

# YMC modelling efforts – Why bother?

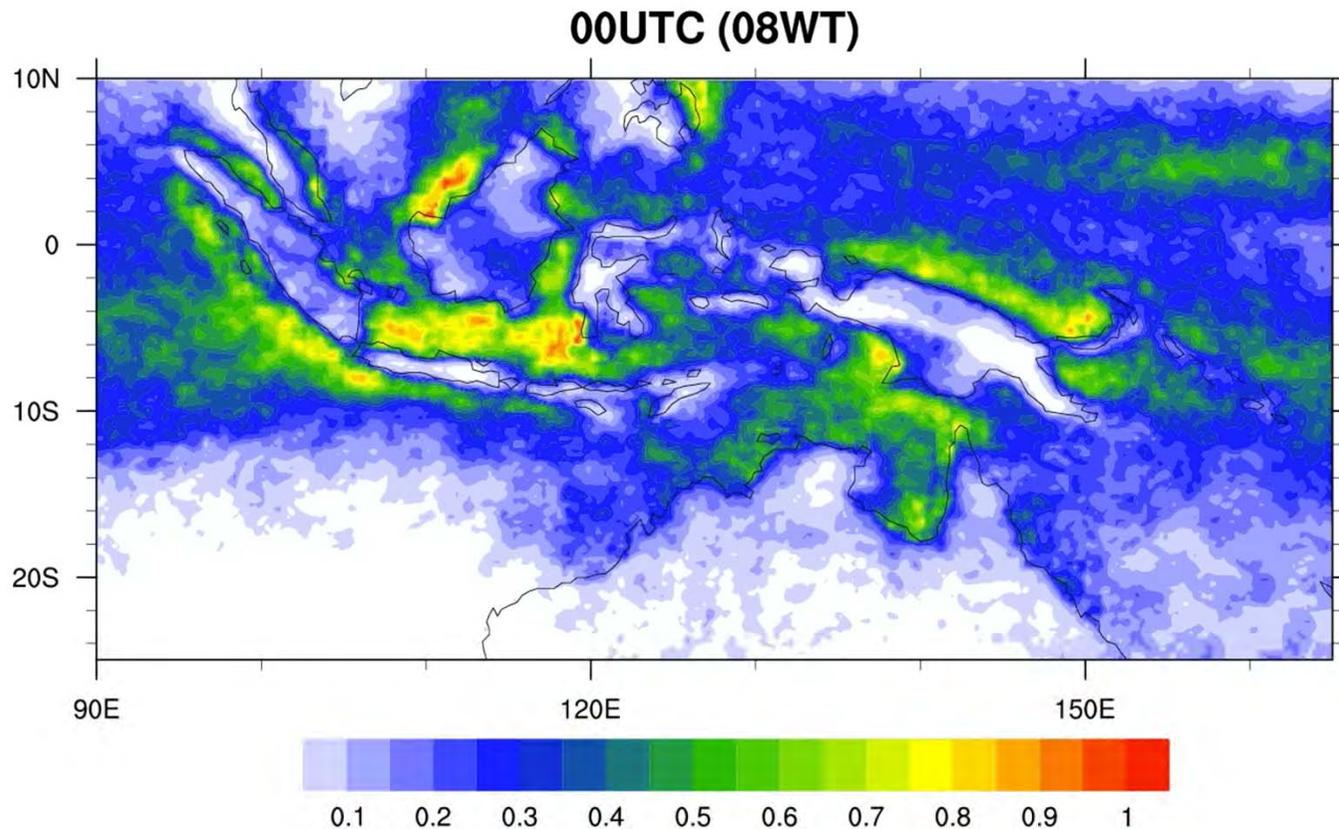
Christian Jakob, ARC Centre of Excellence for Climate System Science, Monash University, Melbourne, Australia

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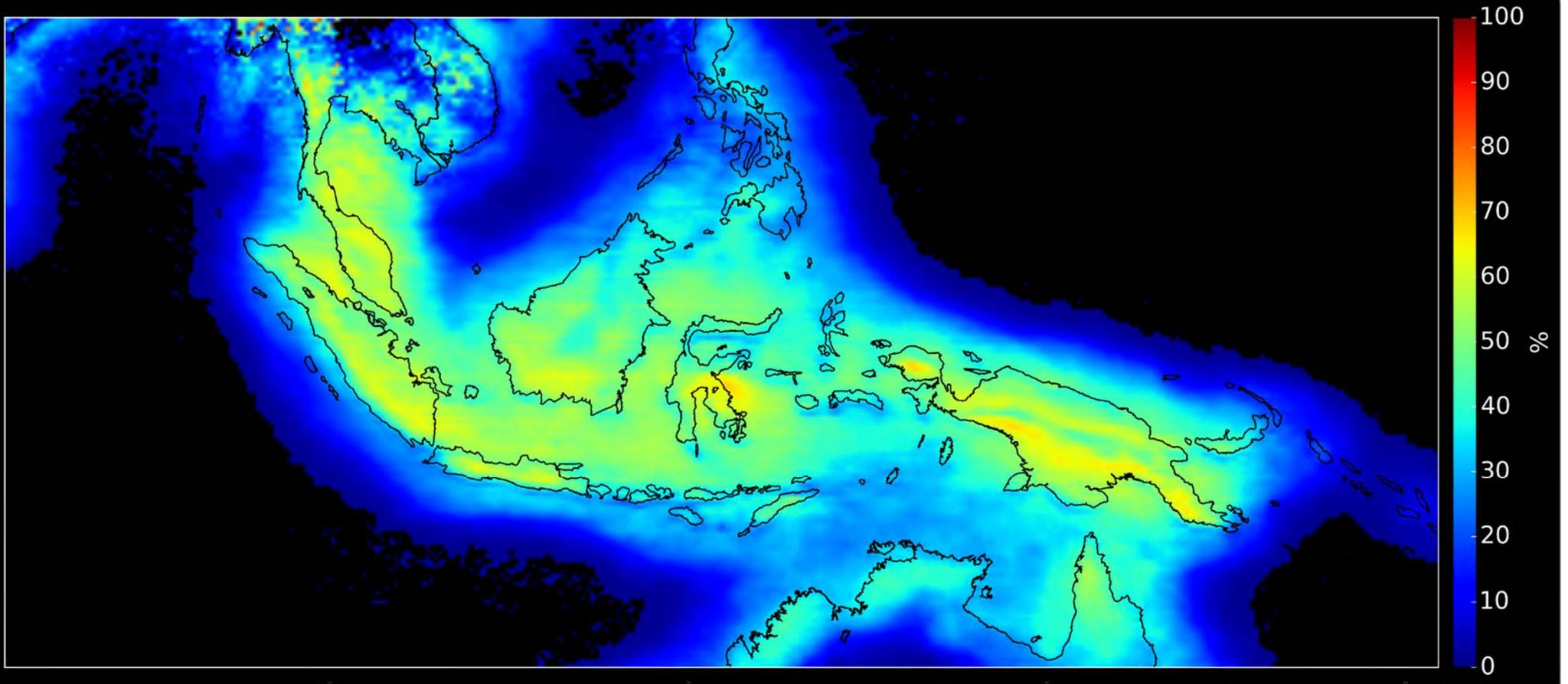
Based on the work of G Berry, M Bergemann, Juliane Schwendicke, Duncan Ackerley, Suaydhi Suaydhi

