Observation and Circulation of Water Masses
Home Project: Currents from Hydrology

Due to 23 October December 2020

Instructions:

- Students are required to prepare a *commented* python notebook containing some codes and figures and analysis of the WOCE levitus climatology dataset, on one of the following oceanic basin : Indian, Pacific, Atlantic.

- The notebook will have to be sent by email to `steven.herbette@univ-brest.fr` by 23 October 2020.

- The WOCE levitus climatology is an atlas that provides temperature and salinity vertical profiles over the World Ocean. The data has been interpolated on ga regular grid-cells of 1° latitude by 1° longitude. Netcdf files of this climatology can be downloaded on:`http://mespages.univ-brest.fr/~herbette/M2-POC-2019-2020/Data/WOA2018/`. A full description of the data can be found on:`https://www.nodc.noaa.gov/OC5/woa18/woa18data.html`

Questions:

1. Choose one of the following ocean basin: Indian, Pacific, Atlantic. You will stick to this choice for the whole project.
2. Plot a north-south transect of conservative temperature (Θ), absolute salinity (SA), oxygen, nitrates, silicate and phosphates at roughly the middle longitude of the oceanic basin of your choice.
3. Add a transect of potential density
4. Use the data of this transect to plot a $\Theta - SA$ diagram
5. Report on this diagram the major water masses
6. Propose an algorithm that calculates the geostrophic currents at some given depth from the WOA2018 climatology
7. Write a python program that calculates the surface currents from the hydrology. The level of no motion may be taken at -1500 m.
8. Provide a map of the surface currents
9. Compute the sea-surface height that would give the same surface geostrophic currents derived from the hydrology. This sea-surface height is referred to as the steric height, as it reflects the heat content of the Ocean.