

Optimal control of turbulence models for the marine upper layer

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Abstract

The marine upper layer is the place of exchanges of mass, energy and heat between atmosphere and ocean and also for mixing processes with a multiscale variability, both in time (seasonal thermocline, nyctemeral cycle, wind gusts and storms) and space (surface and internal waves, Ekman layer instability, Langmuir circulation). The good representation of this mixing layer is a key problem for atmosphere – ocean coupled models for climate and bio-geochemical purposes. The sensitivity of the velocity profiles to eddy viscosity distribution is investigated using stochastic optimal control techniques based on Simultaneous Perturbation Stochastic Approximation method, with and without stratification. Moreover from quasi 3D in situ measurements using HF radars and floating profilers, the behaviour of the upper marine layer is analysed in the North Western Mediterranean sea.

Reference:

Aldebert, C., Koenig, G., Baklouti, M., Fraunié, P., & Devenon, J.-L. (2021). A fast and generic method to identify parameters in complex and embedded geophysical models: The example of turbulent mixing in the ocean. *Journal of Advances in Modeling Earth Systems*, 13, e2020MS002245. <https://doi.org/10.1029/2020MS002245>

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