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Eddy identification from along track altimeter data using deep learning: EDDY project

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Eddies are circular rotating water masses, which are usually generated near the large ocean currents, e.g., Gulf Stream. Monitoring eddies and gaining knowledge on eddy statistics over a large region are important for fishery, marine biology studies, and testing ocean models.

At mesoscale, eddies are observed in radar altimetry, and methods have been developed to identify, track and classify them in gridded maps of sea surface height derived from multi-mission data sets. However, this procedure has drawbacks since much information is lost in the gridded maps. Inevitably, the spatial and temporal resolution of the original altimetry data degrades during the gridding process. On the other hand, the task of identifying eddies has been a post-analysis process on the gridded dataset, which is, by far, not meaningful for near-real time applications or forecasts. In the EDDY project at the University of Bonn, we aim to develop methods for identifying eddies directly from along track altimetry data via a machine (deep) learning approach.

At the early stage of the project, we started with gridded altimetry maps to set up and test the machine learning algorithm. The gridded datasets are not limited to multi-mission gridded maps from AVISO, but also include the high resolution (~6 km) ocean modeling simulation dataset (e.g., FESOM, Finite Element Sea ice Ocean Model). Later, the gridded maps are sampled along the real altimetry ground tracks to obtain the single-track altimetry data. Reference data, as the training set for machine learning, will be produced by open-source geometry-based approach (e.g., py-eddy-tracker, Mason et al., 2014) with additional constraints like Okubo-Weiss parameter and Sea Surface Temperature (SST) profile signatures.

In this presentation, we introduce the EDDY project and show the results from the machine learning approach based on gridded datasets for the Gulf stream area for the period 2017, and first results of single-track eddy identification in the region.