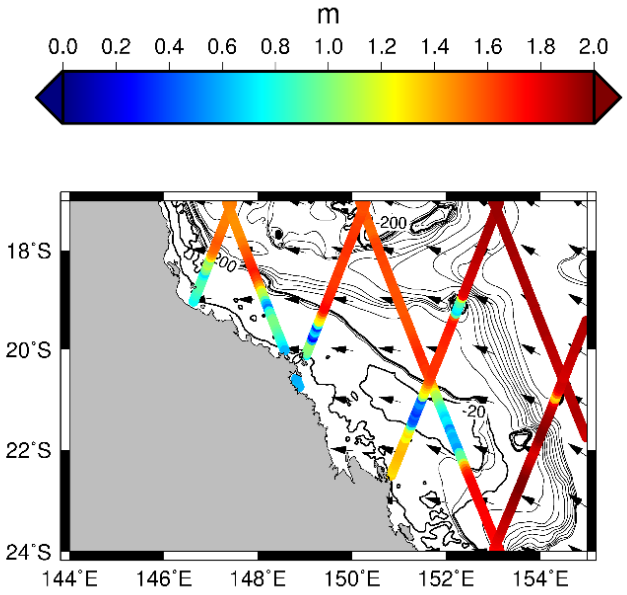
Current topic for a Master's Thesis

Effect of Coral Reefs on Wave Height and Wave Energy

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*).



Mean wave height along altimetry tracks, crossing the Great Barrier Reef in Australia, and mean wave direction (from Passaro et al., 2021)

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. This opens new possibilities in collecting observations of key coastal environments that are difficult to model and/or scarcely sampled by in-situ observations.

Among those environments, coastal reefs play a key role as a barrier against incoming waves and at the same time are threatened by climate-change related phenomena, such as changes in the pattern and intensity of storms.

The objective of this Master's Thesis is to assess and exploit the coastal observations of wave height from the latest coastal satellite altimetry datasets as a contribution to the coral reef observing system.

Main tasks:

- Find suitable coral reefs case studies based on available literature, model data, in-situ data and satellite altimetry tracks
- Assess the ability of different altimetry missions to observe significant wave height across the reefs
- Quantify the effect of coral reefs on significant wave height and wave energy flux for different sea states
- If feasible, observe changes in the impact of coral reefs on wave height after destructive storms

Prerequisites:

- Experience in Python and/or MATLAB 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

Ferrario, F., Beck, M.W., Storlazzi, C.D., Micheli, F., Shepard, C.C. and Airoldi, L., 2014. The effectiveness of coral reefs for coastal hazard risk reduction and adaptation. Nature communications, 5(1), pp.1-9. https://doi.org/10.1038/ncomms4794

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