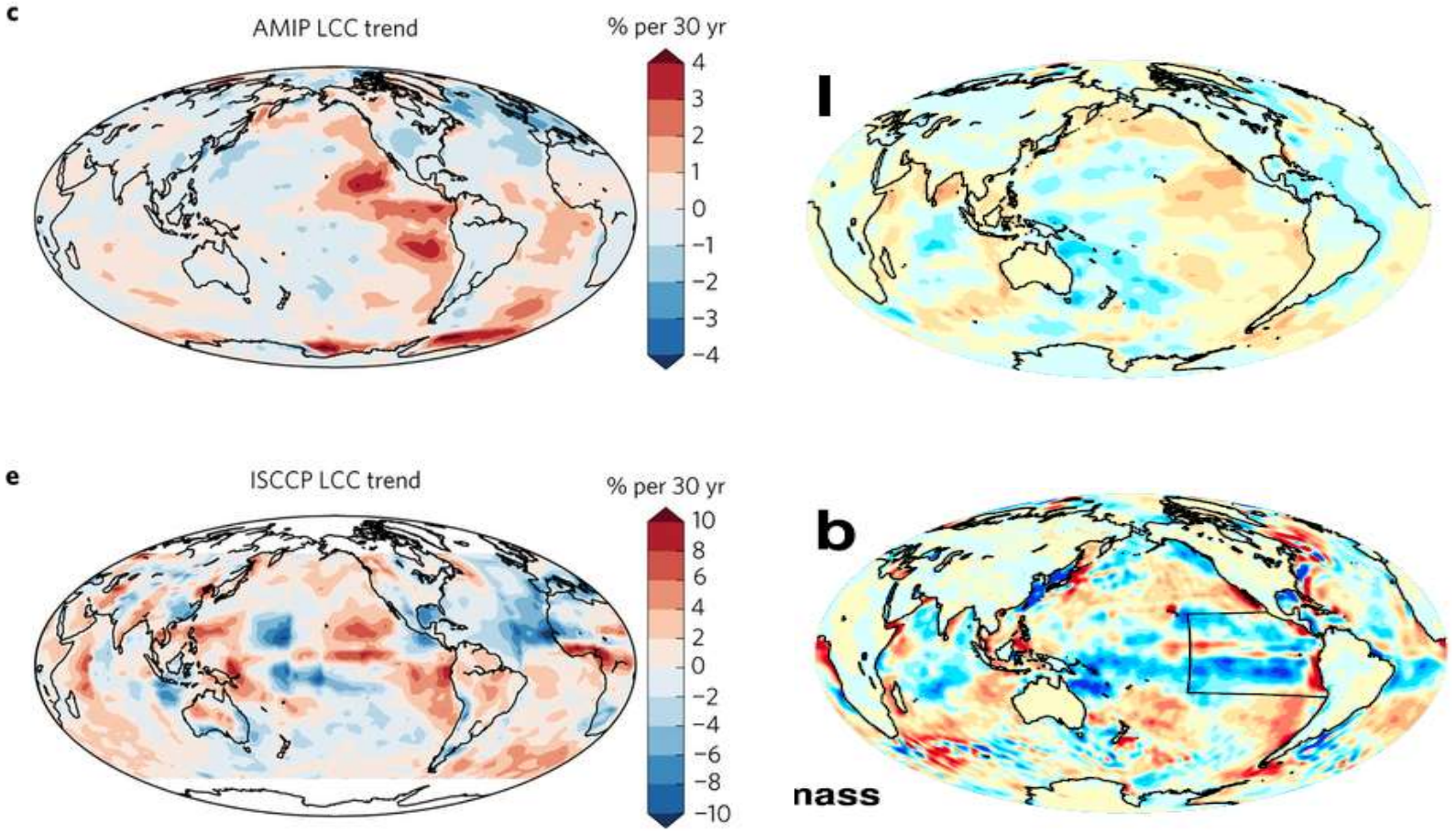
University of Reading

Low Cloud Cover trend 1980s-2005

Surface energy flux change ~1986-2008

AMIP MODELS

OBSERVATIONS



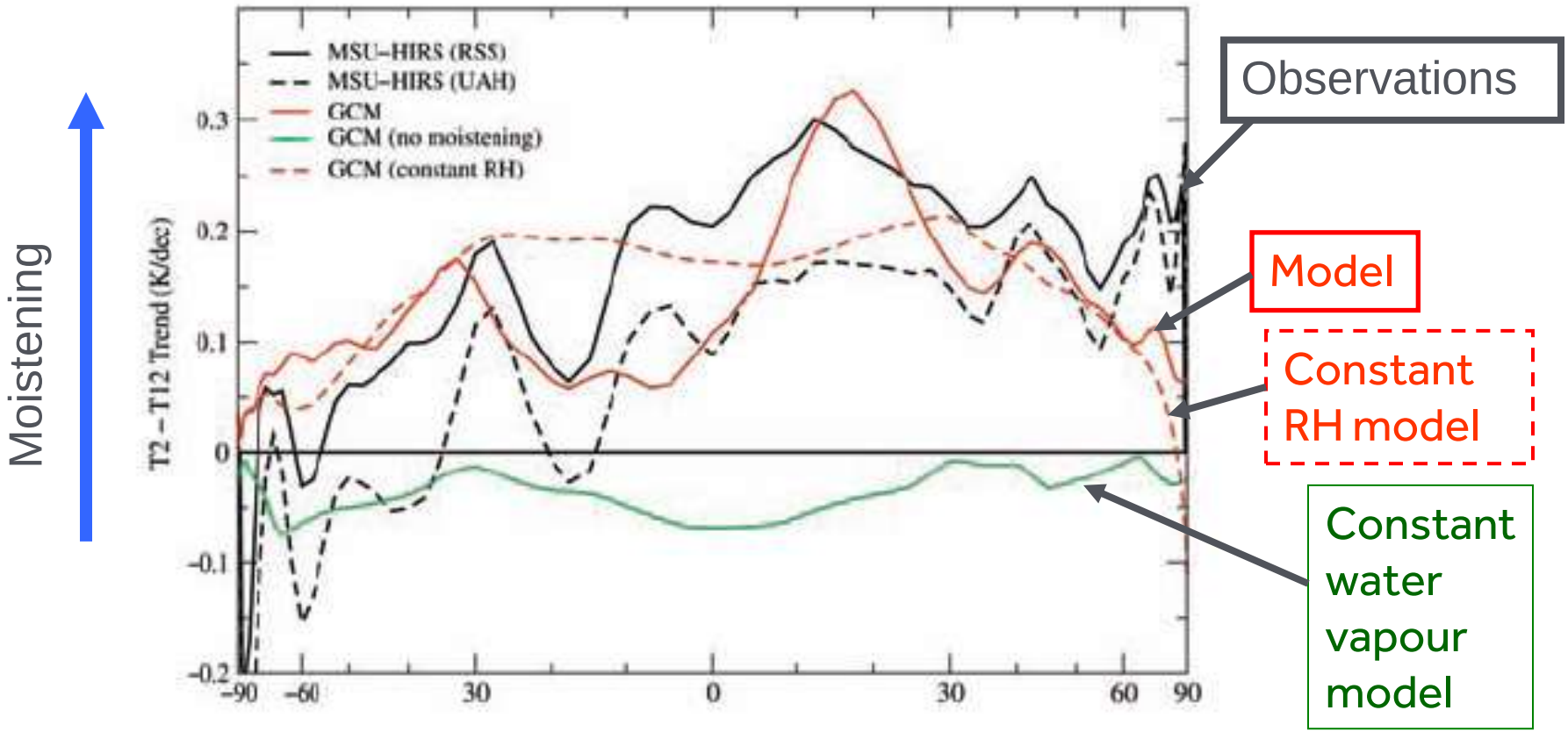
Zhou et al. (2016) Nature Geosci

Liu et al. (2015) JGR

EVALUATING FEEDBACKS ON CLIMATE CHANGE

University of Reading

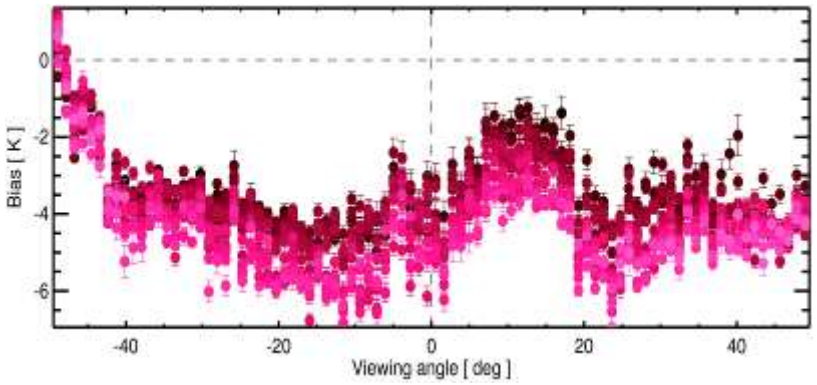
Trend in brightness temperature difference: 1983-2004



