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On the detection and tracking of mesoscale ocean eddies: Parameter sensitivity

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The characteristics of coherent mesoscale eddies are an important point of evaluation for high-resolution ocean and coupled climate models. Mesoscale eddies are rotating features in the ocean on horizontal scales from 10 to 100 km that transport physical, chemical and biological properties of the ocean water. There are many possible ways to identify and track eddies (sea surface height anomalies, sea surface temperature anomalies, vorticity, etc.) and even within one method parameters can be adjusted to lead to different eddy identification results, for example, the allowed shape error of eddies.

Here we explore systematically the sensitivity of the identification and tracking results to choices made with regard to data, allowed eddy size and shape error and the use of different high-pass filters. Additionally, eddy identification and tracking are done on a regular latitude-longitude grid rather than the native model grid, therefore, the impact of the chosen grid size is assessed.

To this end, we use “py-eddy-tracker” (Mason et al. 2014) a commonly used open-source geometry-based approach. The algorithm uses sea level anomaly data and several adjustable parameters to identify eddies. It then joins the identified eddies to form tracks by using the ellipsoid method described in Chelton et al. 2011, where the two closest lying eddies in subsequent time steps are connected if they occur within a restricted search region.

We apply this identification and tracking algorithm to high frequency output from different high-resolution coupled climate models run as part of the EERIE project and compare the results of eddy characteristics to observations. This study will help to make more informed and study-specific choices when setting threshold values in eddy identification algorithms for model assessment or creating eddy observational data set from satellite altimetry data.