

# Constraining uncertainties of impact assessment using multi-model climate scenarios

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# Measuring skills of climate models

## ex. for global precipitation pattern

(Nohara et al., 2006)

Table 2:  
(RMS), &

Models
CNRM
CSIRO
GFDL
GISS-A
GISS-E
GISS-E
INM-C
IPSL-C
GPCP

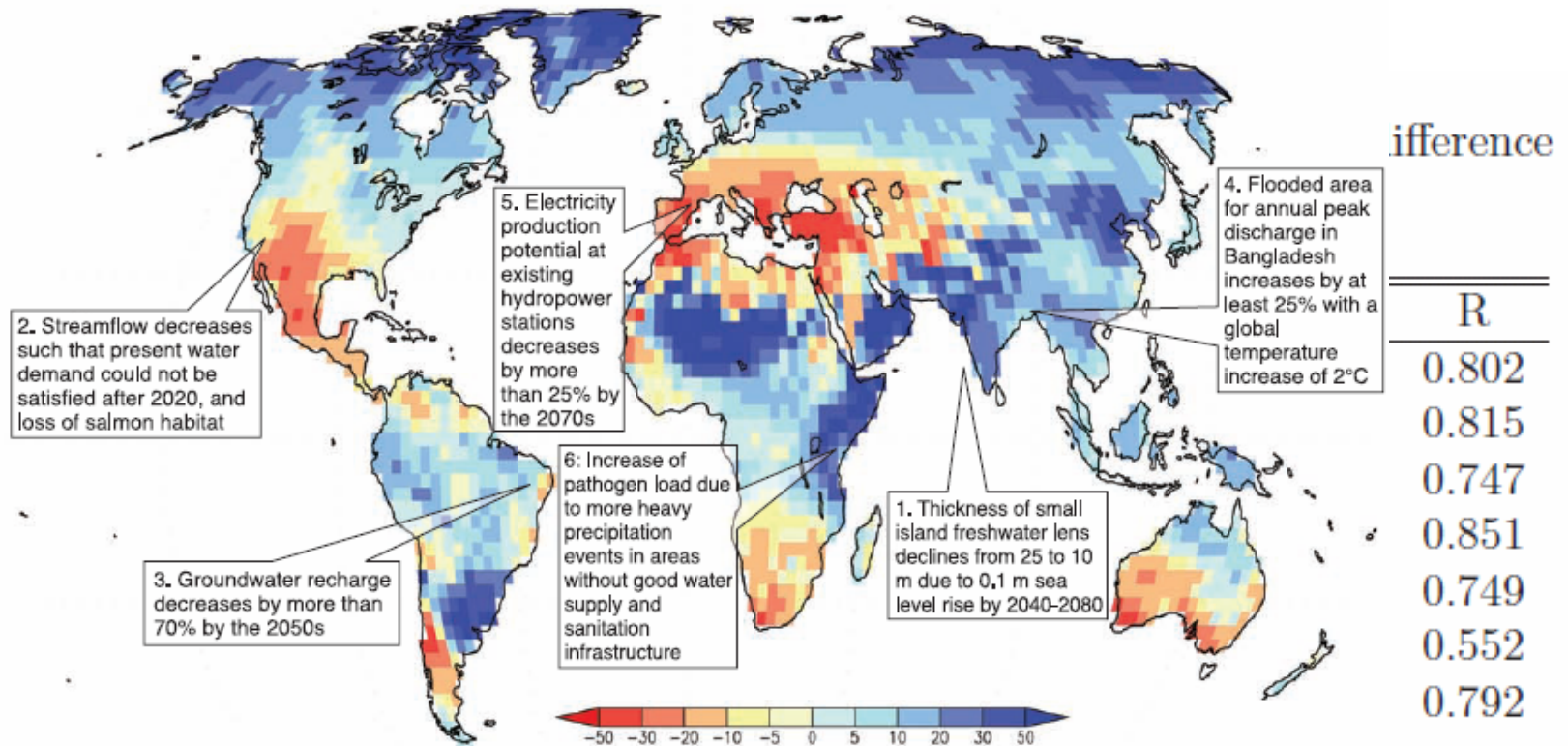


Figure TS.5. Illustrative map of future climate change impacts on freshwater which are a threat to the sustainable development of the affected regions. Background shows ensemble mean change of annual runoff, in percent, between the present (1981-2000) and 2081-2100 for the SRES A1B emissions scenario; blue denotes increased runoff, red denotes decreased runoff. Underlying map from Nohara et al. (2006) [F3.8].