# The MC provides a fascinating set of convective features

## Mean diurnal cycle – December – TRMM



A large fraction of the rainfall is associated with coastal features:

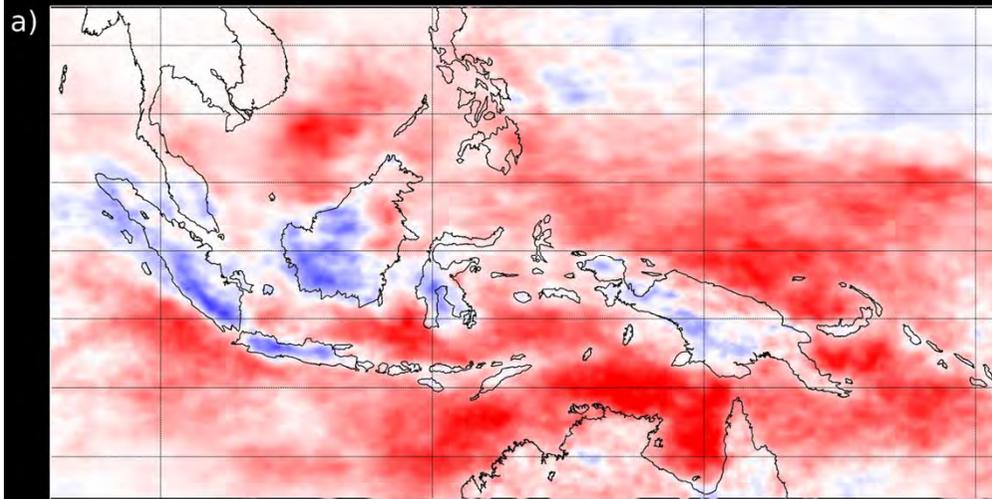


Annual percentage of rainfall from coastal features

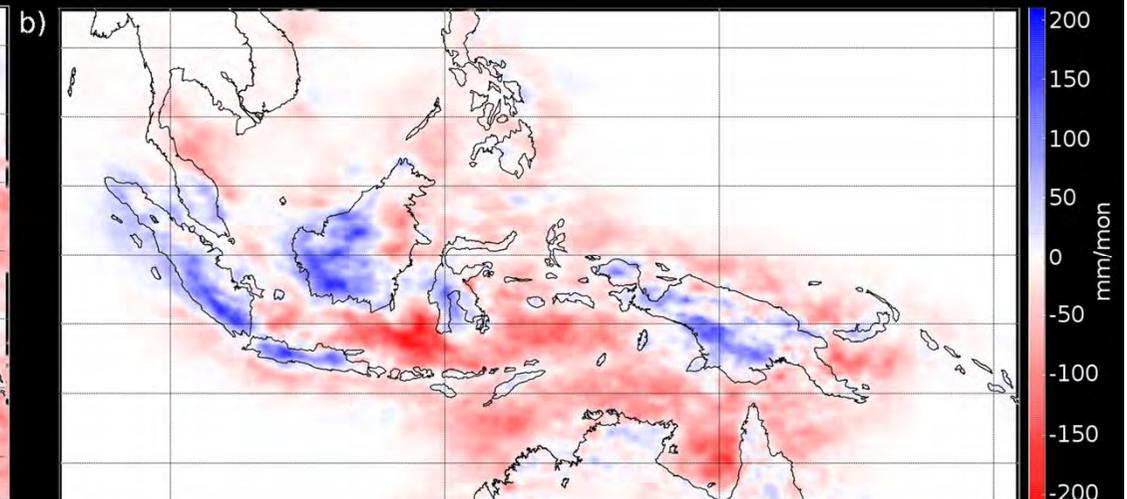
Thanks to Martin Bergemann

