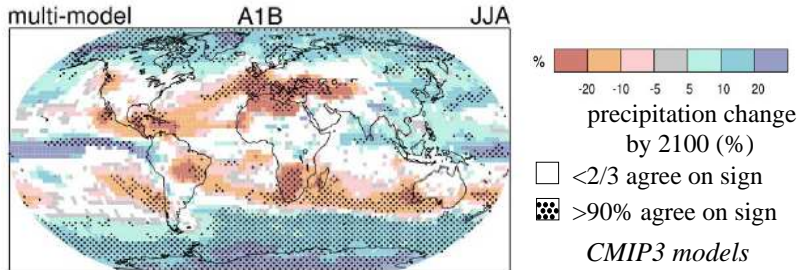# Link between past and future precipitation changes in tropical South America based on CMIP5 simulations

Camille Risi, Sandrine Bony, Françoise Vimeux
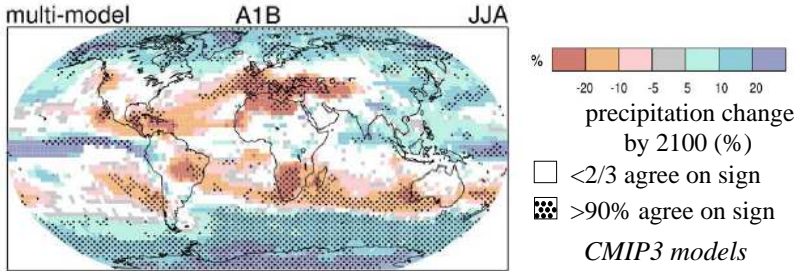
LMD/IPSL/CNRS

Journées Missterre, 21 November 2011

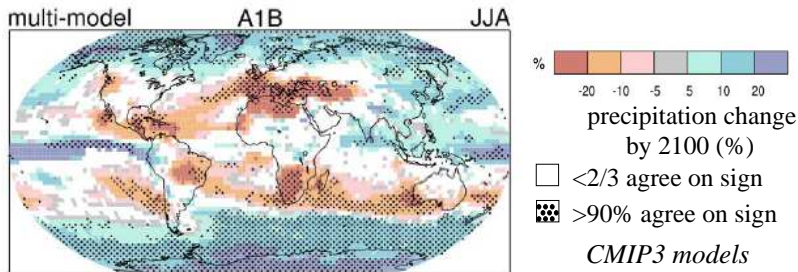# Spread in precipitation projections

Spread in precipitation projections

multi-model   A1B   JJA

%

-20   -10   -5   5   10   20

precipitation change
by 2100 (%)
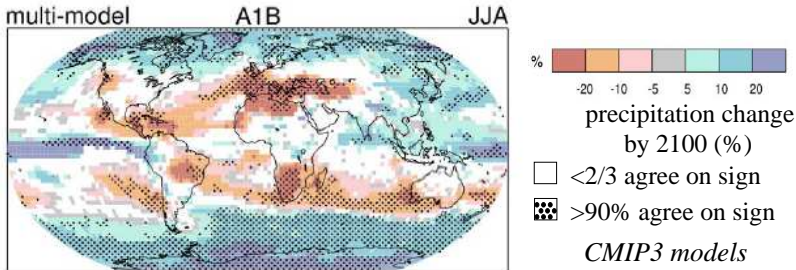
☐ <2/3 agree on sign

▦ >90% agree on sign

CMIP3 models

▶ Can we assess the credibility of future precip projections of
tropical precip using past changes?
  ▶ if a model is better for the past, is it better for the future?
⇒ compare past/future CMIP5 simulations

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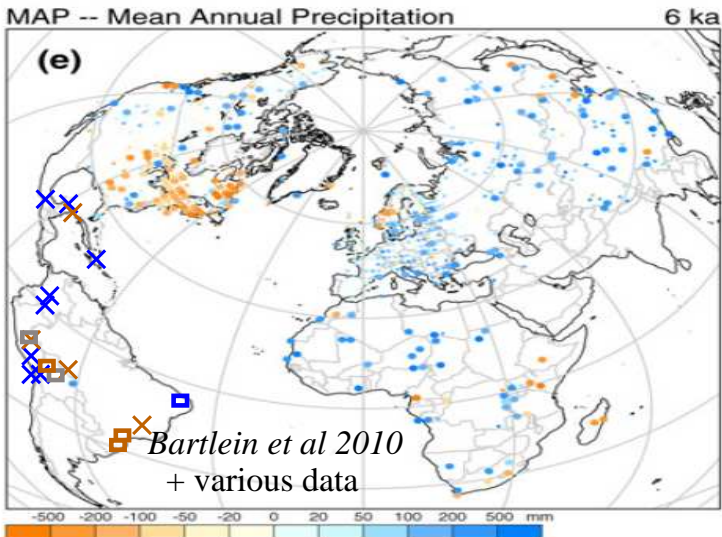- ⇒use idealized CMIP5 simulations

