

Calculation of Atmospheric Radiances and Brightness Temperatures: In Infrared Window Channels of Satellite Radiometers - U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Environmental Satellite Service, 1980 - 1980 - Michael P. Weinreb, Michael L. Hill

Satellite passive microwave radiometers measure raw antenna counts from which we determine the antenna temperature and then calculate the brightness temperature of the Earth. Large antennas are used for the various channels of the radiometer, and during operation, each antenna feedhorn passes a hot and cold target in order to provide consistently calibrated raw counts. Brightness temperature (also referred to as TB) is a measure of the radiance of microwave radiation traveling upward from the top of Earth's atmosphere. The conversion from radiometer counts to top-of-the-atmosphere TB is called the calibration process. Several calibration processing steps are required to derive the TB values. "We describe a method of simulating measurements of atmospheric radiances and brightness temperatures in wide-bank window channels (at 11 and 3.7 [micro]m) of satellite radiometers. As input the simulation takes vertical profiles of atmospheric temperature and water-vapor mixing ratio, as well as the spectral response functions of the window channels. It models the atmospheric transmittances and integrates the equation of radiative transfer. We demonstrate the use of the method with applications to the Advanced Very High Resolution Radiometer on the TIROS-N satellite."--p.1. 31. Addeddate. "We describe a method of simulating measurements of atmospheric radiances and brightness temperatures in wide-bank window channels (at 11 and 3.7 um) of satellite radiometers. As input the simulation takes vertical profiles of atmospheric temperature and water-vapor mixing ratio, as well as the spectral response functions of the window channels. It models the atmospheric transmittances and integrates the equation of radiative transfer. We demonstrate the use of the method with applications to the Advanced Very High Resolution Radiometer on the TIROS-N satellite."--Page 1. Keywords Since the infrared (IR) radiance measured in space by radiometers and spectrometers is part of the outgoing LW flux, there have been methods to estimate the OLR by combining radiance observations in several spectral regions. For example, a single IR window channel radiance (10-12 mm) from the Advanced Very High Resolution (AVHRR) was used to estimate the OLR by Ohring et al. (1984). By adding water vapor variance, the two-channel technique was applied to calculate the OLR from the geostationary satellite Meteorological Satellite (Meteosat)-2 by Schmets and Liu (1988). ... The representative applications of satellite observations of the earth radiation budget in climate studies are discussed. Keywords: absorption, brightness temperature, radiometer, radiative transfer equation, remote sensing, scattering, sounding channel, window channel. Contents. 1. Introduction 2. Principles of Satellite Remote Sensing 2.1 A satellite-borne radiometer receives radiative energy from the Earth and its atmosphere. The received energy may be the emission originated from, or the reflection by the Earth and atmosphere, or a combination of both. Therefore, the radiometer-received energy contains the information on the characteristics of the atmosphere and its underlying surface. [This article describes how radiances at sounding channels of TOVS is assimilated in numerical weather prediction models]. Fairall, A. B. White, J. B. Edson, and J. E. Hare (1997).