

Limited evidence of an anthropogenic role in 2011-12 extreme rainfall over SE Australia

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Sarah Perkins, Lisa Alexander,
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and Mitchell Black

Outline

1. Was there an anthropogenic signal in Australian extreme rainfall of 2011-12?
2. Investigating performance of CMIP5 models in capturing ENSO-rainfall teleconnection



1. Was there an anthropogenic signal in Australian extreme rainfall of 2011-12?

King, A.D , S. C. Lewis, S. E. Perkins, L. V. Alexander, M. G. Donat, D. J. Karoly, and M. T. Black, 2013: Limited Evidence of Anthropogenic Influence on the 2011-12 Extreme Rainfall over Southeast Australia. [in “Explaining Extreme Events of 2012 from a Climate Perspective”]. *Bull. Amer. Meteor. Soc.*, **94** (9), S55-S58.



Summers of 2010-11 and 2011-12

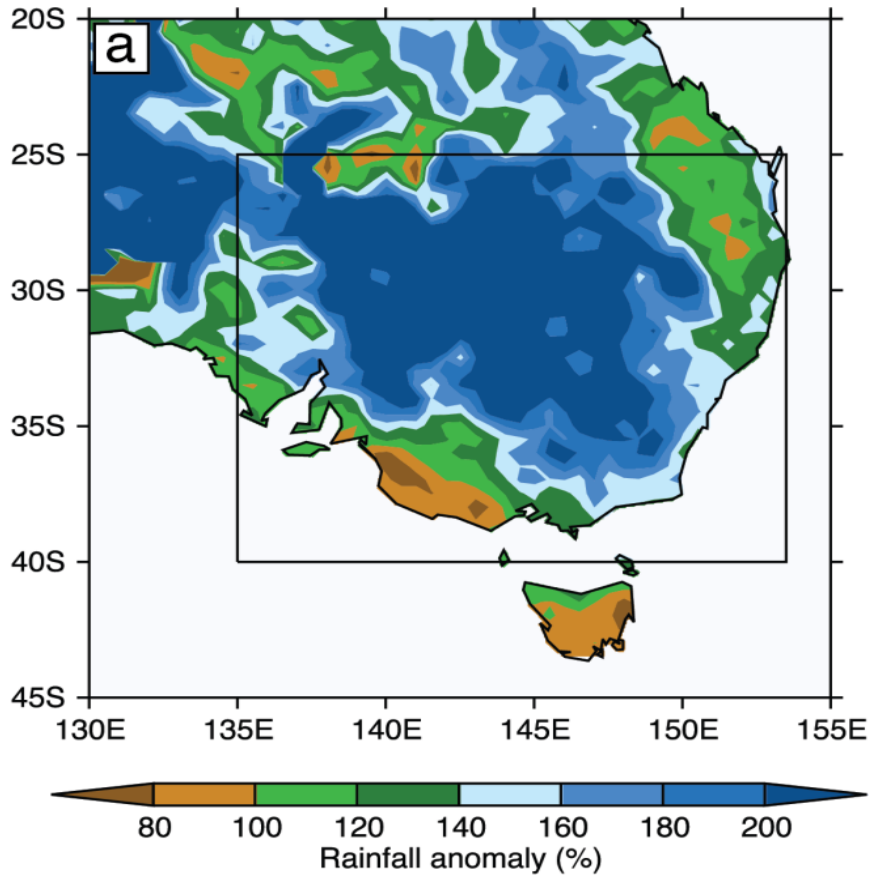
- Above average rainfall across SE Australia associated with back-to-back La Niña events.
- Flooding in inland areas of NSW and VIC.



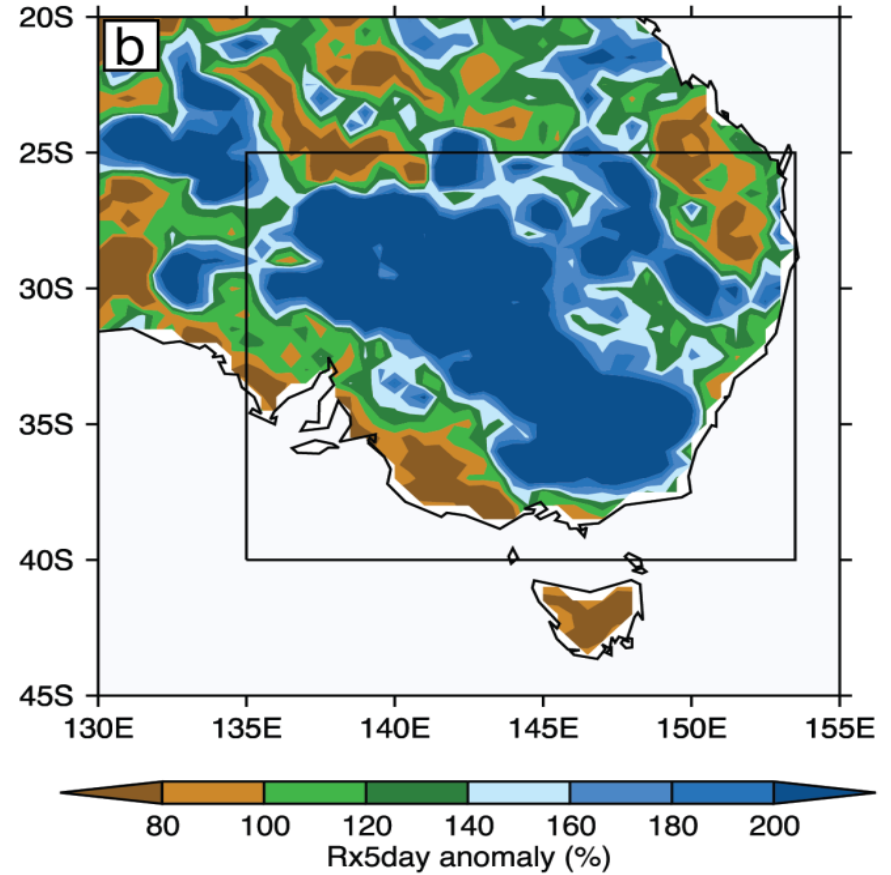
Flooding in
Wagga Wagga,
NSW on 6th
March 2012.
Source: The
Australian