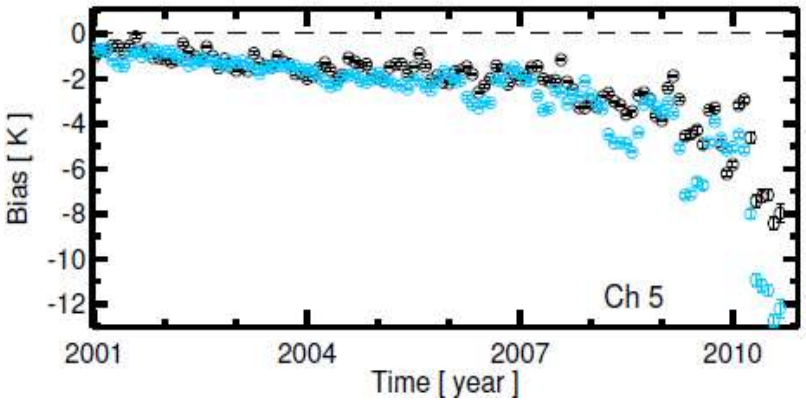
Soden et al. (2005) *Science*

CORRECTION OF DRIFT/BIAS

Correct for scan-dependent biases

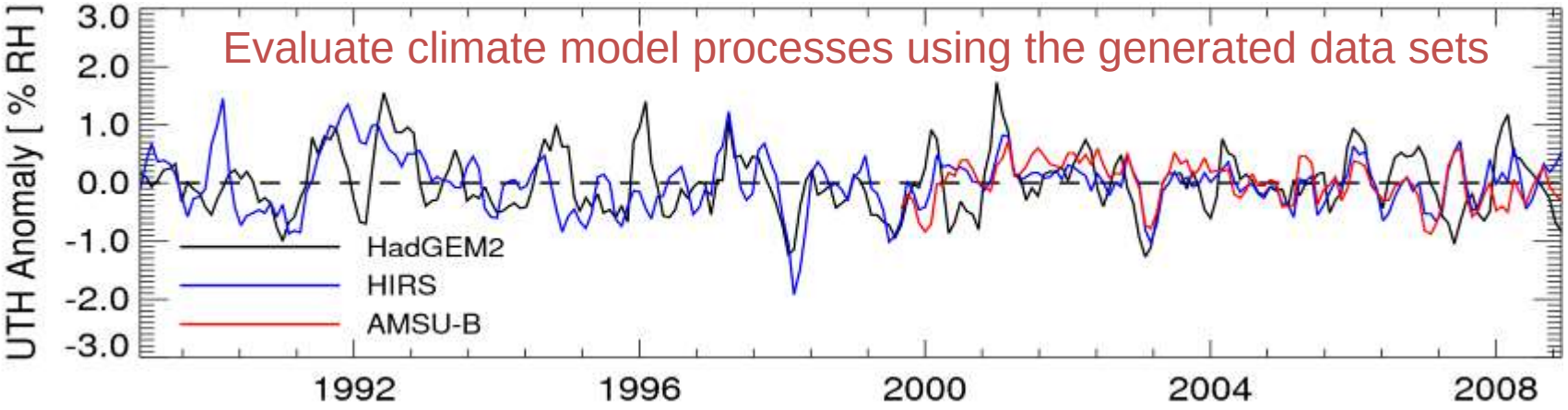


Correct for time-dependent biases

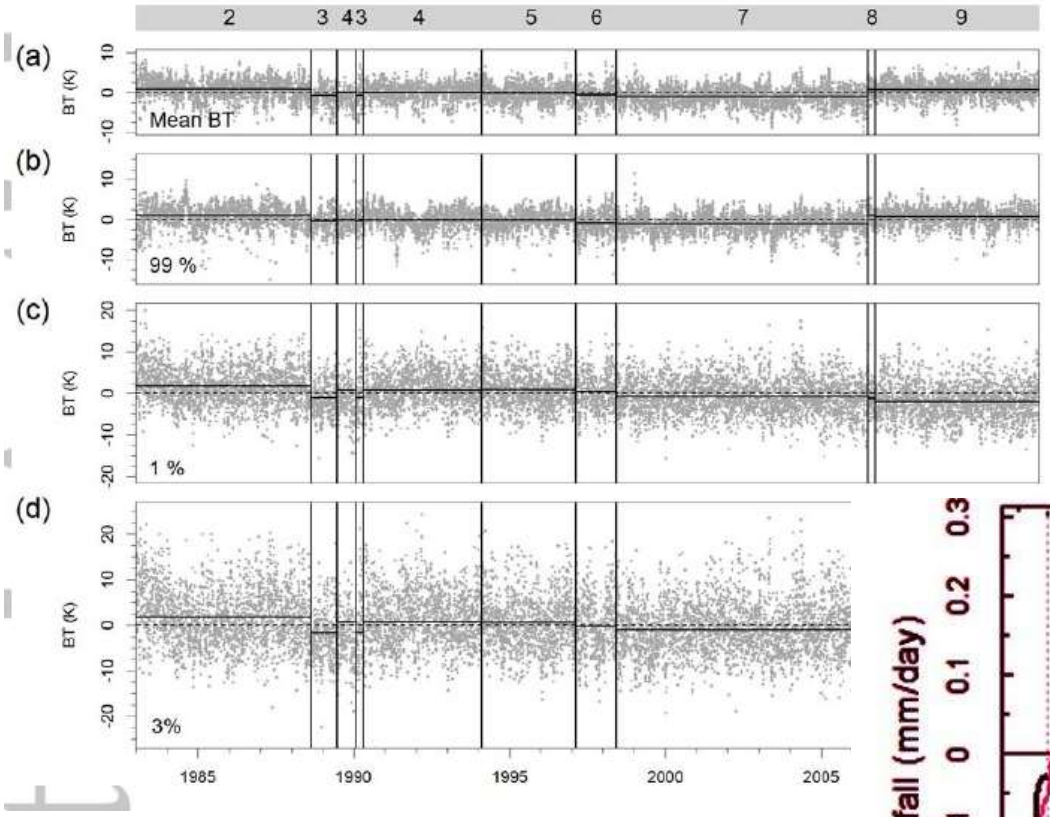


John et al. (2013) JGR

Evaluate climate model processes using the generated data sets

