

Course on e-science tools for climate research "Climate science at high latitudes: Modeling and model evaluation"

Location: Andøya Space Center, Andøya, Norway

Time: 22 October – 2 November 2018

Coordination:

Michael Schulz (UiO/MetNo), Paul Zieger (SU) and Antti Lauri (UHEL),
with NAROM/Andøya Space Center

Context:

This course aims to teach in a Nordic framework the next generation of scientists to integrate different eScience tools and infrastructures to achieve a more holistic interpretation of the climate system and its components through model and data analysis. The focus of the course is on the application of eScience tools, but applied to climate and air quality research at high northern latitudes. It is the second part of a series of three two-week graduate courses, open to Nordic graduate students and early career scientists, developed originally within the education program of the Nordic Centre of Excellence eSTICC (eScience Tools for Investigating Climate Change at High Northern Latitudes).

The course is supported by Nordforsk (Nordic eScience Globalisation Initiative; NeGI), the University of Oslo (course GEO4990), eSTICC, Bolin Centre for Climate Research and the CHES Research School.

Course Content

The course in 2018 will introduce earth system analysis as well as data analysis with practical exercises. The course will make use of existing eSTICC related infrastructures, such as climate models (e.g., NorESM, EC-EARTH), model databases (e.g. AeroCom, CMIP5), model data evaluation portals (AeroCom), and atmospheric databases (for example EBAS). Practical work is initiated and accompanied to apply modern visualization, data analysis and statistical tools (Jupyter notebooks, AeroCom tools, ESMValTool, cis tool). Subjects for practical work will be suggested depending on student's background. Introductions will be given on the Arctic climate, the role of aerosols and clouds, observational techniques, climate forcing and climate model evaluation.

The course involves a set of relevant lectures and tutorials, with the main emphasis placed on intensive group work and a final report that will be written during and after the course by each student. Before the course, the selected students will be asked to practice the tools to be used on the course by solving a pre-exercise. The course is primarily aimed at PhD students in atmospheric and biospheric sciences in Nordic universities (also advanced MSc students are welcome to apply). During the course the students can either use their own data or utilize provided model data together with long-term aerosol, air, ion, trace

gas, meteorological data measured at field stations.

Background:

The course series is part of Nordic eScience Globalisation Initiative (NeGI) partially funded by Nordforsk. Within the project "Applied methodologies for improved exchange between atmospheric e-science Infrastructures at high latitudes" the courses have been designed and launched in a collaboration between Stockholm University (SU), University of Helsinki (UHEL), Norwegian Meteorological Institute (MetNo) and the Finish IT center for Science (CSC). The first courses has been held in Hyytiälä, Finland, in October 2017 on "Climate science at high latitudes: Online data storage and visualization tools". It brought together teachers, assistants and 10 students from all three countries and institutions involved. Novel e-teaching and reporting was performed in the form of Jupyter – Python notebooks, something the second course shall build on (see also previous course report <http://www.aces.su.se/report-from-the-first-nordic-workshop-on-e-science-tools-for-climate-research/> and website: <http://www.atm.helsinki.fi/ABS/courses/2017negi.htm>). The outcome of the first course is a series of Jupyter notebooks with exemplary data analysis and will be available for the participants for inspiration and further elaboration. The third course in the series will be held in Abisko, Sweden, 1-12 April 2019.

Detailed course content:

Introductory lectures on:

Arctic climate
Aerosols and Clouds
Climate forcing
Climate model evaluation
Climate model diagnostics
Observational methods (in-situ and remote sensing techniques)
Model analysis tool introductions AeroCom, cis tool, ESMvalTool
Model data base structures AeroCom and CMIP5
Python and Jupyter notebooks

Practical work:

Students are asked to cooperate in small groups (2-3) with an assistant on individual subjects of interest in the realm of climate model evaluation and analysis. Jupyter notebooks shall be compiled to document the work and results. Two Presentations are expected during the course to report on progress.

The learning outcomes:

In the end of the course the student will have

- skills to set up small python based data analysis projects;
- knowledge about existing online databases containing atmospheric and ecosystem data;
- the ability to understand and evaluate model output;
- increased skills to visualize data;

Some of the transferable skills the course strives to improve:

- statistical analysis of model and field measurements;

- multidisciplinary approach;
- project management; and
- collaborative learning.

Prerequisites:

The participants are expected to be able to write scripts using a structural programming language (e.g. Python, R or MATLAB). Basic data analysis skills are also expected. The main programming language to be used on the course will be Python. The main tool for visualization and online publishing will be Jupyter Notebook.

Course Fees :

The course fee is 1200 EUR.

For doctoral students enrolled in any university in Nordic countries (Denmark, Finland, Iceland, Norway, Sweden), the fee is covered by the NeGI project [Applied methodologies for improved exchange between atmospheric e-science Infrastructures at high latitudes](#). UiO students participating in the course on the Earth System GEO4990 will be covered by the University of Oslo.

This fee covers:

- all academic and social programme during the course
- access to the electronically provided course material
- accommodation and logis during the course
- transportation on Andøya (from airport to center, other small excursions)

The fee does not cover:

- travel expenses to and from Andøya
- personal health and civil liability insurance
- personal expenses such as drinks, telephone, photocopies, laundry etc. during the course

Maximum number of participants: 20

Application deadline: 7th September 2018

Successful applicants will be notified by September 15th.

How to apply?

Register via: <https://goo.gl/forms/it1Q1Zc1IXtC5N8k2>

Send eventually email to Michael.schulz@geo.uio.no to be informed about further updates.