SIO 173 (Spring Quarter 2022)
Dynamics of the Atmosphere and Climate

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Canvas website: https://canvas.ucsd.edu/courses/36296

Lectures: Lectures will be delivered in-person on Tuesdays and Thursdays at 2:00-3:20 in Keck 150. 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 in MESOM M351, and Wednesdays at 2:30-3pm via zoom at https://ucsd.zoom.us/my/pczhang. Instructor office hours will be held 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

An Introduction to Dynamic Meteorology (Fourth Edition, 2004)
J.R. Holton
Online (UCSD only): http://roger.ucsd.edu/record=b7294699~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 4/28 (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 6/7.

Course Schedule (subject to change)

Date	Instructor	Topic	Reading	HW
Tu 3/29	Lutsko	Introduction	M 1.1-1.2 (omitting 1.2.3)	
Th 3/31	Lutsko	Fundamental forces	M 2.1	
Tu 4/05	Lutsko	Apparent forces	M 2.2	HW-0 due
Th 4/07	Lutsko	Momentum equation, Continuity equation, Hydrostatic relationship	M 3.1, 3.3	
Tu 4/12	Lutsko	Geostrophic flow, Thermal wind, Energy equation	M 3.2, 3.3	HW-1 due
Th 4/14	Lutsko	Potential temperature, Static stability	M 3.3	
Tu 4/19	Lutsko	Pressure as a vertical coordinate	M 4.1	HW-2 due
Th 4/21	Lutsko	Global energy balance	H 2.1-2.3	
Tu 4/26	Lutsko	Climate sensitivity and feedbacks	H 9.1-9.2	HW-3 due 4/26
Th 4/28		Midterm Exam		

Date	Instructor	Topic	Reading	HW
Tu 5/03	Xie	Natural coordinates, balanced flow	M 4.4	HW-4 due
Th 5/05	Xie	Circulation theorem	M 5.1	
Tu 5/10	Xie	Vorticity, potential vorticity	M 5.2	HW-5 due
Th 5/12	Xie	Divergence, vorticity generation	M 5.3	
Tu 5/17	Xie	Quasi-geostrophic system	M 5.4	HW-6 due
Th 5/19	Xie	Rossby waves, numerical weather prediction	Holton 7.7.1, WH 7.5	
Tu 5/24	Xie	Ocean upwelling, El Nino	WH 1.4, 2.1d, 10.2.2a	HW-7 due
Th 5/26	Xie	Climate variability, climate prediction	WH 10.2.1-2a, 10.5, 8.2.4	
Tu 5/31	Xie	California climate, atmospheric rivers, marine layer, fires	Handout notes	HW-8 due
Th 6/2	Xie, Lutsko	Review session		
Tu 6/7		Final Exam (3-6pm)		