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Nonlinear studies of Norwegian Coastal Current from Eulerian and Lagrangian point of views.

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A three-dimensional modeling study of the Norwegian Coastal Current is undertaken. Predictions are conducted with the Harvard Ocean Prediction system (HOPS). The model region extents from 58.5 N to 61.5 N and from 1 E to 6 E. Horizontal resolution is 2.5 km in each direction with 48 levels in the vertical. The model is initialized with a feature model of the Norwegian Coastal Current. Prediction are performed for structures that occur in the month of March.

A three branch (one at 2.5 E,59.5 N, another at 3.5 E, 59.5 N and third at 4.5 E, 59.5 N) coastal current structure evolves. Each branch exhibits meanders with eddie structures. Areas near the and between the branches contain varying mesoscale structures.

Near surface predictions of convergence and divergence spots, indicate areas along the coast of adjacent up and down motion within the currents and eddies associated with the branches of the coastal current. The region between the up and down motion locations, are suggestive of a separatrix or Lagrangian Coherent Structure (LCS) locations, that outline filament structures.

Particles are placed in selected subregions of the model domain and their paths predicted in the Eulerain domain. One subregion is located in the outer coastal current where a complex mesoscale structure with 4 eddies evolves. Two other subregions are placed in the meandering inner coastal branch where eddies develop at coastal topographic features. Response of trajectories to exiting currents and gradients due to convergence/divergence zones, positive/negative vorticity, mesosclale meanders and eddies are analyzed. The associated horizontal gradients of velocity are related to Lagrangian Coherent Structures (LCS).