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CLIMATE CHANGE RESEARCH

Low-level Circulation, Moisture Convergence and Precipitation Biases in Regional Climate Simulations for Central America with COSMO-CLM

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Main Aim of Study & Default Configuration

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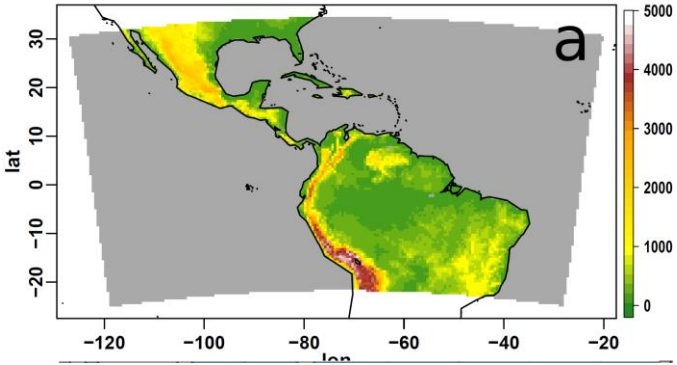
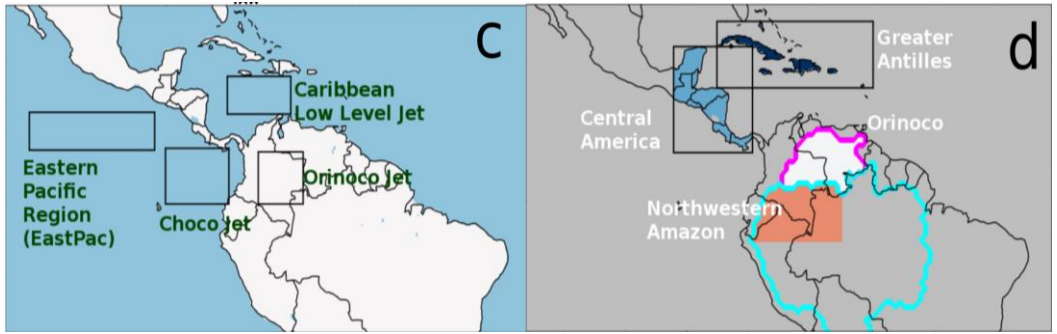
COSMO-CLM Evaluation determining a reliable configuration for climate projections

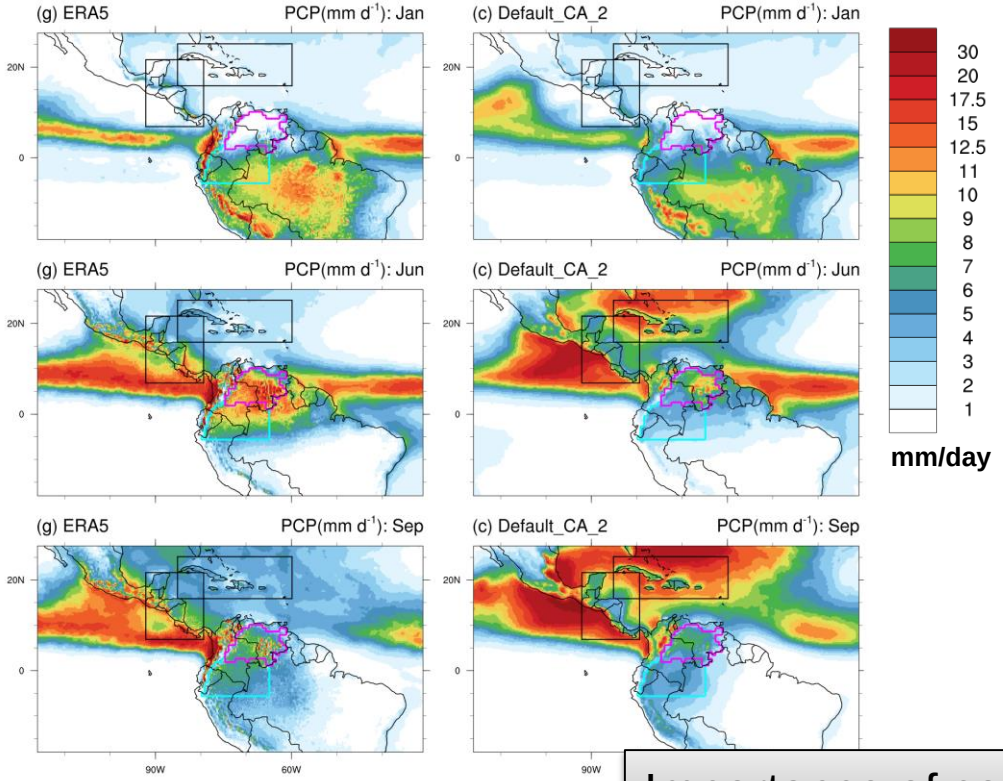
Default Configuration - Lange et al. 2015 CORDEX South America

