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The wave climate of the NW European Continental Shelf

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Over recent years various studies of the wave climate of the NW European continental shelf have been made using wave models validated against wave observations. Model runs include 10 year hindcast from 1999-2008 and projections of future wave climate around the UK driven by winds from a subset of the Met Office/Hadley Centre climate model ensemble members. The wave model which is used is based on the well-tested 3rd-generation spectral model WAM implemented on two grids: a coarse 1° grid for the Atlantic to provide boundary conditions, and a 12km model of the NW European continental shelf. The WAM model has been well-validated previously and is shown to be in reasonable agreement with observations for the hindcast runs and statistically in reasonable agreement with the ERA-40 reanalysis for the NE Atlantic. Seasonal mean and extreme waves are generally expected to increase to the SW of UK, reduce to the north of the UK and experience little change in the southern North Sea. There are large uncertainties especially with the projected extreme values. A detailed study of Liverpool Bay has been made using wave buoys and acoustic instruments within the footprint of a phased-array HF radar system (measuring currents and waves), as part of the NOC Irish Sea Observatory. Several years of data have been collected and are supplemented by an 11-year wave model hindcast. The variation of wave climate over various time-scales from seasonal and inter-annual to inter-decadal is examined, using various statistics, including extreme value methods. Projections of 50-year return period wave heights differ between different instruments and model datasets. The future wave climate of Liverpool Bay is not expected to change much from the present day. There is evidence for variability on decadal time-scales, with some correlation with the North Atlantic Oscillation, thus future extreme wave events will be closely related to future North Atlantic storm tracks.