

## Seminar über Microwave Physics and Atmospheric Physics

**Referent/in:** Dr. Frédéric Vogt, MeteoSwiss, Payerne, CH

**Titel:** Raman spectroscopy of the atmosphere with an 8-m class astronomical telescope

Professional ground-based astronomical telescopes can be equipped with special optical systems designed to alleviate the impact of atmospheric turbulence on the observations. A growing number of these systems rely on 589-nm lasers to excite sodium atoms in the mesosphere (at an altitude of ~80-100 km), thereby creating “artificial guide stars”. Although lasers have been used by astronomers for many years, it has only been discovered very recently that their use can lead to the spectral contamination of scientific observations via Raman scattering. Through this inelastic process, laser photons lose energy by exciting ro-vibrational modes of air molecules. In this presentation, I will discuss our studies of the “Raman lines” at the European Southern Observatory’s Very Large Telescope located in the Atacama Desert (Chile), from their unexpected discovery and characterisation to their exploitation for calibration purposes. I will highlight our latest observations, acquired with the ultra-high-resolution ESPRESSO spectrograph, that let us resolve individual molecular transitions from the most abundant molecules of dry air and their isotopes, including:  $^{14}\text{N } ^{14}\text{N}$ ,  $^{14}\text{N } ^{15}\text{N}$ ,  $^{16}\text{O } ^{16}\text{O}$ ,  $^{16}\text{O } ^{17}\text{O}$ ,  $^{16}\text{O } ^{18}\text{O}$ , and  $^{12}\text{C } ^{16}\text{O } ^{16}\text{O}$ . This work, recently accepted for publication (<https://arxiv.org/abs/2304.13747>), demonstrates how Raman lines can be exploited by professional observatories as highly accurate, on-sky wavelength references. It also illustrates a possible new use of astronomical telescope to study and monitor the atmosphere of Earth, in a manner reminiscent of Raman LIDARs.

**Zeit:** Freitag, 12. Mai 2023, 10:15 Uhr

**Ort:** Room A97, ExWi, Sidlerstrasse 5, 3012 Bern  
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ch.zoom.us/j/97081325603?pwd=d0ozME5xOS9pQVNxallLem81VHQyZz09](https://unibe-ch.zoom.us/j/97081325603?pwd=d0ozME5xOS9pQVNxallLem81VHQyZz09)  
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