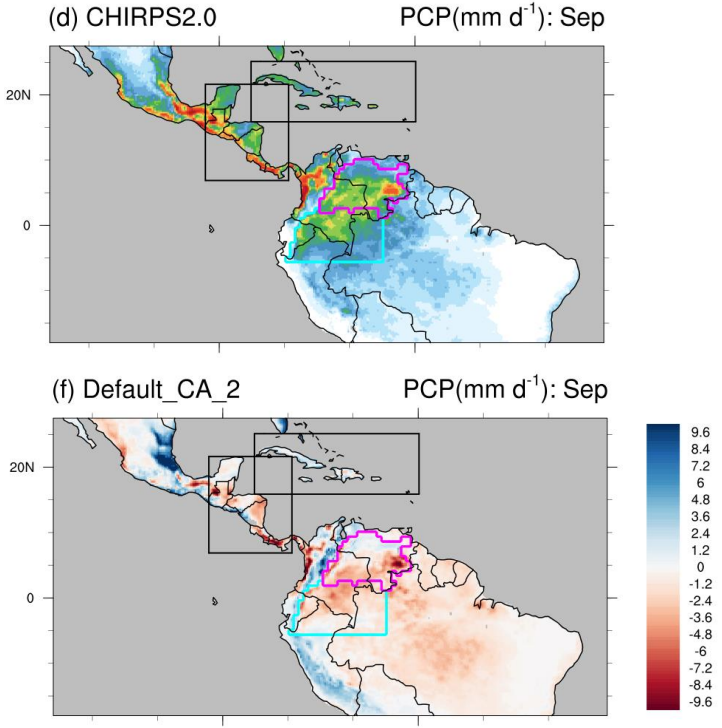
- Target-period: 1991-2015
- Spatial Resolution: 0.22°
- Drivers: ERA-INTERIM
- IFS Tiedtke-Bechold scheme for convection
- 40 vertical layers
- Prognostic TKE-based scheme for vertical turb. Diff.
- 10 soil layers and Soil hydraulic active boundary layer at 7 meters





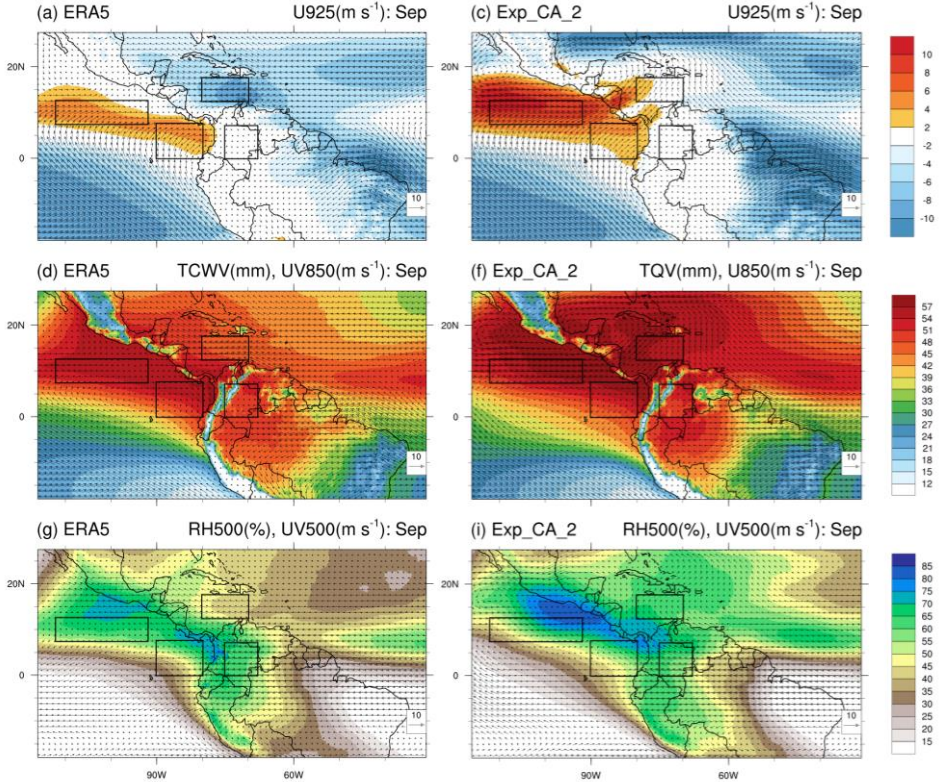
Monthly Precipitation Default Configuration





