Geophysical Research Abstracts,
Vol. 10, EGU2008-A-11447, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-11447
EGU General Assembly 2008

Plans for remote sensing of Arctic cloud and boundary-layer structure during ASCOS

O. Persson(1,2), M. Shupe(1,2), A. Gasiewski(3), I. Brooks(4), M. Tjernstrom(5), T. Uttal(2) and C. Fairall(2)

(1)CIRES, University of Colorado, Boulder, CO USA
(opersson@cires.colorado.edu/303-497-6181)

Plans exist to measure the macro- and microphysical structure of the Arctic clouds and the associated thermal and kinematic structure of the Arctic boundary layer during the Arctic Summer Cloud-Ocean Study (ASCOS), planned for August and September 2008 near the North Pole. ASCOS is an IPY-approved project. These measurements will utilize both remote sensing technology combined with retrieval techniques and in-situ measurements. The remote sensing instruments are provided by the National Oceanic and Atmospheric Administration's Earth System Research Laboratory (NOAA/ESRL/PSD) and the University of Colorado's Cooperative Institute for Research in Environmental Sciences (CIRES). They include a Ka-band cloud radar, an enhanced S-band vertically-pointing cloud and precipitation radar, a ceilometer, a microwave radiometer, a 449 MHz wind profiler, and a scanning 55-GHz radiometer. Retrievals using the Ka-band cloud radar, ceilometer, and microwave radiometer can provide macrophysical properties such as cloud base, cloud top, cloud fraction, cloud duration, and cloud reflectivity and microphysical properties that include cloud phase, liquid water path, and profiles of ice water content, ice particle effective radius, liquid water content, effective drop radius, vertical velocity, and turbulent dissipation rate. The S-band radar will generally provide macrophysical data that is redundant to the Ka-band but may provide better cloud description aloft under precipitating conditions. It will also provide better quantitative measurements of precipitation intensity. Combining the S-band radar data with that from the Ka-band radar provides the potential for new application of dual-frequency retrievals, which may give independent

estimates of water vapor and liquid water content. The scanning 55-GHz radiometer will provide high-temporal resolution temperature profiles in the lowest 1 km, while the 449 MHz wind profiler will provide wind speed and wind direction data between 200 m and 4 km (or higher) at hourly temporal resolution. Doppler sodars to be deployed by the University of Leeds should provide the kinematic structure of the lowest hundreds of meters.

These remote sensing measurements will be supplemented and validated with in-situ aircraft measurements planned by University of Colorado scientists using a low-flying National Aeronautic and Space Administration (NASA) DC-8 aircraft, with in-situ tethersonde measurements provided by the University of Leeds, and four times daily rawinsondes provided by the University of Stockholm. This suite of measurements will be one of the most complete sets of measurements ever obtained in the Arctic boundary layer over the pack ice.

The presentation will summarize these measurement plans, outline the remote-sensor retrieval methods, give examples of data collected from these systems during other deployments in the Arctic, and specify how these measurements will be used to address the objectives of the ASCOS field program.