

CALIBRATION OF THE GROUND-BASED SCANNING RADIOMETER DURING THE ARCTIC WINTER RADIOMETRIC EXPERIMENT 2004

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Abstract Submission Form  
2004 National Radio Science  
Meeting

Abstract: cimini22853

Date Received: September 22, 2004

The Arctic atmosphere is extremely important for the climate of our planet, because water vapor and clouds in the Arctic play a key role in the earth's energy budget. Thus, continuous and accurate monitoring of the Arctic atmosphere is needed to improve the understanding of its radiative properties. In contrast, there is lack of continuous measurements due to the extreme and remote conditions. For these reasons, the Environmental Technology Laboratory (ETL) of the National Oceanic and Atmospheric Administration (NOAA) has designed and developed a multi-channel polarimetric microwave radiometer, called the Ground-based Scanning Radiometer (GSR), for continuous and unattended observations of the Arctic atmosphere. The GSR is provided with twenty-five channels in the micro- and millimeter-wave spectrum (from 50 to 380 GHz), plus one infrared channel (10 m). The set of frequencies has been selected for the simultaneous retrieval of atmospheric temperature profile, water vapor content, cloud liquid path, and cloud depolarization ratio. Particularly, the millimeter-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. The design of the instrument allows for three stages of the calibration process, suggesting a high level of expected accuracy. Internal calibration is achieved with fast switching between two reference loads. External hot and cold targets are observed every two minutes, accounting for system thermal drift and providing absolute calibration. Finally, tip-curve up to 3.5 air masses provides the third level of calibration. The GSR has been deployed for the first time during the Arctic Winter Radiometric Experiment held from March 10 to April 9, 2004, at the Department of Energy Atmospheric Radiation Measurement Program site in Barrow, Alaska. The different stages of the calibration process will be discussed and comparisons of GSR data with measurements from other in situ and remote sensors will be presented.

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2. F - Wave Propagation and Remote Sensing
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4. C - Contributed Paper
5. No special instructions