



Climate Change Education in Earth System Science

Stephanie Hänsel and Jörg Matschullat

TU Bergakademie Freiberg, Interdisciplinary Environmental Research Centre, Freiberg, Germany
(stephanie.haensel@ioez.tu-freiberg.de)

The course “Atmospheric Research – Climate Change” is offered to master Earth System Science students within the specialisation “Climate and Environment” at the Technical University Bergakademie Freiberg. This module takes a comprehensive approach to climate sciences, reaching from the natural sciences background of climate change via the social components of the issue to the statistical analysis of changes in climate parameters.

The course aims at qualifying the students to structure the physical and chemical basics of the climate system including relevant feedbacks. The students can evaluate relevant drivers of climate variability and change on various temporal and spatial scales and can transform knowledge from climate history to the present and the future. Special focus is given to the assessment of uncertainties related to climate observations and projections as well as the specific challenges of extreme weather and climate events. At the end of the course the students are able to critically reflect and evaluate climate change related results of scientific studies and related issues in media. The course is divided into two parts – “Climate Change” and “Climate Data Analysis” and encompasses two lectures, one seminar and one exercise. The weekly “Climate change” lecture transmits the physical and chemical background for climate variation and change. (Pre)historical, observed and projected climate changes and their effects on various sectors are being introduced and discussed regarding their implications for society, economics, ecology and politics. The related seminar presents and discusses the multiple reasons for controversy in climate change issues, based on various texts. Students train the presentation of scientific content and the discussion of climate change aspects.

The biweekly lecture on “Climate data analysis” introduces the most relevant statistical tools and methods in climate science. Starting with checking data quality via tools of exploratory data analysis the approaches on climate time series, trend analysis and extreme events analysis are explained. Tools to describe relations within the data sets and significance tests further corroborate this. Within the weekly exercises that have to be prepared at home, the students work with self-selected climate data sets and apply the learned methods. The presentation and discussion of intermediate results by the students is as much part of the exercises as the illustration of possible methodological procedures by the teacher using exemplary data sets.

The total time expenditure of the course is 270 hours with 90 attendance hours. The remainder consists of individual studies, e.g., preparation of discussions and presentations, statistical data analysis, and scientific writing. Different forms of examination are applied including written or oral examination, scientific report, presentation and portfolio work.