Extreme rainfall in SE Australia

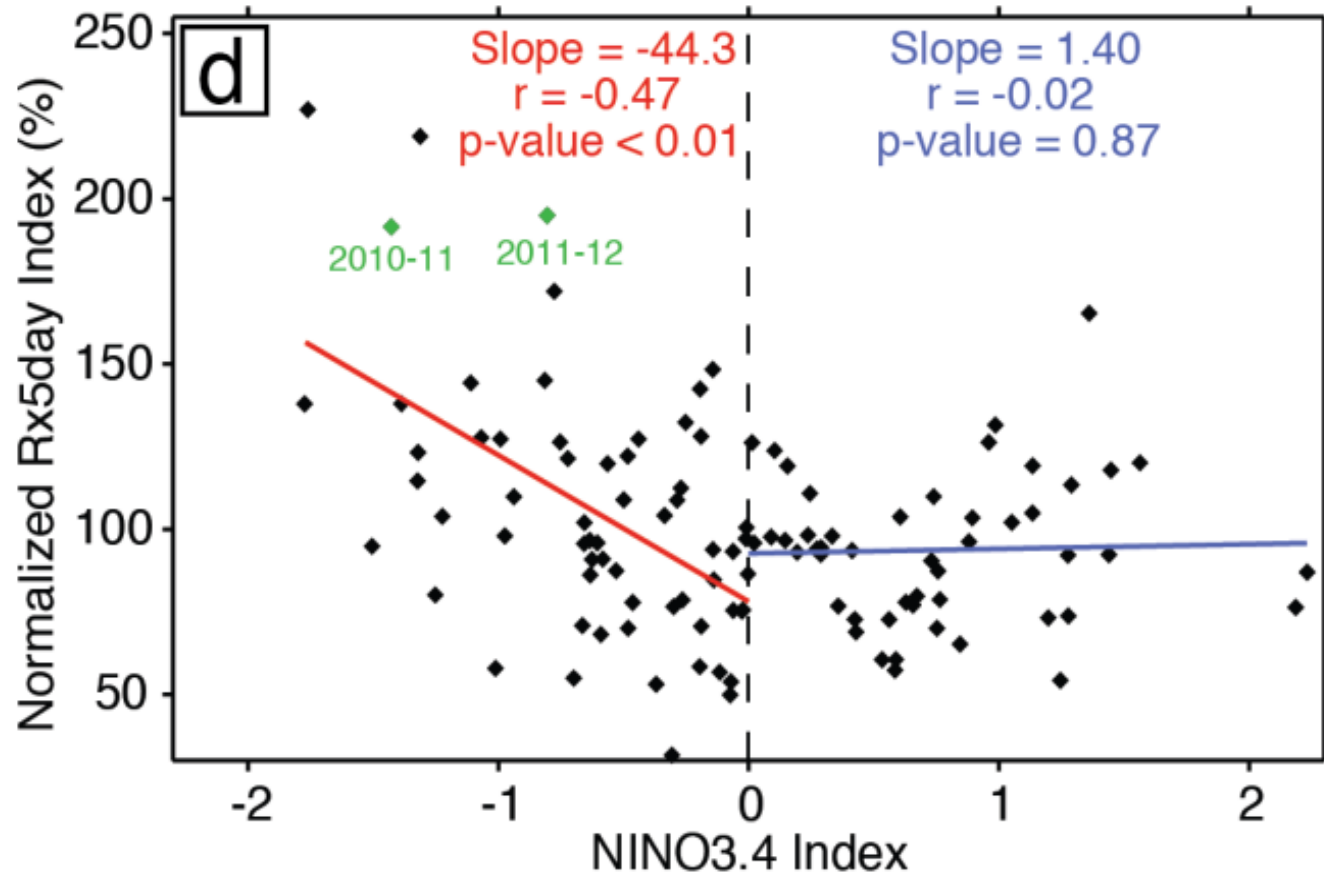
ONDJFM 2011-12 rainfall anomaly



ONDJFM 2011-12 Rx5day anomaly



ENSO teleconnection

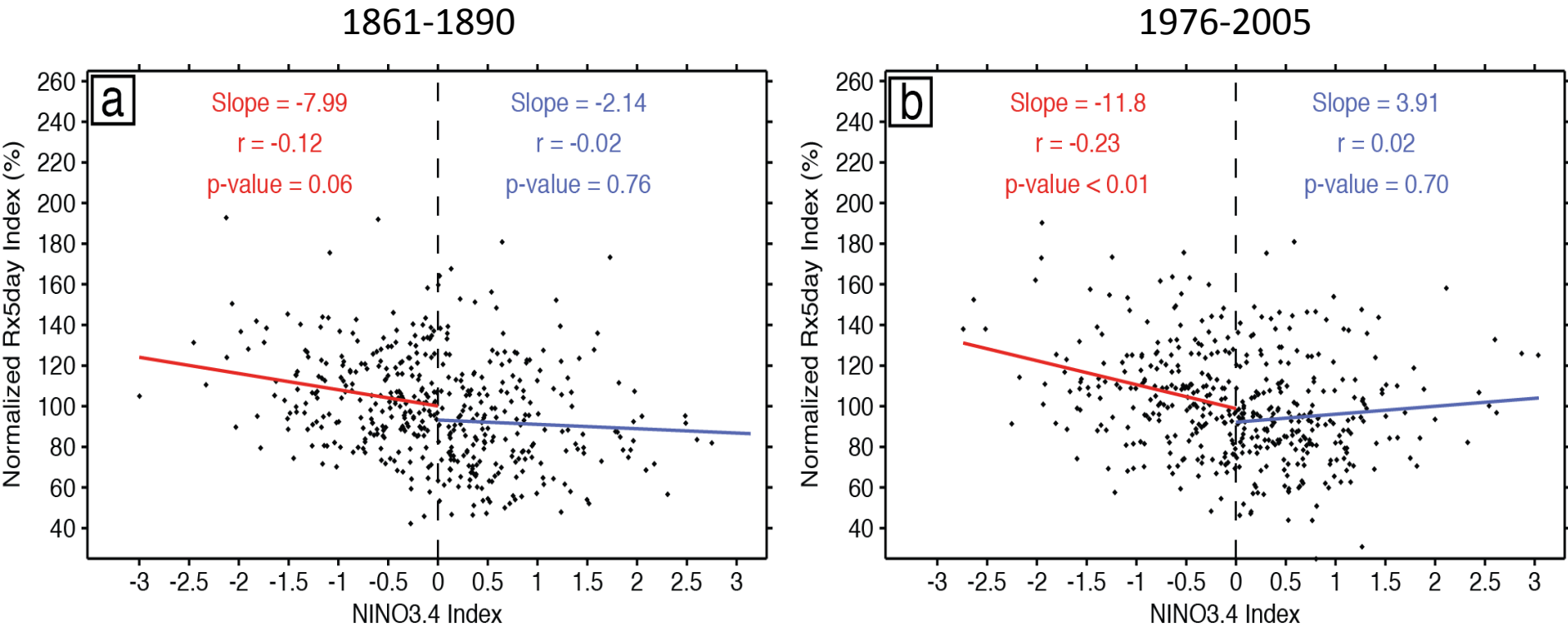


Model study

Model
bcc-csm1-1
CanESM2
CCSM4
CNRM-CM5
CSIRO-Mk3-6-0
GFDL-CM3
GFDL-ESM2M
HadGEM2-ES
MRI-CGCM3
NorESM1-M

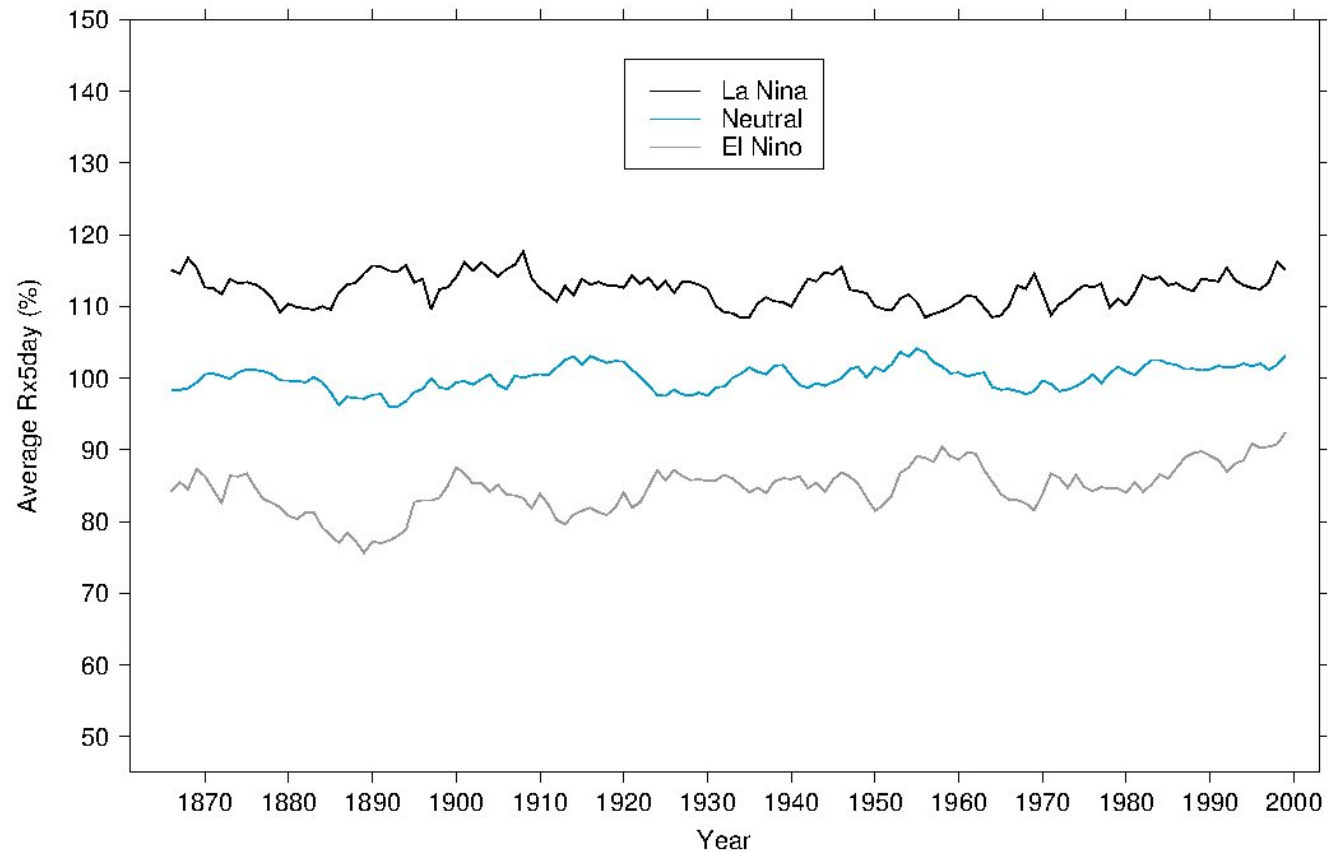
- Historical runs of 10 CMIP5 models studied.
- Analysis over 1861-2005.
- Scatter plots of Niño-3.4 SSTAs vs. Total and extreme rainfall analysed.
- Comparisons made between first and last 30 years of historical period.