# The Maritime Continent does interesting things to the MJO (and other waves)

Rainfall difference – Suppressed – Active MJO Phase



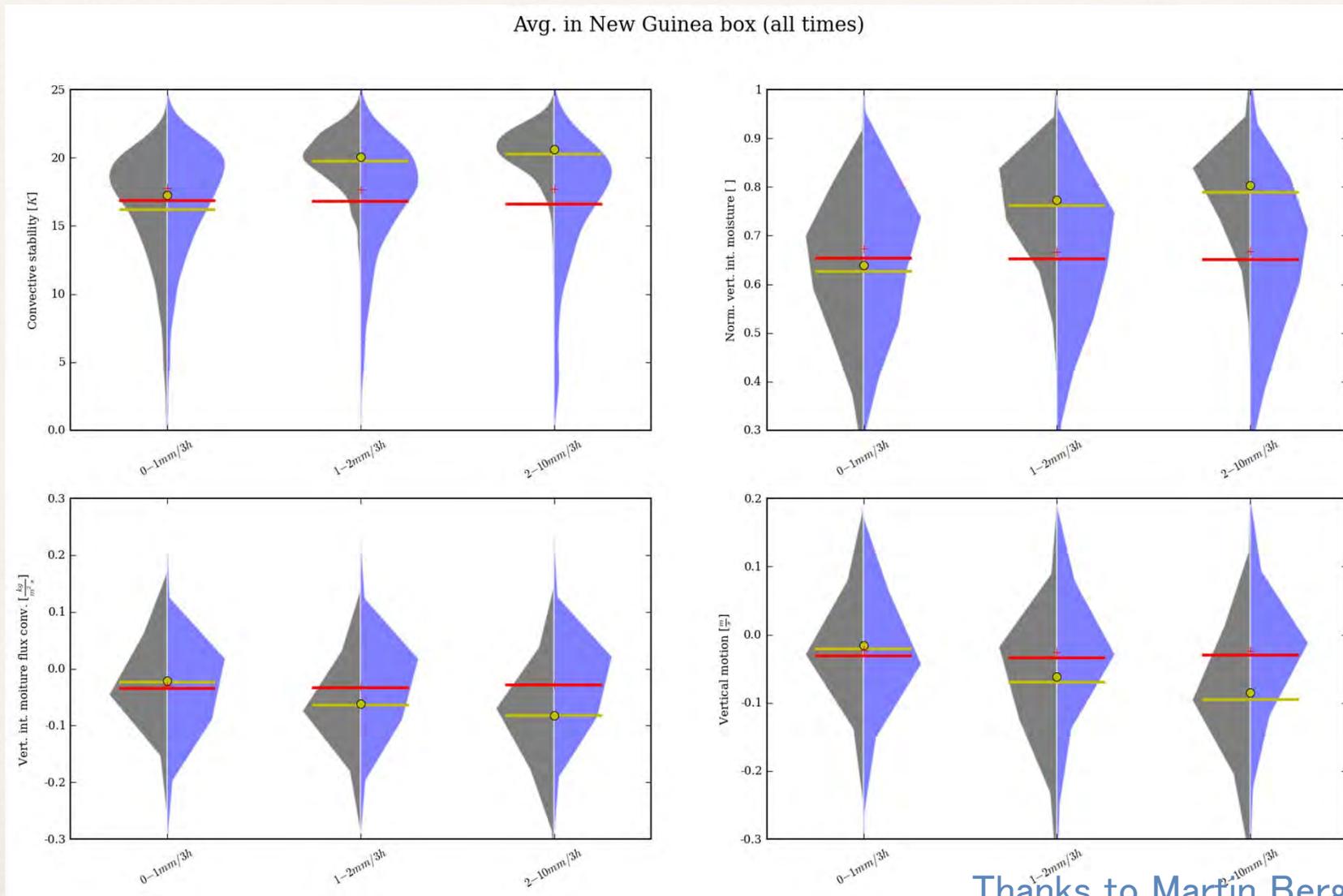
All rain



Coastal rain

Thanks to Martin Bergemann

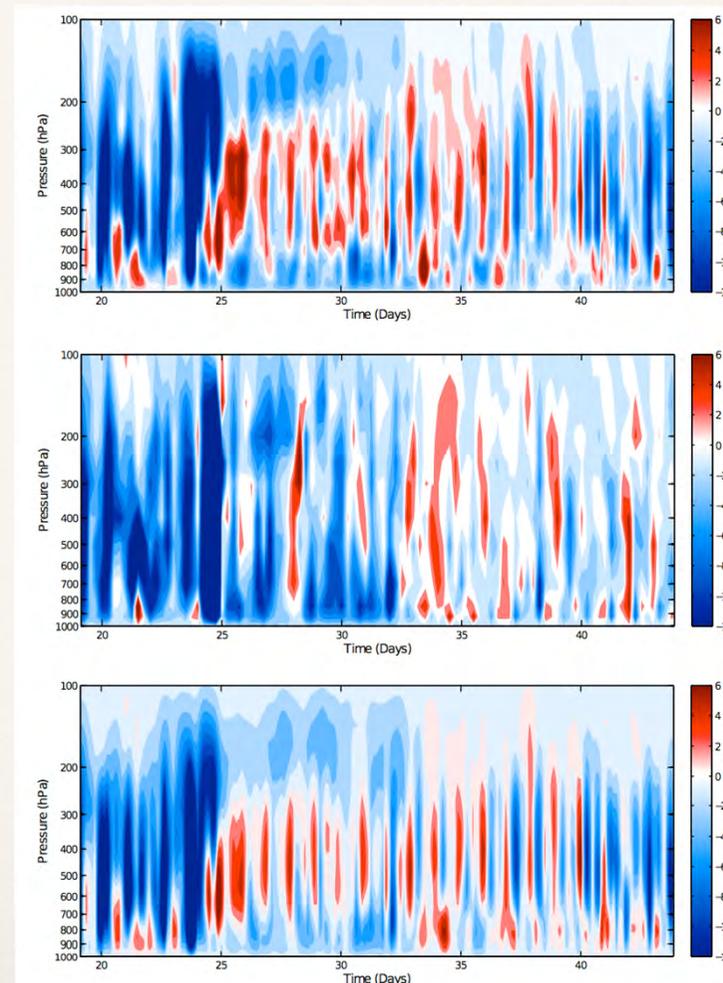
# Rainfall over land occurs at distinctly different large-scale conditions



