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The new airglow measurement system OASIS at Cerro Paranal, Chile nearby the Very Large Telescope (VLT)

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In November 2022 three airglow instruments, two SWIR-cameras (FAIM) and one SWIR-spectrometer (GRIPS) were deployed at Cerro Paranal (70.4°W, 24.6°S) in the Atacama Desert, Chile nearby ESO's (European Southern Observatory) Very Large Telescope (VLT) as part of the project OASIS (Observations of Airglow with Spectrometer and Imager Systems). The instruments observe hydroxyl (OH) airglow originating at about 86 km altitude from a nearly Gaussian layer with a typical half-width of 4km. The data allow studying middle atmospheric dynamics in all temporal regimes from a few seconds (infrasound), through hours (gravity waves), to several days (planetary waves), months (seasonal variations) and years (perennial variations). Measurements are performed routinely every night.

One objective of OASIS is to act as a prototype for aiding the Chilean tsunami early warning systems by giving additional information about the dynamical situation in the airglow layer after a sea quake. Therefore, one imager permanently focusses on the subduction zone in the oceanic area in the West of the observation site and the spectrometer can be pan-tilted to an arbitrary location in the night sky (up to zenith angles of 60°) and is automatically pointed to the area in the sky above the centre of the earthquake or at least in direction of a more distant earthquake. A second simultaneously operated FAIM instrument is permanently aligned to the entire sky. These all-sky images give an overview of the atmospheric dynamical condition from horizon to horizon. All instruments are optimised for a high temporal resolution (one observation every 1 s or 2 s or 15 s, respectively,) to be able to resolve infrasound and acoustic gravity waves as best as possible.

In addition to the usefulness of the data for aspects of basic research in the field of atmospheric dynamics and the aforementioned potential applications in the field of early detection of natural hazards, the observations are also of interest for astronomy at the Paranal Observatory. The continuous observations of OASIS may help the astronomers by providing information of even very short-term changes in the airglow intensity. This might allow for a more precise correction of astronomical spectra and potentially an improved scheduling of astronomical measurements.

The OASIS measurement system will be presented as well as first results from over a year of observations on the variability of OH airglow.

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