ENSO-Extreme rainfall relationship in CMIP5

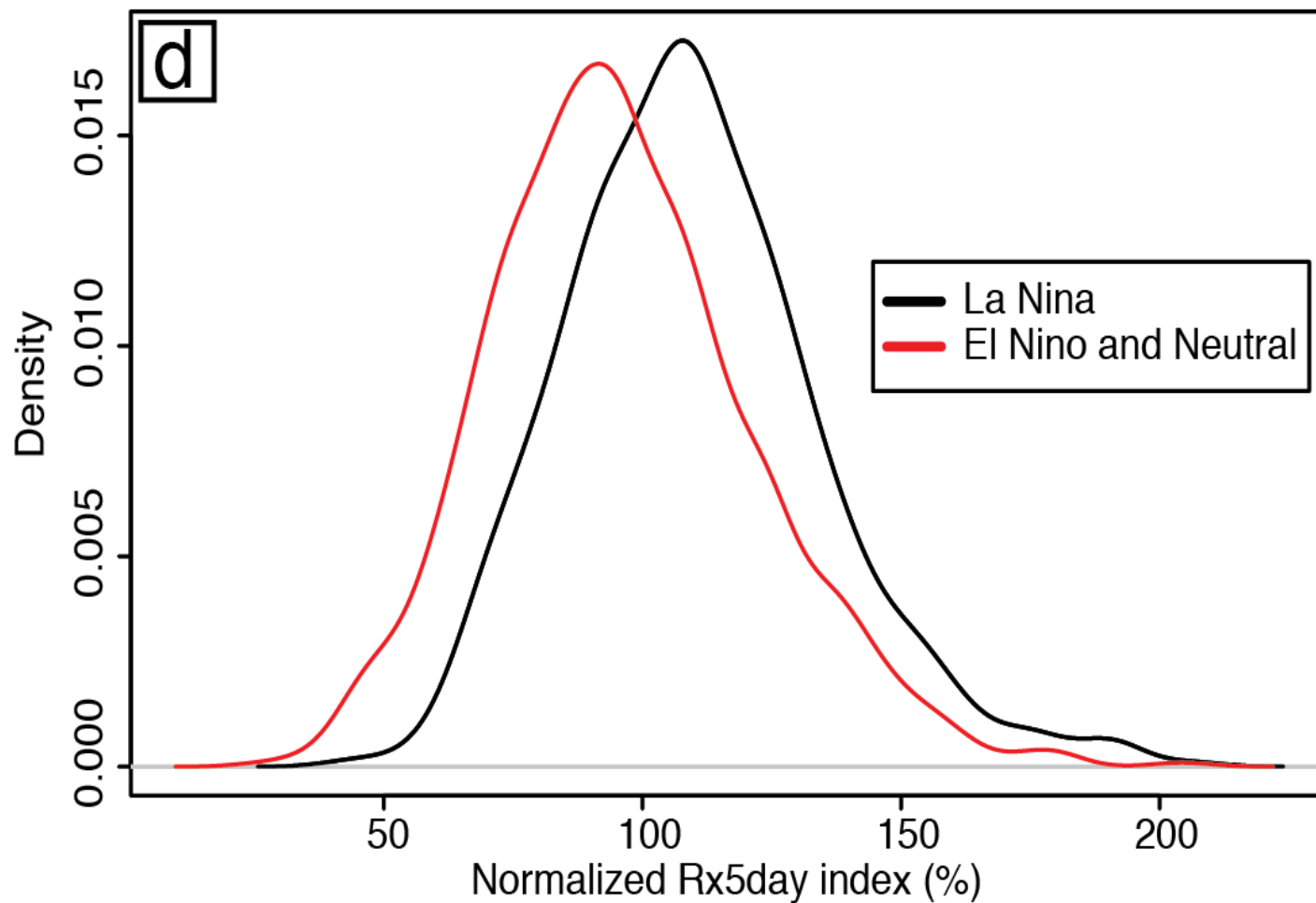


Increasing extreme rainfall in CMIP5

11-year moving average Rx5day values (El Nino, La Nina and Neutral time series)



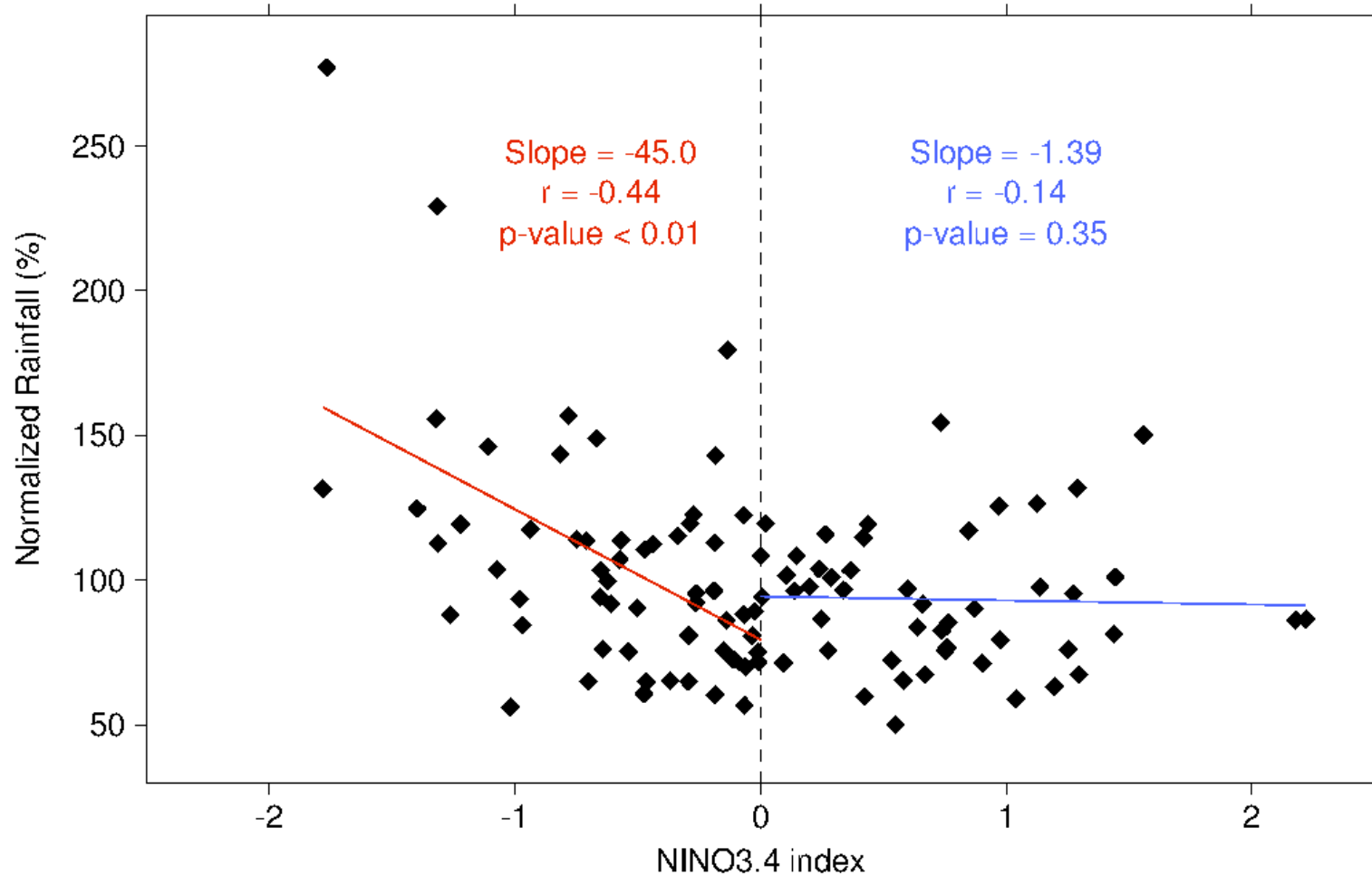
ENSO variability trumps anthropogenic influence



