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Dispersal patterns in the North Sea, insights from a high resolution model

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Lagrangian particle tracking simulations are useful to elucidate the fate of materials transported by ocean currents (i.e. larvae, pollutants, debris, drifters), and can therefore be useful to study important process in coastal seas. Dispersal patterns should be improved by the new generation of high horizontal resolution (<2 km) ocean circulation models which provide an improved, more dynamic representation of the coastal ocean. We used the new high resolution Northwest European Shelf NEMO ocean circulation model and LTRANS, a particle tracking code, to study the effects of the increased resolution on the dispersion of Lagrangian particles in the North Sea. Particles were released at the locations of offshore oil and gas platforms in the North Sea and tracked for periods similar to the larval duration of benthic organisms that have colonized the subsea platforms. Dispersal patterns and spatio-temporal scales are identified for the summer (stratified) and winter (mixed) oceanographic regimes. The high resolution of the new NEMO model allows for fine scale detail of flow speed and variability. The small scale features (i.e. eddies and fronts) now represented in the model trap particles, decreasing their dispersal and increasing retention times in comparison to simulations done on a previous coarser resolution NEMO version (7 km AMM7). We isolated the effects of resolution from those due to different representations of the circulation in the different versions of the ocean circulation model by averaging the high resolution model velocity fields to the coarser (7 km) grid, and comparing the results of identical particle tracking experiments using these two flow fields. Our results provide a measure of the importance of high resolution flow fields when estimating transport of materials in an enclosed sea and provide a more realistic characterisation of dispersion in the North Sea.