



Do Aircraft Black Carbon Emissions affect Cirrus Clouds on the Global Scale?

J. Hendricks (1), B. Kärcher (1), U. Lohmann (2), and M. Ponater (1)

(1) DLR-Institut für Physik der Atmosphäre, Oberpfaffenhofen, Germany, (2) ETH, Institut für Atmosphäre und Klima, Zürich, Switzerland, (Johannes.Hendricks@dlr.de)

Potential cirrus modifications caused by aircraft-generated black carbon (BC) particles via heterogeneous ice nucleation were studied using the ECHAM general circulation model. The role of BC in cirrus cloud formation is currently not well understood. Therefore, hypothetical scenarios based on various assumptions on the ice nucleation efficiency of background and aircraft-induced BC particles were considered. Using these scenarios, the sensitivity of ice cloud microphysics to aviation-induced BC perturbations is investigated. The model results suggest that cloud modifications induced by aircraft BC particles could change the ice crystal number concentration at northern midlatitudes significantly. Perturbations of the annual mean zonally averaged crystal concentration of 10-40% are obtained for the main flight altitudes, provided that aircraft-generated BC particles serve as efficient ice nuclei. The sign of the effect depends on the specific assumptions on aerosol-induced ice nucleation. These results demonstrate that, based on the current knowledge, significant cirrus modifications by BC from aircraft cannot be excluded.