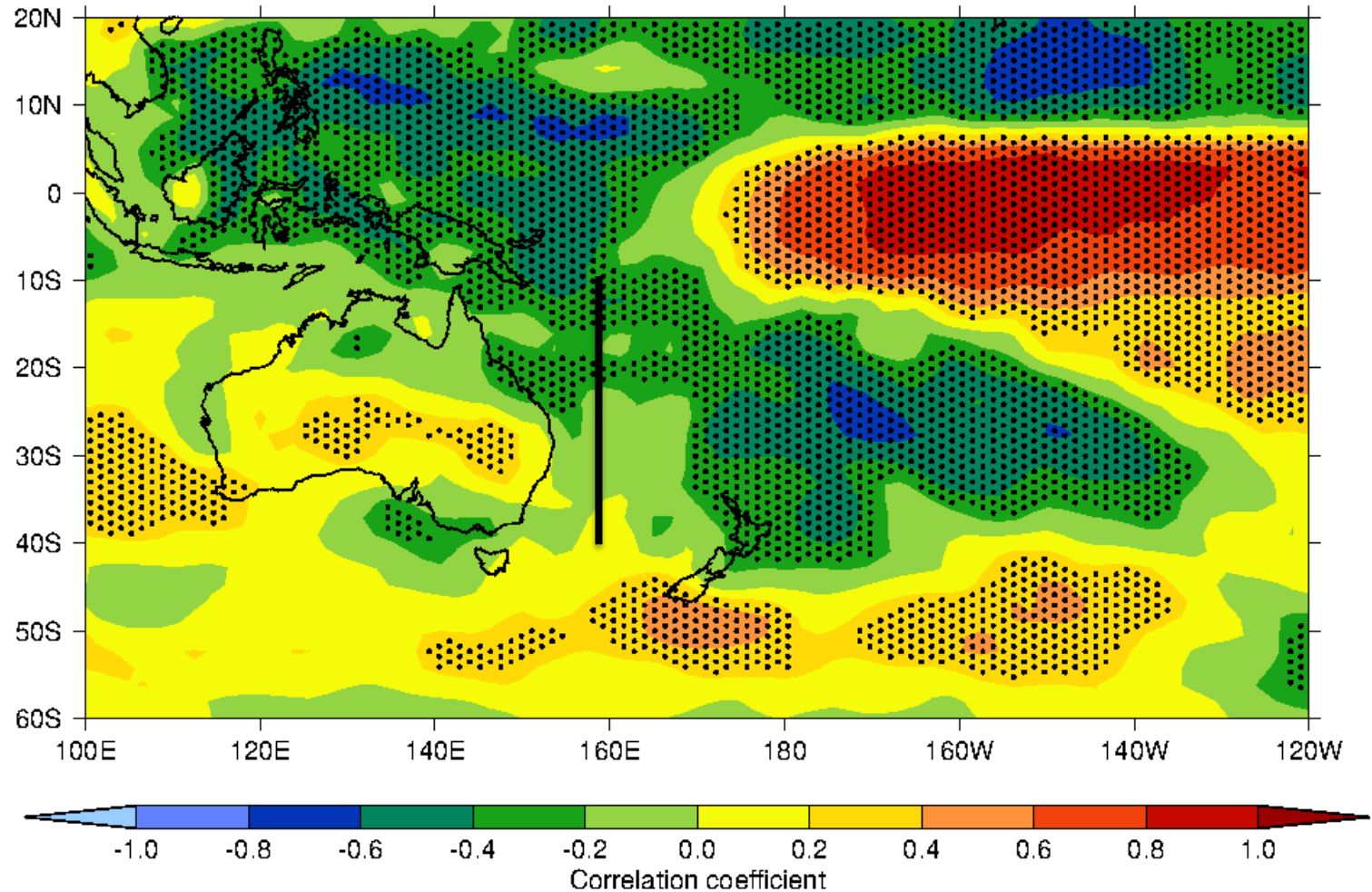
2. Investigating performance of CMIP5 models in capturing ENSO-(extreme) rainfall teleconnection

Work done with Markus Donat, Lisa Alexander, and David Karoly

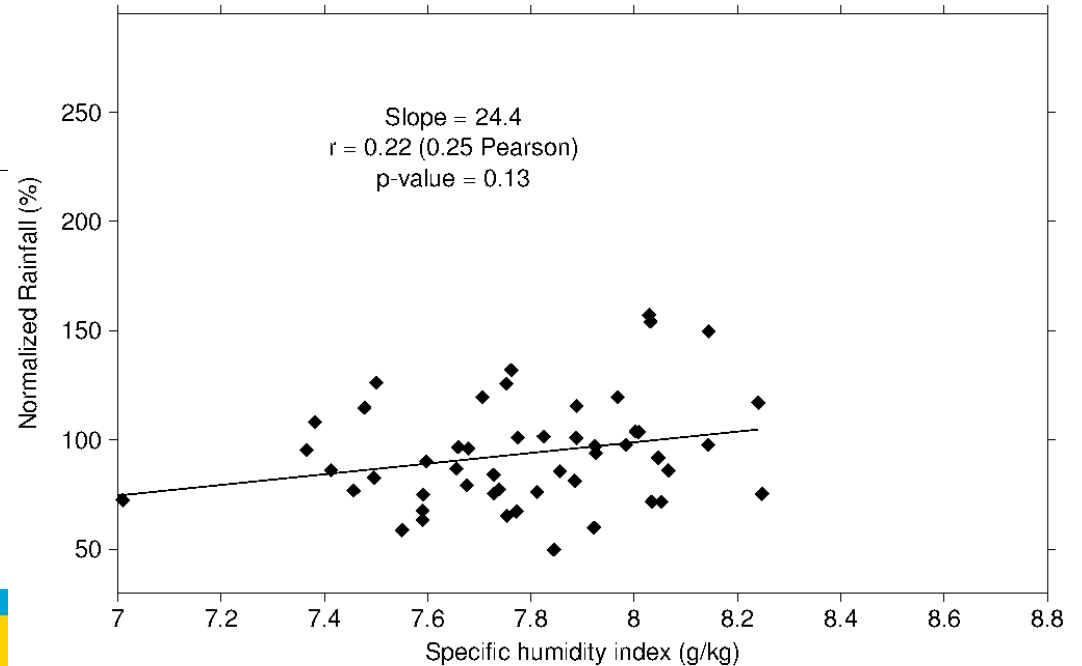
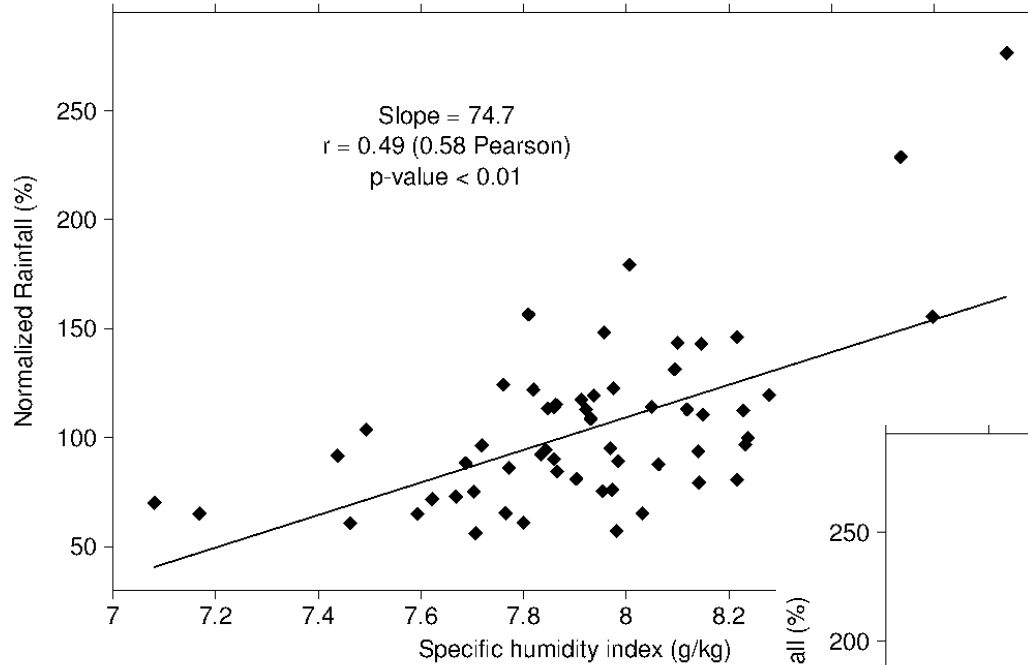
Twentieth Century reanalysis captures ENSO-rainfall relationship



