ATM313 Biosphere-atmosphere process modelling I (2020-2023)

HUOM! OPINTOJAKSOJEN TIETOJEN TÄYTTÄMISTÄ KOORDINOIVAT KOULUTUSSUUNNITTELIJAT HANNA-MARI PEURALA JA TIINA HASARI

1. Course title

Biosphere-atmosphere process modelling I

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2. Course code

ATM313

Aikaisemmat leikkaavat opintojaksot 53350 Ilmakehämallinnus I, 5 op.

3. Course status: optional

-Which degree programme is responsible for the course?
Master's Programme in Atmospheric Sciences

-Which module does the course belong to?
ATM3001 Advanced Studies in Aerosol Physics (optional for Study Track in Aerosol Physics)
TCM300 Advanced Studies in Theoretical and Computational Methods

-Is the course available to students from other degree programmes?
Yes

4. Course level (first-, second-, third-cycle/EQF levels 6, 7 and 8)

Master’s level, degree programmes in medicine, dentistry and veterinary medicine = secondcycle degree/EQF level 7
Doctoral level = third-cycle (doctoral) degree/EQF level 8

-Does the course belong to basic, intermediate or advanced studies (cf. Government Decree on University Degrees)?
Advanced studies

5. Recommended time/stage of studies for completion

-The recommended time for completion may be, e.g., after certain relevant courses have been completed.

6. Term/teaching period when the course will be offered

The course will be lectured every other year (odd years) in the III period.

7. Scope of the course in credits

5 cr

8. Teacher coordinating the course

Putian Zhou

9. Course learning outcomes

This course aim to provide basic education on the most important biological, chemical and physical mechanisms in atmospheric science and how to implement these processes numerically in atmospheric models with the main target to educate the "Next Generation of Atmospheric Modellers" for the Nordic modelling community.

10. Course completion methods

Students write a scientific report based on the results of their model simulations and send the report and their developed numerical code to the lecturer.

11. Prerequisites

A basic knowledge of programming in some computer language (e.g. Fortran, C++, Python, Matlab) is required. In the course, we will only provide a small amount of Fortran-lectures to teach the basics of Fortran and programming.

You will also need to bring your own laptop.

12. Recommended optional studies

Fortran if you have no knowledge on any other computer language.

13. Course content

The course consist of lectures on different topics related to development of the boundary layer model and intensive supervision during the coding sessions. The lectures provided are:

- What is "good" coding
- General introduction to FORTRAN programming language
- Overview of models from process or box models to the complex structure of climate models
- Introduction to boundary layer meteorology (BLM)
- Emissions of anthropogenic and biogenic compounds
- Deposition of gas compounds and aerosols in the forest canopy
- Complex techniques like model parallelization and optimisation
- Implementation of our achieved knowledge in large scale models and what are the main features of an Earth System Model (ESM)

14. Recommended and required literature

Will be announced during the lectures - all lecture presentations will be available for the students

15. Activities and teaching methods in support of learning

All students develop their own 1D-model with individual supervision during the exercise or coding sessions.

16. Assessment practices and criteria, grading scale

Written report and developed numerical code send to lecturer. Pass/fail (no grades)

17. Teaching language

English