



Chemical processing of Sahara dust aerosol during long-range transport

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A version of the coupled aerosol-climate model ECHAM5-HAM that includes a parameterization for cloud processing (i.e., aerosol activation and aqueous phase sulfur chemistry), was used for a simulation of tropospheric aerosol during the IMPACT measurement campaign, conducted in May 2008 at Cabauw (The Netherlands). The climate model reproduces actual meteorology, atmospheric transports and cloud formation through nudging with ECMWF temperature, surface pressure and divergence. Monthly averaged concentration profiles of Aitken and accumulation mode aerosol are in good agreement with observations, and simulated cloud droplet radii over land and over the ocean are consistent with MODIS retrievals. The end of the campaign was characterized by large scale transport of Sahara dust over the polluted central Europe. According to the model results the dust aerosol was subject to chemical processing during transport, in the form of condensation of soluble sulfate on the unsoluble dust particles. Comparison with a simulation where anthropogenic emissions are not considered shows that the processing of the dust particles by anthropogenic pollution contributes significantly to CCN concentrations at Cabauw and has a significant impact on cloud formation in NW Europe during the IMPACT campaign. This event is an interesting illustration of the mutual influences between atmospheric species from natural and from anthropogenic origin, and their effect on radiative properties of the atmosphere.