Importance of considering the entire domain of study

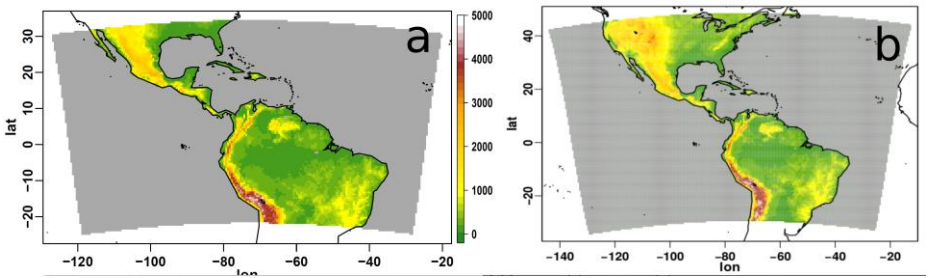
Biases Default Configuration



Possible Drivers of Evinced Biases

1. Interaction Ocean-Atmosphere
   RAT_SEA = 20 instead of 10

2. Effect of Boundaries



Role of Ocean-Atmosphere Interaction

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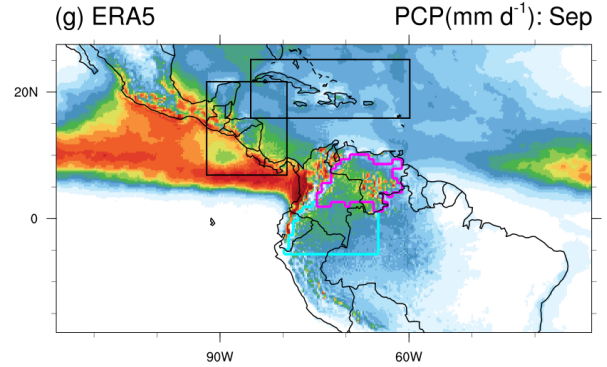
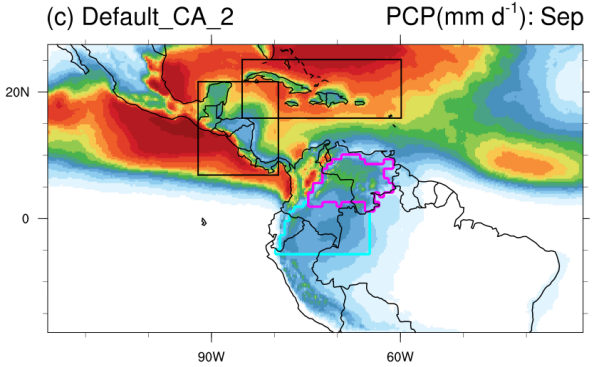
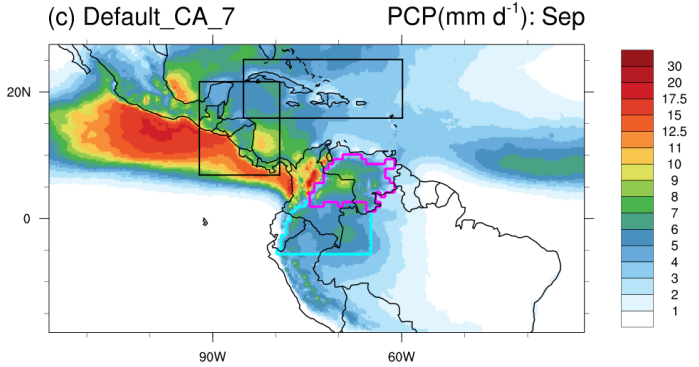


