SIO 212B: Geophysical Fluid Dynamics B – Spring 2019

Instructor

My name is Paola Cessi, and my office is in Room 366 in the OAR building (a.k.a. the Keck Building). My e-mail addresses is `pcessi@ucsd.edu`. I will not enter into extended electronic correspondence but for quick questions this is the best way to communicate. I am usually in my office, but it is best to check before coming or make an appointment if you want to come see me.

Class schedule

The schedule is Tu-Th from 11 to 12:20pm in NH101 with a recitation on Wed 9:30am - 10:50am in NH101.

Assignments and assessment

The course is offered for **letter grade** only. If you have signed for S/U, please change to letter grade.

I will assign problems regularly on Tuesday, due the following Tuesday, and then discuss them in the recitation session on the Wednesday after the due date. As I have less than one day to grade them, I will not accept late homework.

The grade in this course is based on an in-class mid-term test on 5/2/2019 (40%), in-class end of term test on 6/6/2019 (40%) and homeworks (20%) The in-class tests will be 80 minutes each, "closed books and closed notes", with problems *very* similar to those on the assignments. You may bring one sheet of paper to help your memory (written on both sides, if you wish).

Recommended texts

I will follow different books for different topics. Here is the list I use:

Vallis, G.K. Atmospheric and oceanic fluid dynamics, Cambridge University Press, 2017.

Gill, Adrian E. Atmosphere-ocean dynamics. New York : Academic Press, 1982.

Pedlosky, Joseph. Geophysical fluid dynamics. 2nd ed. New York : Springer-Verlag, c1987.

Pedlosky, Joseph. Ocean circulation theory. Berlin ; New York : Springer, c1996.

Syllabus for SIO 212B

Homogeneous circulation theory and Sverdrup balance: The linear theories of Stommel and Munk and the nonlinear Fofonoff flow; Numerical solutions of the problem; The effects of topography. (Vallis Chapter 14 - Ch. 19 in new edition)

The vertical structure of the wind-driven circulation: QG models of planetary scale flows; eddy fluxes; PV homogenization. The ventilated thermocline. (Vallis Chapter 15 - Ch. 20 in

new edition- Pedlosky GFD, chapters 6.21-6.23, Pedlosky OCT Chapters 3 and 4).

The concept of residual circulation and transformed Eulerian mean (Vallis Chapters 7 and 16 - ch. 10 in new edition - notes and papers).

The meridional overturning circulation: simple models with multiple equilibria (Vallis new edition ch. 21).

The general circulation of the tropical atmosphere: symmetric models of the Hadley circulation. (Vallis Chapter 14 – new edition – and in-class notes)

The Walker circulation: Gill's and Matsuno's models (Gill Chapter 11.14 and Vallis new edition ch. 8.5 and 22.6)

Two-dimensional and geostrophic turbulence. (Vallis Chapter 9, ch 12 in new edition)

The general circulation of the mid-latitude atmosphere: the maintenance of the midlatitude jet (Vallis Chapter 12.1-3, cp. 15.1 in new edition)

Simple models of El Nino - Southern Oscillation (Vallis new edition ch. 22.7-22.9)