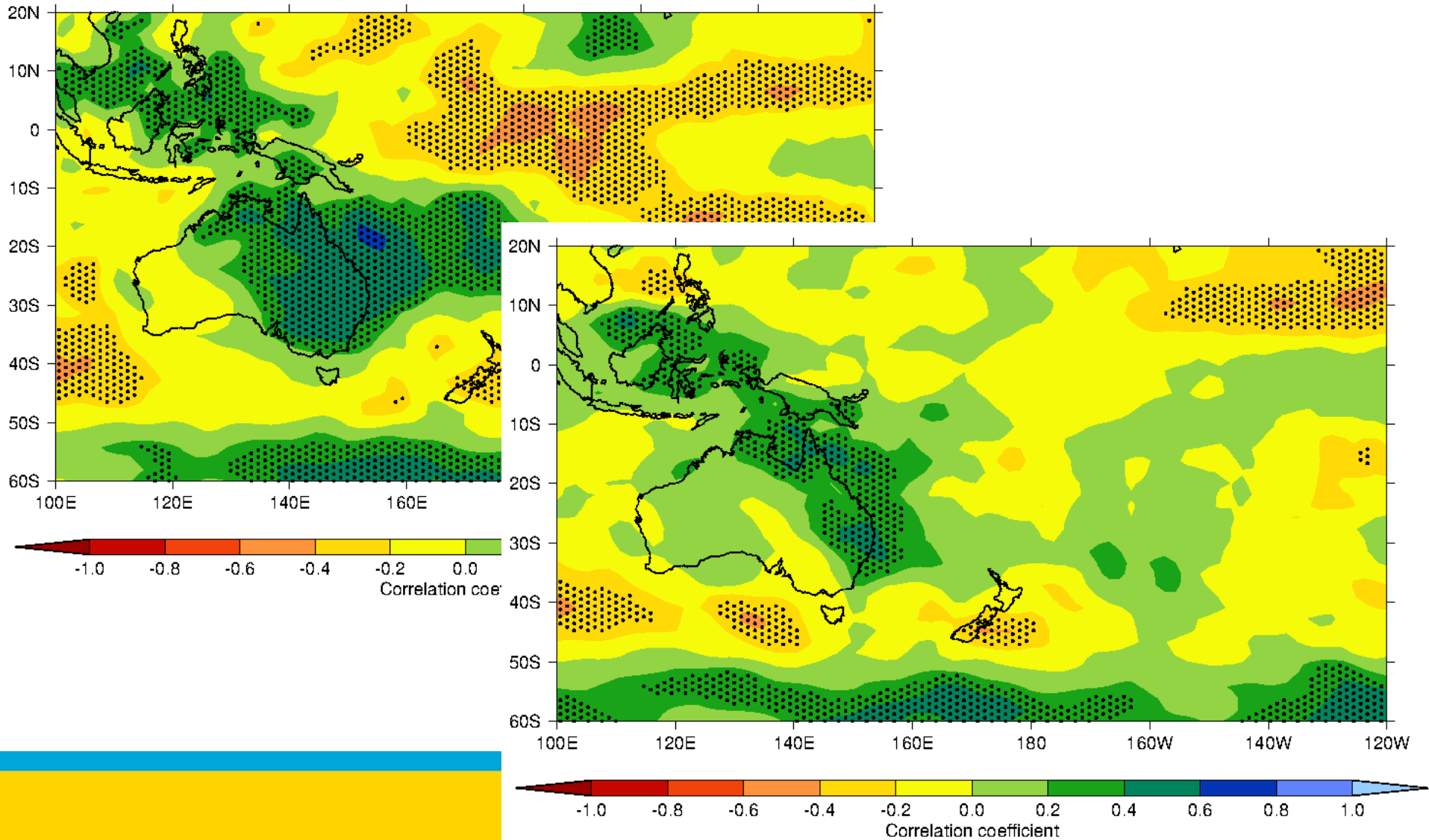
Twentieth Century reanalysis captures ENSO-rainfall relationship



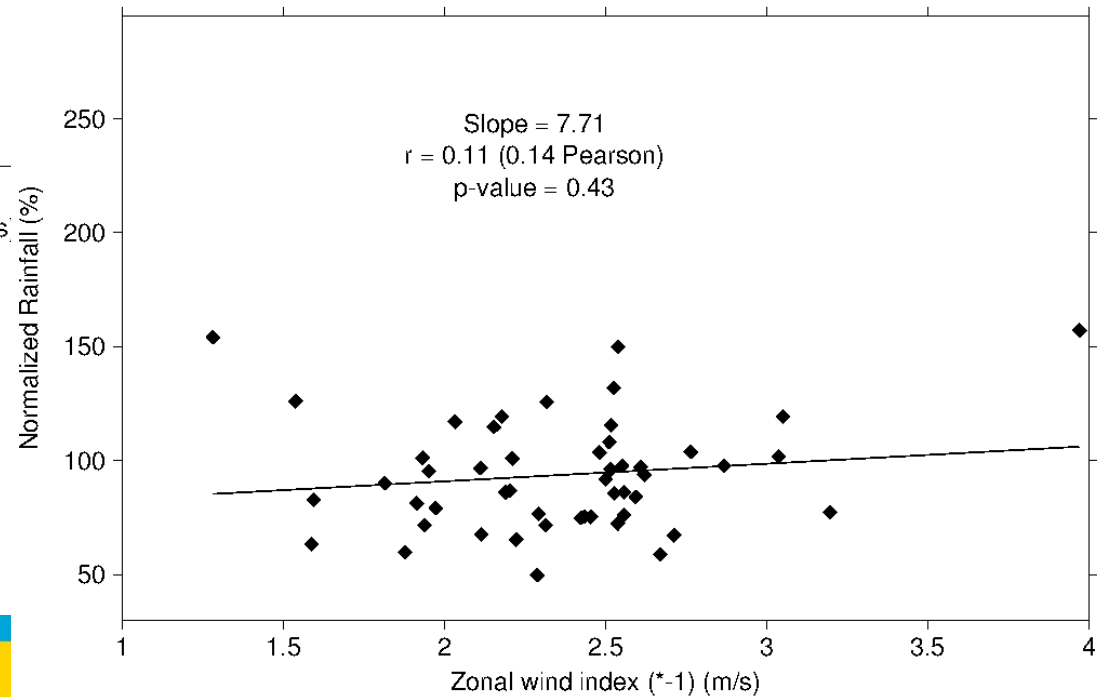
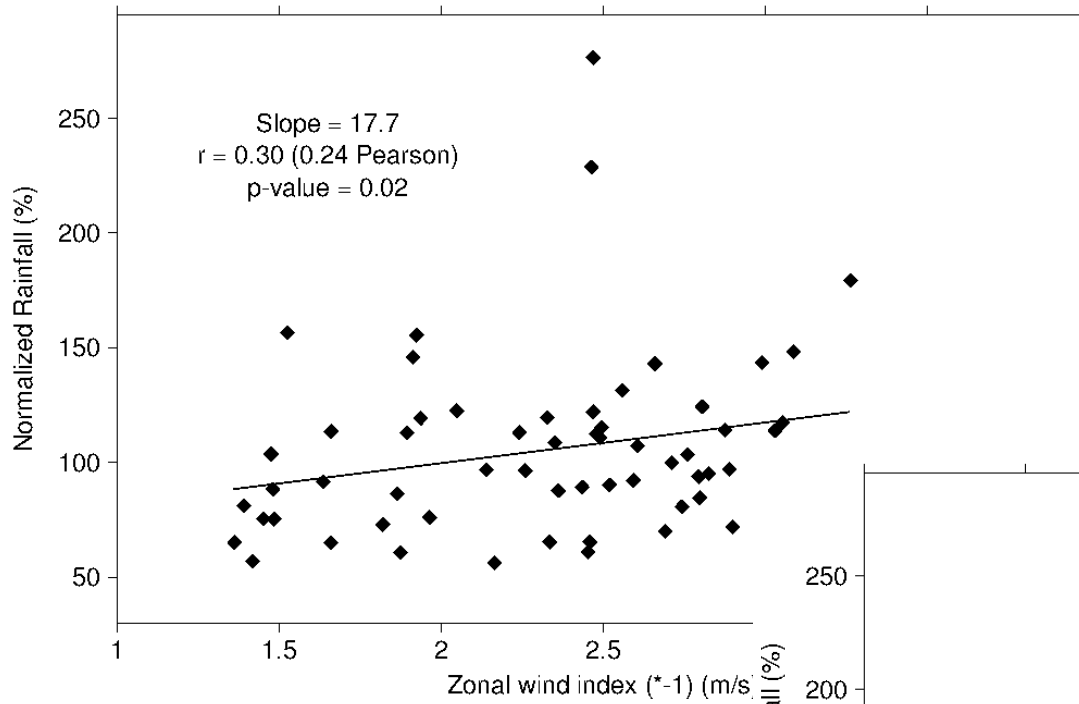
Thermodynamics explains part of asymmetry



