



Possible Changes in the Characteristics of the Rainy Season over Northern South America: Results from a Regional Climate Simulation

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Regional Climate Simulations were performed with RAMS6.0 to evaluate possible changes in the behaviour of the rainy season over the Amazon region, within the CORDEX domain of the Inter-tropical Americas. We forced the regional model using data from one of the CMIP5 participants (HadGEM2-ES), both for the Historical Experiment (1980-2005) and along the XXI century under RCP 8.5 (heavy-emission scenario). Regarding projections, we analyzed results for three time slices, short (2014-2035), middle (2044-2065) and long term (2078-2099), according to the following steps. First, the spatially averaged precipitation in non-overlapping pentads over 7 sub-regions over northern South America was calculated ("boxes" 1 to 7). Then, we calculated the climatological annual cycle for each one of them. Finally, dates of the onset and demise of the rainy season are found, validating the model results against GPCP observations and checking for projected changes. In general, in the Historical Experiment, the model delays the onset of the rainy season over the northern areas and anticipates it over most inland sub-regions. Over eastern Amazon, the regional model represents it properly, besides a delay in the demise of about one month. In short-term projections, there is a slight increase in precipitation and a modest anticipation of the rainy season onset in the coastal areas. Projected changes in the annual cycle of most sub-regions are relatively modest for the short-term and mid-term periods, but may become very significant by the end of the century. Over Colombia (Box 1), which has a bimodal precipitation annual cycle, the model projects a late century increase in the first precipitation peak. Little change is projected for the two boxes roughly covering Venezuela, the Guianas and the northernmost portion of northern Brazilian states (Boxes 2 and 3). The box covering northern Peru and Ecuador (Box 4) shows increased March-April precipitation, but with no significant changes in the phase of the annual cycle. The most important changes are expected over the three boxes corresponding to Brazilian Amazon. Over the westernmost box of them (Box 5), enhanced precipitation is projected towards the end of the century with a marked development of a bimodal annual distribution in the simulation, with well-defined rainfall peaks in November-January and March-May. Over Box 6 (Eastern Amazon) the most dramatic change is expected, with very large reduction of the springtime precipitation and a shift of about a 5-7 pentads in the onset of the rainy season over that area (in contrast, the later portion and the demise of the rainy season remain essentially unchanged). Finally, over Box 7, which covers the transition between the Amazon rainforest and the semiarid Northeast Brazil, the major projected features are a general increase in the wet season precipitation accompanied by a reduction of the dry season rainfall. Onset and demise dates of the rainy season are expected to remain unchanged over that area.