Thanks to Martin Bergemann

# Consequently we must know the large-scale state well

TWP-ICE  $\omega(p)$



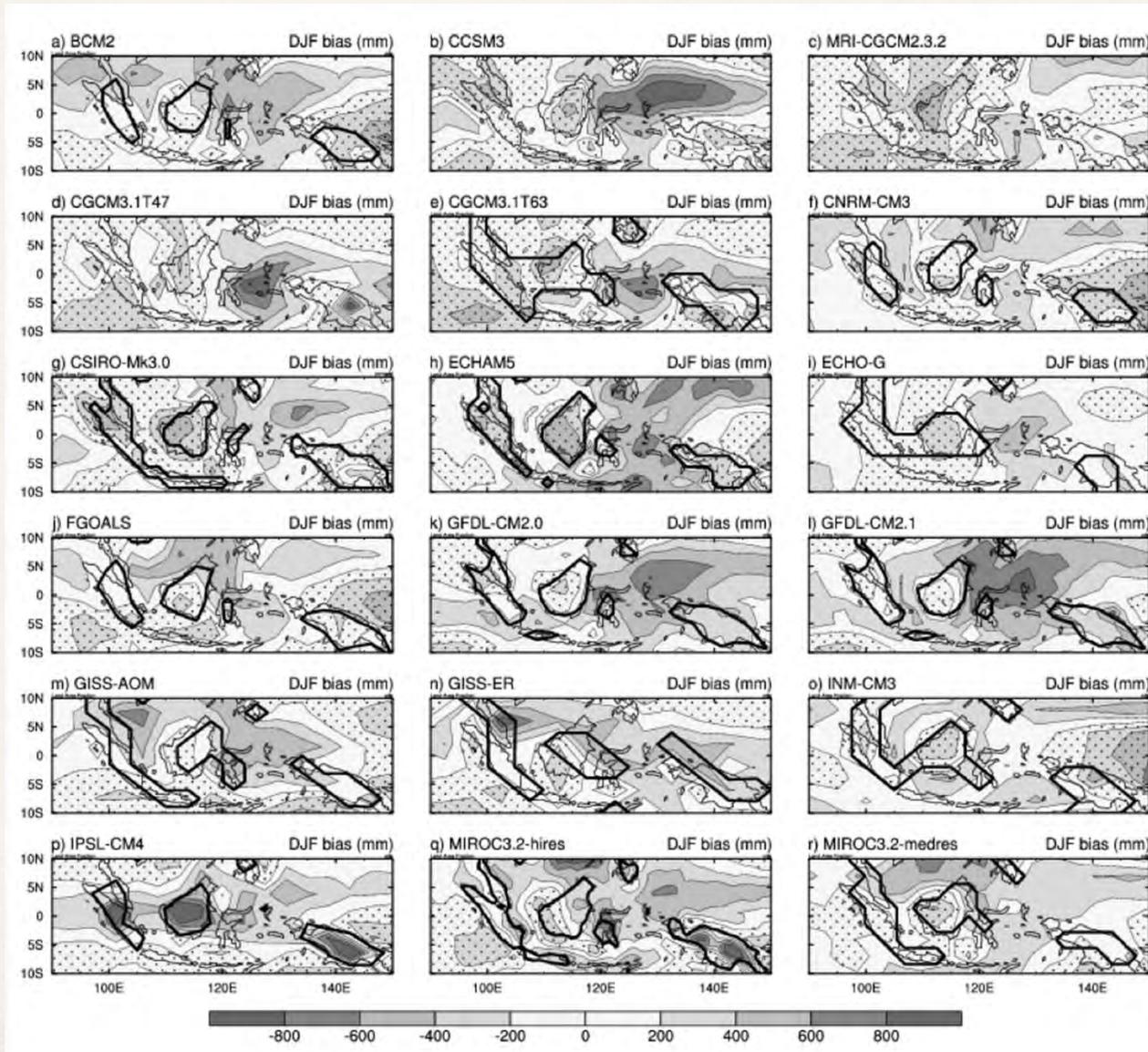
Analysis  
Obs

Analysis  
ECMWF

Analysis  
Hybrid

Large Scales

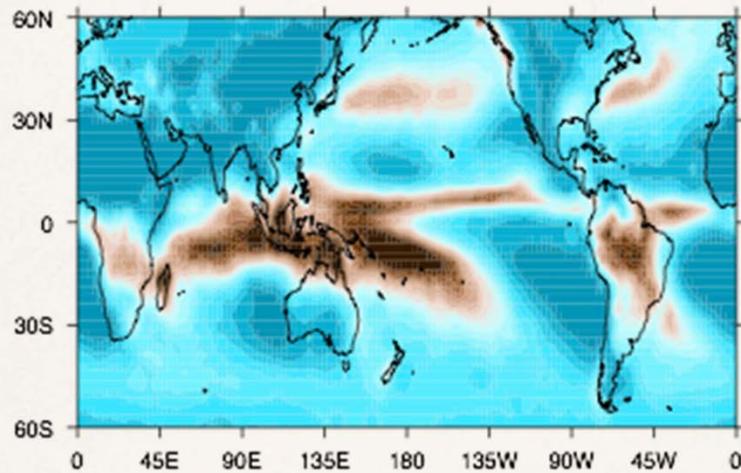
# Models have all sorts of trouble around the Maritime Continent