difference
R
0.802
0.815
0.747
0.851
0.749
0.552
0.792

Weighted Multi-Model Ensemble Mean of Runoff

# How to choose the metric?

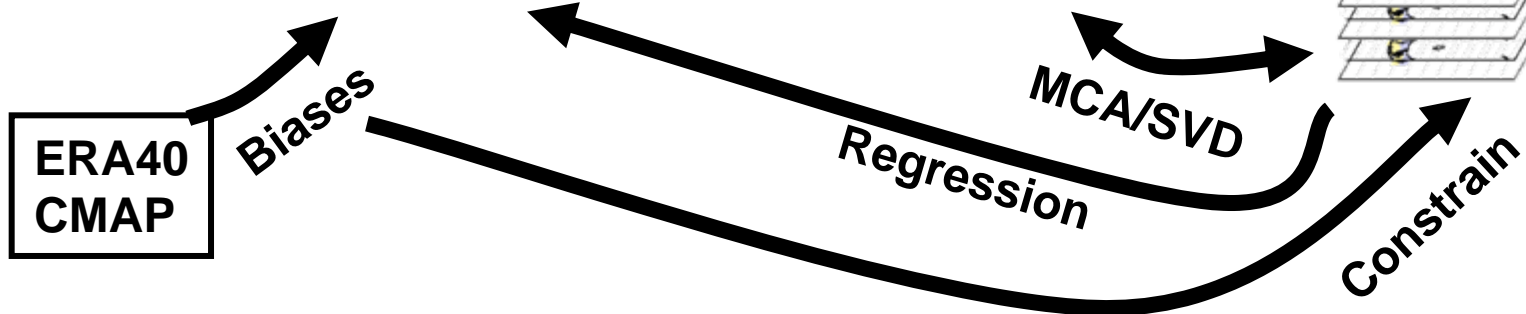
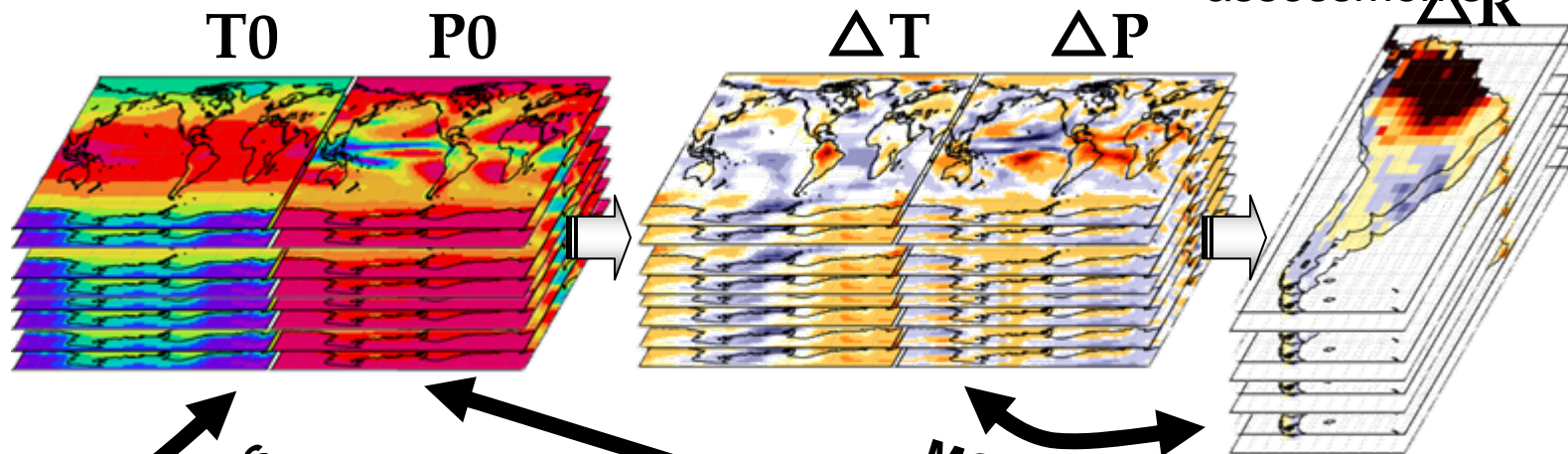
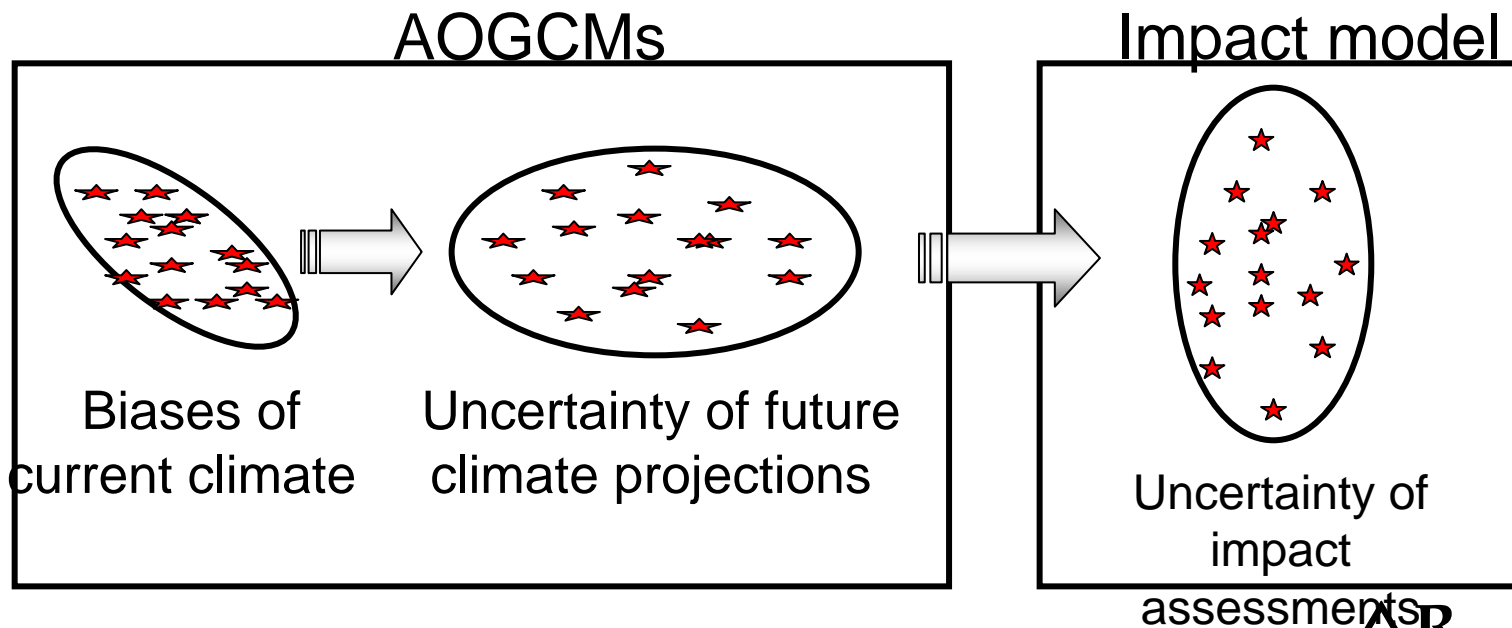
Is RMS or pattern correlation a good indicator of reliability of future projection?

