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Study of the Impact of Saharan dust on west African regional climate using a regional climate model. Advantages, limits and sensitive issues

fabien solmon (1), marc mallet (2), nellie elguindi (1), filippo giorgi (1), and ashraf zakey (3)
(1) ICTP, ESP, Trieste, Italy, (2) LA , OMP, UPS, Toulouse, France, (3) DMI, Copenhagen, Denmark

We first investigate the climatic impact of shortwave and longwave radiative forcing of Saharan dust on the West African monsoon and Sahel precipitation using a regional climate model (RCM) interactively coupled to a dust model and running for a 20 year period. Two competing effects are found. First a reduction of monsoon intensity induced by dust surface cooling and surface fluxes decrease causes a reduction of precipitation, and second an 'elevated heat pump effect' in the higher troposphere induced by dust diabatic warming can in some conditions induce an increase of precipitation. The net average impact of these effects is however a statistically significant reduction of precipitation over most of the Sahelian region. The second part of the study aims at evaluating the sensitivity and the robustness of this climatic signal with regards to sensitive modeling conditions and parameters. We notably investigate the influence of domain boundaries, interactive SST coupling, land surface and convection schemes, dust absorption properties and the use of on line vs climatological dust coupling.