

ATM SCI 352 Dynamic Meteorology II SPRING 2023

Section	LEC 001
Class Number	48013
Level	U/G
Credits	3
Prereq	Atm Sci 351(P)
Dates	1/25–5/13
Days/Hours	MW 11:30–12:45am
Format: hybrid	Physics Building 146
Instructor	Kravtsov, Sergey
Text	Holton, J. R. “An Introduction to Dynamic Meteorology,” Chapters 4–6.
Additional refs.	Gill, A., 1982 “Dynamics of Atmospheres and Oceans.” Kundu, P. K., 1990 “Fluid Mechanics.” Pedlosky, J., 1987 “Geophysical Fluid Dynamics.”

Description

This class builds on the ATM SCI 351 to continue introducing a theoretical framework for analysis of large-scale motion within the Earth’s fluid envelope. Format: Weekly online readings and assignments combined with f2f lecture and problem-solving sessions.

Homework, Exams, Grading

You will be given three major homework projects (25% of the grade), a number of shorter quiz assignments (25% of the grade) to help digest the material presented in class; the course will also have two exams (25% of the grade each), midterm and final. All of the assignments and exams will be open book. The final grade will be computed as follows (in percentage of maximum possible score based on all assignments excluding extra-credit assignments):

% Score	Grade	% Score	Grade
95 – 100	A	70 – 75	C
90 - 94	A-	65 – 69	C-
85 - 89	B+	60 – 64	D+
80 - 84	B	55 – 59	D
78 – 79	B-	50 – 54	D-
76 – 77	C+	0 – 49	F

Office hours

Officially, MW 1–3pm, EMS W441, or via Skype/Microsoft Teams. However, please feel free to arrange an online or f2f appointment via email for any other time.

Syllabus Addendum

To comply with a Higher Learning Commission requirement, we provide below information on the estimated amount of time an average student needs to invest in order to achieve the learning goals for this class:

- 35 hours in the classroom attending f2f sessions (or studying the recorded sessions online)
- 65 hours for weakly readings, quizzes and homework assignments
- 40 hours of study and preparation for quizzes and exams
- 2-hour mid-term and final exams

Total number of hours: 144

Syllabus COVID-19 Statement

See <https://uwm.edu/cetl/covid-19-syllabus-statements/>

Tentative schedule (Note: the layout below is for informational purposes only. The actual weekly readings [from Holton, as well as from instructor's notes] and quizzes will be assigned online, as the course progresses)

01/23 Recap of governing equations. Geostrophic degeneracy. Vorticity and potential vorticity in a homogeneous fluid.

01/30 Vorticity in natural coordinates. Introduction to circulation.

02/06 Circulation theorem. Ertel potential vorticity. Flow over a mountain.

02/13 Vorticity and potential vorticity equations.

02/20 Quasi-geostrophic approximation. **HW#1 due.**

02/27 QG equations in Boussinesq-fluid layer models.

03/06 Dynamical equivalence of layer and level models.

03/13 Midterm exam.

03/20 No classes (Spring Break)

03/27 Dynamical pressure/geopotential height tendency equations in a two-layer model.

04/03 Role of temperature and thickness advection in QGPV evolution. Vertical velocity (ω) equation.

04/10 QGPV equation: Derivation and analysis in pressure coordinates. **HW #2 due.**

04/17 Waves and oscillations. Phase and group velocities. Acoustic (sound) waves. Shallow-water gravity waves.

04/24 Internal gravity waves. Topographic waves. Inertia-gravity waves.

05/01 Adjustment to geostrophic balance. Rossby waves.

05/08 Baroclinic instability in a two-layer model. **HW #3 due.**

05/15 Final exam.