A hybrid 3D eddy detection based on surface height and velocity field

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Summary:

A critical task for ocean scientists is detecting eddies due to the important role they play in ocean circulation. In this paper, we propose a new hybrid approach to detect the eddy structures in the Red Sea dataset using sea surface height, the velocity field and several geometric criteria. Specifically, we first use minima in the sea surface height to locate the eddy region, which we search for the local minima of velocity magnitude as a precisely located candidate for an eddy center. A circular trace of the velocity field is tested against geometric criteria to confirm coherent and consistent rotation of each eddy. Repeating this test at increasing radii and on deeper planes provides an accurate assessment of eddy width, eddy depth, and a boundary for the eddy region. A comparison of other studies and methods applied to the Red Sea dataset suggests that center detection results are highly dependent on the particularities of method and Our approach provides an reliable detection result of eddy.

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