-> not obvious

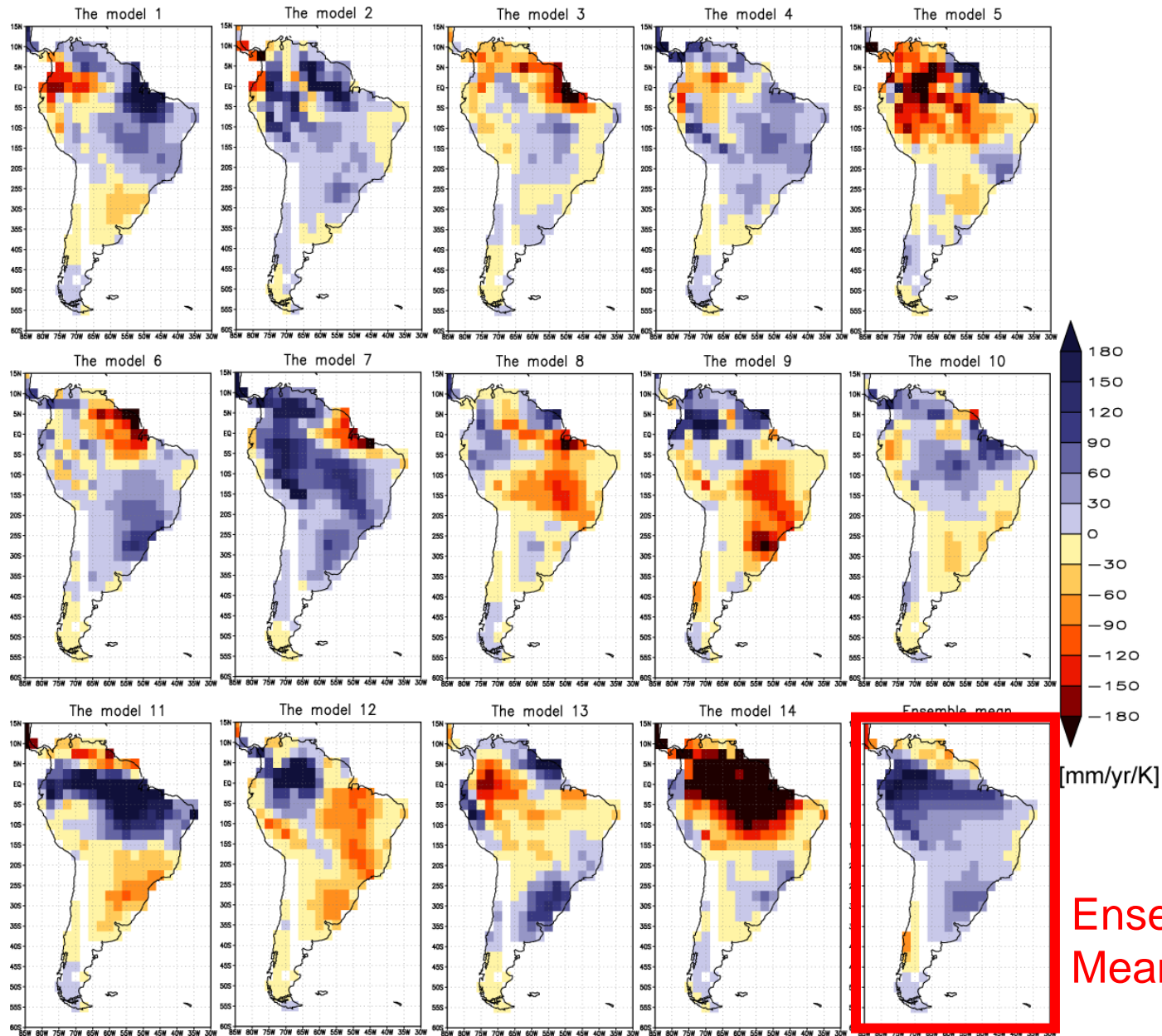
*Key Uncertainties:*

*A proven set of model **metrics** comparing simulations with observations, that might be used to narrow the range of plausible climate projections, has yet to be developed.*

