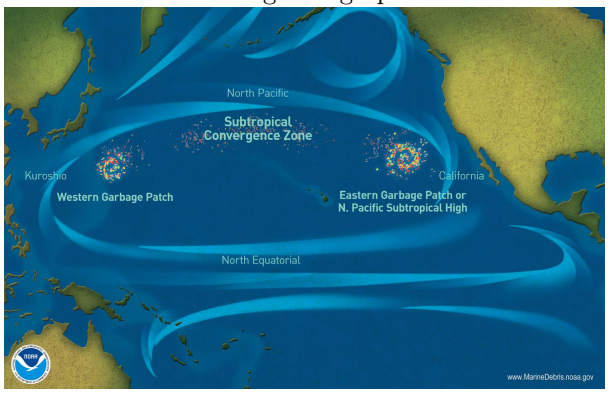
Problem Set #3/Take-home Midterm

OCEA/EART 172/272: Geophysical Fluid Dynamics

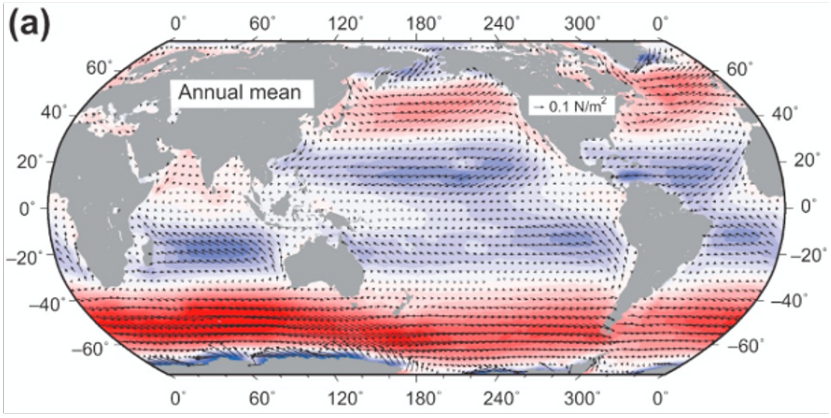
Due: Tuesday May 5, 2020

You can ask me questions about this, but otherwise, you must do this problem set entirely on your own (open book/open notes, of course).

1. Cushman-Roisin (2nd edition) Analytical Problem 4-3. This problem is not found in the first edition.
2. Cushman-Roisin (2nd edition) Analytical Problem 8-1. (1st edition problem 5-1) Hint: There are 2 ways to answer this problem. You can describe the answer from the perspective of a non-rotating frame or from within a rotating frame. I prefer the one from the rotating frame, but the other is acceptable too.
3. Cushman-Roisin (2nd edition) Analytical Problem 8-2. (1st edition problem 5-2)
4. Cushman-Roisin (2nd edition) Analytical Problem 8-6.(1st edition problem 5-5)
5. Over the last 10 years, the great Pacific garbage patch has gotten a lot of attention. The first link from my web search today is `https://www.nationalgeographic.org/encyclopedia/great-pacific-garbage-patch` which has the following nice graphic



The description on this page and other descriptions of the garbage patch in popular press seem off to me or at least confusing. Based on what you have learned in this class, explain why floating debris gathers in the center of the North Pacific. Focus on the northern and eastern garbage patches above. Please do not say the currents transport the garbage there and stop there. That is of course correct, but not a sufficient explanation. The following image of mean wind stress over the ocean will help.



Mean wind stress (arrows) and zonal wind stress (color shading) (N/m^2): (a) annual mean from the NCEP reanalysis 1968–1996 (Kalnay et al., 1996).