

Proposal Outline

Topic	Next Generation Ocean Modelling for Downstream Services
Research Theme	Information & Spatial Technologies, Analytics and Modelling
Background and Rationale	<p>The National Marine Research & Innovation Strategy 2017-2021 purports that “as data streams grow, and access to them simplifies, the opportunities for research focused on use cases to support policy decision making will grow. Applied research, focusing on data integration, analytics and visualisation will have particular application in areas such as maritime spatial planning, ecosystem modelling and understanding the cumulative effects of anthropogenic activities The ability to downscale from the large grid sizes of global and regional models, and to improve the predictive capability and computational efficiency of coastal oceans models is a key area of importance for Ireland. “</p> <p>Observational datasets will be collated and processed statistically to make them ready for assimilation. Satellite Sea Surface Temperature (SST) and Sea Level Anomalies (SLA) as well as the CTD (conductivity, temperature, and depth) data from research surveys, moorings, argo floats, glider missions and Galway Bay observations will be used.</p> <p>Extensive model simulations will be executed to quantify the degree of improvement of the accuracy of the model predictions. More accurate models will then allow the delivery of higher quality downstream services across all areas (extreme events and storm surges, HABs, search and rescue, etc.).</p>
Scope of Research (Scientific/ Technical Challenge)	<p>This fellowship will work to advance the accuracy of Marine Institute operational modelling by investigating optimal Data Assimilation (DA) methods to be used in conjunction with the Institute’s modelling systems (e.g. 3dvar, 4dvar, kalman filter, etc.).</p> <p>Following successful implementation of Data Assimilation in the Marine Institute numerical models, the Fellow will work on setting up and executing the Ocean Observing Simulation Experiments (OSSE). This will allow for optimization of the Marine Institute observational networks in terms of the scientific value of collected data and also in terms of cost efficiency.</p> <p>The fellow would ideally have a primary degree in mathematics, oceanography, physics, civil engineering, meteorology or closely related discipline with PhD and/or post-doctoral experience in data assimilation in oceanographic models.</p>

<p>Expected Impact</p>	<p>This fellowship will help to build national expertise in this research area and publish their research findings as widely as possible through peer-reviewed papers, conference presentations, articles, etc.</p> <p>An improvement of the Marine Institute models skill is expected through the application of DA and the fellow is expected to provide a comprehensive quantification of this improvement. Furthermore, the value of incorporating DA in the operational modelling framework will be demonstrated through the execution of an OSSE for selected downstream application(s), e.g. a HAB warning system, storm surges, search and rescue.</p> <p>The fellow is also expected to engage with relevant national and international networks, and explore opportunities for collaboration and securing further research funding under Horizon Europe.</p>
<p>Specific Collaboration</p>	<p>Ocean Science and Information Services, Marine Institute</p>
<p>Location of Fellow</p>	<p>Higher Education Institute or Public Research Body (Republic of Ireland)</p>
<p>Duration and Funding Available</p>	<p>3-5 years €100,000 per annum maximum (e.g. €400,000 for 4 years duration)</p>
<p>References</p>	<p>Aydoğdu, A., Hoar, T. J., Vukicevic, T., Anderson, J. L., Pinardi, N., Karspeck, A., Hendricks, J., Collins, N., Macchia, F., and Özsoy, E.: OSSE for a sustainable marine observing network in the Sea of Marmara, <i>Nonlin. Processes Geophys.</i>, 25, 537-551, https://doi.org/10.5194/npg-25-537-2018 (2018).</p> <p>George R. Halliwell Jr., Michael F. Mehari, Matthieu Le Hénaff, Villy H. Kourafalou, Ioannis S. Androulidakis, Hee Sook Kang & Robert Atlas (2017). North Atlantic Ocean OSSE system: Evaluation of operational ocean observing system components and supplemental seasonal observations for potentially improving tropical cyclone prediction in coupled systems, <i>Journal of Operational Oceanography</i>, 10:2, 154-175, DOI: 10.1080/1755876X.2017.1322770</p> <p>Sperrevik, A.K., Röhrs, J., Christensen, K.H. (2017): Impact of data assimilation on Eulerian versus Lagrangian estimates of upper ocean transport. <i>J. Geophys. Res. Oceans</i>, 122</p> <p>E J O’Dea, A K Arnold, K P Edwards, R Furner, P Hyder, M J Martin, J R Siddorn, D Storkey, J While, J T Holt & H Liu (2012) An operational ocean forecast system incorporating NEMO and SST data assimilation for the tidally driven European North-West shelf, <i>Journal of Operational Oceanography</i>, 5:1, 3-17, DOI: 10.1080/1755876X.2012.11020128</p>



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- Larsen, J & Høyer, Jacob & She, Jun. (**2007**). [Validation of a hybrid optimal interpolation and Kalman filter scheme for sea surface temperature assimilation.](#) *Journal of Marine Systems.* 65. 122-133. 10.1016/j.jmarsys.2005.09.013.