

COMPARISONS OF MEASUREMENTS AND FORWARD MODEL CALCULATIONS OF MILLIMETER- AND SUBMILLIMETER-WAVE BRIGHTNESS TEMPERATURES FOR AN ARCTIC ATMOSPHERE.

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In a companion paper in this digest (Cimini et al, 2006), an overview is given of the Arctic Winter Radiometric Experiment - Water Vapor Intensive Operational Period (WVIOP2004) that was conducted near Barrow, Alaska. During the WVIOP2004, the multi-channel polarimetric Ground-based Scanning Radiometer (GSR) was deployed for the first time. In addition, the Radiometrics Corporation's Microwave Radiometric Profiler (MWRP) was also operated. The major goal of the experiment was to compare measurements of water vapour during cold (-20 to -40 deg C) and dry (Precipitable Water Vapor less than 5 mm) conditions. A variety of in situ data were available, including observations of temperature, pressure, and humidity profiles from radiosondes that carried Vaisala RS90 and chilled-mirror humidity sensors. During clear-sky conditions, comparisons of measured and calculated brightness temperatures can be made using radiosonde data inserted into absorption and radiative transfer models. For our analysis, an infrared radiometer from the MWRP was used to determine clear conditions. In addition to the calibration techniques that are described by Cimini et al.(2006), we also present a quality control method that was required because of radio frequency interference that was sometimes present in the data. Calculations of brightness temperature from five absorption models are compared with measurements: Liebe-1987, Liebe-1983, Rosenkranz-1998, Rosenkranz-2003, and Liljegren-2005. Data are taken at 7 GSR frequencies in the 50 to 56 GHz region, 7 GSR channels near 183.31 GHz, and 7-MWRP channels in the 50 to 58.8 GHz region. We also compare calculations with measurements taken by the dual-polarized GSR channels at 89 and 340 GHz. No one model is superior to the others at all frequencies, although the latter two more recent models show the best overall agreement.

Reference: Ground-based passive millimeter- and submillimeter-wave observations of the Arctic atmosphere, D. Cimini, E. R. Westwater, A. J. Gasiewski, M. Klein, V. Leuski, S. Dowlatshahi, this digest. (National Radio Science Meeting, University of Colorado at Boulder, 2006).

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