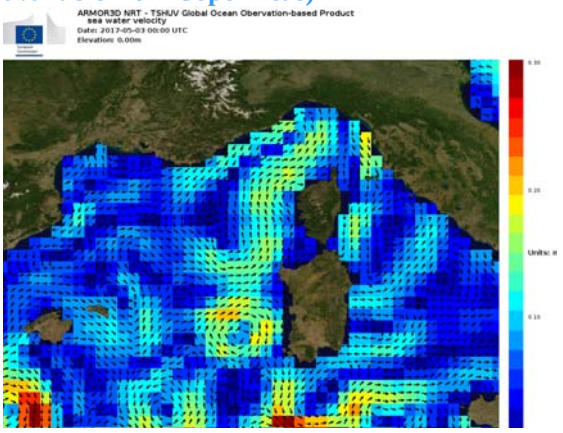
Current topic for a Master's Thesis

Observing coastal currents: a challenge for new radar altimetry missions and processing techniques

The observation of geostrophic currents (i.e. currents in which the pressure gradient and the Coriolis effect are in equilibrium) was the main motivation for the launch of the first satellite altimetry missions, in order to exploit the relationship between sea level slopes and pressure gradient. But still, the detection of the circulation at scales below 100 km is challenging due to the noise of the altimetric measurements. This is even more evident for coastal currents, since the quality of standard satellite altimetry products decreases with the proximity to land. New dedicated reprocessing techniques and the advent of Delay-Doppler (also called SAR-) altimetry missions are opening new possibilities by improving the precision of coastal sea level data.

Current Velocities in Western Mediterranean from merged data (ARMOR 3D NRT - TSHUV available from Copernicus)



DGFI-TUM is at the forefront of coastal altimetry research: it reprocesses standard altimetry data based on the Adaptive Leading Edge Subwaveform (ALES) retracker, an algorithm that fits a modelled waveform to the radar signal, and it stores and analyses the raw data provided by Sentinel-3 A and B, which carry a SAR altimeter onboard. The objective of this study is to generate across-track velocities of ocean currents from these data in two coastal ocean domains. Differences and similarities of different altimeters and processing algorithms shall be examined. The currents derived from altimetry shall be compared with datasets from ocean circulation models, merged products (available from the Marine Copernicus program) or in-situ data.

Main tasks:

- Theory: Understand the principle of geostrophic circulation and its relation to sea level.
- Dataset: Get familiar with the data format of Copernicus ocean data and, where available, in-situ data; learn how to correct and filter the raw sea level measurements near the coast.
- Methodology: Derive the ocean current velocity from standard altimetry missions, ALES reprocessing (Jason-3) and SAR altimetry (Sentinel-3); analyze noise characteristics, apply filtering and study the variability.
- Quality assessment: Evaluate the impact of different processing techniques for the estimation of ocean currents by comparing the results with external data.

References:

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- Le Bars D., et al. (2014). An observed 20-year time series of Agulhas leakage. *Ocean Science*, *10*(4), 601.

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