Geophysical Research Abstracts, Vol. 9, 02878, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-02878

A comparison of four vertical mixing schemes with an application to the Pacific Ocean

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In this study, we compare four turbulence models which are used for the parametrization of the oceanic boundary layer. Two of these models, called R224 and R22, are new and the others are Pacanowski and Philander's model (PP model, 1981) and Gent's model, 1989. These four models depend on the bulk Richardson number. This modelization is coherent with the studied region, the Tropical Pacific Ocean, in particular the West Pacific Warm Pool, because of the large mean shear associated with the equatorial undercurrent. For the numerical implementation, we use a non-conservative numerical scheme. We consider as initial conditions the climatology of the TOGA-TAO experiment at 165°E, 0°N. In parallel, we study the mathematical stability of the equilibrium solution. The numerical simulations show that the new model called R224 has a larger resolution spectrum than PP model and Gent's model. The results of the mathematical study show that R224 has better mathematical properties than the others. In fact, this model is good for the case of static stability and static instability. In addition, it is numerically more robust than the others. The mathematical part is to appear in Applied Mathematical Letters and the results of numerical simulations will be shown in an article which is in preparation. In the future, we plan to compare R224 with the KPP of Large and Gent, 1998. This work was done in collaboration between the University of Rennes 1 and the University of Sevilla, the member of the team being : AC. Bennis, M. Gomez Marmol, T. Chacon and R. Lewandowski.