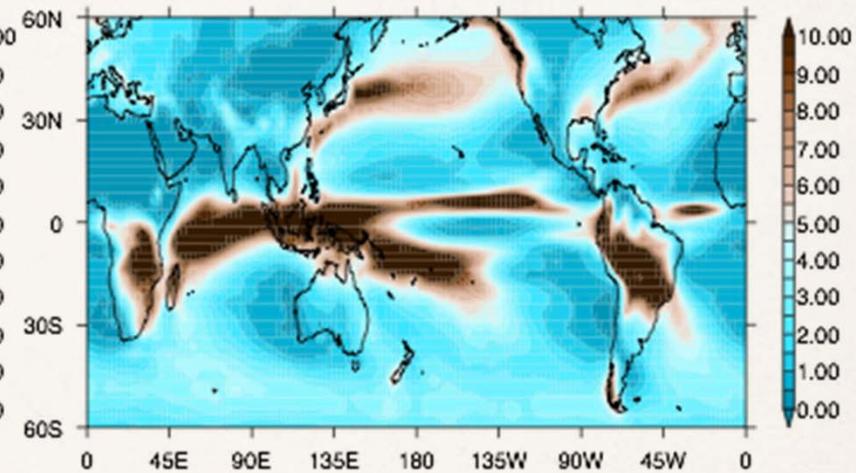
DJF Rainfall biases  
– CMIP3 models

# ACCESS has large rainfall biases around the Maritime Continent

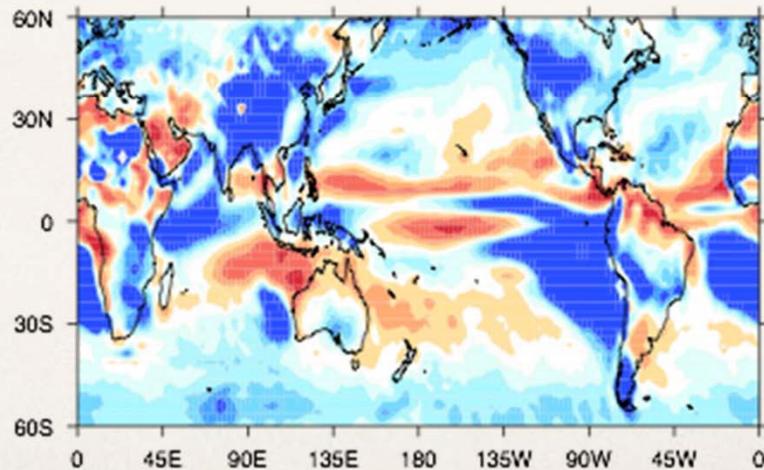
(a) CMAP DJF-mean precipitation ( $\text{mm day}^{-1}$ )



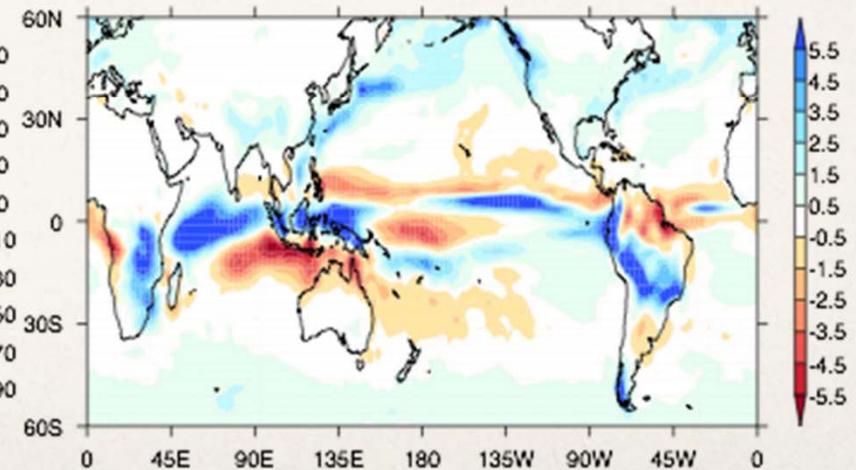
(b) ACCESS1.3 DJF-mean precipitation ( $\text{mm day}^{-1}$ )



(c) ACCESS1.3 - CMAP precipitation (%)



