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Configuring a regional model for climate change simulations over South America

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The Regional Atmospheric Modeling System (RAMS), developed at Colorado State University is being used for regional climate simulations at the State University of Ceará in the context of Coordinated Regional Climate Downscaling Experiment (CORDEX). This work describes configuration tests for simulations over an extended South America CORDEX domain, for a short period (1984 - 1985). The horizontal model grid comprises 182 by 172 points with 50 km spacing, ranging from 85.25W - 20.75W and 58.75S - 15.25N. The regional model was driven by data from the member 1 of the historical run from the global model HadGEM2-ES and regional model precipitation results were compared against GPCP data. The use of large-scale nudging was shown to be a very important parameter, as we tested central nudging timescales ranging from relatively strong (12h) to weak (10 days). Strong nudging was generally associated with a wet bias over the Amazon and Central Brazil, which was reduced as the nudging timescale increased. Simulations with weak nudging, in opposition, tended to produce a dry bias. The role of the width of the nudging "buffer zone" for lateral nudging was also investigated and model results suggest that a small number of points (3, in our case) can indeed be used, with no negative impacts in the model results over the area of interest within its domain We analyzed model sensitivity regarding parameters of plant fisiology (such as root depth and stomatal resistance), and the number of model soil levels, but those showed less influence in model results. In the end, we found that the best possible RAMS configuration that enable investigating climate processes and climate change over South America (especially over the Amazon) is the one that uses a 5-day large-scale nudging timescale, a 3-point "buffer zone" for lateral nudging and a 2,0m deep soil model, with 20 levels.