SIO 173 (Spring Quarter 2021)

Dynamics of the Atmosphere and Climate

Instructors: Ian Eisenman eisenman@ucsd.edu
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Canvas website: https://canvas.ucsd.edu/courses/26062

Lectures: Lectures will be delivered live over Zoom on Tuesdays and Thursdays at 2:00-3:20. The Zoom link will be given through Canvas. All lectures will be recorded and made available through Canvas for those who are not able to join them live. Lecture slides or notes will be posted on Canvas after each course meeting.

Office Hours: TA office hours will be held on Mondays at 4-5pm and Wednesdays at 2-2:30pm at the same Zoom link as class meetings. Instructor office hours will be held over Zoom immediately after each class. Students are also welcome to email the instructors or TA with questions or to set up a Zoom appointment.

Course Description: Introduction to the dynamical principles governing the atmosphere and climate using observations, numerical models, and theory to understand atmospheric circulation, weather systems, marine layer, Santa Ana winds, El Nino, climate variability, climate change, and other phenomena.

Grading Criteria: 50% homework, 20% midterm exam, 30% final exam

Textbooks:

Mid-Latitude Atmospheric Dynamics (1st edition)
Jonathan Martin
Online (UCSD only): http://roger.ucsd.edu/record=b7722336~S9

Atmospheric Science: An Introductory Survey (2nd edition)
J. M. Wallace and P. V. Hobbs
Online (UCSD only): https://doi.org/10.1016/C2009-0-00034-8

Global physical climatology (1st edition)
Dennis Hartmann
Online (UCSD only): http://roger.ucsd.edu/record=b7294702~S9

Homework: Homework assignments will be posted on Canvas and should be turned in through Canvas. They may be turned in one class later than they are due without penalty (grace period), but they will be accepted later than this only in exceptional circumstances. Each student's lowest homework grade will be dropped in the calculation of the final grade.

Collaboration: Students may collaborate on homework exercises (as long as each student turns in his or her own work). No collaboration is allowed on exams.

Examinations: There will be a midterm exam and a final exam. The midterm will be targeted to take about 80 minutes and will be available on Canvas throughout the day on 4/29 (there will be no lecture that day), and the final will be targeted to take about 3 hours and will be available on Canvas throughout the day on 6/8.

Course Schedule (subject to change)

Date	Instructor	Topic	Reading	HW
Tu 3/30	Eisenman	Introduction	M 1.1-1.2 (omitting 1.2.3)	
Th 4/01	Eisenman	Fundamental forces	M 2.1	
Tu 4/06	Eisenman	Apparent forces	M 2.2	HW-0 due
Th 4/08	Eisenman	Momentum equation, Geostrophic flow	M 3.2	
Tu 4/13	Eisenman	Hydrostatic relationship, Continuity equation, Energy equation	M 3.1, 3.3	HW-1 due
Th 4/15	Eisenman	Potential temperature, Static stability	M 3.3	
Tu 4/20	Eisenman	Pressure as a vertical coordinate	M 4.1	HW-2 due
Th 4/22	Eisenman	Global energy balance (Emma Beer)	H 2.1-2.3	
Tu 4/27	Eisenman	Climate sensitivity and feedbacks (Emma Beer)	H 9.1-9.2	HW-3 due 4/26
Th 4/29		Midterm Exam		

Date	Instructor	Topic	Reading	HW
Tu 5/04	Xie	Natural coordinates, balanced flow	M 4.4	HW-4 due
Th 5/06	Xie	Thermal wind	M 4.3	
Tu 5/11	Xie	Circulation theorem	M 5.1	HW-5 due
Th 5/13	Xie	Vorticity, potential vorticity	M 5.2	
Tu 5/18	Xie	Divergence, vorticity generation	M 5.3	HW-6 due
Th 5/20	Xie	Quasi-geostrophic system, numerical weather prediction	M 5.4, WH 7.5	
Tu 5/25	Xie	General circulation, climate, monsoons	WH 7.3.6, 7.4.0; WH 10.1	HW-7 due
Th 5/27	Xie	El Nino, climate variability	WH 10.2.1, 10.2.2a	
Tu 6/1	Xie	SoCal climate	Notes to be distributed	HW-8 due
Th 6/3	Xie, Eisenman	Review session		
Tu 6/8		Final Exam (3-6pm)		