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    - ⇒use idealized CMIP5 simulations
- ▶ Focus on tropical South America
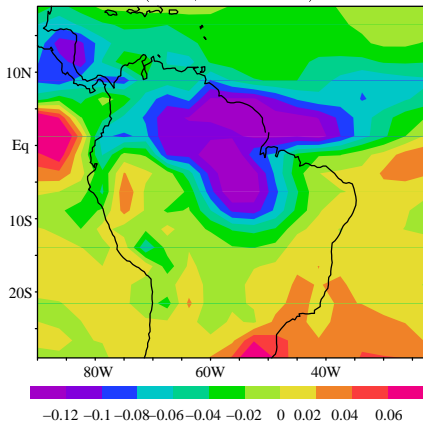- ▶ 9 models with MH, 4 models with LGM ⇒ focus on MH

Mid Holocene (6ka)
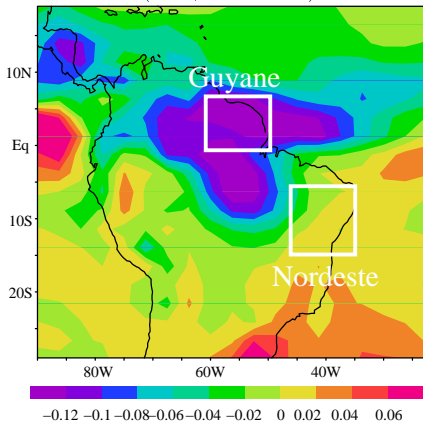
▶ orbital forcing, little CO_2 and temperature changes

MAP -- Mean Annual Precipitation   6 ka

(e)

Bartlein et al 2010
+ various data

-500 -200 -100 -50 -20 0 20 50 100 200 500 mm
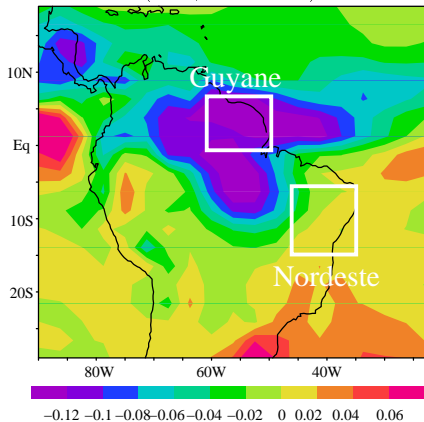
Multi-model EOF of future precip changes

EOF 1 annual-mean ΔP
RCP8.5-PI
(86%, 16 models)

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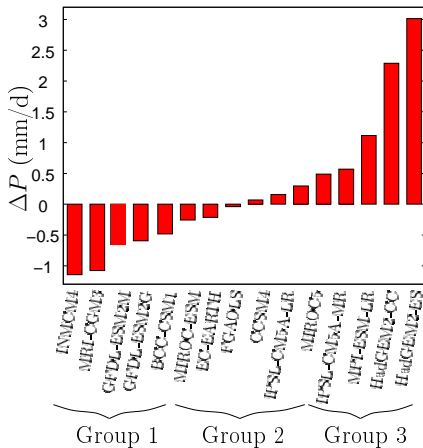RCP8.5-PI
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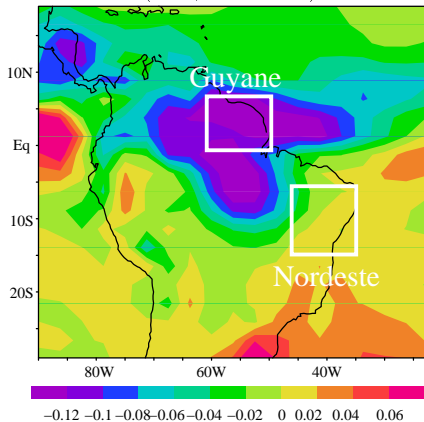RCP8.5-PI
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Guyane-Nordeste
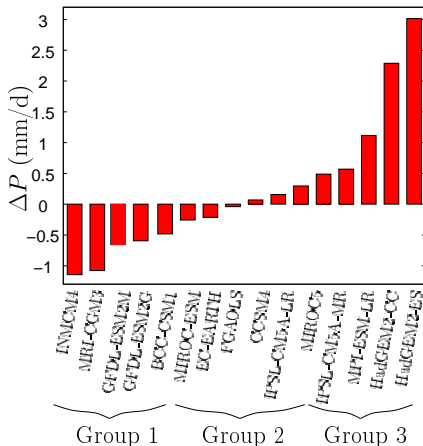RCP8.5-PI precip change