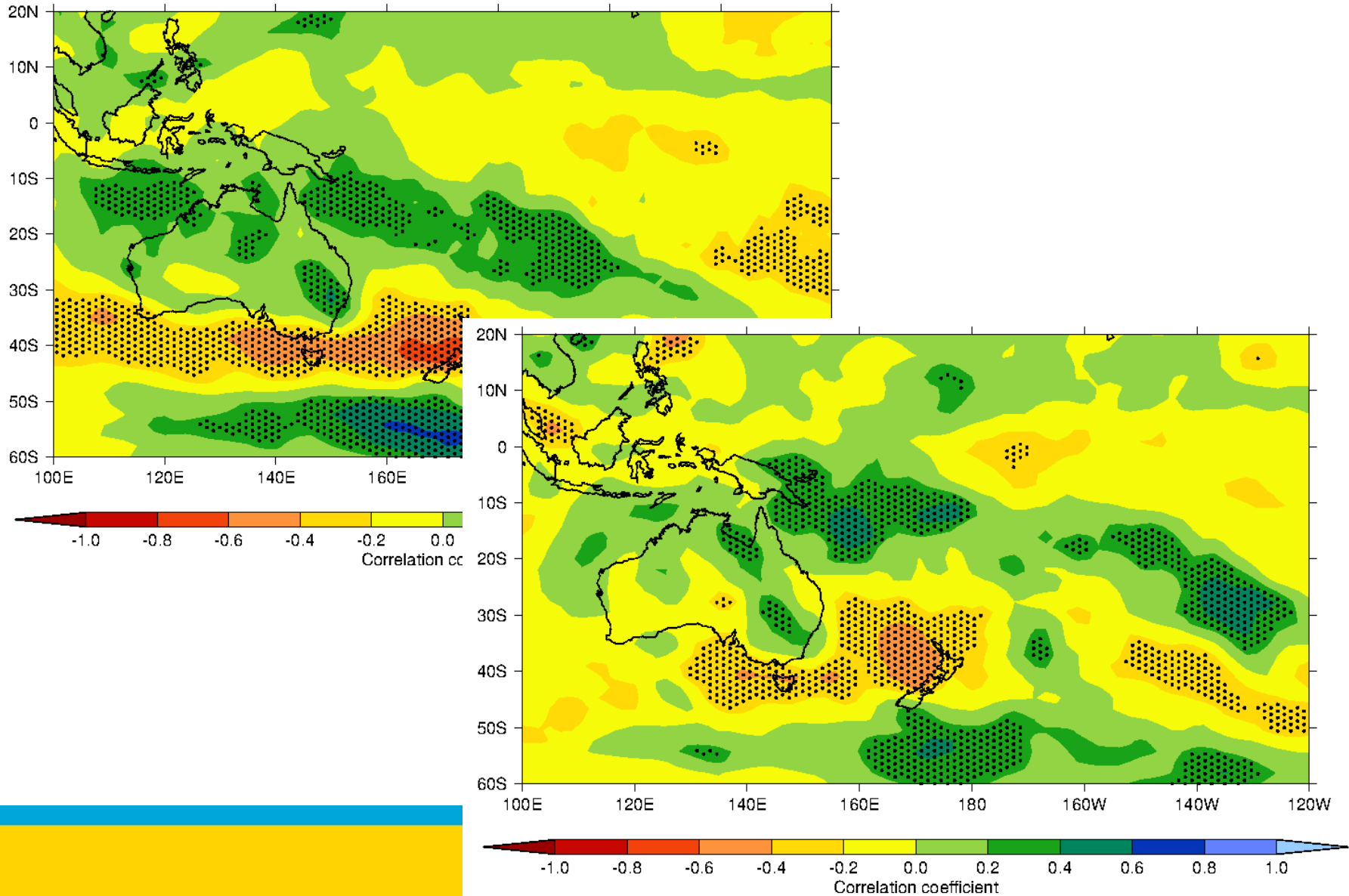
Thermodynamics explains part of asymmetry



