Eddy Hunter: a new data mining system for high-resolution eddy signal retrieval in SWOT altimetry

The SWOT mission has opened a new chapter in understanding mesoscale and sub-mesoscale ocean dynamics, providing a constantly growing amount of high-resolution Sea Surface Height (SSH) observations. However, this extremely valuable repository of data is still not fully exploited by researchers, largely due to technical reasons and the novelty of the product. In particular, the KaRIn altimeter's limited spatial coverage and the long orbit cycle duration impose challenges for eddy detection and tracking using SWOT data.

Conversely, traditional satellite altimeters have served as the backbone of mesoscale eddy research for over 30 years, providing reliable SSH measurements with wide spatio-temporal coverage. The integration of such satellites and SWOT could offer a possible solution to some of the aforementioned challenges. Therefore, we aim to provide a system capable of overcoming the eddy detection and tracking limitations of KaRIn altimetry data, leveraging the integration between SWOT and conventional SSH satellite altimetry, adopting an information retrieval approach to identify high-resolution eddy signals similar to a low resolution counterpart.

Considering the evolving trends in oceanographic modelling, integrating our system as a module within a Digital Twin of the Ocean (DTO) can boost scientific research in two different applications: firstly, it provides a data mining tool to retrieve useful information from a complex data source, fostering new discoveries regarding mesoscale and sub-mesoscale physical oceanography; secondly, it enables the building of an extensive repository of high-resolution eddy signals, allowing for advancements in AI methods in oceanography, like eddy clustering or generative-AI interpolation of the SWOT data.

Autor: SCARSCELLI, Federico (GEOMAR)

Co-Autoren: SCHÜTTE, Florian; ZELENKA, Claudius; KRÖGER, Peer

Vortragende(r):   SCARSCELLI, Federico (GEOMAR)