DESCRIPTION OF A MODIFIED VERSION OF THE GOTM TO STUDY THE OCEANIC MIXING LAYER OVER THE EQUATORIAL ATLANTIC OCEAN

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The study of turbulence modeling applied to the oceanic mixing layer (OML) has begun with engineering and meteorological models due the necessity to simulate oceanic physical process such as strong stratification, wind shear turbulence, gravity waves, etc. The development of new theories and measurement techniques originates controversial claims about how well the problem of turbulence modeling in marine waters was being treated, and then, different methods of simulating ocean mixing were made independently. Burchard et al. (1999) developed a computational tool that compiles the main statistical closure turbulence models in marine waters, which they called *General Ocean Turbulence Model* (*GOTM*). In this way, the *GOTM* allows a practical way to compare the different turbulence models and to simulate the OML for the different cases in oceanography – estuaries, costal, open ocean, etc.

The most sophisticated version of the *GOTM* is second order turbulent closure with two equation k-ε model. Statistical closure two equations turbulence models provide the adequate complexity without computational expenses (Burchard et al., 1999) and estimate turbulent quantities such as the turbulent kinetic energy (TKE), k, and the TKE dissipation rate, ε, which can be compared to observations. Numerically, the model solve a diffusion equation (Eq. 1) using a scheme centered at space and advanced in time, with a staggered one-dimensional grid over the water column.

$$\partial_t X = \partial_z (\nu \partial_z X) \tag{1}$$

In Eq. 1, X is any mean flow property – horizontal velocity components, temperature, salinity, and, in case of the k-ε model, the TKE and its dissipation rate. The eddy viscosity or diffusivity (ν) at Eq. 1 is obtained by the following relation:

$$\nu = ck / \varepsilon \tag{2},$$

where c are the named instability functions and contain all the second order turbulent closure details (Canuto et al., 2001).

The Air-Sea Interaction Research Lab of IAG-USP is using this version of the *GOTM* to study the OML evolution over the equatorial Atlantic Ocean using the dataset of PIRATA buoys and from satellite (SRB-NASA). Due to the dynamics particularities of the oceanic equatorial region, as the existence of the equatorial undercurrent, some modifications had to be done for more realistic simulation, such as the input of a relaxation term of the observations at the mean equations of velocities, temperature and salt.

REFERENCES

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