



Measurement of middle and upper atmospheric horizontal winds with a submillimeter/THz limb sounder: results from JEM/SMILES and simulation study for SMILES-2

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In a near future, ESA will launch the Atmospheric Dynamics Mission (ADM) equipped with a lidar for measuring tropospheric and lower stratospheric winds. NASA will continue a long-term series of upper atmospheric wind measurements (altitudes >80 km) with the new Michelson Interferometer for Global High-resolution Thermospheric Imaging (MIGHTI) on the Ionospheric Connection Explorer (ICON) satellite. No mission is planned to observe winds in the middle atmosphere (30-80 km), though they are recognized as essential parameters for understanding atmospheric dynamics and the vertical coupling between atmospheric regions. They are also promising data for improving long-term weather forecast and climate modelling.

It has been demonstrated with the Superconducting Submillimeter Wave Limb Emission Sounder (SMILES, Oct 2009 – Apr 2010) that a 4-K cooled microwave radiometer can provide data to fill the altitude gap in the wind measurements. Its possible successor named SMILES-2, is being designed in Japan for the study of the middle and upper atmospheric chemistry and dynamics (O_3 , H_2O , T, atomic O, OH, HO_2 , ClO, BrO, ...). If realized, the instrument will measure sub-millimeter and THz molecular spectral lines (616-150 μm) with high sensitivity and frequency resolution.

The SMILES-2 characteristics are very well suited for horizontal wind observations between 20 km to more than 160 km. The best performances are found between 35-90 km where the retrieval precision is better than 3 m/s for a vertical resolution of 2-3 km [1]. In this presentation, we summarize the results obtained from SMILES and assess the measurement performances of SMILES-2 to measure horizontal winds.

[1] P. Baron, N. Manago, H. Ozeki, Y. Irimajiri, D. Murtagh, Y. Uzawa, S. Ochiai, M. Shiotani, M. Suzuki: "Measurement of stratospheric and mesospheric winds with a SubMillimeter wave limb sounder: Results from JEM/SMILES and simulation study for SMILES-2"; Proc. of SPIE Remote sensing, 96390N-96390N-20, 2015