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Dynamical downscaling of historical climate over CORDEX Central America domain with a regionally coupled ocean-atmosphere model

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ABSTRACT

Recently, there has been a concerted effort by several research groups to model precipitation variability for North America and Central America in the context of the Coordinated Regional Climate Downscaling Experiment (CORDEX). One important objective of CORDEX is to dynamically downscale global output from coupled and non-coupled models and to objectively gauge a measure of added value from higher resolution boundary conditions forcing regional atmospheric and ocean models at their lateral walls. Up to now, a sufficiently large computational domain covering from the southern US to the north of South America including the eastern Pacific Ocean, the southern Atlantic and the Caribbean Seas has been lacking. Such a computational domain permits the analysis of an ample range of inter-annual and intra-seasonal time-scales phenomena and the possibility of exploring sensitivity to horizontal resolution. To date, most simulations performed for the region remain too coarse to be of any use at the regional scale but also, and most importantly, most modeling studies of the region rely on regional atmospheric models forced at their lower boundaries by prescribed sea surface temperature. In this work we explore both, climate sensitivity to coupling and, to the choice of horizontal resolution, using a regional atmospheric model (REMO) coupled to a global ocean model (MPI-OM). External atmospheric forcing is applied to REMO at its lateral walls and over the ocean surface that is not coupled to REMO. In order to gain insight into the sensitivity to the choice of the atmospheric forcing, two sources are used: 1) ERA-Interim and 2) a global free run of the MPI-ESM coupled system. Preliminary results suggest that the original biases between the ERA-Interim and the MPI-ESM forcing data tend to become similar when comparing the downscaled simulations at 50 km and 25 km atmospheric resolutions. Additionally, biases at 25 km tend to become smaller over most of the computational domain when compared to ERA-I data. Coastal regions in the Western Atlantic, however, remain a challenge to simulate properly