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WRF Sensitivy Simulations on the CORDEX South America domain

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INTRODUCTION AND OBJECTIVE

- During recent years, have started a coordinated effort for several regions of the world to explore not only the associated uncertainty of the RCM produts but also their quality. In this way, the CORDEX initiative is an excellent example of a coordinated effort, which aims to coordination of international efforts in regional climate downscaling.
- **Goal:** To identify systematic errors and areas with large uncertainties of precipitation on the South American continent. Different radiative schemes, as well as convective and microphysics parametrizations available for the WRF model are tested.

DATA AND METHODS

Data

- For lateral boundary condition: ERA-40
- For validation: TRMM, MERRA and CFSR

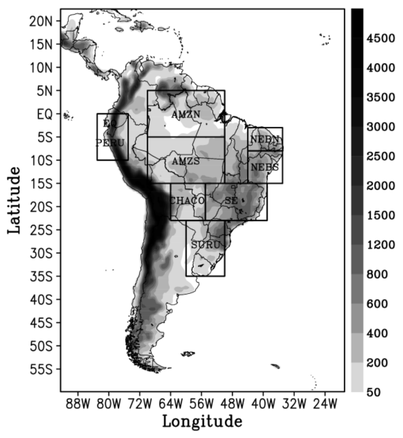
Evaluation Methods

- Study period: **2002**
- Resolution: 50 km (horizontal) and 38 levels
- A total of 10 simulations were run and an ensemble mean between them was generated.
- Three convection schemes, three radiation physics options and two microphysics options were tested.

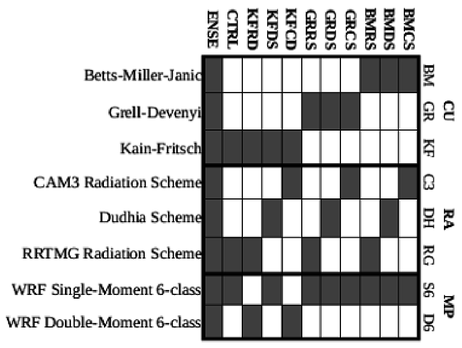
Evaluation Methods

- The simulated monthly average precipitation is assessed using Taylor diagram, which graphically summarize the degree of similarity between each experiment carried out by WRF model and the reference data in terms of the phase and amplitude of their evolution, measured by standard deviation (SD), centered root-mean-square error (RMSE) and Pearson correlation coefficient.
- In addition, we used boxplot diagrams to evaluate whether errors were random or systematic.

