



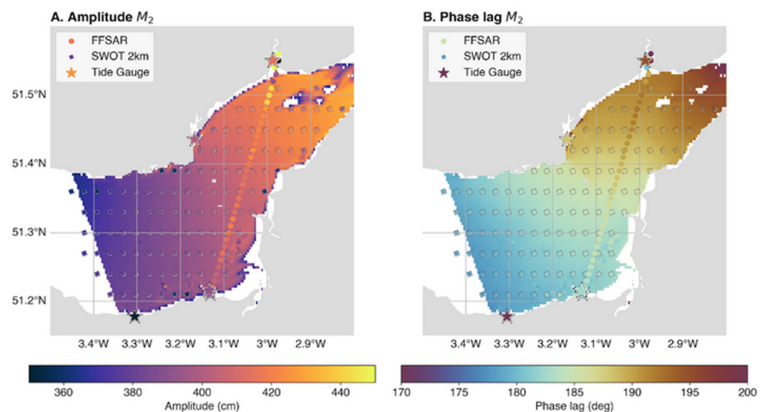
## Current topic for a Master's Thesis

### Tides in the coastal region:

### Using wide-swath and nadir satellite altimetry observations to improve the understanding of nearshore tidal dynamics

The complexity of tides increases the closer you go to the coast, where tides experience large spatial variations and are increasingly influenced by non-tidal processes. The recently launched SWOT satellite (Surface Water and Ocean Topography) measures the sea surface at unprecedented spatial scales, which has already proved to be valuable for tidal research (Hart-Davis et al., 2024). Ocean tides play an important role in a wide range of geophysical processes, which influence oceanographic and geodetic studies. Accounting for the influence of tides has resulted in the production of tidal corrections, which are critical corrections applied to several geodetic space techniques, including satellite altimetry and satellite gravimetry.

At DGFI-TUM, significant effort is placed on the computation of the Empirical Ocean Tide model (EOT), which exploits multi-mission nadir altimetry, with the aim to produce accurate estimations of tides in the coastal region (Hart-Davis et al., 2021). This thesis shall further investigate the usability of the SWOT satellite data and methods of combining wide-swath and nadir measurements. Several methods of combining the data shall be investigated, including ML approaches such as Bayesian inference or super-resolution. The study will focus on a regional experiment that you can select based on the availability of satellite and in-situ measurements. The results shall be validated with already available in-situ tide gauges.



**Figure.**  $M_2$  tidal amplitude and phase lag derived from SWOT observations (background and squares), along-track data (circles) and tide gauges (stars).

#### Main tasks of this thesis:

- Investigate the use of SWOT wide-swath altimetry to derive tidal constituents in coastal areas
- Experiment on the combination of nadir and wide-swath data
- Validate the results with in-situ measurements

#### References:

Hart-Davis, M., et al. (2024): Tides in complex coastal regions: early case studies from wide-swath SWOT measurements. Doi: [10.1029/2024GL109983](https://doi.org/10.1029/2024GL109983)  
Hart-Davis, M., et al. (2021): EOT20: a global ocean tide model from multi-mission satellite altimetry. Doi: [10.5194/essd-13-3869-2021](https://doi.org/10.5194/essd-13-3869-2021)

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