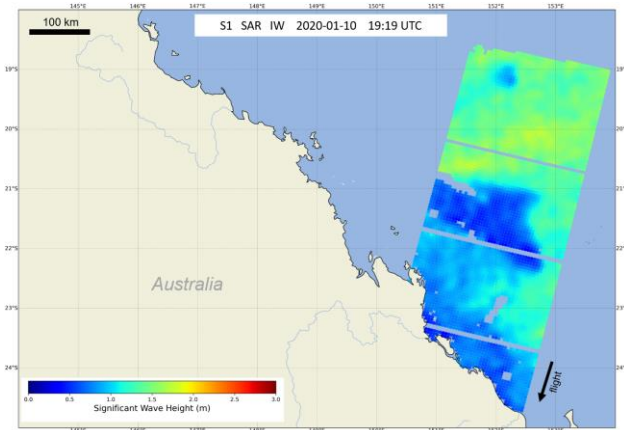




Current topic for a Master's Thesis

Coastal variability of wave height from different remote sensing techniques

For the past decades, the radar technology of satellite altimetry has been used for determining physical parameters of the ocean surface, among them wind-related wave heights (*sea state*).



Recently, such measurements have been made available in the coastal zone, where the gradient of wave height is particularly significant due to the interaction of the wave field with coast and bathymetry. Nevertheless, radar altimetry provides essentially 1D measurements along a track, although very recently the new SWOT mission has begun to estimate this in 2D on larger areas. In the framework of the ESA Sea State Climate Change Initiative, a dataset providing wave height estimated on the 2D images from side-looking synthetic aperture radars (SARs) have been developed (see Figure, showing strong gradients of wave height estimated from Sentinel-1 SAR images in the Great Barrier Reef in Australia).

The objective of this Master's Thesis is to assess and compare the coastal observations of wave height from SAR imaging and radar altimetry, with a particular focus on the spatial variability. The Master Thesis will be supervised in close collaboration with the German Aerospace Centre (DLR) Applicants can choose whether they would like to be based at DGFI-TUM in Munich or with DLR in Bremen for the duration of their master's thesis.

Main tasks:

- Find suitable matches between SAR images and satellite altimetry tracks, also based on the location of in-situ data
- Compare the capabilities of the different sensors to observe gradients in wave height towards the coast
- Quantify the differences for variable conditions (such as sea state and swell ration)
- If feasible, include the observations of the 2D significant wave height derived from the Karin instrument on the SWOT mission

Prerequisites:

- Experience in Python programming

References:

- Passaro, M., Hemer, M.A., Quartly, G.D., Schwatke, C., Dettmering, D. and Seitz, F., 2021. Global coastal attenuation of wind -waves observed with radar altimetry. *Nature Communications*, 12(1), pp.1-13. <https://doi.org/10.1038/s41467-021-23982-4>
- Pleskachevsky, A., Tings, B., Jacobsen, S., Wiehle, S., Schwarz, E., and Krause, D., 2024. A System for Near-Real-Time Monitoring of the Sea State Using SAR Satellites. *IEEE Trans. on Geos. and Remote Sen.*, 62, pp. 1-18. <https://doi.org/10.1109/TGRS.2024.3419582>

Institutes:

Deutsches Geodätisches Forschungsinstitut der TUM (DGFI-TUM); www.dgfi.tum.de
Insitut für Methodik der Fernerkundungs des DLR (DLR-MF): <https://www.dlr.de/de/eoc>

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