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Title: Developing coupled models at km-scale: advances enabled through Regional Environmental Prediction research in the UK

Abstract:

In partnership with other UK institutions, the Met Office initiated development of a Regional Environmental Prediction (REP) system at km scale. Research has advanced with partners with a focus on two domains of interest: the Northwest European shelf and the Indian region.

The REP tools provide a flexible research capability with which to study the interactions between atmosphere, land, river, ocean, wave and biogeochemistry processes resolved at km-scale, and the effect of environmental feedbacks on the evolution and impacts of multi-hazard weather events. The coupled system incorporates models of the atmosphere (Met Office Unified Model), land surface with river routing (JULES), shelf-sea ocean (NEMO), ocean surface waves (WAVEWATCH III) and biogeochemistry (ERSEM) coupled together using OASIS3-MCT libraries and the FabM coupler.

This talk will highlight some of the research and application benefits that developing and evaluating Regional Environmental Prediction has enabled for both weather and climate timescales. This includes:

- Improvements of UK NWP deterministic and ensemble forecasts by using SST prediction from the marine prediction system,
- Benefits of introducing ocean-wave coupling in the regional ocean prediction system
- Improvements to winter storm wind forecasting when coupling the atmosphere with the wave models, resulting in changes to the atmospheric drag scheme
- Changes to tropical cyclone prediction from atmosphere-ocean coupling, through a more rigorous treatment of the near-surface energy budget
- Benefits and challenges of moving towards more integrated hydrological simulation, as part of a multi-hazard forecasting approach
- Impacts of SST perturbations within regional coupled ensemble forecast systems
- Assessments of the first atmosphere-ocean climate runs at km-scale over the Northwest European shelf

Opportunities for further collaborative development of Regional Environmental Prediction across the UM Partnership will be discussed.