

SIO 172: Physics of the Atmosphere

Winter Quarter 2021

11:00—12:20, Tuesday & Thursday

Instructors

Prof. Amato Evan

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Office hours: Tuesday 1:00-2:00

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Office hours: Thursday 2:00-3:00

In-Person and Remote Options

This course is offered both in-person and remotely. No matter the section you have enrolled in, you are welcome to attend in either manner, at any time. The in-person content and the Zoom content will both be recorded and available to watch at any time via our course Canvas site.

Another option is to not attend virtual or in-person lectures in real-time, but rather watch this content at a later date.

In-person location: Warren West Outdoor Space

There is more than enough room in our tent for anyone enrolled in either Section to attend in-person lectures. So if you decide to do so at any point during the quarter, just show up. Location is here: <https://maps.ucsd.edu/map/?id=1005#!m/187746>. More information regarding the tent space is here: <https://aps.ucsd.edu/faculty-resources/covid-19/faq.html#Outdoor-Instructional-Spaces>

Remote (Zoom) login:

As noted above, you can attend lectures in-person or remotely. The Zoom information is below. Please note that *all zoom lectures will be recorded and posted to our classes Canvas site*. You can only access the meeting through a UCSD ip address. So this means [you will need to VPN if you are off-site](#).

Course description

This course provides an understanding of the physical principles governing the behavior of the Earth's atmosphere, with emphasis on the atmospheric thermodynamics, radiation and clouds. Upon completion of this course, students will be able to identify and understand atmospheric processes that influence weather and climate.

Course Canvas Website

I will post all of my lecture notes and slides, the lecture podcast (made from the tent), and the recordings of the simultaneous zoom meeting on the TritonEd Canvas website for our course, <https://canvas.ucsd.edu/courses/23965>. If you feel uncomfortable with being included in the course recordings, you do have the option to leave your camera off and stay muted throughout.

Required textbook

Fortunately the textbook for this course is freely available through the library. However, if you are really interested in the subject, I recommend purchasing this great resource:

Atmospheric Science: An Introductory Survey (2nd edition), by J. Wallace & P. Hobbs, Academic Press. <https://www.elsevier.com/books/atmospheric-science/wallace/978-0-12-732951-2>

And here is the link to the downloadable pdfs (must access via a UCSD IP):

<http://uclibs.org/PID/240988>

Evaluation

There will be one mid-term and one final examination. The exams will primarily consist of essay-type questions and quantitative problem solving. The materials included in exams will be taken directly from lectures, class discussions, and textbook reading assignments. Exams are open book/open note/open internet.

There will be 4 Weather Blog assignments and 2 lab assignments. The Weather Blog assignments will start out simple and then grown in complexity. Mid-way through the quarter I will offer an extra credit assignment that will be worth up to 5 percentage points towards your final grade.

Assignment	Percentage	Due Date
Weather Blogs:	20%	1/14, 1/28, 2/25, 3/11
Lab Assignments:	20%	2/11, 3/11
Mid-term Exam:	30%	Thursday, February 11
Final Exam:	30%	Thursday, March 18

Your final grade will be determined according to the following scale:

A: 100–93	A-: 92–90	
B+: 89–87	B: 86–83	B-: 82–80
C+: 79–77	C: 76–73	C-: 72–70
D: 69–60		
F: Less than 60		

Course Schedule

Lecture	Topic	Date	Reading
1	Introduction: Thermodynamics: Basics	1/5 Tu	WH 1, 2
2	Thermodynamics: Gas Law, Hydro Balance	1/7 Th	WH 3.1, 3.2
3	Thermodynamics: 1 st Law, Adiabatic Processes	1/12 Tu	WH 3.3, 3.4
4	Thermodynamics: Water Vapor, Second Law <i>Due: Weather Blog 1</i>	1/14 Th	WH 3.5, 3.6
5	Thermodynamics: Theta-e, Stability	1/19 Tu	WH 3.6, 3.7
	Balloon Launch (Meet at Scripps Pier) <i>tentative</i>	1/21 Th	
6	Thermodynamics: Stability	1/26 Tu	
7	Thermodynamics: Stability, Sonde Exercise	1/28 Th	
	Thermodynamics: Summary <i>Due: Weather Blog 2</i>	2/2 Tu	
8	Radiation: LW & SW Radiation, Satellite Remote Sensing	2/4 Th	WH 4.1–4.3, 4.5
9	Midterm Exam (through lecture 7) <i>Due: Sounding Lab</i>	2/9 Tu	
	Radiation: Optical Phenomenon I	2/11 Th	
10	Radiation: Optical Phenomenon II	2/16 Tu	
11	Radiation: Optical Phenomenon III	2/28 Th	
12	Radiation: TOA Balances	2/23 Tu	WH 4.4
13	Radiation: TOA Balances, Summary <i>Due: Weather Blog 3</i>	2/25 Th	WH 4.6

14	Cloud Physics: Cloud Types & Nucleation (HWK 2 and sounding lab due)	3/2 Tu	WH 6.1, 6.2
15	Cloud Physics: Structure, Droplet Growth & IN	3/4 Th	WH 6.4, 6.5
16	Cloud Physics: Aerosols & Cloud Modification	3/9 Tu	WH 6.6
17	Cloud Physics: Summary Due: Weather Blog 4, Flux Lab	3/11 Th	