Geophysical Research Abstracts
Vol. 20, EGU2018-1772, 2018
EGU General Assembly 2018

Simulation study for sensing the middle and upper atmosphere using the molecular and atomic oxygen lines selected for SMILES-2

Philippe Baron (1), Satoshi Ochiai (1), Richard Larsson (1), and Makoto Suzuki (2)

(1) National Institute of Information and Communications Technology, koganei, tokyo, Japan (baronph@gmail.com), (2) Japan Aerospace Exploration Agency, Tsukuba, Japan

The Superconducting Submillimeter-Wave Limb-Emission Sounder 2 (SMILES-2) is a satellite mission that will be proposed to the Japan Aerospace Exploration Agency (JAXA) for a launch after 2023 [1]. If realized, it will scan the atmospheric limb from the lower stratosphere to the lower thermosphere for retrieving the profiles of temperature between 15 and 160 km, horizontal wind vector (30-160 km), ground state atomic oxygen (90-160 km), and dynamical-tracers and ozone-chemistry related species (15-120 km). The atmosphere will be observed with two antennas pointing at perpendicular directions for retrieving the 2d wind vector.
In this study we are interested in the retrievals from the molecular oxygen (O_2) and atomic oxygen (OI) lines selected for SMILES-2. The O_2 line at 487 or 774 GHz will be used for measuring temperature, wind and O_2 abundance up to $\sim$120 km. The OI lines is that at 2.06 THz allowing us to retrieve temperature, wind and the ground-state of OI between 90 and 160 km. The lines are transitions between rotational states associated with the non-zero electronic spin of the molecule or atom. These degenerated states are split into fine structure levels by the geomagnetic field, the so called Zeeman splitting. The signal is polarized and non isotropic, and consequently the measured lineshape depends on the line-of-sight orientation with respect to the geomagnetic field and on the receiver polarization (linear and circular for the THz and sub-millimeter receivers, respectively). Simulations will be presented to assess the retrieval performances with a special focus on these effects.

[1] Ochiai et al., 2017: “SMILES-2 Mission for Temperature, Wind, and Composition in the Whole Atmosphere”, SOLA, 13A, pp 13–18, https://doi.org/10.2151/sola.13A-003