*(IPCC AR4 TS)*

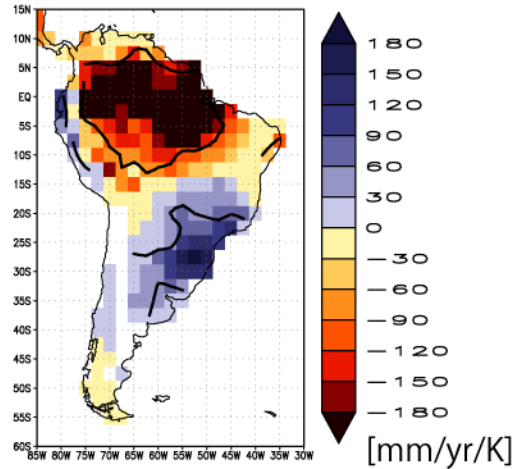
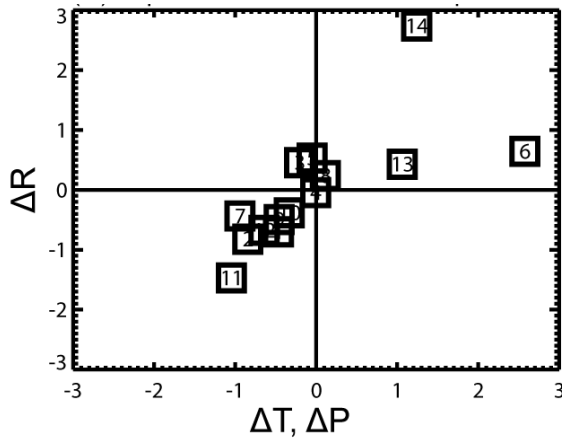


# Runoff Changes from Various Models



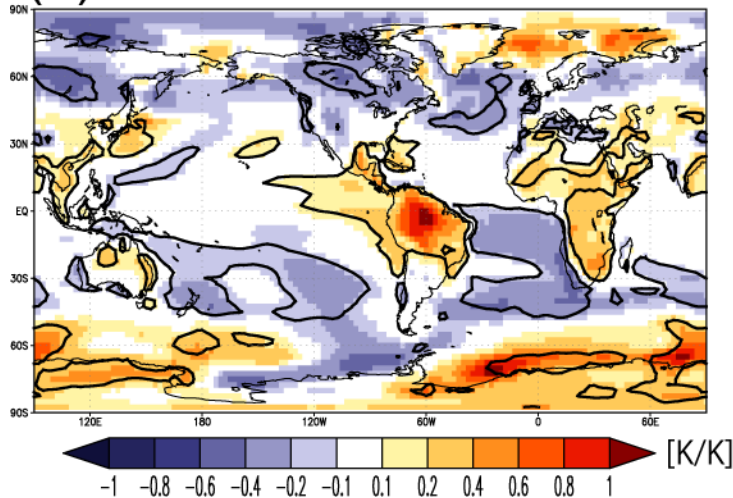
# 1<sup>st</sup> mode (47%)

(a)  $\Delta R$

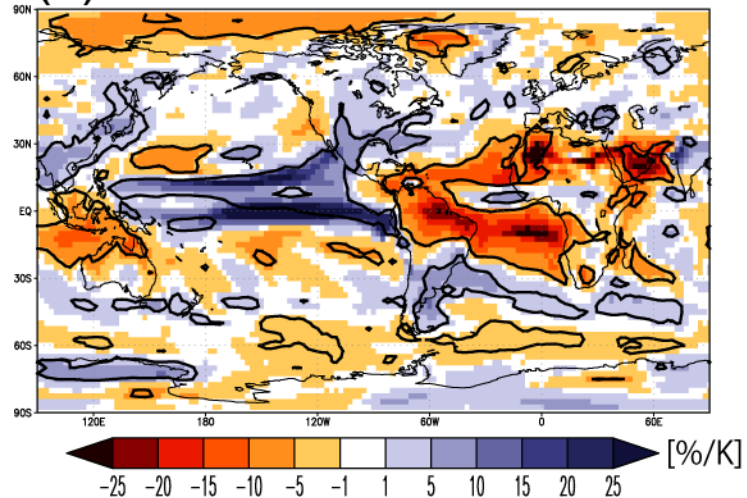


Principal mode of inter-model variation extracted from Maximum Covariance Analysis of  $\Delta R$  and ( $\Delta T$ ,  $\Delta P$ )