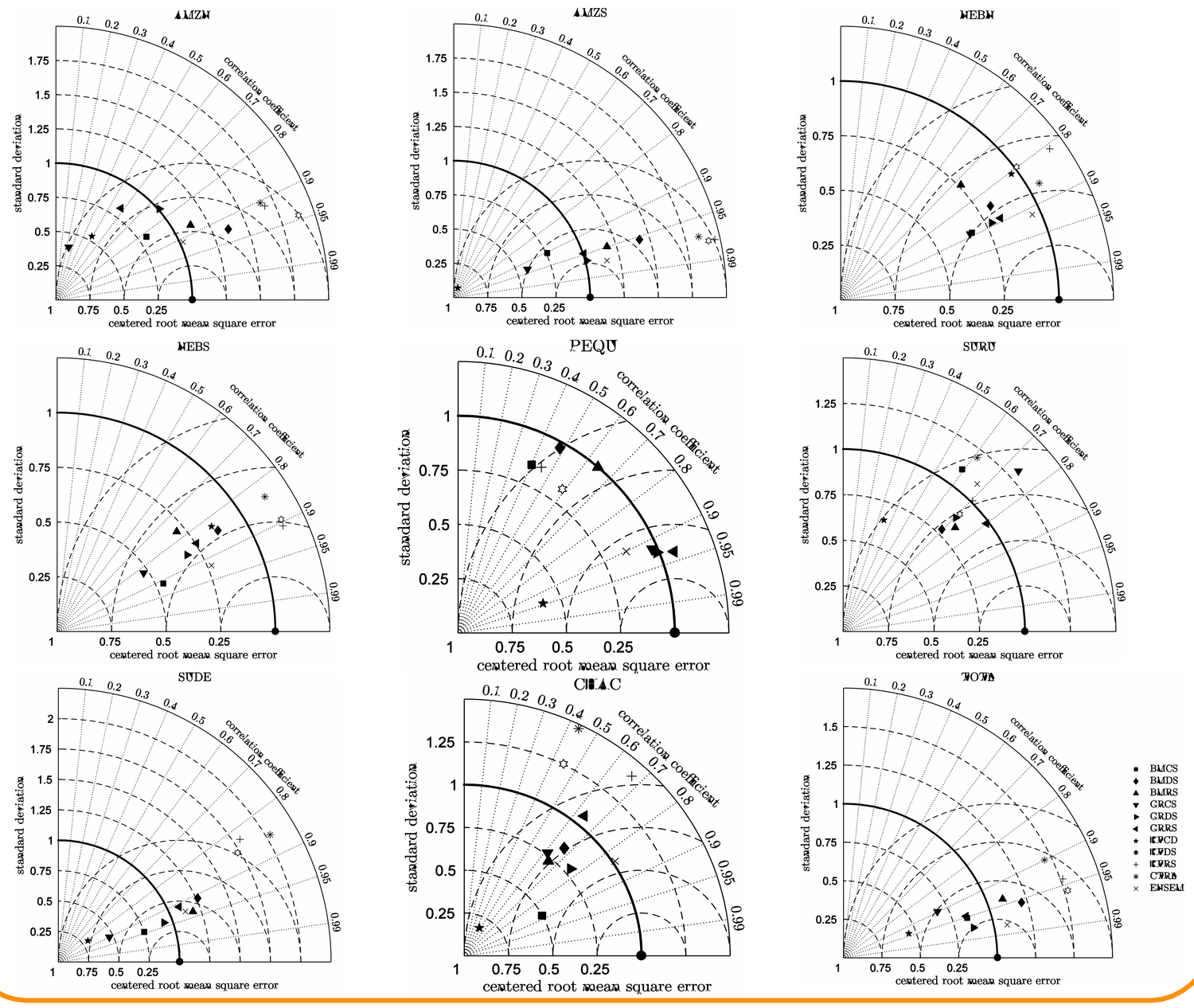
DOMAIN AND TOPOGRAPHY



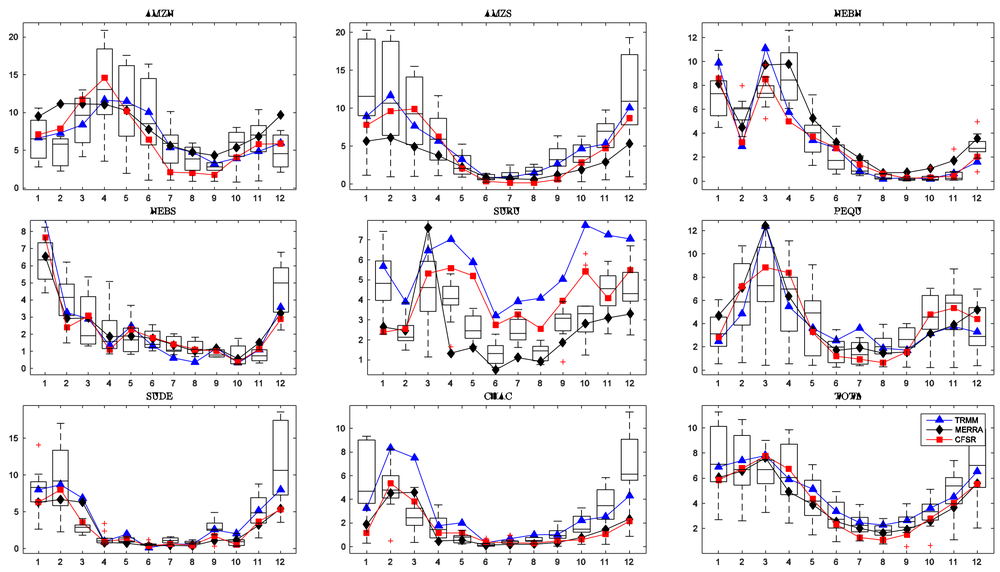
Different model configurations adopted for each experiment



Taylor diagrams for area-averaged montly precipitation



BOXPLOT DIAGRAMS FOR MONTHLY AVERAGE PRECIPITATION



SUMMARY

- A total of 10 simulations were run and an ensemble mean between them was generated.
- Three convection schemes were used, namely the Kain–Fritsch (KF), Grell–Devenyi (GR) and Betts–Miller–Janjic (BM). The radiation physics options selected were the newer version of the Rapid Radiative Transfer Model (RG), Dudhia scheme (DH) and CAM scheme (C3). The tested microphysics options were the WRF single-moment 6-class scheme (S6) and WRF Double-Moment 6-class scheme (D6).
- For control (CTRL) simulation we have used the KF cumulus scheme, RG radiation scheme and S6 scheme for the cloud microphysics.
- Thus, the effects of changing each parametrization can be evaluated comparing every possible combination. In general, most of the experiments showed a good correlation compared to the observed data, except on the PEQU, CHAC regions and mainly over SURU region. Moreover, a greater sensitivity of WRF model is observed regarding the choice of cumulus parameterization used, with Grell in greater conformity with the TRMM data, except in AMZN and NEBS regions.

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