ATMOSPHERIC CHEMISTRY

CHEM F406 Overview and Schedule ---- Fall 2018

Instructor	Dr. Jingqiu Mao (Reichardt 188, 907-474-7118, jmao2@alaska.edu)
Office Hours	Tu, Th 11:20A-12:20P and any other time by appointment
Class	Tu, Th, 9:45A-11:15A, REIC 207
Text:	Introduction to Atmospheric Chemistry, Daniel J. Jacob
	(Available online: http://acmg.seas.harvard.edu/people/faculty/djj/book/index.html)
Supplements	Atmospheric Chemistry and Physics: from Air Pollution to Climate Change, John H. Seinfeld and Spyros N. Pandis, 3rd Edition.

Course Description (from catalog):

Chemistry of the lower atmosphere (troposphere and stratosphere) including photochemistry, kinetics, thermodynamics, box modeling, biogeochemical cycles and measurement techniques for atmospheric pollutants; study of important impacts to the atmosphere which result from anthropogenic emissions of pollutants, including acid rain, the “greenhouse” effect, urban smog and stratospheric ozone depletion.

at a time that is convenient for interested students. In addition to these basic topics, we will cover the following topics, but some knowledge in this area would be beneficial:

Final exam	25%
Problem sets	40%
Participation in class discussion	10%

Students taking CHEM F406 complete a few fewer problems on the problem sets than the graduate students in addition to not presenting term project in class. However, undergraduate students are expected to do the term project together with graduate students and participate in the in-class discussions of project presentations. Graduate-level students lead a term project and give in-class presentation, which is a graded activity, and all students are given credit for participation in the in-class discussions of oral presentations.

Tentative Grade Scale:

A	90 - 100%
B	80 - 89%
C	70 - 79%
D	60 - 69%

If I find that students are close to a borderline between grades, I may choose to lower the threshold for the higher grade, but I will not raise the thresholds above the scale listed above.

Disability Services- I will work with the Office of Disabilities Services (208 Whitaker Bldg, 474-5655) to provide reasonable accommodation to students with disabilities. It is the student's responsibility to make an appointment with me to discuss appropriate accommodations. A letter from disabilities services must be provided.

Tentative Schedule:

Wk	Dates	Topic	Reading
1	28,30 Aug	Introduction/ Atmospheric chemical composition	1,2
2	4,6 Sep	Simple atmospheric models; lifetimes	3,5
3	11,14 Sep		

Student protections and services statement
Every qualified student is welcome in my classroom. As needed, I am happy to work with you, disability services, veterans' services, rural student services, etc. to find reasonable accommodations. Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. As required, if I notice or am informed of certain types of misconduct, then I am required to report it to the appropria

- **Title** should describe in a specific manner the content you are covering. If you are focusing on a specific location or season, be sure to include that in the title.

- **Abstract** should include a brief statement of the scientific question to be addressed and why it matters; the approach(es) to address this question; and must summarize key messages and findings.

- **Introduction** provides the context for the question being addressed. What background information must the reader know in order to understand the rest of the paper? Remember to assume the reader has taken this course, so it should not be a textbook discussion. What work has previously been done, and what questions remain, that you are addressing here? It's often effective to end your first paragraph of the intro with

If a model matches observations, can you report a correlation coefficient or an amplitude of a seasonal cycle as observed vs. modeled? Note that the papers you are reviewing may not do this (but they should!). If you are presenting your own research results, try to do so quantitatively by reporting statistics where possible.

- **Conclusions** The first paragraph should briefly remind the reader of the problem being addressed (in other words, for the readers who skip the paper and only read the abstract and conclusions [though of course I will read carefully your every word! !]). Here is where you should focus each paragraph on a different key message. What are the implications? What questions remain? How might these knowledge gaps be filled? What observations are needed? Tests with models? Lab experiments? Theory? i.e., you can discuss what future work is needed to advance your understanding beyond what you've learned from the papers you've studied.

- **Figures and Tables. You may include up to 4 figures and tables (combined)**. A picture is worth 1000 words… if it's a good one! This is a critical review, so it's certainly ok to include figures from the papers you're reading but they must be properly cited (i.e. to..24 12rly

Oxidizing capacity as determined from observed methyl chloroform or ^{14}CO
Isotopes in atmospheric chemistry (sulfate, nitrate, water, or hydrocarbons)
Methane trends (paleo, preindustrial-to-present, or recent decades)
Methane role in oxidizing capacity and/or air quality
Chemistry occurring on dust or other aerosols
Sources of baseline ozone levels in surface air
Atmospheric budgets of oxygenated volatile organic compounds (e.g., acetone, ethanol, methanol, glyoxal, etc.)
Tropospheric halogen chemistry
Peroxy acetyl nitrate and long-range pollution transport
Isoprene oxidation and secondary aerosol or ozone formation
Monoterpene oxidation and formation of secondary organic aerosols
Paleo atmospheric composition
Planetary atmosphere (choose a planet or set of chemical reactions)
Radiative forcing from non-CO_2 species
Trends in regional air pollution (choose a pollutant/region)
Mercury budgets or oxidation pathways
Persistent organic pollutants Dry deposition
Wet removal (gases or aerosol)
Emissions from the biosphere: soil NOx, isoprene, terpenes, wildfires, or methane

Alternative – write a research paper on your own project:
Describe and draw conclusions from a short data analysis project from a field campaign, monitoring network, applying a simple model, or your own relevant research. You are encouraged to use this project as an opportunity for a seed project that could turn into thesis work. Talk to the instructor if you'd like to take on your own project but need help finding a dataset or model to use.