ATMS/CHEM 558 Atmospheric Chemistry
Spring 2011

General Information

Instructor: Becky Alexander, Assistant Professor, Atmospheric Sciences

Schedule: MW 9 - 10:20 AM; ATG 610

Grading:

4 Short Exams (based on problem sets): 60%
Final Project: 25% Review Paper or NSF-like Proposal
Participation: 15% Presentations/Paper discussions

Contact Information

Office: 306 ATG Building
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Office hours: by appointment, drop in, etc.

Class Web Site:http://www.atmos.washington.edu/academics/classes/2011Q2/558

NOTE: Please contact me if you have any questions. Conceptual issues are best handled in person.

Textbooks

The required textbook for the course is:
Introduction to Atmospheric Chemistry, **D.J. Jacob**, Princeton University Press

Other excellent references are: (All books are on reserve in the Odegaard library)
1. *Introduction to Atmospheric Chemistry,* **P.V. Hobbs** Cambridge University Press
2. *Chemistry of Atmospheres,* **R. Wayne**; Oxford University Press
3. Atmospheric Chemistry and Physics, from Air Pollution to Climate Change, **J.H. Seinfeld and S.N. Pandis,** Wiley-Interscience
4. Chemistry of the natural atmosphere, **Peter Warneck**
5. *Chemistry of the Upper and Lower Atmosphere*, **Finlayson-Pitts and Pitts**, Academic Press

Lectures

This is a rough outline for where we are heading. We will cover some topics in more detail than others, and the time frames will be flexible. We will also have the opportunity to discuss current scientific literature in each topic area.

Week 1-2 **Introduction and Fundamentals: Chemical kinetics, photochemistry, reaction mechanism, steady state, equilibrium, models**

Weeks 3-5 **Stratospheric Ozone Chemistry: Natural and Perturbations**

Weeks 6-8 **Tropospheric Chemistry: Impacts of its Oxidizing Capacity**

Week 9 **Atmospheric Chemistry and Climate: Direct and Indirect Couplings**

Week 10 **Student presentations**

Final project information

Students write a paper and give a 15-minute presentation during the last week of class and finals week. A partial list of possible topics is included below, or students can pick a topic of their own choosing. Whatever topic you choose, you must check with me to make sure the topic is appropriate and of reasonable scope. The paper should be at least 5 pages long (but no more than 10 pages) using ~1.5 line spacing and include at least 10 references, as well as figures to illustrate your points.

Potential topics.

- The effects of global warming on the recovery of the stratospheric ozone
- Air pollution in mega-cities
- Intercontinental transport of pollutants
- Composition of polar stratospheric clouds
- Biomass burning, and its effect on tropospheric ozone levels
- Biogenic emissions of VOCs
- Halogen chemistry in the marine boundary layer
- Ozone depletion events in the arctic boundary layer
- Is the global oxidizing capacity of the atmosphere changing?
- Satellite observations of tropospheric or stratospheric composition
- Lightning and the global NO_x budget
- Sources and chemistry of DMS
- Past or recent trends in CH_4
- Planetary photochemistry
- Effects of aerosols on tropospheric ozone
- Formation of the stratospheric ozone layer in Earth's early atmosphere

ATM S 558 Class Schedule
Spring 2011

Date	Lecture Topic	Required Reading	Due
WEEK 1		Chapters 1 and 9	
M 3/28	Introduction. Measures of atmospheric composition.		
W 3/30	Analysis of reaction mechanisms. Photochemistry.		
WEEK 2		Chapter 3	
M 4/4	Theory of gas-phase/multiphase reaction rates. Box models. Lifetimes and transport scales.		
W 4/6	Ozone and the Chapman mechanism.		PS1
WEEK 3		Chapter 10	
M 4/11	Catalytic loss cycles. CFCs.		Exam 1
W 4/13	Polar ozone loss. Recovery of stratospheric ozone.		
WEEK 4		*Solomon* 1999	
M 4/18	Mid-latitude ozone loss. Role of aerosol chemistry in the stratosphere.		
W 4/20	*Paper discussion*		PS2
WEEK 5		Chapter 11	
M 4/25	Montreal Protocol.		Exam 2
W 4/27	Oxidizing capacity of the atmosphere. The global budgets of CO, CH_4 and VOCs.		
WEEK 6		*Hofzumahaus et al*., 2009	
M 5/2	*Paper discussion.*		
W 5/4	Tropospheric halogen chemistry.		PS3
WEEK 7		Chapter 12	
M 5/9	Tropospheric ozone and NO_x.		Exam 3
W 5/11	Air pollution.		
WEEK 8		Chapters 6 and 13	
M 5/16	Aqueous-phase and aerosol chemistry. Acid rain.		
W 5/18	Biogeochemical cycles.		PS4
WEEK 9			
M 5/23	Chemistry-climate feedbacks.		Exam 4
W 5/25	*Student presentations*		Papers
WEEK 10			
M 5/30	NO CLASS – Memorial Day		
W 6/1	*Student presentations*		
FINALS WEEK			
W 6/8 8:30am	*Student presentations*		