(b)  $\Delta T$

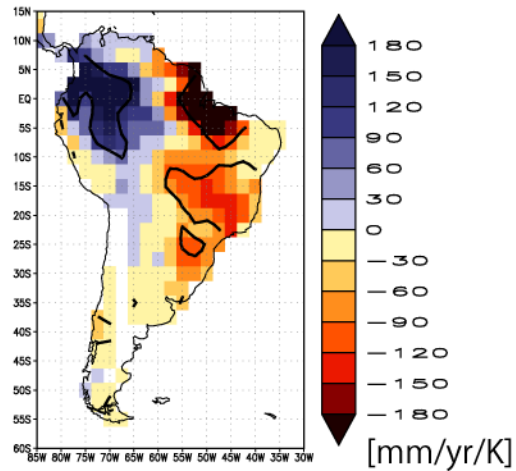
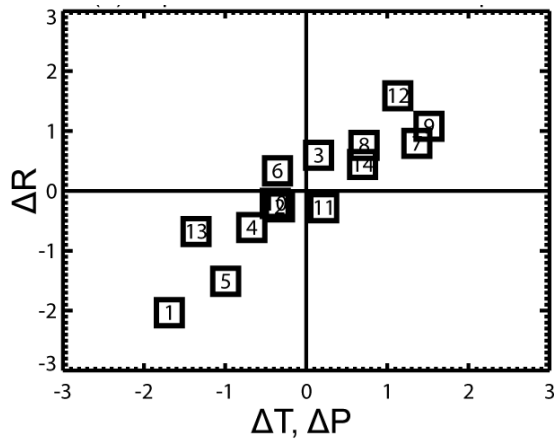


(c)  $\Delta P$



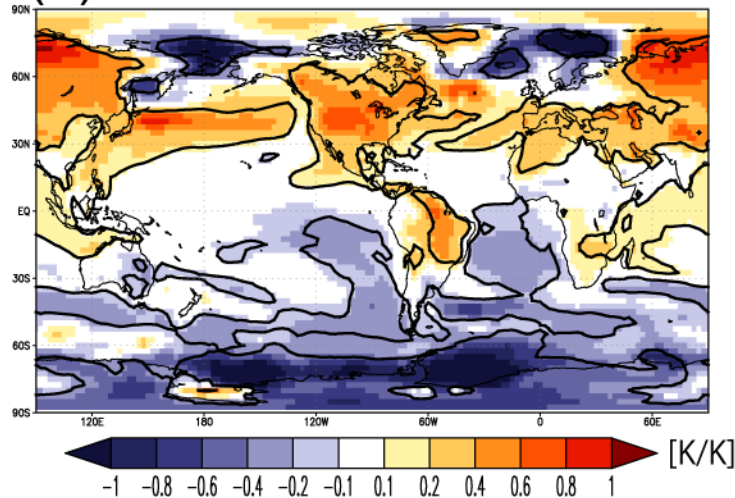
# 2<sup>nd</sup> mode (19%)

(a)  $\Delta R$

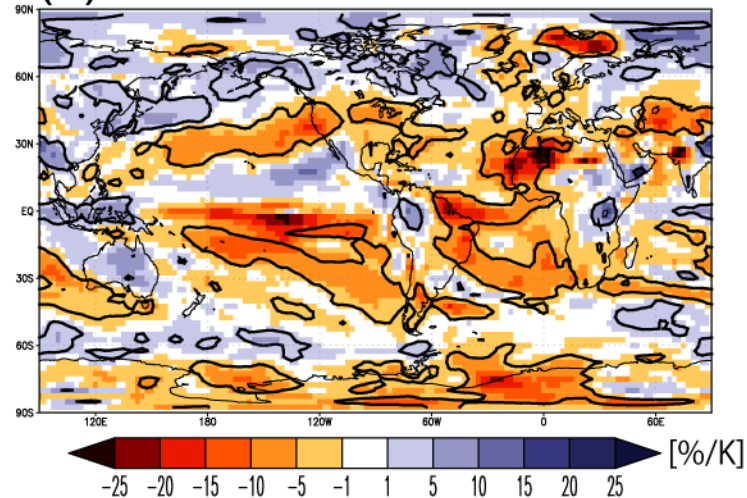


Principal mode of inter-model variation extracted from Maximum Covariance Analysis of  $\Delta R$  and ( $\Delta T$ ,  $\Delta P$ )

