UNIVERSITY OF GOTHENBURG

DEPARTMENT OF EARTH SCIENCES

NGEO309 Greenhouse gases GHG - measurement, data analysis and policy advise, 3 credits

Växthusgaser - mätteknik, data analys och politik, 3 högskolepoäng

Third-cycle level / Forskarnivå

Confirmation

This syllabus was confirmed by the Department of Earth Sciences on 2020-12-15, and is valid from Spring semester 2021.

Responsible Department
Department of Earth Sciences, Faculty of Science

Entry requirements

Admitted to third cycle education

Learning outcomes

Methane and carbon dioxide emissions are caused by numerous biogeochemical processes with spatial and temporal variability. Greenhouse gas (GHG) measurement techniques such as: chamber measurement in form of manual, automated (steady) and intelligent robot sampling, eddy covariance flux towers and various laser-instruments using 13C/12C will be studied as hands-on during the course.

The student will learn: i) Advanced knowledge of the biogeochemistry of GHG emission; ii) Applications of stable isotopes of elements in GHGs; iii) Strengths and weaknesses of various methods: chamber measurements and eddy-flux; iv) Calculating soil respiration and stem respiration from chamber data; v) Understanding footprint and micro-metrology theory; vi) Analysis and interpretation of foot-print data; vii) Understanding methane emission from boreal upland and drained peatland forests; viii) Selection of appropriate methodologies to answer research question; ix) Global and local demand for knowledge on sustainable land use GHG emissions – for policy and management; x) Data analysis in groups and report writing of measurements from Skogaryd (Sites) will assess the year-round GHG emission at selected landscapes.

Knowledge and understanding

- Advanced knowledge of the biogeochemistry of GHG emission
- Understand how science can support society and organizations' for improved knowledge on GHG emissions and different land use mitigation options
- Applications of stable isotopes of elements in GHGs
- Understanding methane and N2O emission from boreal upland and drained peatland forests
- Understanding foot-print and micro-metrology theory

Competence and skills

- Calculating soil respiration and stem respiration from chamber data
- Analysis and interpretation of foot-print data

Judgement and approach

- How the knowledge and data can be used for mitigation of GHG emissions from ecosystems and landscapes
- What knowledge and data are needed
- Strengths and weaknesses of various methods: chamber measurements and eddy covariance flux towers

Sustainability labelling

The course is sustainability-focused, which means that at least one of the course's learning outcomes clearly shows that the course content meets at least one of the University of Gothenburg's stipulated criteria for sustainablity labelling. Content of this kind also constitutes the course's main focus.

Course content

Methane and carbon dioxide emissions are caused by numerous biogeochemical processes with spatial and temporal variability. What methodologies can be used at what scale, and to answer what research question? GHG measurement techniques such as: chamber measurement in form of manual, automated (steady) and intelligent robot sampling, flux towers observing fluxes at landscape scale and various laser-instruments using 13C/12C will be studied. Lectures will elaborate on: the interaction between biosphere, atmosphere and climate change, the biogeochemistry behind N2O, CH4 and CO2 emissions in various types of ecosystems, stable isotope techniques, the logic and equations behind eddy-covariance footprint data assimilation, GHG emission factors from different landscape types. Data analysis in groups and report writing of measurements from Skogaryd (Sites) will assess the year-round GHG emission at selected landscapes.

Types of instruction

This course for Ph.D. students is focussed during one week near Gothenburg, Sweden. Prior to that week a period of pre-study is expected. After the course week an individual report must be written up, submitted and approved. The actual course week is one intensive week with lectures,

field visit & demonstrations (eddy covariance, GHG (CO2 and CH4) measurements, laser, robotics), calculations instructions, data analysis, report work, several student seminars with oral presentation of own PhD topic (10 minutes power point each) and student presentation of results from the course. Two weeks after course is the deadline for the report; approval is completed within a month.

Language of instruction
The course is given in English.

Grades

The grade Pass (G) or Fail (U) is given in this course.

To pass the course, the students are obliged to participate in all class-hours during the one intensive week, including own oral presenataion, as well as the approval of the final report.

Types of assessment

After the course-week, an individual written report is handed in and assessed a few weeks after the intensive week (approved / not-approved).

Course evaluation

The course evaluation is carried out together with the Ph.D. students at the end of the course by individual, anonymous survey followed by an open discussion with the entire class.

Other information

Accommodation is made jointly at a local hostel 'Örtagaarden' in Lane-Ryr, a participation fee is for food and any student not member of the ClimBecco school needs to pay for own accommodation.