



On the weighting of SABER temperature profiles for comparison with ground based hydroxyl rotational temperatures.

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Kinetic temperature profiles are retrieved from limb-emission radiance measurements of CO₂ at 15 and 4.3 um by the SABER (Sounding of the Atmosphere using Broadband Emission Radiometry) instrument on the TIMED (Thermosphere Ionosphere Mesosphere Energetics and Dynamics) satellite. Profiles extend from about 20-120km and measurements are available since the spacecraft launch in Dec-2001.

Hydroxyl (6-2) band rotational temperatures are measured using a ground-based scanning spectrometer at Davis station, Antarctica (68°S, 78°E). Measurements are available each year since 1995 on nights between early February and late October, when the sun is more than 6° below the horizon.

In order to compare temperatures from these two instruments we must derive hydroxyl layer equivalent temperatures for the SABER profiles using a weighting function which represents the hydroxyl layer profile.

In this study, we examine a number of different weighting profiles to determine the best equivalent to hydroxyl nightly average temperatures at Davis. These profiles include (1) the customary Gaussian peaked at 87km and width 8km [Baker and Stair, 1988 :Physica Scripta. 37 611-622], (2) the layer profile derived from WINDII\UARS hydroxyl height profiles [She and Lowe, 1998 :JASTP 60, 1573-1583], (3) layer profiles derived from the hydroxyl volume emission rate (VER) from the SABER OH-B channel at 1.6um, which contains the Meinel OH(4-2) and OH(5-3) bands and (4) a Gaussian fitted to the SABER hydroxyl VER peak.

The comparison is made with approximately 2500 SABER retrievals from overpasses within 500km of Davis station, and with solar zenith angle >97°, which have coincident hydroxyl temperature measurements over the 8 winters between 2002 and 2009. Due to the satellite 60 day yaw cycle the sampling over Davis has occurred in approximately the same three time intervals each year; between days 75-140, 196-262 and 323-014, however the latter interval is entirely rejected on the solar zenith angle selection requirement.

An aim of this exercise is to enable equivalent comparisons between ground based stations measuring hydroxyl temperature (for example within the NDMC (Network for the Detection of Mesopause Change) community) using the SABER profiles as a reference temperature and calibration transfer standard.