

Developing and evaluating a new operational north-west European shelf model using NEMO

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The Met office runs a north-west European shelf model operationally each day, with a one day hindcast and five day forecast. Through MyOcean, we will be replacing the existing 12km POLCOMS NW European shelf model with a new 7km NEMO NW European shelf model covering the same domain, which has been developed and tested jointly by the Met Office and the National Oceanography Centre, Liverpool (formerly Proudman Oceanographic Laboratory).

We briefly outline some of the developments, and associated testing, undertaken to enable NEMO to be employed for shelf seas modelling. These include the use of: hybrid s-coordinates; an advanced horizontal pressure gradient scheme; tidal boundary conditions and tidal potential forcing; atmospheric forcing; log layer and semi-implicit bed stress; an updated river input scheme and a radiation scheme with a depth dependent attenuation coefficient.

We discuss the performance of the new NEMO based model, with and without sea surface temperature data assimilation, in relation to both observations and the previous POLCOMS model, which did not include data assimilation. The NEMO and POLCOMS models are compared daily, monthly and annually to the OSTIA sea surface temperature analysis product over the full 2007-2008 hindcast period. The monthly and annual mean NEMO and POLCOMS simulations are also compared to climatology. Analysed tidal harmonic constituents are assessed against observations. Observational comparisons using the NEMO observational operator for remote sensed data, drifting buoys, ARGO floats and FerryBox observations are presented, together with associated statistics. Particularly attention is given to the sensitivity of near-coastal salinity to the vertical mixing scheme, comparing the generic length scale method (here we use $k-\epsilon$) with the original TKE scheme in NEMO, and a similar combination in POLCOMS. This is contrasted with the sensitivity to the riverine freshwater forcing and the models' ability to reproduce sea surface temperature features and frontal locations. This demonstrates an important role of investigating salinity structure in informing model configurations. These results have important implication not only for salinity but also modelling the coastal dispersion of pollutants, nutrients and optically active constituents, and hence the accuracy of coastal water quality and ecosystem models.