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Comparison of AMSU-B brightness temperatures simulated by a fast radiative transfer model, RTTOV-7 and by a line by line model, ARTS.

N. Courcoux, S. A. Buehler and V. O. John

University of Bremen, Institut of Environmental Physics Otto Hahn Alle 1, D-28359 Bremen (nathalie@sat.physik.uni-bremen.de fax:00494212184555)

Fast radiative transfer models are an important tool for climate studies, linking observed satellite radiances to the atmospheric state, but they may introduce biases. To identify such potential biases a comparison can be made between simulations obtained by a fast model and by a line by line model.

The results of such a comparison between a fast radiative transfer model, RTTOV-7 (Radiative Transfer for TOVS 7) and a line by line radiative transfer model, ARTS (Atmospheric Radiative Transfer System) are presented. Brightness temperatures are simulated for the five AMSU-B (Advanced Microwave Sounding Unit-B) channels by both models for the whole globe for a single time of a single day (1 January 2000 0000 UT). ECMWF ERA-40 reanalysis temperature, pressure, geopotential height and specific humidity profiles are used as inputs for both models, the simulation is done for two different ground emissivities, namely 0.6 and 0.95.

The results of the comparison present the difference in brightness temperature between both models for each channel projected on a map. Thanks to the projection of the results on a map it is possible to visualize where, geographically speaking, greatest biases occur. This is an interesting feature for climatological studies since biases due to a given state of the atmosphere may occur always over the same geographical area and consequently introduce non negligible biases in climatology.

The comparison featuring a ground emissivity of 0.6 shows an overall good agreement for most of the profiles for channel 18 (183.31 GHz) with a small negative bias (between 0.1 and 0.4 K), however, a positive bias of up to 1.5 K occurs in some re-

gions for very dry atmospheres. For the other channels and the same ground emissivity the agreement is not as good as for channel 18. For the second simulation, the ground emissivity is changed to 0.95 and the overall agreement is much better for all channels. However, a 0.95 ground emissivity may not be appropriate since under dry conditions even AMSU-B channel 18 at 183.31 Ghz would "see the surface", the identified dry regions are covered with snow at the time of the comparison, and the microwave emissivity for snow is expected to vary from 0.45 to 0.9 at AMSU-B frequencies.