

Storms and waves

What is the issue?

Wind-driven waves and storms are seen as the primary drivers of short-term coastal processes on many European coasts (Smith *et al.*, 2000). Higher waves and increased storm-surge elevations would have important potential consequences, such as enhanced erosion and flooding in estuaries, deltas and embayments (Flather and Williams, 2000; Lionello *et al.*, 2002; Tsimplis *et al.*, 2005; Woth *et al.*, 2005).

What has happened and how confident?

Recent analyses of a more extensive data set confirm a significant upward trend in wave heights in the North Atlantic, but only for the last 50 years and embedded within a pattern of multi-decadal variability over more than a century (Gulev and Hasse, 1999; Gulev and Grigorieva, 2004).

Many of the changes in storms and waves over the last 50 years in the North-East Atlantic can be understood in terms of the behaviour of the North Atlantic Oscillation (NAO). A recent strong trend in the NAO (towards stormier conditions) is apparently unique in its history, but it is controversial whether this is a response to greenhouse gas forcing (Osborn, 2004).

What might happen?

At present, confidence in Global Climate Models (GCMs) and Regional Climate Models (RCMs) modelled wind field changes is very low (Hulme *et al.*, 2002).

In light of the overall low confidence, a large number of analyses have been conducted and many GCMs suggest a general trend towards the stormier tendency of NAO in the 21st century (e.g. Terray *et al.*, 2004; Miller *et al.*, 2006). However, some Regional Climate Models suggest different and mostly weaker changes in winds and storminess (e.g. Hulme *et al.*, 2002; Barnett *et al.*, 2006). Overall climate models typically predict a decrease in the total number of extra-tropical cyclones, but an increase in the number of the most intense storms (Lambert and Fyfe, 2006).

Either a strengthening of the storm track or an increase in intense cyclones will result in a deterioration of wave conditions (Wolf and Woolf, 2006).

Are there any OSPAR regional differences?

The size of storm systems means that variations in the path of storms across the North Atlantic would directly affect the OSPAR regions differently. It may be that a decrease in storms over one area might directly mean an increase in another.

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