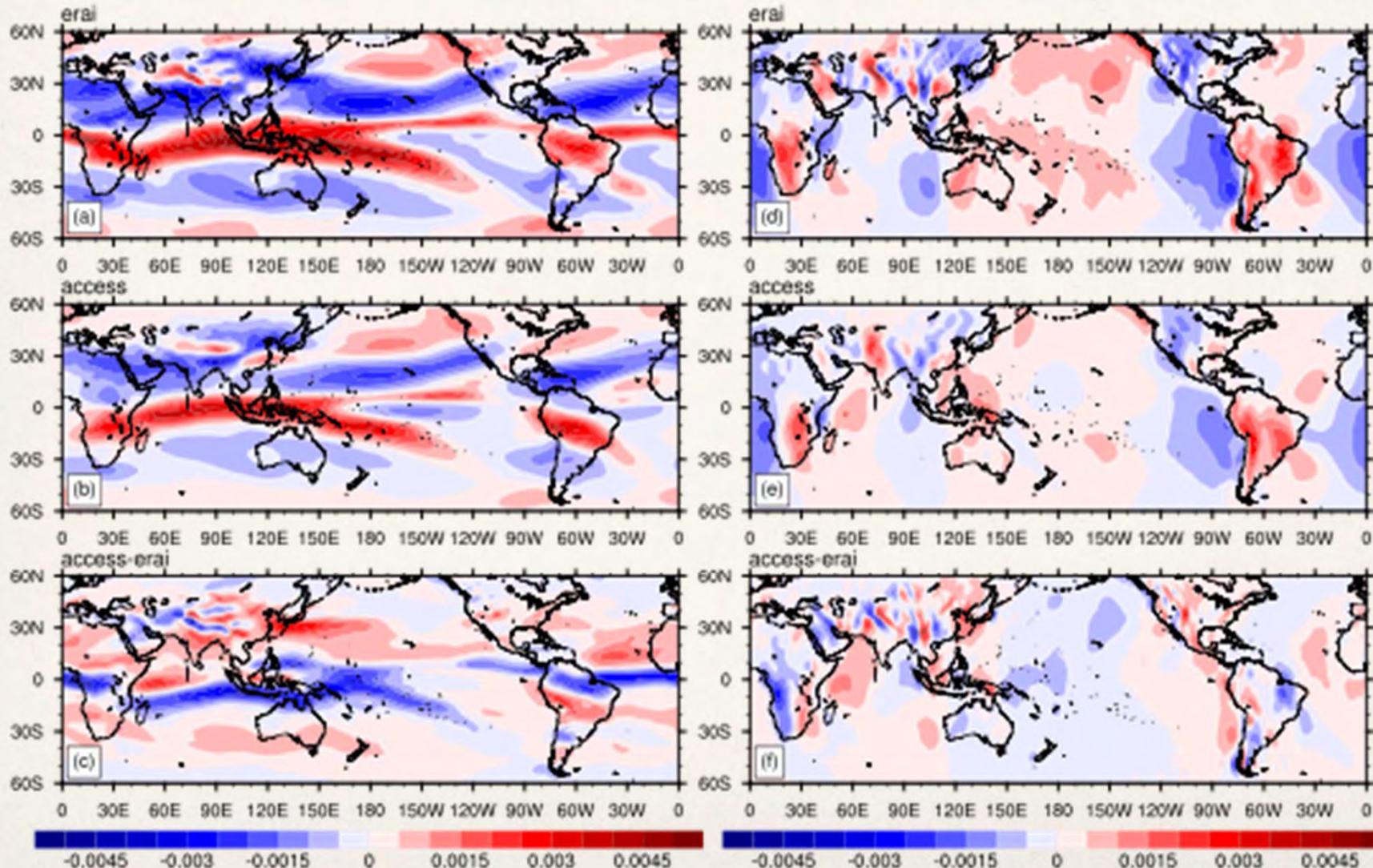
(d) ACCESS1.3 - CMAP precipitation ( $\text{mm day}^{-1}$ )



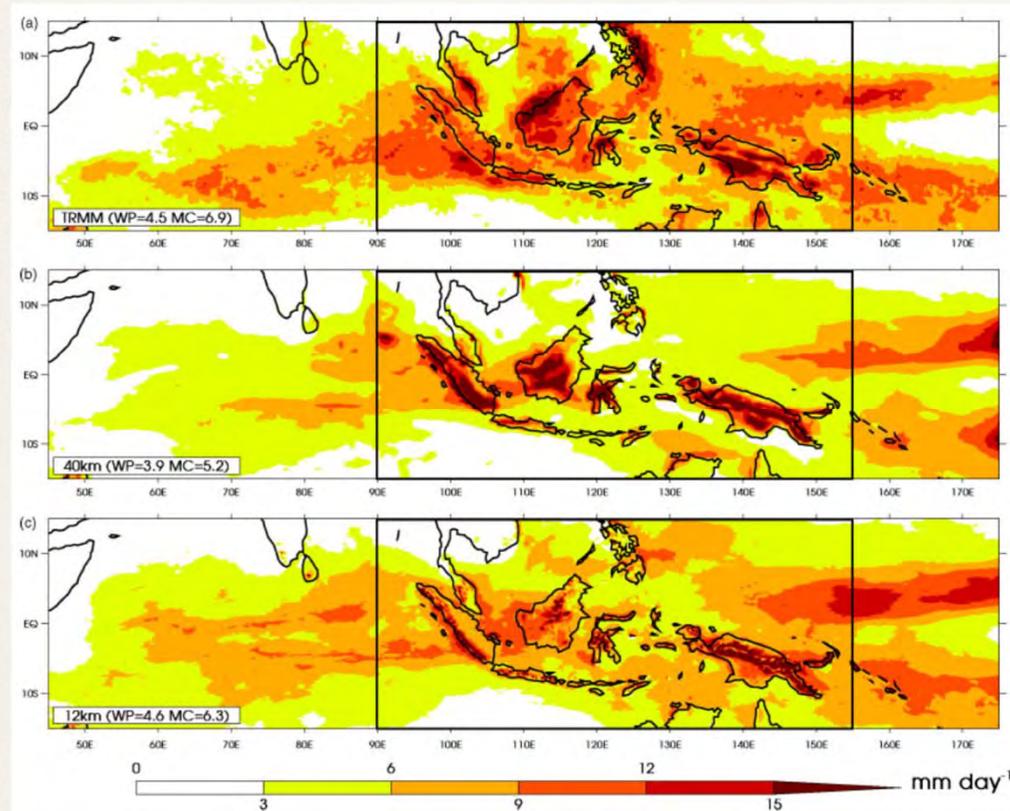
# There is a dynamical link between the biases over the MC and other regions

