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Sensitivity of seasonal climate and diurnal precipitation over Central America to land surface and SST schemes in RegCM4

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Multi-annual simulations over the Central America CORDEX domain are conducted with the latest version of regional climate model RegCM4 driven by ERA-Interim reanalysis fields. The RegCM4 system can reproduce both the annual cycle and the spatial patterns of mean summer precipitation over Central America and Mexico. Regional circulation features are also reproduced, although the intensity of the Central America Low Level Jet is underestimated and it is located too far south. Over most land areas, RegCM4 surface air temperatures are lower than observations by 1-3 degrees, which however may also be related to biases in the reanalysis forcing data. The model can realistically simulate the amplitude of the onvective diurnal cycle in areas where the convective triggering is dominated by non-local gravity wave effects. However, the simulation of the phase of the diurnal cycle of convection is less satisfactory, with the peak precipitation occurring earlier than observed, a common fault in atmospheric models.

We also investigate the model sensitivity to land surface and prognostic diurnal SST schemes. Use of the Community Land Model (CLM) instead of the Biosphere- atmospher Transfer Scheme (BATS) results in a warmer and drier land surface and a better simulation of the seasonal average spatial pattern of precipitation. However, with BATS, RegCM4 has a more realistic simulation of the mid-summer drought over the region. The impact of the prognostic SST scheme is generally small. In general, neither of these surface physics upgrades results in a clearly superior model performance.