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Impact of submesoscale motions in dissolved O_2 in an upwelling system

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In this work, we explore the role played by physical-biogeochemical interactions at the submesoscale range in the distribution of dissolved O_2 in an idealized upwelling system. We model a wind forced baroclinically unstable front in a period channel that gives rise to a field of mesoscale and submesoscale structures such as vortices and filaments that promote cross-frontal exchange of tracers. The submesoscale turbulence is characterized by the concentration of vorticity in thin filaments. Strong rotational cores are found with diameters of the order of 2-10 km. The biogeochemistry is modelled by a simple phytoplankton-zooplankton-dissolved O_2 model. We compute biomass and O_2 production and export for different wind regimes and water column stratifications. Eddy fluxes and streamfunctions are used to assess the impact of submesoscale motions on the sources, sinks and transport of dissolved O_2.