

SIO217d

Atmospheric Chemistry

Instructors: Ralph Keeling and Lynn Russell

Atmospheric chemistry that impacts climate change, including photochemical reactions, ozone chemistry, and aerosol evolution in the troposphere and stratosphere. Atmospheric applications of catalytic cycles, heterogeneous chemistry, and microphysical processes will include the ozone hole, urban smog, and aerosol-cloud interactions.

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Textbooks:	<u>SP:Atmospheric Chemistry and Physics, Seinfeld and Pandis (2016)</u>	
	<i>WF:Ocean Dynamics and the Carbon Cycle, Williams and Follows (2011)</i>	
	<i>A:Isotope Geology, Allegre (2008)</i>	
Structure:	This course focuses on the chemical compounds and processes that affect the Earth's atmosphere.	
	The topics include aerosols, clouds, greenhouse gases, and other climate-relevant aspects.	
	The goals include developing a quantitative understanding of:	
	(1) the microphysical mechanisms that regulate aerosol concentrations and evolution in the atmosphere.	
	(2) the physical and chemical interactions of aerosols with clouds and their effects on climate.	
	(3) the anthropogenic controls on greenhouse gases, with a focus on recent rises in CH ₄ , N ₂ O and CO ₂ .	
	(4) isotopic basics in relation to climate change	
	Students will participate regularly in discussions related to these topics.	
Grading:	50%	Carbon Cycle (Exam 20%, Homework 30%)
	50%	Aerosol-Cloud Microphysics (Exam 20%, Homework 30%)
Policies:	Rescheduling exams requires a written reason from a doctor, dean, divinity, or DoD.	
	Honest, objective, polite participation; no cheating or misrepresentation of others' work as your own.	

Date		Time	Ch	Instr.	Hmwk	Topics
10-Jan	Tu	11:00	WF6.1-6.3	RK		Aqueous Chemistry of CO ₂
12-Jan	Th	11:00	WF6.1-6.3	RK		Aqueous Chemistry of CO ₂ - continued
17-Jan	Tu	11:00	SP22.1-2	RK	Set1 due	Atmospheric CO ₂ phenomenology and controls
19-Jan	Th	11:00	SP22.1-2	RK		Atmospheric CO ₂ phenomenology and controls - continued
24-Jan	Tu	11:00	SP8.1-2	LR	Set2 due	Aerosol Size Distributions: Comparisons and Quantification
26-Jan	Th	11:00	VonDerWeiden	LR		Aerosol Size Distributions: Moments and Losses
31-Jan	Tu	11:00	SP9.1-3	LR	Set3 due	Aerosol Motion and Formation: Particle Slip, Drag, Velocity, and Lifetimes
2-Feb	Th	11:00	SP11.1-3	LR		Aerosol Motion and Formation: Nucleation
7-Feb	Tu	11:00	SP12.1-2	LR	Set4 due	Aerosol Chemical Evolution: Mass Transfer of Gases to Particles
9-Feb	Th	11:00	SP7.3,5 (SP10)	LR		Aerosol Chemical Evolution: Aqueous Chemistry
14-Feb	Tu	11:00	SP13.2-3	LR	Set5 due	Aerosol Population Dynamics: Coagulation and Condensation
16-Feb	Th	11:00	Pandis	LR		Aerosol Population Dynamics: Time Scales and Self-Preserving Distributions
21-Feb	Tu	11:00	SP17.1,5	LR	Set6 due	Aerosol-Cloud Microphysics: Activation and CCN
23-Feb	Th	11:00	Kreidenweis	LR		Aerosol-Cloud Microphysics: Kappa and Hoppel Gap
28-Feb	Tu	11:00	SP23.4-5,23.9	RK	Set7 due	GHG Lifetimes and Global Warming Potential
2-Mar	Th	11:00		RK		CH ₄ and N ₂ O budget and controls
7-Mar	Tu	11:00	A7.1-7.2	RK	Set8 due	Isotope basics
9-Mar	Th	11:00	A7.3.3,7.5.1	RK		Isotopes and hydrological cycle
14-Mar	Tu	11:00	Broecker	RK	Set9 due	Radiocarbon
16-Mar	Th	11:00	WF6.6	RK		Air-sea gas exchange
21-Mar	Tu	11:00			Set10 due	Optional Aerosol Review Session