



## Are eddies important in coastal seas?

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Signals of geostrophic eddies are rarely seen clearly in the coastal ocean. The absence of a clear signal may be due to a variety of reasons: surface signals are eroded by air-sea interaction; features have a small spatial scale of a few kilometers; and during winter eddies are destroyed by mixing. However, we examine here through observations, numerical modelling and theory, the possibility that signals of eddy-scale variability can be seen in the interior thermocline during the summer when stratification is set.

High-resolution Scanfish observations in the North Sea show patches of freshwater advected laterally inside the thermocline from a well-mixed region, where tidal mixing is important throughout the entire water column. Their associated potential vorticity signals, and spatial scales comparable with the Rossby radius of deformation, suggest that these freshwater patches are associated with eddies.

A series of idealised eddy-resolving numerical experiments have been conducted in order to explore how these freshwater signals might be formed through cross-front eddy exchange between well-mixed turbulent waters and a stratified interior. The model was forced by coastal-trapped Kelvin waves, leading to an enhanced near-coast tidal mixing. Model results show that for the steady state, there is an eddy exchange across the front involving an eddy shoreward flux of surface water and bottom water together with a compensating offshore flux of intermediate waters within the thermocline. Ultimately this eddy-driven, lateral transfer might be important for the transport of nutrients and tracers in coastal seas.

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