Hadley circulation DJF 500 mb

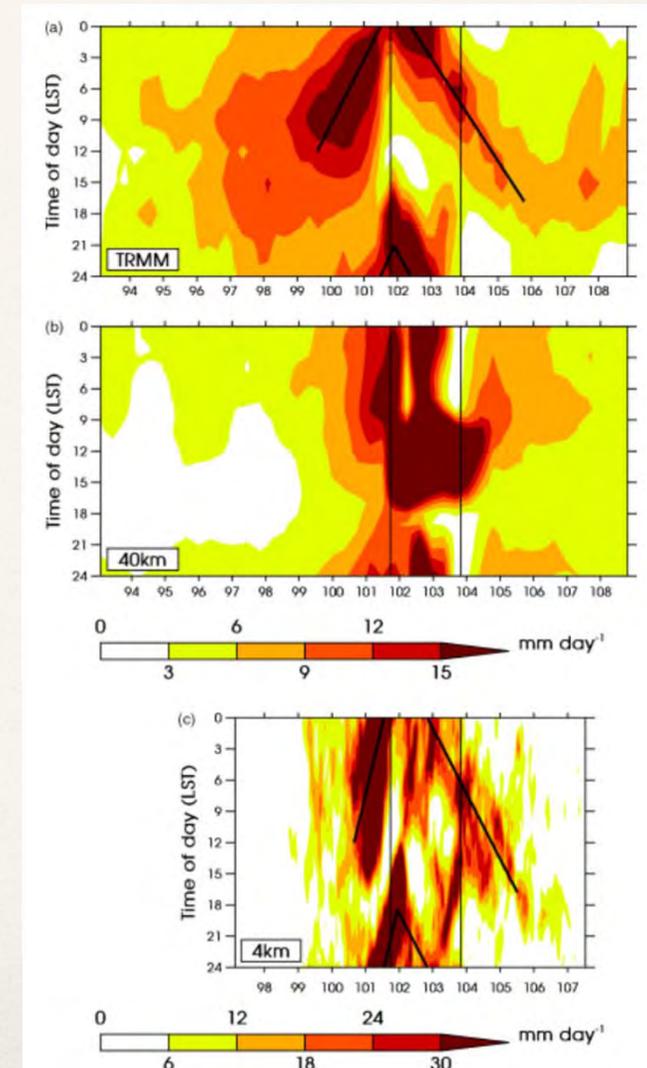
Walker circulation DJF 500 mb



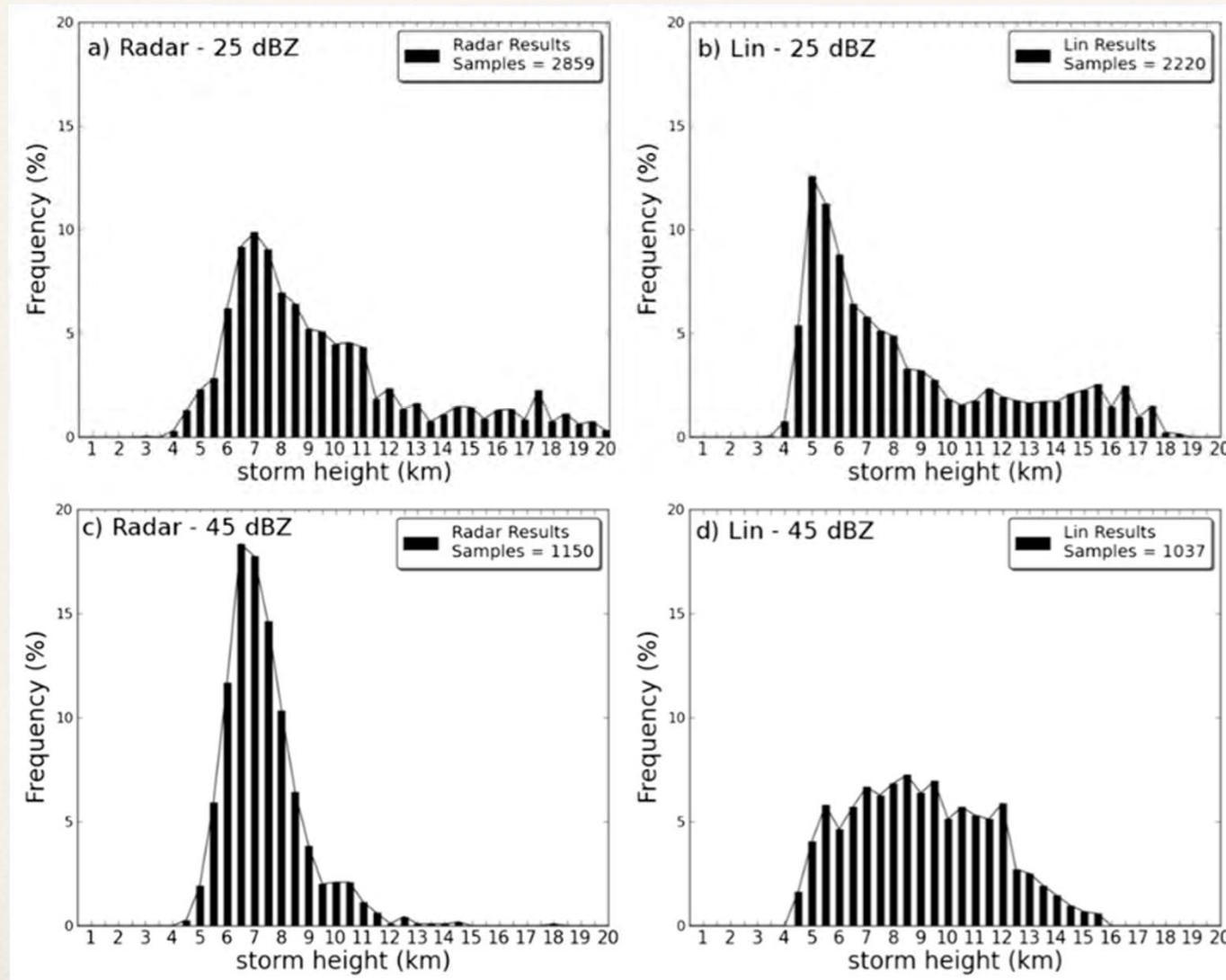
# High-resolution models capture some of the rainfall behaviour



