



A future view of ocean-shelf exchange and shelf-scale circulation on the NW European continental shelf

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The potential impacts of climate change on shelf seas is highly uncertain, with many vectors of atmospheric, oceanic and terrestrial change likely to play a role. Previous studies have highlighted the importance of change in oceanic properties (e.g. nutrients) as they are advected on-shelf. Here we demonstrate how substantial changes in circulation may also occur, with far-reaching consequences for on-shelf properties. We consider a 130 year simulation of NEMO AMM7 to 2100. This is driven by the atmospheric component of HADGEM2 (a CMIP5 OAGCM under RCM8.5) and a global ocean model (ORCA1, driven by the same atmosphere). In this single realisation of future conditions the circulation of the northern shelves is qualitatively similar to present day conditions. However, inflows into the North Sea through the Fair Isle channel and east of Shetland are found to substantially decrease, and the Shetland shelf current largely by-passes the North Sea. This significantly reduces the cyclonic North Sea circulation and shifts the balance between oceanic and terrestrial influence in this region, seen by a decrease in salinity. We consider these results in the context of present-day variability and potential future changes in the external drivers, namely the oceanic circulation and pressure field, and the atmospheric forcing, and how this single realisation sits within the CMIP5 ensemble.