

Quantification of Greenhouse Gas Emissions in Thessaloniki, Greece

Background:

For budgeting anthropogenic greenhouse gas emissions, a precise evaluation of current emissions is essential.

The COllaborative Carbon Column Network COCCON initiated by KIT measures greenhouse gases using a ground-based remote sensing technique to estimate emissions.

Field campaigns for quantifying the emissions of dedicated target areas are performed using the portable EM27/SUN Fourier transform spectrometer, developed by IMK-ASF in collaboration with Bruker. The EM27/SUN is a Fourier Transform Infrared (FTIR) spectrometer using the atmospheric absorption of the solar infrared radiation to deduce column-averaged methane and carbon-dioxide abundances. Two spectrometers are shown side-by-side in the picture.



During a campaign several instruments are operated at different locations around the targeted source region. From the differences of measured abundances an estimate of emission amounts can be calculated. Different city campaigns have been performed in the past, an example is the city campaign in Berlin [1]. A further campaign in Thessaloniki, Greece, is planned for Spring/Summer 2022.

You can find more information about the ground based remote sensing group (IMK-ASF BOD) here [2].

Tasks:

The master student will contribute to a field campaign in Thessaloniki in Spring/Summer 2022. She/He will learn how to operate the EM27/SUN and how to retrieve the abundances from the recorded interferograms.

The successful operation of a spectrometer during the campaign, the processing of the raw data, the investigation of the measured trace gas abundances and the calculation of a first estimate of the emission amounts using a simple flux model will be the goal of the master thesis.

Requirements:

- An interest in experimental methods in the diverse field of climate change,
- motivation to perform measurements and to participate in a measurement campaign for several weeks in Greece,
- some experience with data analysis (e.g. in Python) and
- a good command of the English language (speaking and writing).

Organisational Information:

Duration: 1 year

Working plan:

Start: ~ Jan 2022.

Jan – Mar: Learning the operation of the EM27/SUN, calibration measurements, campaign preparation

Apr – Jun: Measurement campaign in Thessaloniki,

Jul – Sep: Processing and analysis of the Data, calculation of emission amounts with a simple model.

Oct – Dec: Thesis writing, presentation of results.

Contact:

If you are interested in this project, please contact me at lena.feld@kit.edu

References:

1. Hase, F. et al. Application of portable FTIR spectrometers for detecting greenhouse gas emissions of the major city Berlin. Atmospheric Measurement Techniques 8, 3059–3068 (2015).

2. Website of the IMK-ASF BOD group: <https://www.imk-asf.kit.edu/english/201.php>