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Modeling the processing of mineral iron during dust transport

Ulrike Vogelsberg, Ralf Wolke, Andreas Tilgner, Ina Tegen, and Hartmut Herrmann
Leibniz Institute for Tropospheric Research, Leipzig, Germany (vogelsb@tropos.de)

The Saharan desert and the Gobi desert are the main contributors to Aeolian desert dust, which is a major source of micronutrients to the remote ocean regions. Micronutrients, such as transition metals like iron or copper, are regarded essential for biological processes of different marine species. In this context recent studies have shown that soluble iron, since it is generally the most abundant transition metal in dust particles, has the ability to control marine productivity and thereby likely influence the CO_2- budget. Nevertheless, the processing of desert dust leading to the release of soluble iron still lacks sufficient understanding since several factors control the solubilization process. Especially anthropogenic emissions are regarded to significantly add to the amount of soluble iron by acidification of dust particles or by the direct emission of soluble iron comprised, e.g. in coal fly ash.
For the investigation of the dissolution process of iron that takes place during dust transportation the spectral air parcel model SPACCIM is used. A mechanism describing the precipitation and dissolution of mineral particles by heterogeneous surface reactions has been implemented. Trajectory properties were derived from COSMO-MUSCAT simulations or from re-analysis data by HYSPLIT. Differences in the chemical composition and the amount of anthropogenic and naturally emitted species on the North African continent and the highly industrialized region of South-East Asia have considerable impact on the acidification of the desert dust. Under this aspect, special cases of dust outbreaks of the Saharan desert and the Gobi desert are investigated and compared with focus on soluble iron produced.