Improving operational services for coastal and estuary systems: studying tuned standalone and nested setups of Limfjord

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Introduction. Prediction of hydrographic conditions e.g., sea level, temperature, salinity and currents in coastal-estuary continuum is the basis for climate change adaptation and mitigation and ecosystem-based management in coastal waters.
Methods. In this study, we extend the CMEMS Baltic Monitoring Forecasting Centre (BAL-MFC) set-up with a nested Limfjord domain in about 185m horizontal resolution (≈0.1nm), which is two-way-nested into the Kattegat (0.5 nm resolution) and the North Sea (1nm resolution). This domain is not covered by CMEMS, despite its importance for sea shipping, aquaculture and mussel fisheries. The ocean model that we apply is the BAL-MFC HBM model (HIROMB-BOOS Model), which covers the North and the Baltic Sea.
Results. The model performance is examined for both scientific quality and computational efficiency. The results show that, this system is able to provide high quality sea level forecast for storm surge warning, temperature, salinity and currents with reasonably good quality for ecosystem-based management. The model is able to handle the shallow thermoclines in summer as well as the strong tidal and wind driven transport through narrow straits in autumn and winter.
Conclusions. Computational efficiency of the model makes it possible to model the transition from the basin-scales to coastal- and estuary-scales seamlessly. The benefit of having such a two-way nested approach is demonstrated by comparing the nested North Sea/Limfjord/Baltic Sea model results with a separate, stand-alone model that is using boundary conditions from the nested model.