(b)  $\Delta T$



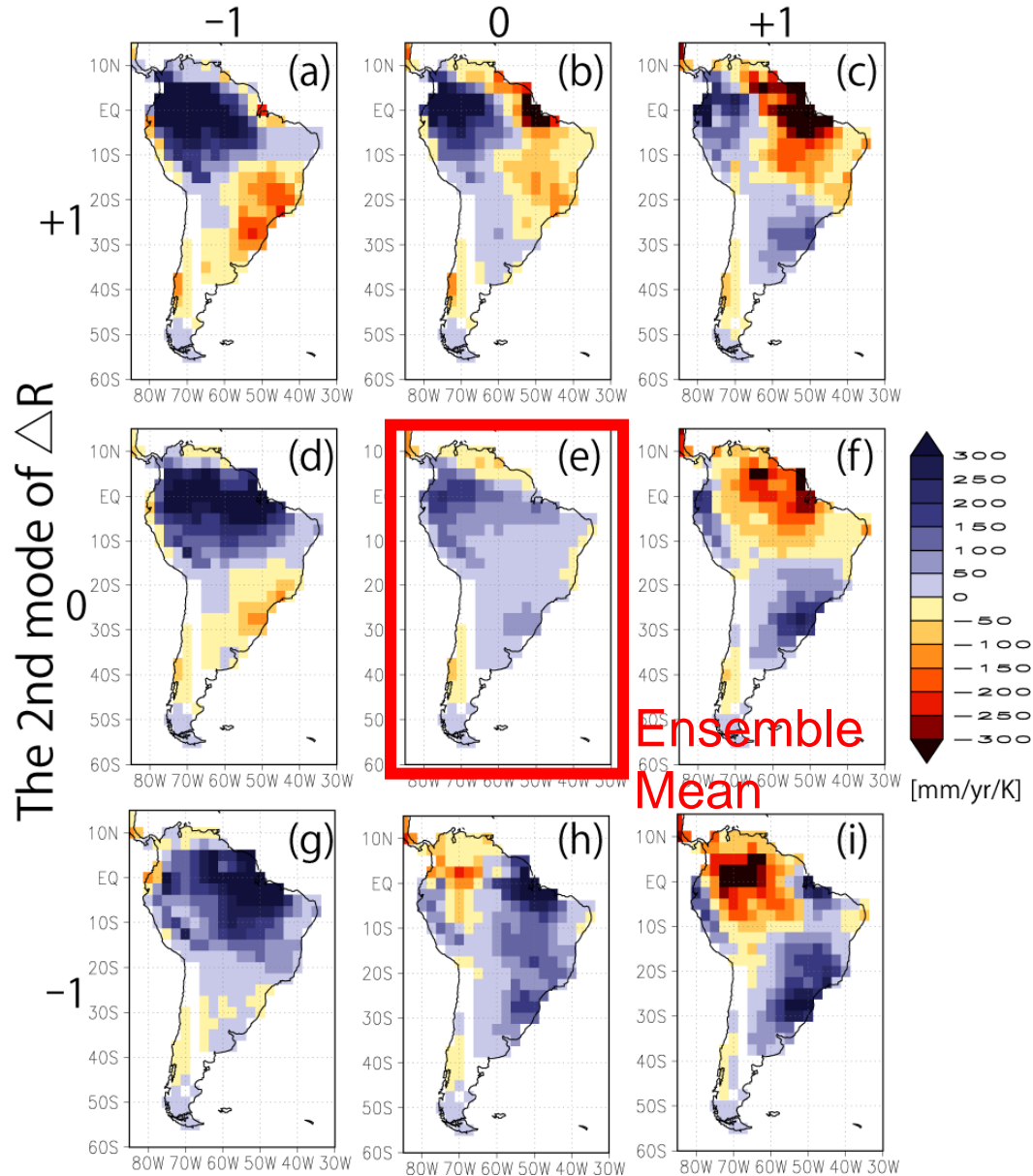
(c)  $\Delta P$





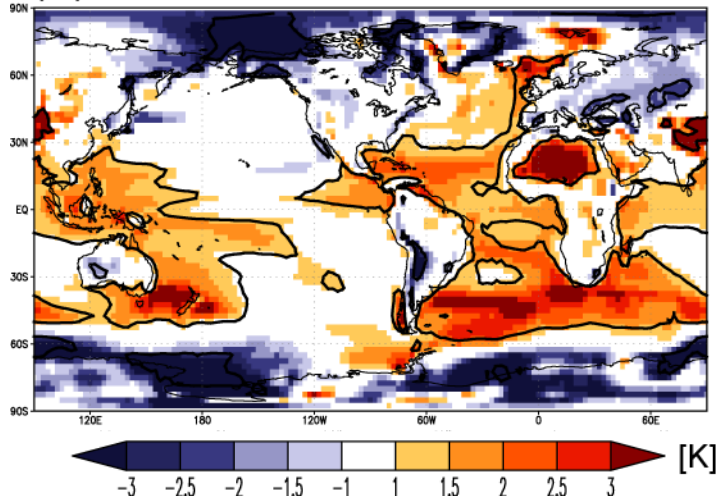
# Inter-model variation in the two modes

