EGU21-15491
https://doi.org/10.5194/egusphere-egu21-15491
EGU General Assembly 2021

Assuring safe port navigation by assimilating from data sources with different spatial and temporal scales

Benjamin Phillips[1], Jonathan Higham[1], Andrew Plater[1], Nicoletta Leonardi[1], Daniel Arribas-Bel[1], Cai Bird[2], and Alex Sinclair[2]

[1]Department of Geography and Planning, University of Liverpool, Liverpool, United Kingdom (b.t.phillips@liverpool.ac.uk)
[2]Marlan Maritime Technologies, Liverpool, United Kingdom

Safe port operations require accurate information on vessel location, routine monitoring and maintenance of navigation channels, and accurate information on coastal hydrodynamics. Accurate bathymetric data enables port operators to have a high level of confidence in assuring sufficient water depth for vessels, and to effectively direct surveying and dredging operations to maintain navigation routes. However, this is not readily facilitated for nearshore approaches where migrating sandbanks and shoals pose a hazard to shipping.

In this presentation, we present an innovative and novel data assimilation method of combining satellite data, hydrodynamic model (Delft3D) outputs and land-based radar data using machine learning and advanced statistical methods (Dynamic Mode Decomposition). To assimilate these data we use machine learning and statistical methods to detect "patterns" or "modes" in near- and far-field wave climate that are attributable to sub- and intertidal bathymetry and changes therein. We then combine the dominant modes into a low-order representation of the system, providing informed estimates of spatial resolutions and temporal scales where no measurements are physically performed. Satellite data and associated hydrodynamic model outputs are used to provide information on wave direction and height for the offshore-nearshore approaches while land-based marine radar located in the appropriate position provide wave data at higher temporal and more local spatial resolution.

The data nexus we present in this presentation demonstrates significant improvements in capability above and beyond the use of a given technology in isolation.