Universitat de Lleida

DEGREE CURRICULUM

ST IN THE EARTH SYSTEM IN TIME OF CHANGE

Coordination: SEBASTIA ALVAREZ, MARIA TERESA

Academic year 2023-24

ST IN THE EARTH SYSTEM IN TIME OF CHANGE 2023-24

Subject's general information

<table>
<tr><td>Subject name</td><td>ST IN THE EARTH SYSTEM IN TIME OF CHANGE</td></tr>
<tr><td>Code</td><td>111007</td></tr>
<tr><td>Semester</td><td>ANUAL CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
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<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Master's Degree Erasmus Mundus in Spatial and Ecological Modelling in European Forestry</td><td>2</td><td>OPTIONAL</td><td>Attendance-based</td></tr>
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<tr><td>Course number of credits (ECTS)</td><td>5</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
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<tr><th>Activity type</th><td>PRACAMP</td><td>TEORIA</td></tr>
<tr><th>Number of credits</th><td>3</td><td>2</td></tr>
<tr><th>Number of groups</th><td>1</td><td>1</td></tr>
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<tr><td>Coordination</td><td>SEBASTIA ALVAREZ, MARIA TERESA</td></tr>
<tr><td>Department</td><td>AGRICULTURAL AND FOREST SCIENCES AND ENGINEERING</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>Mostly work by students, including presentations, posters, games, exercises and modeling, essays and discussion of material, plus some short presentations by coordinator and invited experts</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>English</td></tr>
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ST IN THE EARTH SYSTEM IN TIME OF CHANGE 2023-24

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
SEBASTIA ALVAREZ, MARIA TERESA	teresa.sebastia@udl.cat	5	Flexible. Contact: teresa.sebastia@udl.cat

Subject's extra information

In this course, we will investigate how ecosystem management, particularly forests and other terrestrial ecosystems, might contribute to the regulation of the carbon and nitrogen cycles, and greenhouse gas fluxes. We will travel in time and space to assess changes in the Earth system from the past to the present time, with projections towards the future; and from the globe to the intra-ecosystem patches functioning. We will revise international GHG flux networks, and apply some biodiversity-ecosystem function (BEF) models focusing on GHG flux dynamics.

Learning objectives

- To assess how management of forests and other terrestrial ecosystems can contribute to the regulation of greenhouse gas fluxes and emissions
- To investigate how the Earth system works, including the regulation of climate and the carbon and nitrogen cycles
- To learn networks, approaches, models, methodologies to determine GHG concentrations and changes, from the globe to the ecosystem and beyond

Competences

- Capacity for analysis and synthesis of specific situations related to the subject
- Capacity for organization and planning
- Capacity for critical judgement and self-appraisal
- Capacity for teamwork and leadership
- Capacity for discussion and argumentation in different forms

Subject contents

1. Can we manage ecosystems for GHG regulation?
2. Shifts in the carbon and nitrogen cycles in forests and other terrestrial ecosystems in the Anthropocene
3. The role of biodiversity in GHG regulation nowadays and in the past; projections towards the future
4. Measuring and modelling GHG: from the globe to the ecosystem and beyond

Methodology

Most of the course will be developed through discussion of proposed material, and work by the students. In addition, field trips, use of equipment and visits to infrastructures, and Case Studies will be used to investigate methods in GHG research, including eddy covariance micrometeorological towers and photoacoustic.

- Discussion of technical and scientific material, including papers, videos, movies and webs
- Games
- Data analysis and diversity-interaction modeling applied to GHG dynamics
- Short theoretical presentations, and lectures by experts
- Field trip to eddy covariance towers

Development plan

We will start by investigating the capacity of forests and other terrestrial ecosystems to regulate GHG fluxes and the carbon and nitrogen cycles. Mostly, we will focus on CO_2, CH_4, and N_2O. By comparing to the situation in the Anthropocene, we will assess how organisms have modified the Earth system, including climate regulation; and how biodiversity contribute to ecosystem services, including carbon and nitrogen cycling and GHG regulation. Some models on biodiversity-ecosystem services (BEF) focusing on GHG fluxes will be learned and used. Visit to the ECOFUN-FLUXPYR eddy covariance and micrometeorological flux towers in the Pyrenees will be organized. Data from the towers will be distributed to the students, and currently used models will be applied. Methods for the determination of GHG at different spatial scales, from the globe to the ecosystem and beyond, will be investigated.

Evaluation

Evaluation will be:

20% exam (two tests)

50% activities

30% essay

Distributed throughout the course.

Bibliography

Archer, D. (2010) The global carbon cycle. Princeton University Press.

Dakers, D. (2014). The nitrogen cycle (Earth's cycles in action). Crabtree

IPCC. (2021) Climate change 2021: The physical science basis. IPCC.

Lovelock, J. (2006) The revenge of Gaia. Basic Books.

Martinetto, E., Tschopp, E., Gastaldo, R.A. eds. (2020) Nature through time. Springer.

Reichie, D.S.E. (2019) The global carbon cycle and climate change: scaling energetics from organism to the biosphere. Elsevier.

Sedjo, R.A. (2019) Surviving global warming: Why eliminating greenhouse gases isn't enough. Prometheus.