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Development of a Remote Sensing Small Satellite for Temperature Sounding in the Mesosphere/Lower Thermosphere by Measurement of the Oxygen Atmospheric Band Emission

Michael Deiml (1,2), Martin Kaufmann (1), and the AtmoHIT Team
(1) Research Centre Jülich, (2) University of Wuppertal

Coupling processes initiated by gravity waves in the middle atmosphere have increasing importance for the modeling of the climate system and represent one of the larger uncertainties in this field. To support new modeling efforts spatially resolved measurements of wave fields are very beneficial. This contribution proposes a new small satellite mission based on a three unit CubeSat form factor to observe the Oxygen Atmospheric Band emission around 762 nm for temperature derivation in a limb sounding configuration to characterize gravity waves. The satellite instrument resolves individual rotational lines whose intensities follow a Boltzmann law allowing for the derivation of temperature from the relative structure of these lines. The employed Spatial Heterodyne Spectrometer is characterized by its high throughput at a small form factor, allowing to perform scientific remote sensing measurements within a small satellite during day and night. The spectrometer consists of a thermally stabilized solid block and has no moving parts, which increases its reliability in orbit while allowing high precision measurements within a small volume. The instrument is verified in its precursor mission, the Atmospheric Heterodyne Interferometer Test (AtmoHIT), within the REXUS/BEXUS ballistic rocket flight campaign. The description of the flight campaign and the results thereof conclude this contribution.