Modelling of North Atlantic Nor'easters with Modern Wave Forecast Models

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Abstract

In this presentation, three state-of-the-art operational wave forecast models are implemented on fine-resolution grids for the Northwest Atlantic. These models are: (1) a composite model system consisting of SWAN implemented within WAVEWATCHIII® (WW3) on a nested system of 'tradition' structured grids, (2) an unstructured-grid finite-volume version of SWAN wave model, denoted as 'SWAVE', documented by Qi et al. (2010), and (3), a new version of WW3, denoted as WWM (wind wave model) which uses a residual distribution scheme, borrowing ideas from the finite element and finite volume framework, and also implemented on an unstructured grid system, documented by Roland (2008) and Roland et al., 2102). Model systems are implemented on grids that include relatively large domains to capture all the wave energy generated by the storms, as well as, fine-resolution nearshore regions of the Gulf of Maine with resolution on the scale of ~50m to simulate areas that experienced inundation and coastal damage. Storm cases include three intense midlatitude nor'easters: spring storm in May 2005, Patriots Day storm in 2007 and the Boxing Day storm in 2010. Overall, although the wave models have comparable properties in terms of their general performance and skill, it is found that for some wave field variables, there are distinct differences among the models, in terms of simulation skill.

References

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