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Indirect and Semi-Direct Aerosol Campaign (ISDAC): The Impact of Arctic Aerosols on Clouds

Greg McFarquhar and the ISDAC Team
University of Illinois, Dept. Atmospheric Sciences, Urbana, United States (mcfarq@atmos.uiuc.edu)

A comprehensive dataset on arctic boundary layer cloud and aerosol microphysical and radiative properties in the vicinity of Barrow, Alaska was collected in April 2008 during the Indirect and Semi-Direct Aerosol Campaign (ISDAC) sponsored by the Department of Energy Atmospheric Radiation Measurement (ARM) and Atmospheric Science Programs (ASP). The primary aim of ISDAC was to examine the influence of aerosols on clouds influenced by ice to extend studies of aerosol indirect effects that have mainly concentrated on liquid clouds. The experiment utilized the permanent observational facilities of ARM at the North Slope of Alaska (NSA) site in Barrow which include a cloud radar, a polarized micropulse lidar and an advanced emitted radiance interferometer as well as instruments specially deployed for ISDAC including those measuring aerosol, ice fog, precipitation and shortwave spectroradiometer characteristics. The National Research Council of Canada Convair-580 flew a total of 27 sorties during ISDAC, collecting data using an unprecedented 42 cloud and aerosol instruments for more than 100 hours on 12 different days. Data obtained above, below and within single-layer stratus during two golden cases on 8 April and 26 April 2008 are allowing for a process-oriented understanding of how aerosols affect the microphysical and radiative properties of arctic clouds in different surface conditions, with data acquired on a heavily polluted day on 19 April 2008 enhancing this understanding. Data acquired in cirrus on transit flights between Fairbanks and Alaska are being used to better understand the performance of cloud probes in ice. Ultimately these data will be used to improve the representation of cloud and aerosol process in models covering a variety of spatial and temporal scales, and to determine the extent to which long-term surface-based measurements at the NSA site can provide retrievals of aerosols, clouds, precipitation and radiative heating in the Arctic.