Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06165, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06165
EGU General Assembly 2008

Mineral dust and cirrus cloud formation: an integrated perspective using satellite observations and trajectory modeling

A. Wiacek and Th. Peter

Institute for Atmospheric and Climate Science, ETH Zurich, Switzerland

Naturally occurring mineral dust is, on a mass basis, the most abundant aerosol in the atmosphere. It is emitted every few days in large quantities from sources in the Sahara in July and August, and a little less frequently from sources in Asia in the spring. It travels great distances westward across the Atlantic in the first case, and eastward across the Pacific in the second. Along the way, it affects biogeochemical cycles and has a radiative impact by strongly reflecting visible radiation and absorbing in the infrared. The latter process causes a strong direct radiative aerosol effect, which feeds back on surface temperatures and winds, as well as on climate. One of the biggest uncertainties related to aerosols, however, are their _indirect_ radiative effects via them altering clouds and precipitation patterns. Mineral dust is known to be an efficient nucleus for the formation of ice clouds (cirrus); however, uncertainties in this aerosol's atmospheric lifecycle are very large and currently prevent accurate quantitative estimates of its impact on the ice phase of clouds and precipitation.

In this paper, we present insights gained into the role of mineral dust in ice cloud formation from an analysis of data from the CALIPSO LIDAR instrument (launched in 2006) and from the passive MODIS instrument operating in the visible and infrared on the Terra and Aqua satellites since 1999 and 2002, respectively. Focusing on strong dust emission events, we also employed Lagrangian trajectory analyses to trace the transport paths of dust to cirrus-forming regions ($>$ 5-7 km) and as high as the tropopause, where aircraft measurements have identified mineral dusts to be the major fraction of heterogeneously formed ice particle residuals.