

Ocean circulation: quiz 4

This quiz aims at testing your knowledge regarding the most fundamental aspects of lecture 3. Qualitative statements are expected.

1. **Ekman transports.** How do Ekman transports relate to surface winds and what is their typical vertical extent?
2. **Ekman pumping/suction.** What are the two means by which Ekman transports can generate vertical motion? What is the order of magnitude of such motion? Give a typical location where Ekman pumping (respectively suction) occurs.
3. **Barotropic vorticity balance.** Describe the three main steps by which oceanographers can reconstruct the gyre circulation from the horizontal momentum equations.
4. **Sverdrup balance.** What is the physical meaning of the Sverdrup balance in terms of barotropic vorticity? What elements of the circulation does it explain? What are the typical velocities and vertical extent associated to the Sverdrup transport?
5. **Drivers of the gyre circulation.** What other terms of the vorticity balance can drive a gyre circulation? Give for each term its physical meaning and a typical region where it is important.
6. **Shadow zones.** Where are the so-called "shadow zones" located? What explains their low ventilation? What also explains their low oxygen content?
7. **Antarctic circumpolar current.** What is the main balance that determines the strength of the Antarctic circumpolar current? How does it relate to ocean hydrography? What are its two main drivers?
8. **Mesoscale eddies.** Give three reasons why mesoscale eddies are important for the ocean circulation.
9. **Importance of topography.** Give three reasons why topography is important for the ocean circulation.
10. **Equatorial circulation.** Give three particularities that make Equatorial circulation unique compared to extra-tropical circulation.
11. **Tropical cells.** What is the structure and main drivers of Tropical cells?
12. **South Equatorial Currents.** List the three main South Equatorial Currents and give the dynamical particularity of each one of them.
13. **North Equatorial Countercurrent.** How does the North Equatorial Countercurrent relate to the Northern Hemisphere Tropical cells?
14. **Equatorial Undercurrent.** What makes the Equatorial Undercurrent dynamically unique? What accelerates and slows it down?
15. **Ocean versus atmosphere.** Based on these lectures and on your prior knowledge about atmospheric dynamics, name three major differences between oceanic and atmospheric dynamics.