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Eddy-Driven Offshore Transport in the Eastern Boundary Upwelling Systems: Implications of Refined Altimetry

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The important contribution of mesoscale eddies to oceanic fluxes is well known. Travelling eddies trap water in their cores and hence transport mass, physical properties, and biogeochemical tracers along paths that do not necessarily follow large-scale circulation patterns. Eddy-driven transport is therefore an essential regulator of global climate and oceanic productivity.

Assessing eddy contributions to oceanic transport requires identification of individual eddies, followed by an estimate of the volume of water trapped within them. Altimetry, i.e., satellite remote-sensing of sea surface elevation, provides the information required to identify eddy eddies and follow their trajectories.

In this study, we evaluate how a new revision of the satellite sea level anomaly maps released by AVISO in April 2014 affects the representation of mesoscale eddies in the Eastern Boundary Upwelling Systems (EBUS). Due to a finer effective resolution, the new product enables the detection of more eddies (+37%) and also shows changes in eddy characteristics, most notably a tendency for smaller eddy radius estimates.

Estimates of the eddy transport differences from the revised and previous AVISO products yields the counterintuitive result that the new product returns a lower westward eddy transport (-12%). Despite the higher number of eddies identified, this finding arises from the quadratic impact of eddy radius on eddy volume estimation.

Mesoscale activity is an important factor controlling oceanic productivity, especially in EBUS which support about 20% of the world fisheries. While this study should help to understand the complex interplay between mixing and biological activity, it also suggests a need for a reassessment of the mesoscale contribution to oceanic transport in other regions of the world where the revised altimetry product also reveals higher levels of mesoscale activity.