

GROUND-BASED PASSIVE MILLIMETER-
AND SUBMILLIMETER-WAVE OBSERVATIONS OF THE ARCTIC
ATMOSPHERE

Cimini, D.^{1,2}, Westwater, E. R.^{1,2}, Gasiewski, A. J.²,
Klein, M.^{1,2}, Leusky, V.^{1,2}, Dowlatshahi, S.¹

¹CIRES, University of Colorado, Boulder

²ETL, NOAA, Boulder

During March-April 2004, the Environmental Technology Laboratory (ETL) of the National Oceanic and Atmospheric Administration (NOAA) conducted the Arctic Winter Radiometric Experiment - Water Vapor Intensive Operational Period (WVIOP2004), at the Department of Energy Atmospheric Radiation Measurement (ARM) Programs site in Barrow, Alaska. During the WVIOP2004, a new instrument, developed at NOAA/ETL, was deployed for the first time, the multi-channel polarimetric Ground-based Scanning Radiometer (GSR). The GSR operated continuously for a month, collecting observations at twenty-five channels in the micro- and millimeter-wave spectrum (from 50 to 380 GHz), plus one infrared channel (10 mm). All the channels were pointing simultaneously in the same direction and continuously scanned the atmosphere in elevation down to about 19 deg, both sides. Thus, the GSR provided simultaneous information on the spectral and angular features of the cloudy Arctic atmosphere. The set of frequencies was selected for the simultaneous retrieval of atmospheric temperature profile, water vapor content, cloud liquid path, and cloud depolarization ratio. Particularly, the millimeter- and submillimeter-wave channels are very sensitive to low water vapor content and allow for accurate observations even in the extremely dry and cold conditions typical of the Arctic. Moreover, window channels (e.g. 90 and 340 GHz) show a large sensitivity to Arctic clouds over an extended range of liquid water content. In addition, the depolarisation ratio at 340 GHz and the possibility of radiometric ice water path retrievals are investigated. In summary, an overview of GSR measurements under a variety of conditions will be presented, together with a comparison with colocated active and passive observations, as well as simulations based on in situ balloon-borne soundings.

Abstract Submission Form

2006 National Radio Science Meeting

Abstract: cimini14971

Date Received: September 13, 2005

1. (a) Domenico Cimini
NOAA ETL
R/ET1
325 Braodway
Boulder, CO
80305 USA
domenico.cimini@noaa.gov
- (b) 303-497-6527
- (c) 303-497-3577
2. F - Wave Propagation and Remote Sensing
3. (a)
4. C - Contributed Paper
5. No special instructions