Geophysical Research Abstracts
Vol. 14, EGU2012-6778, 2012
EGU General Assembly 2012


# Measurement of horizontal wind in the middle atmosphere (30-80 km) by the submillimeter limb sounder SMILES.

P. Baron (1), D. Murtagh (2), J. Urban (2), S. Ochiai (1), H. Sagawa (1), K. Kikuchi (1), and Y. Kasai (1)

(1) National Institute of Information and Communications Technology (NICT), Remote sensing Fundamentals Laboratory, Japan (baronph@gmail.com), (2) Department of Earth and Space Sciences, Chalmers University of Technology, 41296 Gothenburg, Sweden

Atmospheric wind field measurements are mostly limited to the troposphere although mesospheric winds are measured using optical techniques from satellites and by radar systems such as EISCAT and various meteor radars. Stratospheric winds are computed in meteorological models using mass balance considerations where the pressure and temperature fields are assumed to be in balance with the Coriolis force. Here we report the first global observations of winds in the mid/upper stratosphere using the SMILES sub-mm radiometer that was launched in September 2009. SMILES operated from the Japanese Experiment Module on the International Space Station until April 2010. We have exploited its high frequency resolution and signal-to-noise ratio to derive the small Doppler shifts in the atmospheric spectra and thereby line-of-sight wind velocities. Wind information is derived from 35–80 km and from 40°S–65°N with uncertainties $\sim$10 ms$^{-1}$ between 35 and 50 km. Both zonal and meridional components are measured (not simultaneously). The comparison with the ECMWF analysis in the extra-tropical stratosphere, is consistent with the measurement error. A slight increase of the ECMWF error ($\sim$5 ms$^{-1}$) in the Tropics where the thermal wind hypothesis is not valid, is also noticed. Although the instrument was not designed for this purpose, these observations demonstrate that sub-mm wave radiometers have the potential to fill the altitude gap in atmospheric wind measurements.