Project 1

From optical cavity mode structure to dual comb spectroscopy

Objectives:

- Set up a cavity and measure the mode structure.
- Characterize the mode structure:
  - (a) function of beam position
  - (b) cavity length
  - (c) stability (i) thermal & temporal
    (ii) mechanical
  - (d) optical power and throughput
- Set up dual cavity setup and measure interferogram and Fourier Transform spectrum. Interpret the results.
- Attempt a proof of principle experiment with H_2O as absorbent in the near infrared.

Project is designed for 12 weeks

Project 2

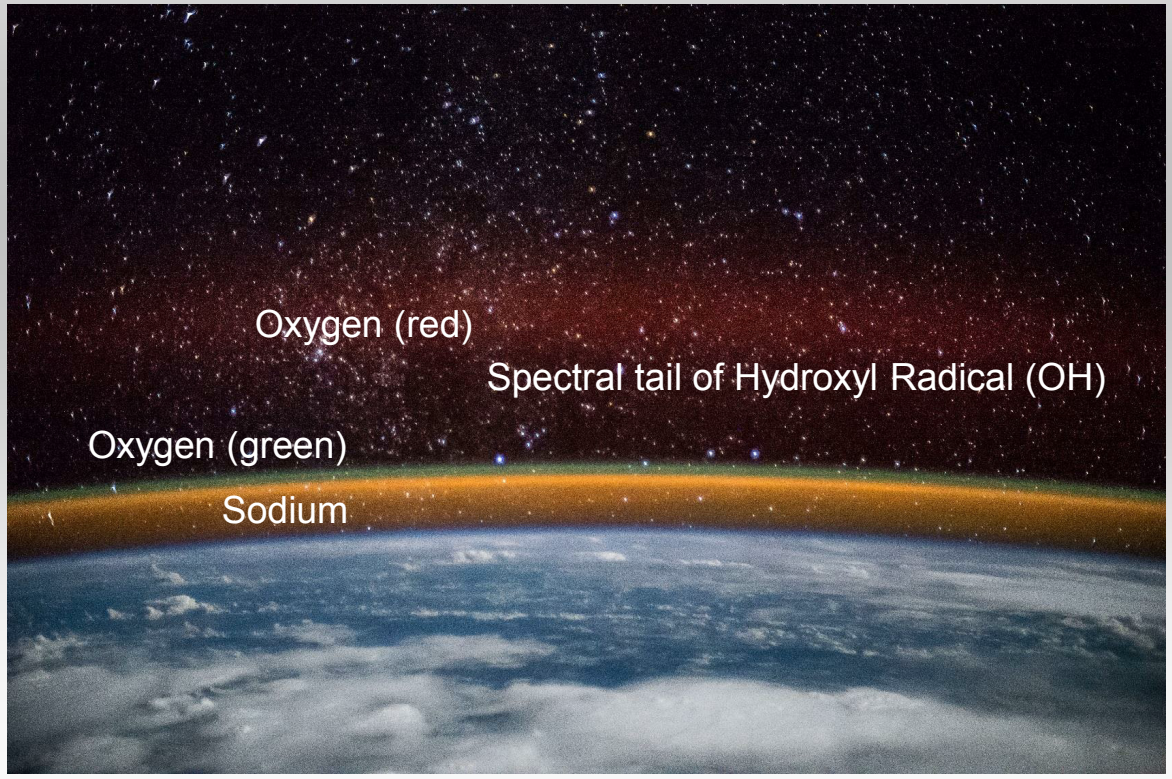
Absorption spectrum of ammonia by Fourier Transform cavity enhanced absorption spectroscopy

Objectives

- Set up the vacuum chamber and align the cavity. Learn how to run the experiment.
- Develop a way to fill traces of ammonia into the cavity.
- Measure ro-vibrational overtone spectra of ammonia in the near IR around 5050 cm^{-1} and identify the ammonia “fingerprint” pattern.
- Take measurements at different pressures up to 1 atm. Establish pressure broadening coefficients.
- Characterize the setup (detection limit, precision) and evaluate its applicability in field trials.

Project is designed for 6 weeks

Project 3
Detection of air glow emissions from the mesosphere



Objectives

- Set up the telescope, optics and spectrometer.
- Measure OH spectrum in an appropriate spectral window (>700 nm) with high resolution.
- Vary conditions of the measurement (observation of different regions, spatial and spectral resolution, diurnal cycles).
- Spectral analysis and line assignment based on literature data where possible.
- Estimate the temperature in the mesosphere/mesopause on the days of the measurement based on the spectra obtained.

Project is designed for 12 weeks