Default



RAT_SEA=20



Regulating heat exchange between ocean and atmosphere allows to correct the anomalous model behaviour

Effect of Extended Domain Vs Heat-Exchange

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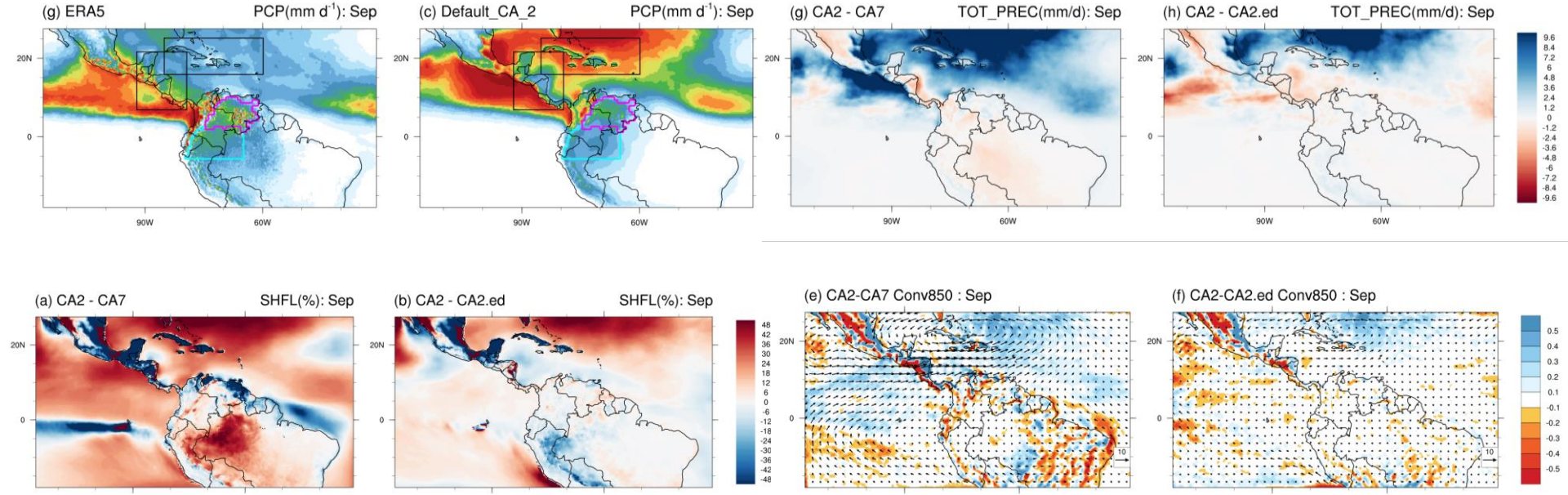
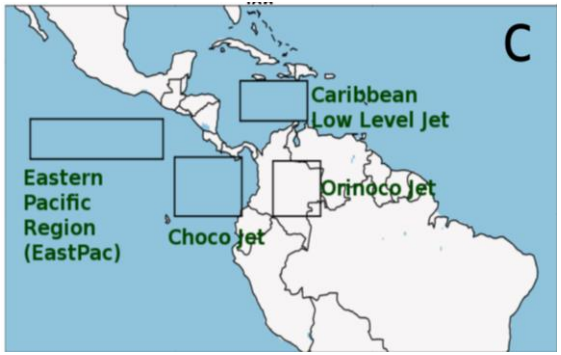
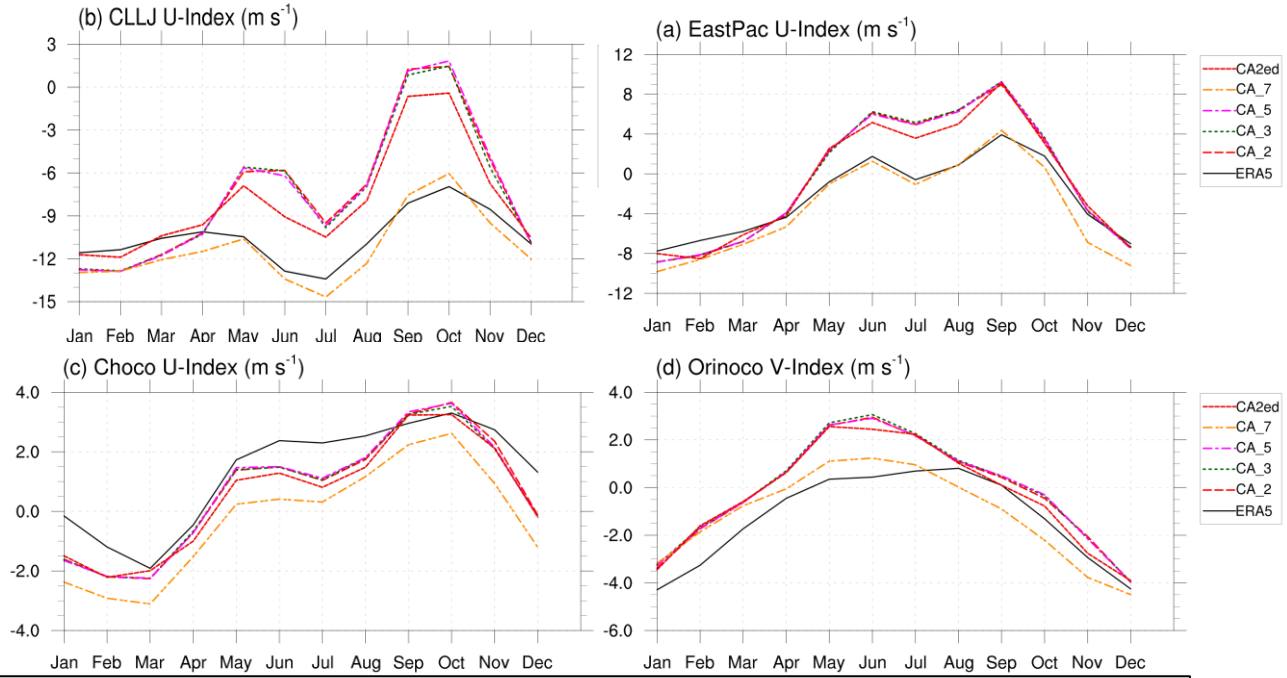


