Abstracts

Prelaunch Calibration of the Advanced Microwave Sounding Unit-A for NOAA-K

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The thermal-vacuum chamber calibration data from the advanced microwave sounding unit-A (AMSU-A) for NOAA-K, which will be launched in 1997, were analyzed to evaluate the instrument performance, including calibration accuracy, nonlinearity, and temperature sensitivity. Particularly, the nonlinearity parameters which will be used for correcting the nonlinear contributions from an imperfect square-law detector were determined from this data analysis. It was found that the calibration accuracies (differences between the measured scene radiances and those calculated from a linear two-point calibration formula) are polarization-dependent. Channels with vertical polarizations show little cold biases at the lowest scene target temperature 84 K, while those with horizontal polarizations all have appreciable cold biases, which can be up to 0.6 K. It is unknown where these polarization-dependent cold biases originate, but the instrument's manufacturer suggests that the source of the observed biases is probably due to some low-level coherent radiation leakage from the instrument itself. The existence and magnitude of nonlinearities in each channel were established and a quadratic formula for modeling these nonlinear contributions was developed. The model was characterized by a single parameter u, values of which were obtained for each channel via least-squares fit to the data. Using the best-fit u values, we performed a series of simulations of the quadratic corrections which would be expected from the space data after the launch of AMSU-A on NOAA-K. In these simulations, the cosmic background temperature of 2.73 K (instead of 84 K that was used in the thermal-vacuum chamber test) was adopted as one of the two reference points of calibration. The largest simulated nonlinear correction is about 0.3 K, which occurs at channel 15 when the instrument temperature is at 38° C. Others are less than 0.2 K in the remaining channels.

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