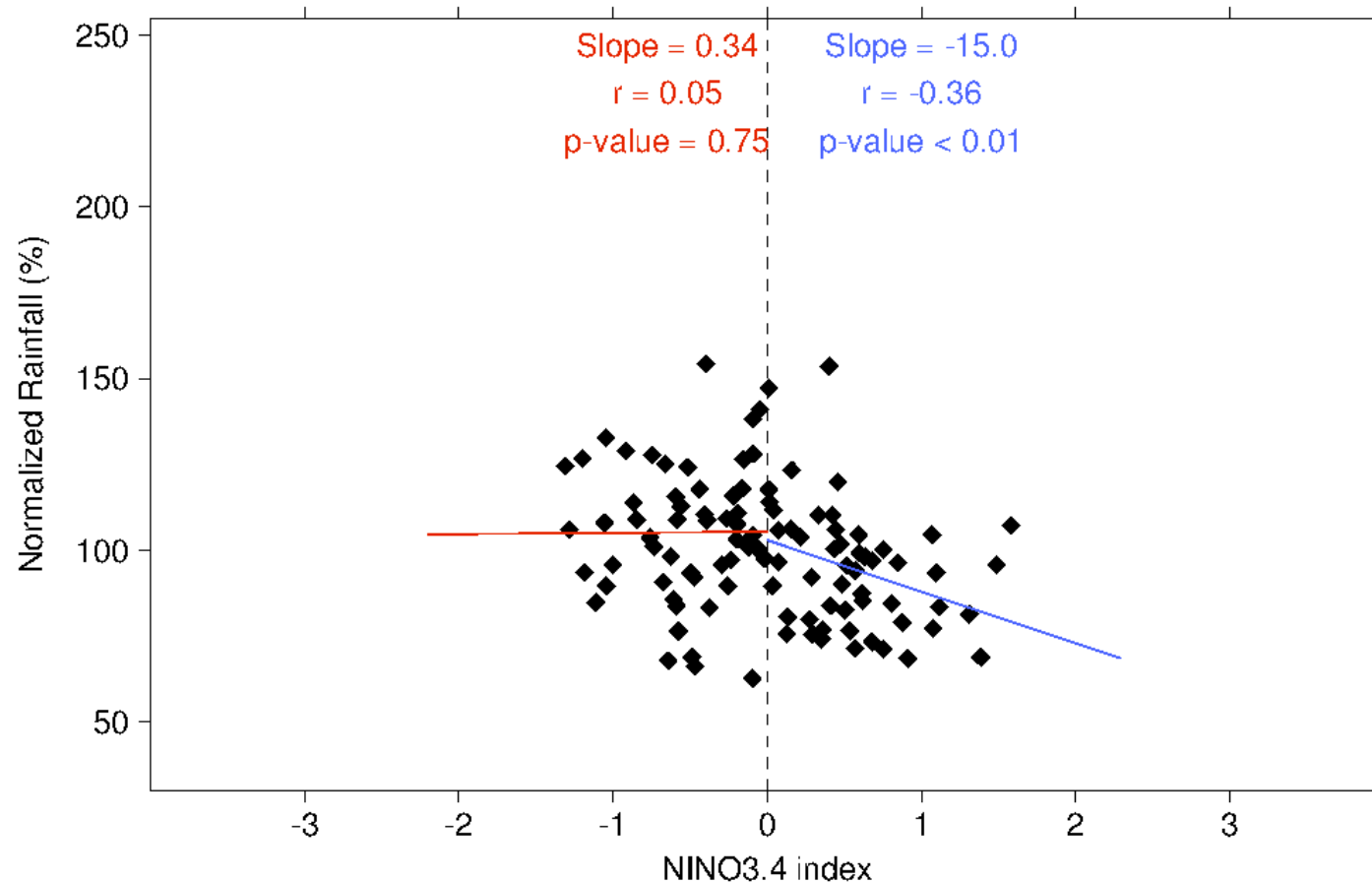
Dynamics explain less of asymmetry



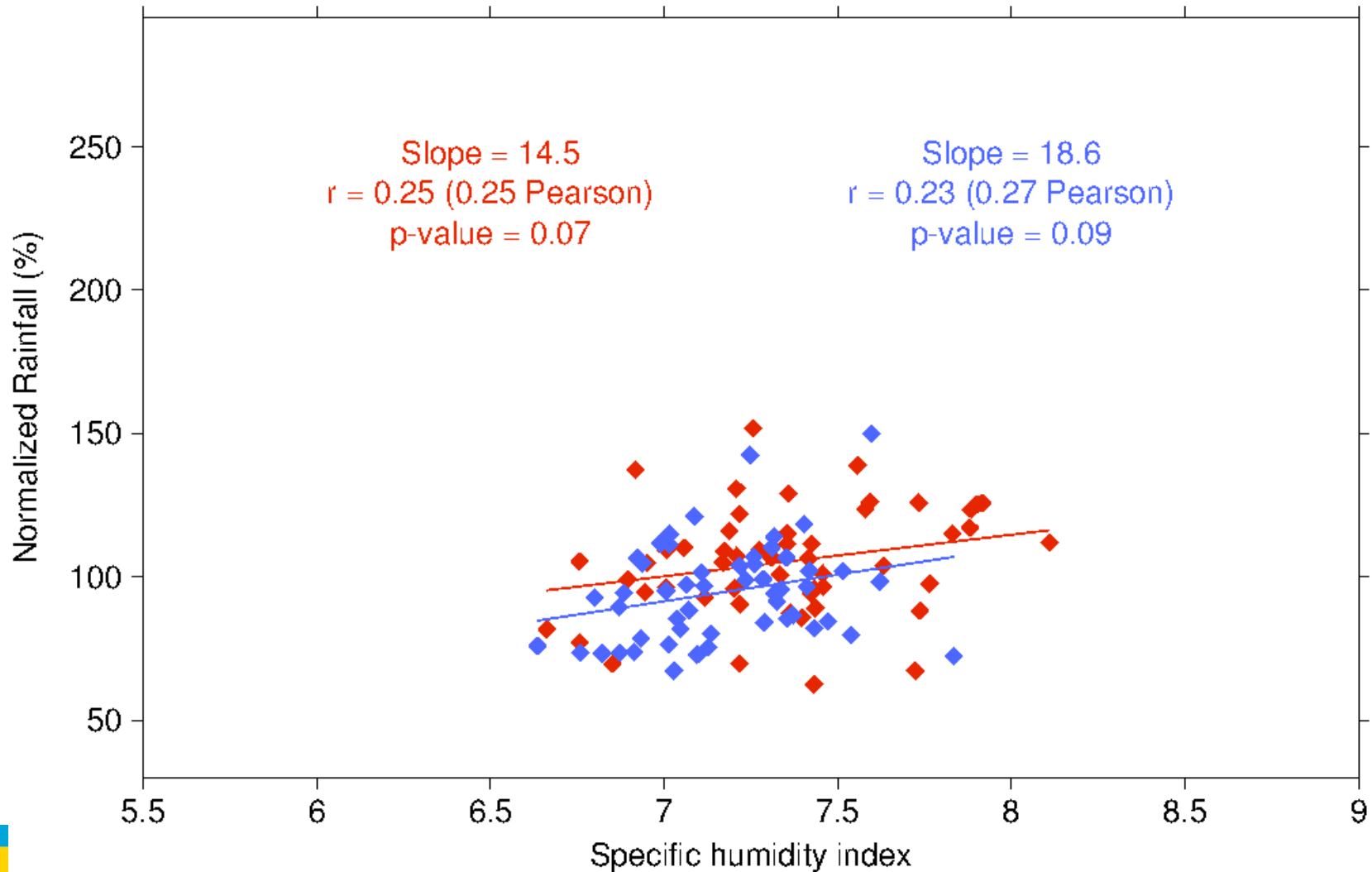
Dynamics explain less of asymmetry



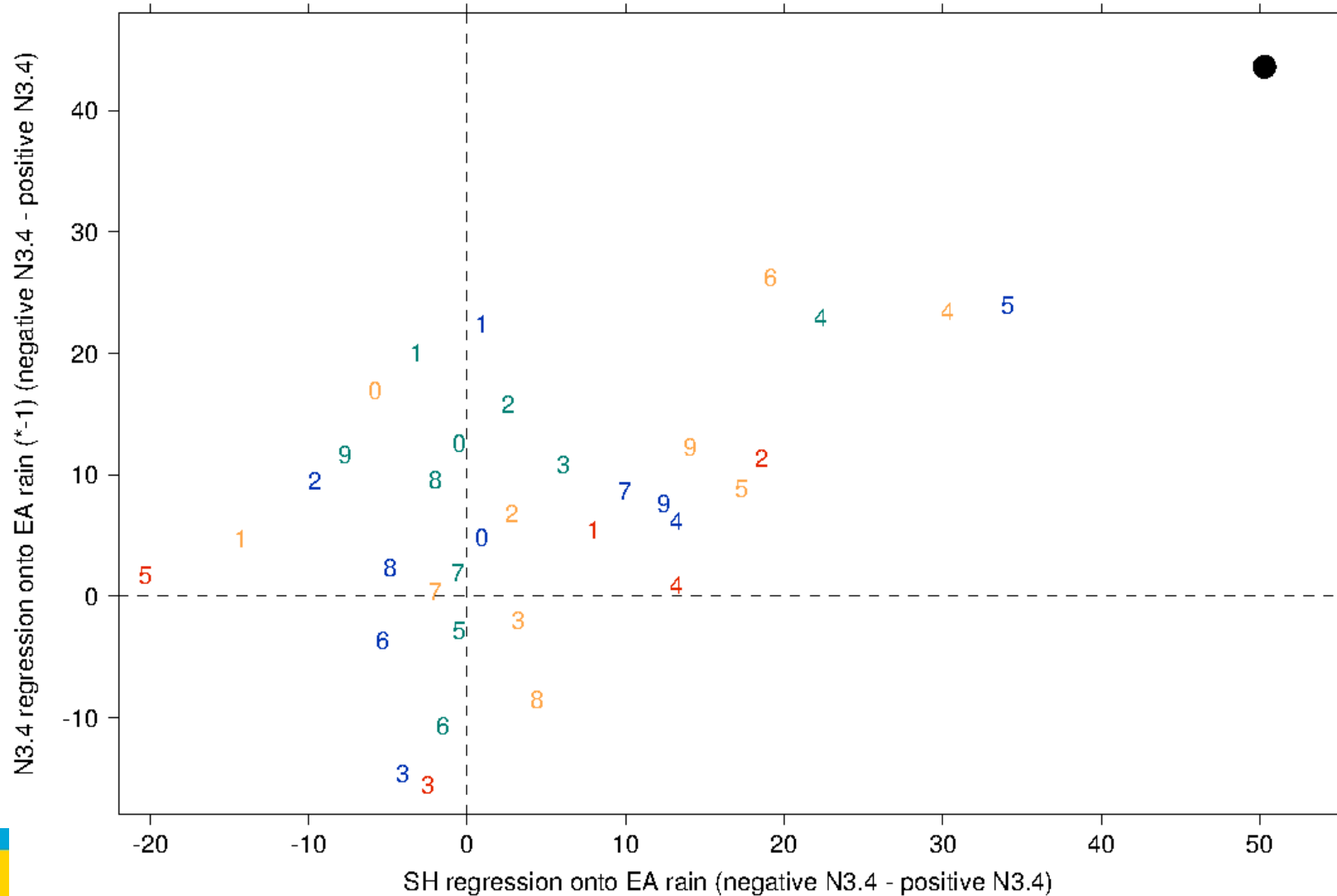
Some models capture asymmetry whilst others don't