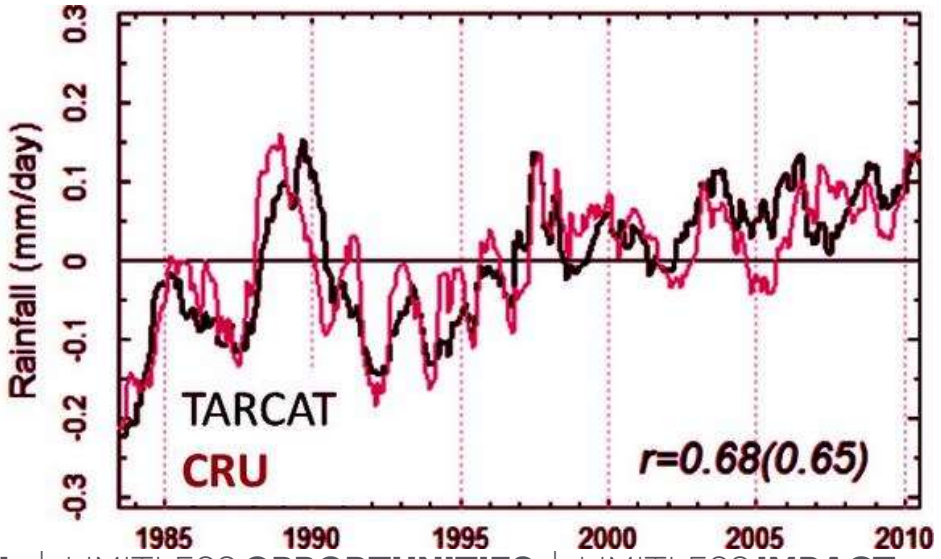


LONG TERM CHANGES IN AFRICAN RAINFALL



- 30 year Meteosat 10.8/11.5 μm window channel BT record
- Cold Cloud Duration rainfall proxy Maidment et al. (2014)
- Simple method but: variability independent of gauges & simple to simulate BTs in model

