



Diagnosing water transformation in neutral density space and the key role of light penetration in the ocean

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A new methodology is proposed for the evaluation of total dianeutral transports in the ocean. The methodology is easy to implement, namely for ocean numerical models, and represents an extension to the whole three dimensional domain of the classical approach to estimation of the cross-isopycnal transports due to surface fluxes. The extension is allowed by the use of the neutral density as global thermodynamical variable. The method is based on the diagnostics of the evolution equation of the neutral density, reconstructed using the diagnostics of tendencies for potential temperature and salinity. Moreover, the use of the tendencies allows for the estimation of the dianeutral transports associated to the different physical mechanisms. Eventually, the exact inclusion of the effect of the penetrative solar radiation in the estimate of surface buoyancy fluxes will also be presented, with a discussion of the implication for inversion of in situ data. We will present the results of the application of the method in the analysis of the mechanisms for water mass transformations in the Southern Ocean of an ice-ocean coupled model.