Role of Pacific Ocean in driving circulation changes and moisture convergence

Analysis of Wind Indices & Additional Tests

- Turbulence Options (CA_3)
- Orography Filtering (CA_5)





Simulation with modified rat_sea (CA_7) new reference for additional tests

Monthly Temperatures Biases in New Tests

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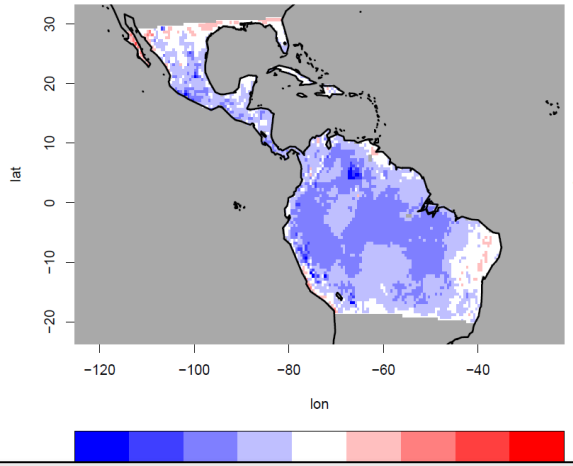
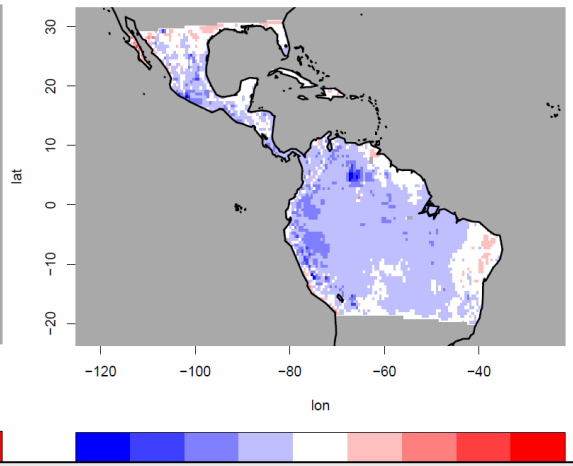
In new simulations target Vegetation and Soil Processes:
- Read a map from ext par for minimum stomata resistance of plants

