RegCM3-CLM3: Land surface modeling in RegCM and impact on aerosols

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Because the land surface model provides the lower physical boundary condition on the atmosphere, its representation in climate models is crucial. A new state-of-the-science land surface model, Community Land Model version 3, has recently been coupled with the ICTP Regional Climate Model version 3 (RegCM3-CLM3). Simulations with the new model (1992-2001) over Europe and northern Africa show significant improvement in the simulation of summer monsoon precipitation as compared to observations. The RegCM3-CLM3 improves the timing of the monsoon advance and retreat across the Guinean Coast and reduces the precipitation bias in the Sahel and Northern Africa. As a result, simulated temperatures are higher, thereby reducing the cool temperature bias noted in northern Africa in RegCM. The mechanisms for this strong feedback include a stronger temperature and moist static energy gradient in the BATS simulations, which allows the movement of the African Easterly jet too far to the north. In the CLM3 simulations, the migration and position of the AEJ more closely match observations. The change in land surface scheme therefore has the ability to impact regional scale circulation over areas of strong land-atmosphere coupling. Additionally, these land surface changes to precipitation and soil moisture are likely to impact the emissions of aerosols to the atmosphere. The important land surface features with respect to aerosol modeling will also be discussed.