Regional Impacts of Carbonaceous Aerosols, 1850-2100

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Measurements of carbonaceous aerosols in ice cores allow us to study historical atmospheric compositions. These datasets in combination with climate models are of great value when examining the role of anthropogenic emissions of carbonaceous aerosols and their role in past and future climates. In this presentation we analyze four transient climate simulations performed with the GISS-modelE climate model. Simulations differ in ocean couplings and aerosol schemes. One aerosol scheme, MATRIX, resolves aerosol microphysics and tracks mass-, number concentrations and aerosol mixing state information. The second scheme is a mass based scheme, but includes a secondary organic aerosol model. The two oceans are ocean A, which uses prescribed sea surface temperatures, and ocean C, a fully coupled dynamical ocean model. Regional analysis for past and future (1850-2100) simulations will focus on Greenland, the Himalayas and the Antarctic. Each region has its specific characteristic; Greenland's historic atmospheric chemistry is strongly influenced by pre-industrial land clearing, whereas its future seems to be dominated by cloud feedbacks; the Antarctic is a good indicator for remote background conditions here differences in aging and removal between the different schemes can be detected; the Himalayas show the most complicated feedbacks, due to its complex terrain, several distinctive different air-mass types influence the region as well as dynamical systems. The two different ocean schemes show a shift in the ITCZ, impacting the distribution of carbonaceous aerosols. In the end, future climate projections of the focus regions along CMIP5s four Representative Concentration Pathways (RCPs) will be presented.