Love et al, 2011, QJ

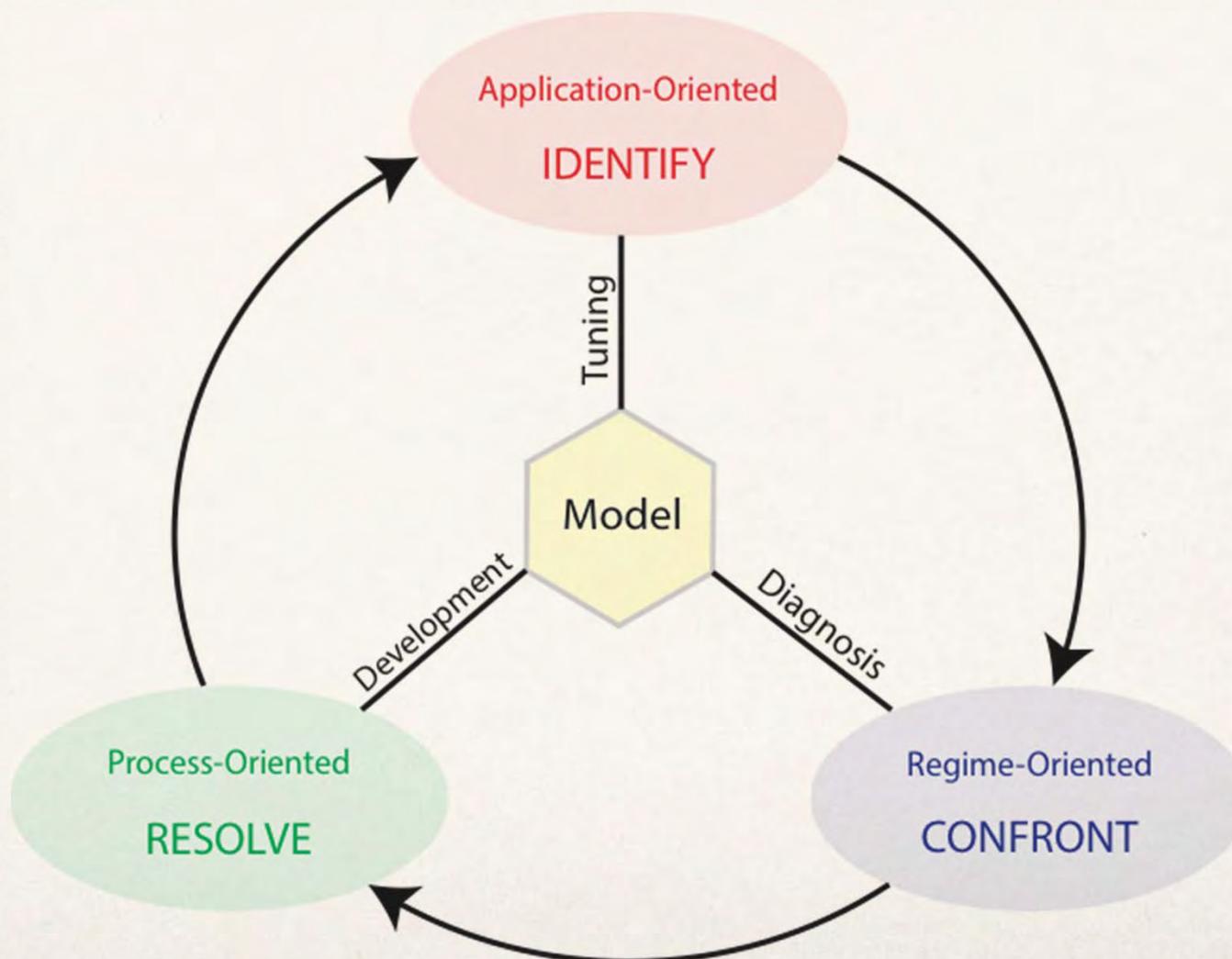


# But more in-depth evaluation reveals interesting problems:



Caine et al., 2013

# How are models really improved?



# Goals for YMC modelling activities

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- ❖ Process understanding at all scales – Hi-res models, NWP-style experiments and GCM sensitivity experiments
- ❖ Model evaluation against observations, both large-scale and YMC
- ❖ Inform model development
- ❖ Study grey-zone issues for deep convection

# Potential activities

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- ❖ CMIP5/CORDEX evaluation studies
- ❖ Comprehensive model study under GASS (AMIP, T-AMIP, LAM, CRM)
- ❖ Grey-zone community experiment including comprehensive CRM evaluation
- ❖ Real-time model predictions

# And finally ...

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- ❖ It is better understanding that will support modelling, e.g., what makes convection possible under conditions that do not allow it to occur over the open ocean?
  - ❖ Larger clouds = less entrainment?
  - ❖ Same entrainment but modified environment due to focussing by sea-breeze?
  - ❖ Something completely different?
- ❖ Questions like this will be what will move us forward