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Calculating diahaline physical and numerical mixing in models of estuarine systems

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Estuaries are characterised by fresh-water inflow from river run-off and inflow of saline sea water due to estuarine circulation. Inside the estuary, brackish water of intermediate salinity is formed by turbulent mixing, flowing out into the ocean through the mouth of the estuary. This mixing is quantified as decay of salinity variance in the estuary. In numerical models, according to Klingbeil et al. (2014), the effective mixing can be accurately decomposed into physical mixing (due to the turbulence closure scheme) and numerical mixing (due to truncation errors of the salinity advection scheme). Using the isohaline analysis framework proposed by Walin (1977), physical and numerical mixing per salinity class an be calculated (Burchard, 2019), which allows to accurately calculate the
diahaline turbulent salt transport. Isohaline volumes and surface areas and thus diahaline salinity gradients can be calculated for each isohaline surface, which in turn allows to estimate effective physical and numerical diahaline eddy diffusivities. These analysis methods are demonstrated for an idealised numerical model of a tidal estuary.

References:

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Walin, G. (1977). A theoretical framework for the description of estuaries. Tellus, 29, 128-136.

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No

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