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Guyane-Nordeste
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$\Rightarrow$ composites for $\neq$ groups, correlation ΔP index vs other indices

Link between future climate and MH

group 1   group 3

RCP85−PI

MH−PI

−1.5 −1 −0.7 −0.4 −0.2 0.2 0.4 0.7 1 1.5   r=0.93

Annual mean precipitation change (mm/d)

Link with Atlantic SSTs

surface temperature change
(normalised by tropical mean SST)

r=0.67
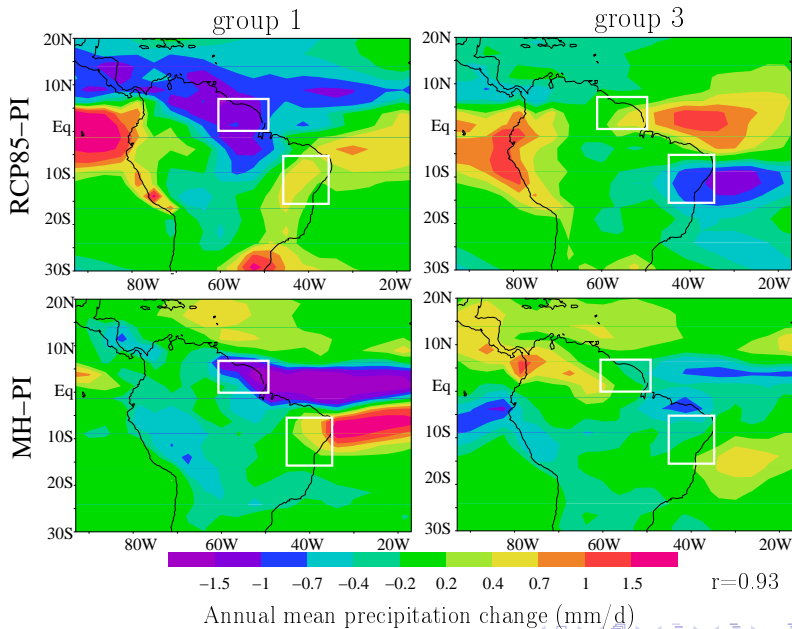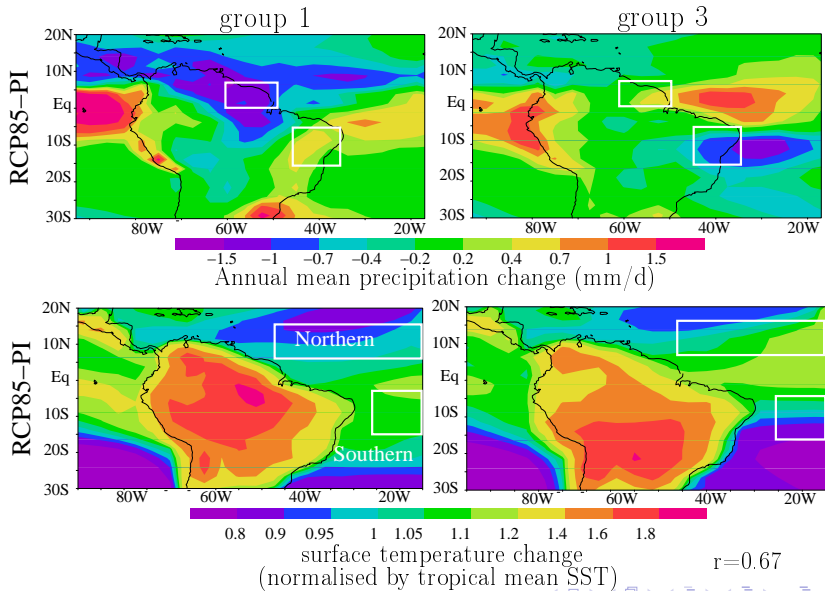
Link with direct CO2 effect

