Séminaire de Soeren Thomsen au LOCEAN

Nom : Séminaire de Soeren Thomsen au LOCEAN

Titre : Let?s take off our Ekman sunglasses

Laboratoire :

Nom du conférencier :

Son affiliation :

Date et heure : 28-01-2020 11h00

Lieu : Campus de Jussieu, salle de réunion LOCEAN, tour 45/55, 4eme étage

Résumé :

In the classical view the rate of coastal upwelling is determined by the intensity of the upper-ocean offshore Ekman transport. But meso- and submesoscale turbulence can modulate offshore transport and hence also the net upwelling rate at any given location. Eddy effects are generally in the sense contrary to that of the Ekman circulation, resulting in a so called "eddy compensation" that has received widespread attention in the context of the Southern Ocean. In this study we investigate the process of eddy compensation in an idealized upwelling model. In particular we explore how air-sea heat/buoyancy fluxes modulate the eddy and net cross-shore circulation. We do this using idealized CROCO (Coastal and Regional Ocean COmmunity model) simulations with constant winds but varying heat fluxes. Two sets of simulations with (dx = 800 m, 1/134º) and without (dx = 8 km, 1/13º) submesoscale-rich turbulence are carried out. Changing heat flux forcings impacts the cross-shore circulation and the eddy effect. For vanishing heat fluxes the release of available potential energy by baroclinic instabilities is strongest and leads, near the coast, to nearly full compensation of the Ekman-driven cross-shore circulation by eddy effects, i.e., zero net mean upwelling flow. The compensation effect is consistently evaluated with three different methods that all account for the quasi-isopycnal nature of ocean circulation away from the surface. With increasing heat fluxes the eddy compensation is reduced and the mean transverse flow progressively approaches the "textbook" Ekman circulation. Sensitivity of the eddy circulation to air-sea heat fluxes is felt down to depths of 100-125 m despite the relatively short duration of the experiments (tens of days). Eddy effects are only modestly stronger when submesoscale turbulence is properly resolved. All these findings have important implications for the overall understanding of upwelling system dynamics and biogeochemical functioning.

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