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Forecasting Oil Spills in Extreme Oceanographic Environments

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In the North Sea, oil and gas exploration is pushing into deeper waters. One such area is the Faroe-Shetland Channel (FSC). The FSC is a physically complex system, most notable for its strong currents, highly energetic internal waves, and mid-water column stratification. Are we able to reliably model a large, subsurface blowout in this region?

This question will be explored in more detail here. A series of idealised experiments have been performed, with the intention of isolating key physical characteristics of plume development. A relationship between momentum and water density will be explored in the context of a recent spill (the CLAIR platform, late-2016). The inclusion of gas alongside the release of oil has shown to be an important control on the surfacing time of the pollutant, and in general an aid to plume buoyancy. Furthermore, it is shown here that even weak stratification can promote the ‘trapping’ of oil, where the density of the pollutant-water mixture matches that of the ambient conditions.

In the far-field, preliminary results show the importance of surface currents in determining the eventual location of a surface slick. This is a particularly important finding, since the hydrodynamic model used in an operational context (FOAM AMM7 NWS) is poor at representing reality.

This research is intended to show the major areas of uncertainty in spill modelling, and how we can improve them in order to save significant environmental and financial cost.