- sstClim4xCO2 vs sstClim
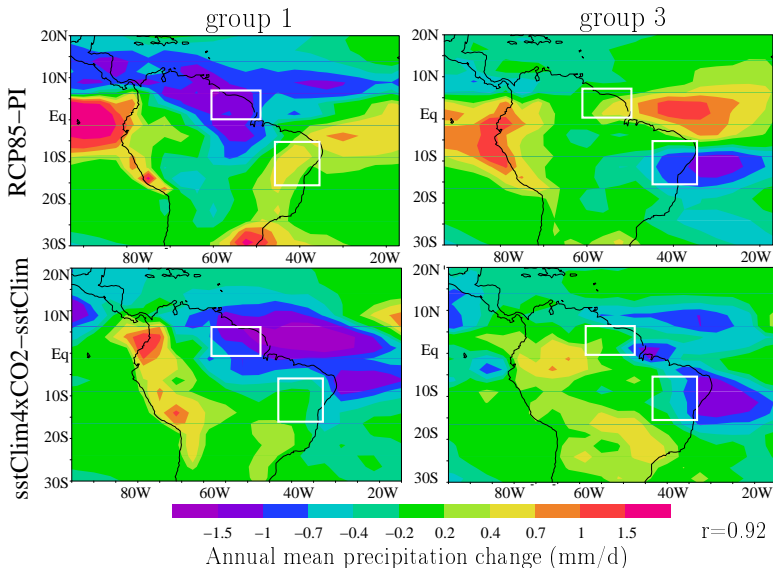
group 1   group 3

Annual mean precipitation change (mm/d)

r=0.92

Summary

In models where precip decreases in Guyane and increases in Nordeste in RCP8.5:

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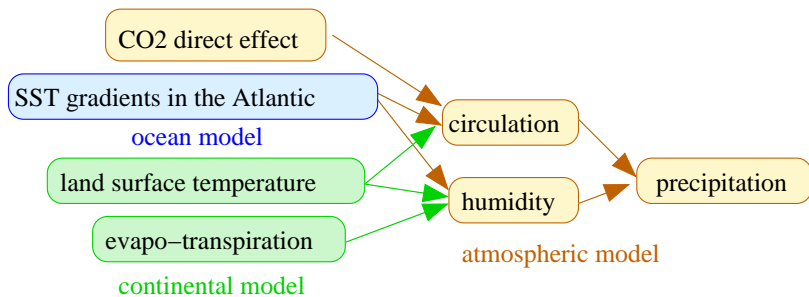- ▶ the double ITCZ problem is less frequent (r=-0.66) ⇒?

Perspectives

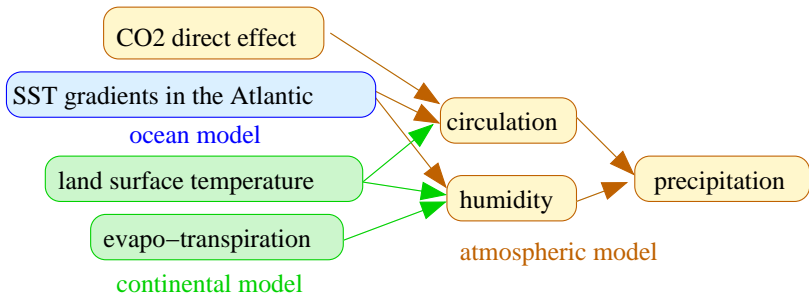▶ Work in progress to understand mechanisms in future, MH:
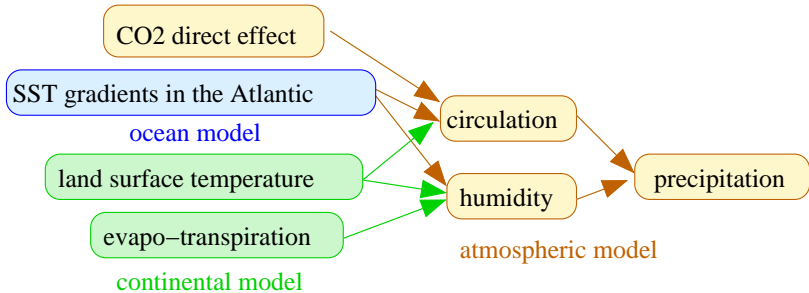
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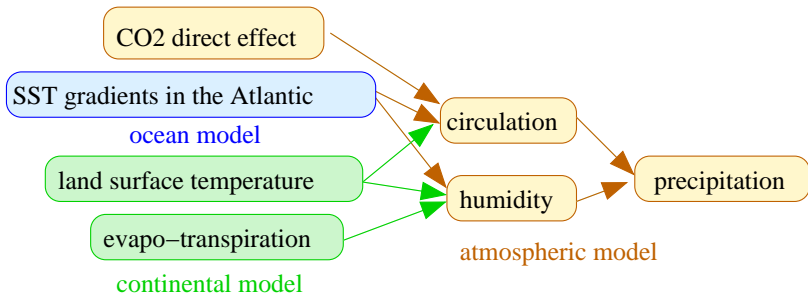⇒use decomposition framework of *Bony et al submitted*

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- Will be continued within ANR ISOTROPIC of F. Vimeux