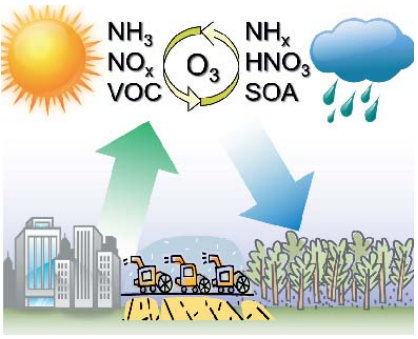
Helmholtz Research School on Mechanisms and Interactions of Climate Change in Mountain Regions
KIT/IMK-IFU, Garmisch-Partenkirchen

MICMoR Technical Short Course

Biosphere-atmosphere nitrogen exchange and fundamentals of atmospheric chemistry

Institute of Meteorology and Climate Research, KIT/IMK-IFU, Garmisch-Partenkirchen, Germany
October 7-11, 2019



Nitrogen availability limits the productivity of most terrestrial ecosystems. But reactive nitrogen is also a limiting component in the atmospheric chemistry that determines tropospheric composition of trace gases and thus the atmospheric input of N-compounds to ecosystems. So, understanding atmospheric sources, sinks and transformations of active nitrogen is of paramount importance. Because of the strong atmosphere-biosphere interactions and feedbacks, experience and knowledge of the processes that dictate atmospheric composition are a prerequisite for understanding atmospheric nitrogen input into ecosystems.

Participants in this course will learn to understand how availability and distribution of active nitrogen in ecosystems interacts with chemical transformations in the atmosphere. The course is set at the level of a first course in atmospheric chemistry. The course will start with fundamentals of relatively simple chemistry (as of stratospheric ozone) to get familiar with basic chemical mechanisms, to learn how to build small chemical box models (using, e.g., the software Berkeley Madonna as a tool), and to explore the drivers that impact chemical balance.

Thus armed, students will delve into the more complicated, nitrogen-based photochemistry in the troposphere that affects the distribution of active nitrogen in ecosystems. The goal of this course is to develop an understanding of basic atmospheric chemistry and the influence of human activity on the balance of trace compounds in the atmosphere. We will touch on socially important issues such as acid rain, photochemical smog, and stratospheric ozone depletion, all with an eye toward ecological consequences and also explore some of the relevant predictions of how future climate will impact the consequences of atmospheric chemistry.

Lead instructor: Prof. Steven B. Bertman PhD, Western Michigan University (USA)

Eligibility

The Summer School is open to 15 doctoral students, postdocs and Master students with a research interest in biosphere-atmosphere nitrogen exchange and atmospheric chemistry. Students should bring their own laptops.

Application

Applicants must submit a motivation letter and a CV to B. Elija Bleher (elija.bleher@kit.edu), with their supervisors in CC. Application is on a first-come, first-serve basis. **Application deadline is 10 September 2019.** There is no tuition fee, lunches and refreshments will be provided, however, participants must cover travel and accommodation costs. The Technical Short Course will award 2 ECTS.

Contact:

MICMoR Coordination Office
KIT/IMK-IFU
Kreuzeckbahnstraße 19
82467 Garmisch-Partenk.

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Course overview
The course will use a mix of lectures and small group exercises. It begins on October 4 at 9am and ends on October 11 after lunch at around 2pm.

Monday, October 7

- introduction
- review of basic physics of the atmosphere
- thermodynamics vs kinetics in the atmosphere
- atmospheric photochemistry principles
- what is a chemical mechanism
- modeling reaction kinetics (with Berkeley Madonna)

Tuesday, October 8

- stratospheric oxygen chemistry
- heterogeneous PSC chemistry
- ozone hole
- build model of stratosphere
- run various parameters and pollutants

Wednesday, October 9

- tropospheric chemistry
- basic Leighton mechanism
- nitrogen photostationary state
- background VOC chemistry
- build basic tropospheric model
- test photostationary state conditions
- compare O3, OH, NO3, CI chemistry

Thursday, October 10

- biogenic VOC chemistry
- air quality
- nitrogen deposition
- tropospheric particles
- add BVOC chemistry to models
- compare reactivities of different compounds
- explore impact of radical recycling mechanisms
- excursion / social dinner

Friday, October 11

- student presentations & wrap-up

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