Rain-gauge (CRU) variability captured by TAMSAT →

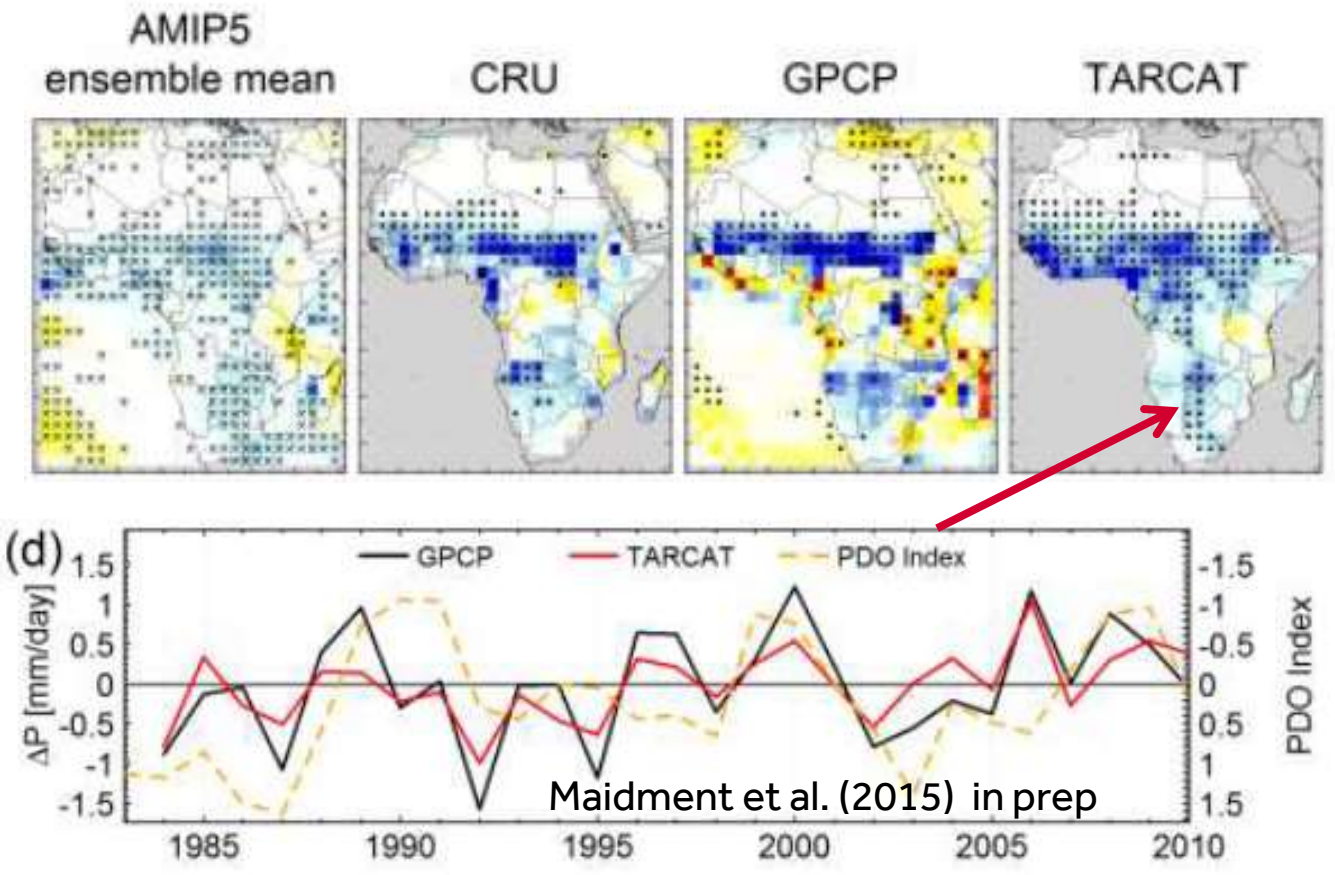


National Centre for Earth Observation
NATURAL ENVIRONMENT RESEARCH COUNCIL

University of Reading

EVALUATING TRENDS IN AFRICA RAINFALL

- Evaluating and understanding recent changes in Africa rainfall Maidment et al. (2015) GRL
- PhD project extending this work: impact-relevant metrics for Africa (Caroline Dunning)



University of Reading

THOUGHTS/CONCLUSIONS

- Why do we care about decadal variability?
  - Climate monitoring, additional test of model fidelity, understanding decadal processes/variability, more relevant to climate change?
  - Internal variability, short term feedbacks, unexpected changes
- Do we have any truly homogeneous decadal records?
- Combination of satellite data and models leads to better characterisation of deficiencies in both and advances in scientific understanding
  - AMIP experiments are the most homogeneous (basic) reanalyses
  - Could there be dedicated reanalyses for each key variable e.g. UTH?
- CMSAF/EUMETSAT climate records for numerical modelling
  - UTH, radiation budget, Cloud… all key to climate processes/feedbacks