

GEOPHYSICAL FLUID DYNAMICS

ATMOSPHERIC SCIENCES C125/C201A, WINTER 2016

Professor James C. McWilliams

COURSE OBJECTIVES: To provide an introduction to the fundamental concepts, analysis techniques, and canonical solutions of geophysical fluid dynamics (GFD). The topics include the fluid dynamics of waves, instabilities, vortices, turbulence, boundary layers, and mean circulations under the influences of advection, shear, gravity, stratification, compressibility, and rotation. Examples will be taken from both the atmosphere and ocean.

WEB SITE: Course materials are at the CCLE site, <https://ccle.ucla.edu/course/view/16W-A>

COURSE TEXT: *Fundamentals of Geophysical Fluid Dynamics*, Cambridge Press (2006, 2011).

The new printing is at

[http://www.cambridge.org/us/knowledge/isbn/item6704704/Fundamentals of Geophysical Fluid Dynamics/](http://www.cambridge.org/us/knowledge/isbn/item6704704/Fundamentals-of-Geophysical-Fluid-Dynamics/)

in paperback and eBook. It is a cheaper version than the earlier printings, and it is supposed to have almost all the corrections listed at the class web site.

PRE-REQUISITES (*de facto*, not *de jure*): General mechanics, fluid dynamics and thermodynamics, methods of mathematical physics, including partial differential equations, and atmospheric and oceanic phenomena.

LECTURES: TR in room 7121 Math. Sci. Bldg., 11-12:30 (with rescheduling if necessary). Discussion sessions will be arranged on an *ad hoc* basis (*e.g.*, before an exam or for homework exercises).

OFFICE HOURS: Following class or by email appointment (jcm@atmos.ucla.edu).

GRADING: Based on mastery of text, classroom participation, homework, and midterm and final exams.

REFERENCE TEXTS: Not required, but useful alternative treatments of course topics.

- Cushman-Roisin, B., and J.-M. Beckers, 2011: *Introduction to Geophysical Fluid Dynamics*, Elsevier.
- Gill, A.E., 1982: *Atmosphere-Ocean Dynamics*, Academic Press.
- Holton, J.R., 1992: *An Introduction to Dynamic Meteorology*, Third Edition, Academic Press.
- Pedlosky, J., 1987: *Geophysical Fluid Dynamics*, Second Edition, & 2003: *Waves in the Ocean and Atmosphere*, Springer-Verlag.
- Vallis, G.K., 2006: *Atmospheric and Oceanic Fluid Dynamics*. Cambridge.