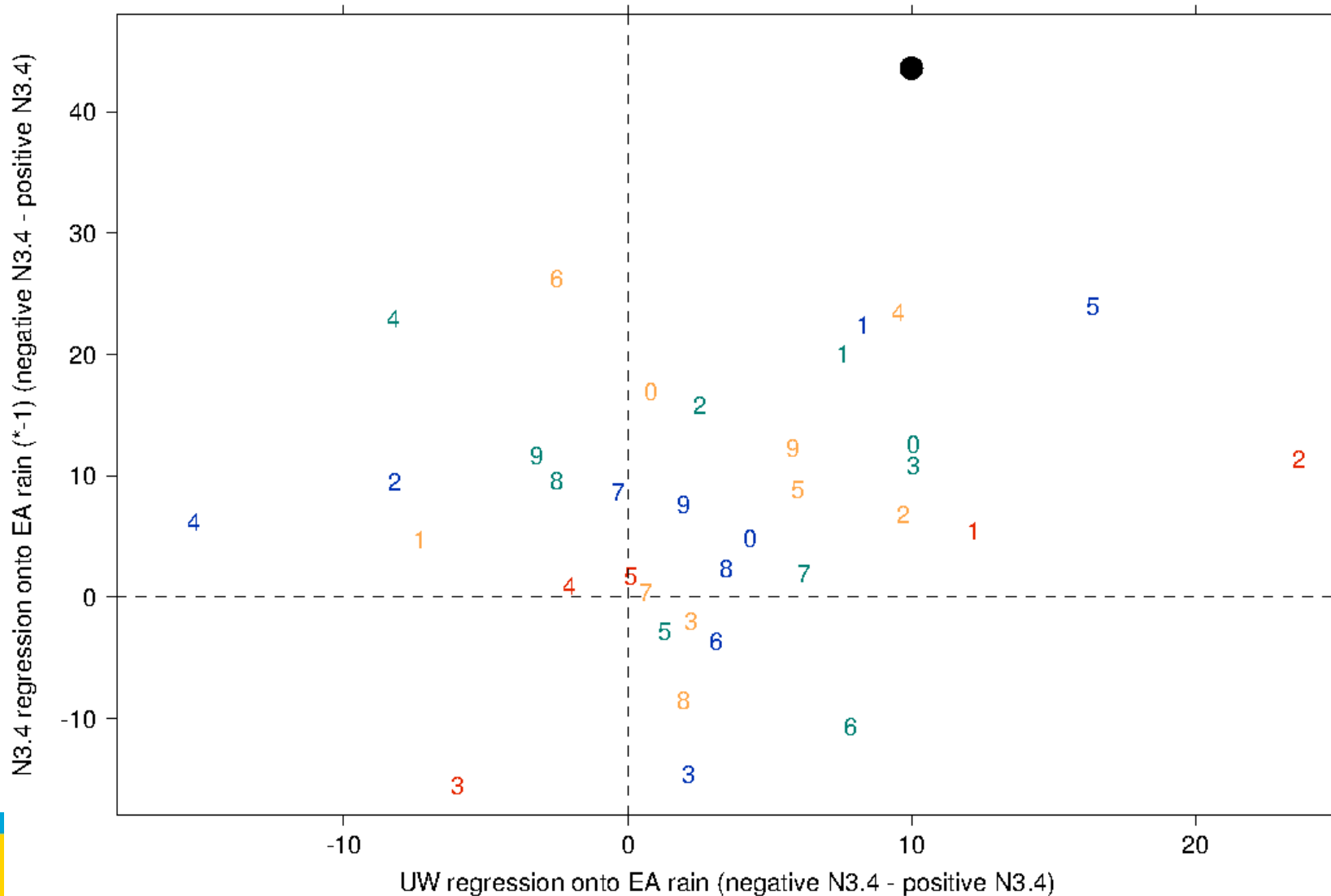
Thermodynamic influence on model asymmetry



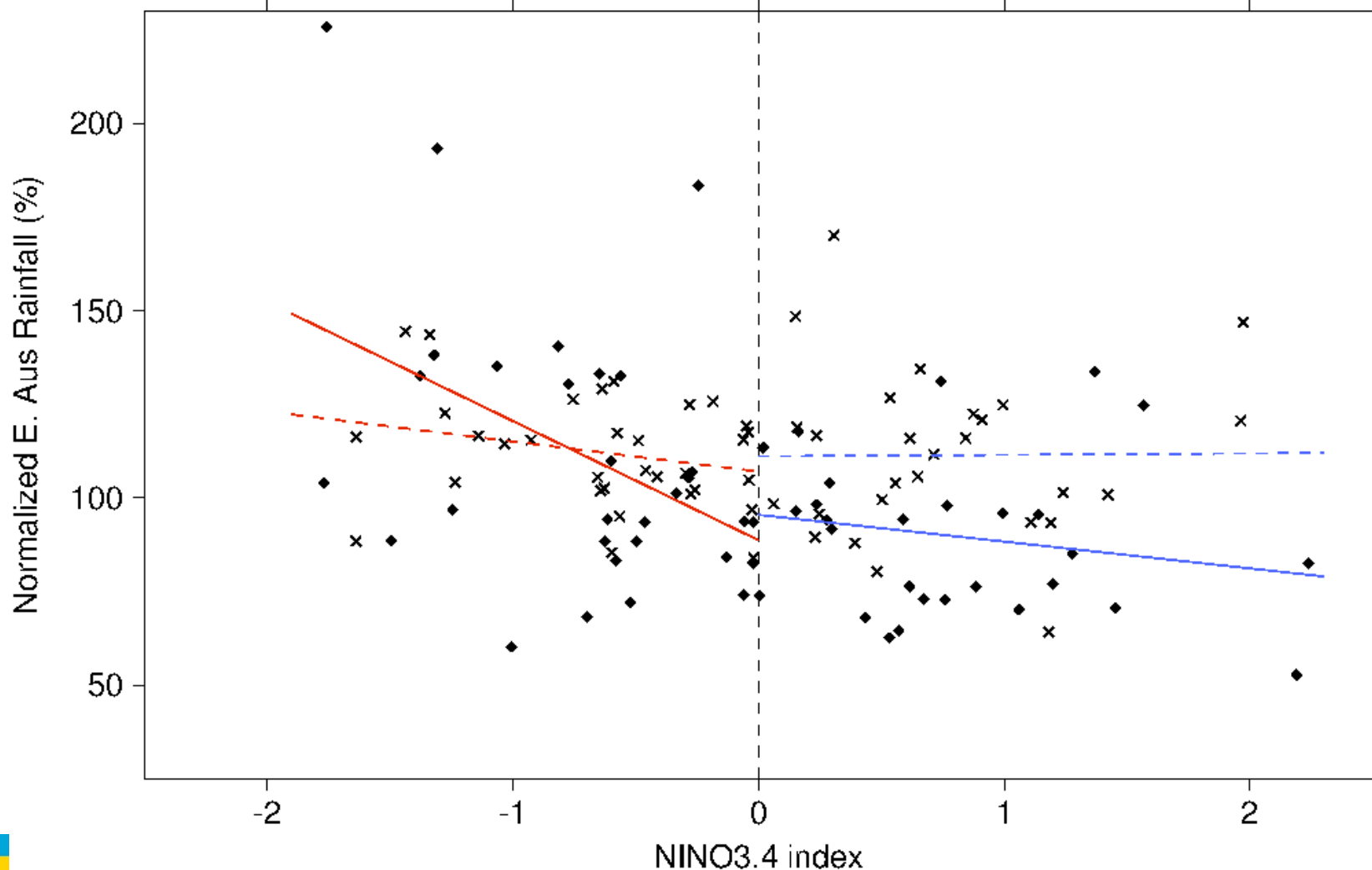
Thermodynamic influence on model asymmetry



Dynamic influence on model asymmetry



AMIP runs do not improve ENSO-rainfall relationship



Conclusions

- The extreme rainfall of 2011-12 was more strongly related to ENSO variability than an anthropogenic influence.
- The ENSO-rainfall asymmetry is captured in reanalysis.
- Asymmetry is more strongly related to moisture availability than dynamic processes.
- Some CMIP5 models have more accurate ENSO-rainfall relationships than others.
- Strength of relationship somewhat related to thermodynamics in models.
- SSTs alone do not help in capturing ENSO-rainfall relationship.



Thank you for listening

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