The 1st mode of  $\Delta R$

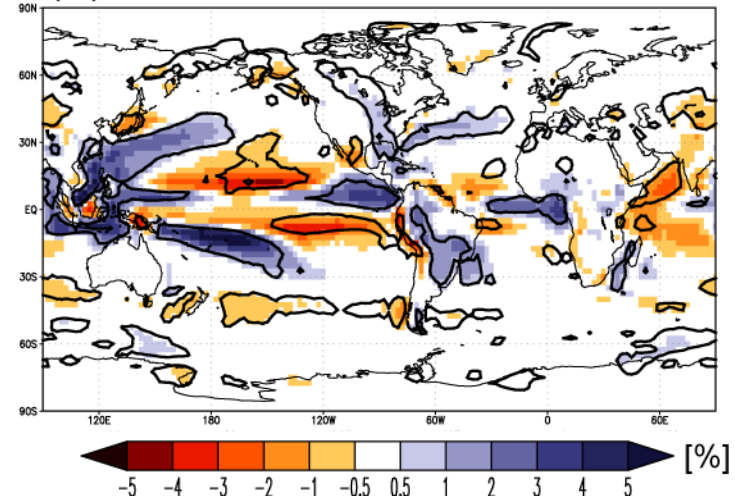


# Patterns of Present Climate Biases regressed on the 1<sup>st</sup> mode

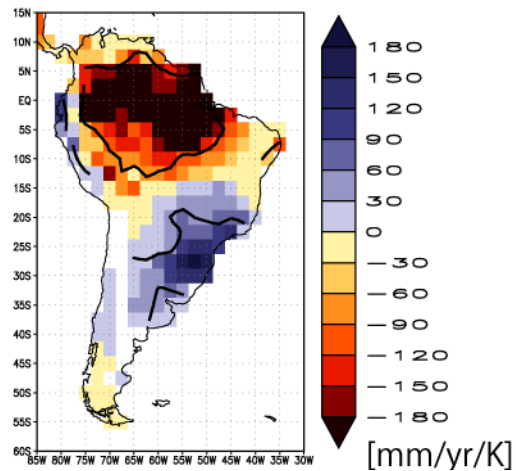
(a) T0



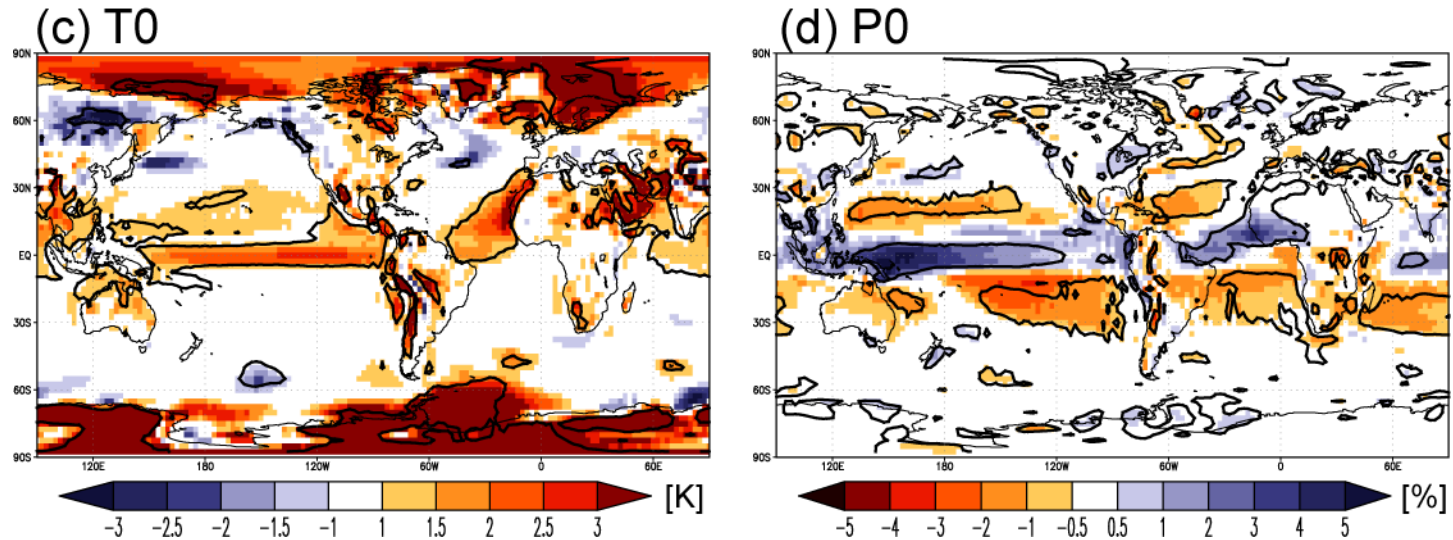
(b) P0



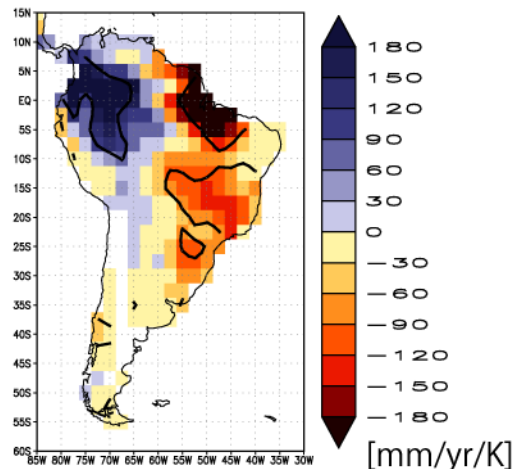
(a)  $\Delta R$



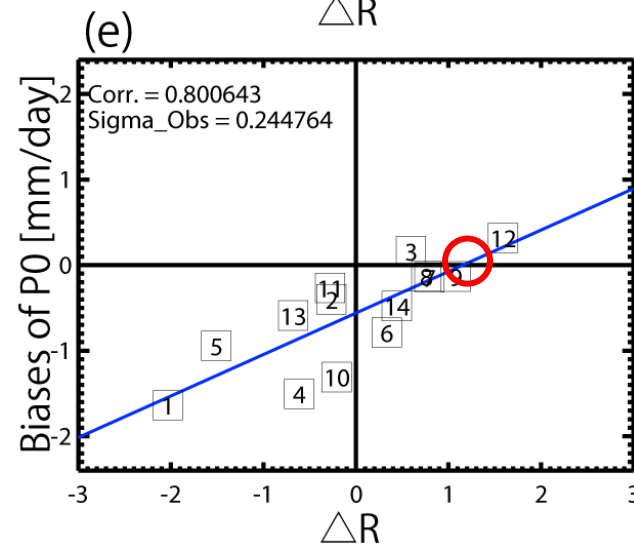
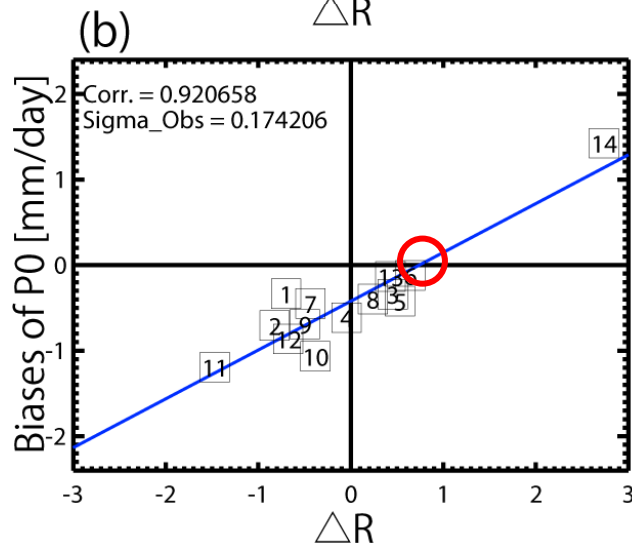
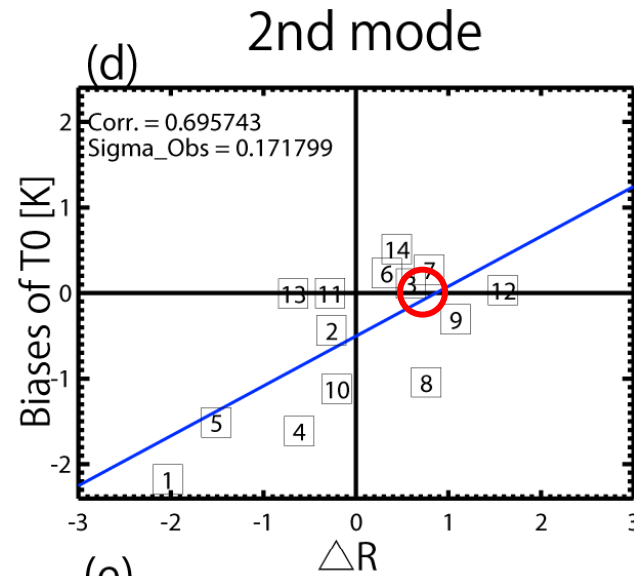
