

Regional-scale aerosol-climate feedbacks of anthropogenic and biogenic aerosols

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Abstract: The role of atmospheric aerosols on global and regional surface air temperatures is well recognized in the climate system, however regional heterogeneities are likely to be large based on the short lifetimes of aerosols in the troposphere. In this talk, I will examine the role of anthropogenic and biogenic aerosol feedbacks at the regional scale. Generally, the localized impact of aerosols is the surface energy balance is relatively small (10-20%), yet a regional climate model simulates a stronger aerosol-land surface feedback through changes in the regional circulation. Decadal-length, 25km regional climate model simulations with anthropogenic aerosols triggers a cooling in the southern Great Plains of up to 0.5 K and a weakening of the Great Plains Low Level jet. We hypothesize that the weakening of the GPLLJ is triggered by black carbon warming over the central US, thereby altering precipitation patterns in the region and causing remote aerosol-land surface feedbacks. In addition to anthropogenic aerosol sources, primary biogenic aerosols are increasingly being investigated for their contribution to the total aerosol forcing. Specifically, biological pollen and its rupture to sub micron particles will be discussed, including experimental evidence for their role as cloud condensation nuclei.