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# Interannual and Intraseasonal oscillations and extreme events over South America simulated by HIGEM models.

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The climatic system has its fluctuations determined mainly by the complex fluxes from the ocean and atmosphere. The fluxes transport energy, momentum and tracers within and between system components; they occur in a wide range of spatial and temporal scales. Because of this, according to Shaffrey et al. (2009) the development of high resolution global models is indispensable, to simulate the energy transfer to smaller scales and to capture the non linear interactions between wide ranges of spatial and temporal scales, and between the different components of climatic system. There are strong reasons to increase the resolution of all the atmospheric and oceanic components of coupled climatic models (AGCM) and uncoupled climatic models (GCM). The South America (SA) climate is characterized by different precipitation regimes and its variability has large influences of the large scale phenomena in the interanual (El Niño South Oscilation – ENSO) and intraseasonal (Maden Julian Oscilation – MJO) timescales. Normally, the AGCM and CGM use low horizontal resolution and present difficult in the representation of these low frequency variability phenomena. The goal of this work is to evaluate the performance of coupled and uncoupled versions of the High-Resolution Global Environmental Model, which will be denominated NUGEM ($\sim$60 Km), HiGEM ($\sim$90 km) and HadGEM ($\sim$135 km) and NUGAM ($\sim$60 Km), HiGAM ($\sim$90 Km) and HadGAM ($\sim$135 Km), respectively, in capturing the signal of interannual and intraseasonal variability of precipitation and temperature over SA. Basically we want discuss the impact of sea surface temperature in the annual cycle of atmospheric variables. The simulations were compared with precipitation data from Climate Prediction Center – Merged Analysis of Precipitation (CMAP) and with temperature data from ERA-Interim, both for the period 1979 to 2008. The precipitation and temperature time-series were filtered on the interanual (period > 365 days) and intraseasonal (30-90 days) timescales using the Fast Fourier Transform (FFT). The occurrence of extreme precipitation and temperature events were analyzed in six sub-regions of SA. The criterion for selection of extremes was based on the quartiles of rainfall anomalies in the bands of interest. The interannual variability analysis showed that coupled simulations intensify the impact of the El Niño Southern Oscillation (ENSO) in the Amazon and southeastern of SA. In the Intraseasonal scale, although the simulations intensify this signal, the coupled models present larger similarities with observations than the atmospheric models for the extremes of precipitation in the SA. Note that there are differences between simulated and observed IS anomalies indicating that the models have problems to correctly represent the intensity of low frequency phenomena in this scale. The simulation of ENSO in GCMs can be attributed to their high resolution, mainly in the oceanic component, which contributes to the better solution of the small scale vortices in the ocean. This implies in improvements in the forecasting of sea surface temperature (SST) and as consequence in the ability of atmosphere to respond to this feature.