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OSAS-B: a balloon-borne heterodyne spectrometer for sounding atomic oxygen in the MLT region

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The Oxygen Spectrometer for Atmospheric Science on a Balloon (OSAS-B) is dedicated to the remote sounding of atomic oxygen in the mesosphere and lower thermosphere (MLT) region of Earth's atmosphere, where atomic oxygen is the dominant species. Quantitative radiometry of atomic oxygen via its visible and near-infrared transitions has been difficult, due to the complex excitation physics involved. OSAS-B is a heterodyne spectrometer for the thermally excited ground state transition of atomic oxygen at 4.75 THz. It will enable spectrally resolved measurements of the line shape, which in turn enables the determination of the concentration of atomic oxygen in the MLT. Due to water absorption, this line can only be observed from high-altitude platforms such as a high-flying airplanes, balloons or satellites. Recently the first spectrally resolved observation of the 4.75-THz line has been reported using a heterodyne spectrometer on SOFIA, the Stratospheric Observatory for Infrared Astronomy [1]. Compared to SOFIA a balloon-borne instrument has the advantage of not being hampered by atmospheric water vapor absorption. OSAS-B will comprise a hot-electron bolometer mixer and a quantum-cascade laser as local oscillator in a combined helium/nitrogen dewar. A turning mirror will allow for sounding at different vertical inclinations. The first flight of OSAS-B is planned for autumn 2022 in the frame of the European HEMERA project [2].

[1] H. Richter et al., Direct measurements of atomic oxygen in the mesosphere and lower thermosphere using terahertz heterodyne spectroscopy, accepted for publication in Communications Earth & Environment (2021).

[2] https://www.hemera-h2020.eu/