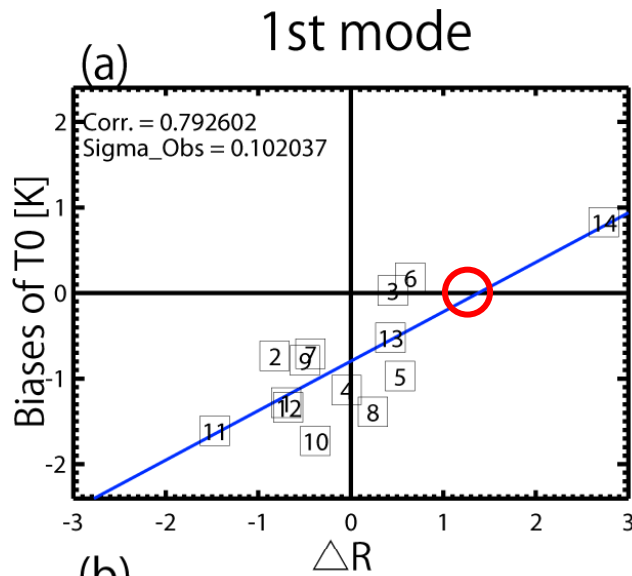
# Patterns of Present Climate Biases regressed on the 2<sup>nd</sup> mode



(a)  $\Delta R$



# Biases of models along the principal modes



~+1 stdv.  
gives the  
Minimum  
Bias for  
1<sup>st</sup> mode

~+1 stdv.  
gives the  
Minimum  
Bias for  
2<sup>nd</sup> mode

Biases = Model minus ERA40 (T) or CMAP (P)

# Constraining Uncertainty

The 1st mode of  $\Delta R$

