CONSIGLIO NAZIONALE DELLE RICERCHE ISTITUTO DI SCIENZE MARINE

CICLO DI SEMINARI

ONLINE LINK

Thursday, 19th June 2025 – 2:30 pm (CEST)

Sizing the largest ocean waves with the SWOT mission

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Abstract - Swells travel across ocean basins, retaining precious information about the extreme waves in storms that elude direct observation. Using precise sea level measurements by the SWOT satellite, we measure swell heights and lengths, and find that swells are the result of nonlinear wave-wave interactions in the most severe ocean storms, followed by linear propagation across ocean basins. Inverting the linear propagation gives access to the properties of extreme waves in the storm, including their dominant wave period. This analysis corrects a 20-fold overestimation in empirical expressions for the energies of the longest ocean waves, providing a new awareness of ocean wave properties. These results hold up to a new record for measured significant wave heights, at 19.7 ± 0.3 m, with a corresponding peak period of 20.1 ± 0.5 s. These new observations of long period swells should have a wide range of applications from coastal dynamics to seismology.

Beyond this direct use case of SWOT data (preprint is available on ESSOAr:

<u>https://doi.org/10.22541/essoar.174250978.85245614/v2</u>) I will discuss the status of SWOT measurements of winds, waves and sea level, and future plans for measuring wind waves and currents and why we need to better understand ocean waves of all wave lengths from millimeters to over a kilometer and their interactions with winds and currents.