May

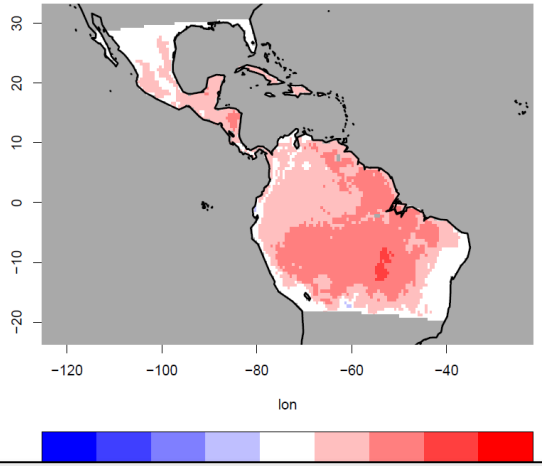
NEW_REF-CRU



STOMATA-CRU



STOMATA-NEW_REF

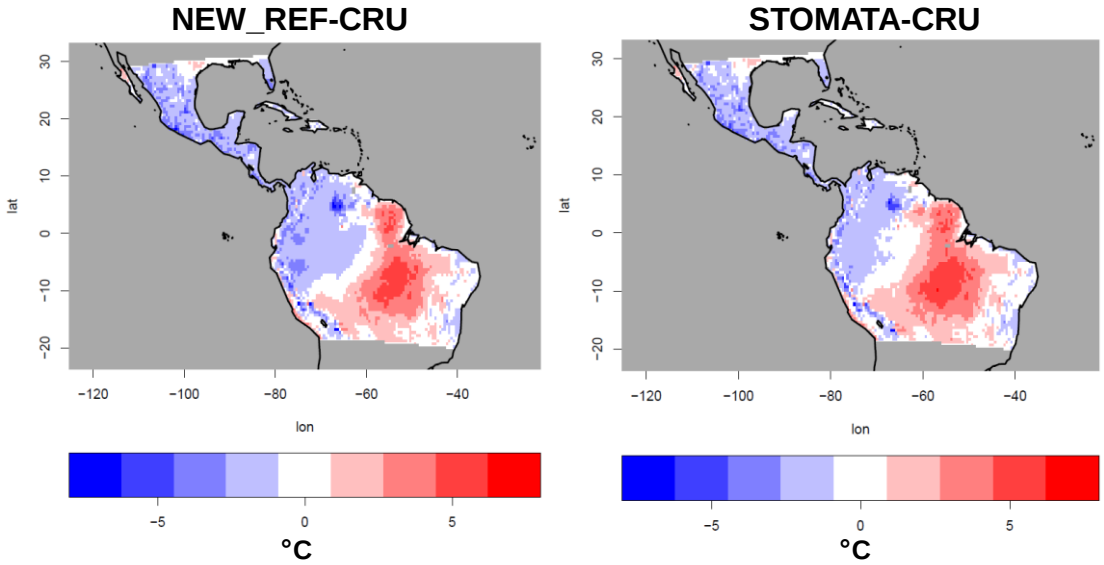


Important improvements for T2M: biases well within ranges of other CORDEX regions

Monthly Temperatures Biases in New Tests

Still some Issues remain and further tests are required

Sep



Currently designing new tests specifically targeting T2M warm bias over Amazonia during the wet season

Conclusions & Outlook

- Importance of Ocean-Atmosphere heat exchange for properly simulating atmospheric circulation and moisture convergence
- A crucial role seems to be played by the Pacific Ocean: further analyses on-going
- Importance of as exhaustive as possible evaluation targeting processes, several variables and the whole domain
- Biases in temperature reduced by reading an external map for the minimal stomata resistance
- Further Tests needed: also the effect of increasing resolution will be tested
- 2021 first projections planned

Thanks for your attention!

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