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Mapping turbiditic currents using Seismic Oceanography

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Using a combination of seismic oceanographic and physical oceanographic data acquired across the Faroe Shetland Channel (FSC) we present evidence of a turbiditic current that transports suspended sediment along the western boundary of the Channel. We focus on a reflections observed on seismic data close to the sea-bed on the Faroese side of the Channel below 900 m. The FSC is a major conduit for exchange of warm Atlantic waters flowing north-east into the Nordic Sea and dense Nordic Sea Deep Water (NSDW) on return flow into the North Atlantic. A strong band of seismic reflectivity centered around 450 m is correlated with the boundary between these two water masses.

Our deeper reflections are wholly within the NSDW as there is no detectable change in temperature or salinity from CTD data. However, there is direct evidence of suspended sediment, both dry matter from water samples taken from these depths and high optical backscatter close to the sea-bed. Also high-resolution mapping of the sea-bed shows that it has a scoured surface.

By direct inversion and forward modelling of the reflected seismic signal we estimate the sediment load of 20 mg/l. This is higher than that measured from the water samples but a high degree of variablity is predicted by the optical backscatter. We believe this is the first direct observation of a turbiditic current using seismic oceanography which, because of its high spatial resolution, can be used to accurately map the shape and extent of this boundary flow.