

Shelf sea stratification

What is the issue?

In the shelf seas, some areas stratify seasonally where surface waters are made buoyant enough through heating and addition of freshwater to overcome the mixing associated with tides. These areas of stratification have an impact on the sea's circulation and on many components of the ecosystem through nutrient supply.

What has happened and how confident?

There is some evidence of a recent trend to earlier stratification and onset of the spring bloom in European shelf seas (Region II – Greater North Sea – and Region III – Celtic Seas), largely in response to warming air temperatures (Young and Holt, 2007, Sharples *et al.*, 2006).

What might happen?

Our understanding of how shallow seas respond to meteorology suggest that stratification and the associated spring bloom will, on average, occur earlier in a warmer climate (Sharples and Dye, 2008). UK Climate Projections (Lowe *et al.*, 2009) suggest that, under a medium future emissions scenario (A1B – IPCC-SRES, 2000), most areas of shelf sea stratification in Regions II and III will not change their extent greatly but that stratification may be stronger and last longer with earlier onset. Conversely, areas of Regions II and III that are stratified by salinity along the European continental coast appear to be stratified for a shorter period under the same future projection (Lowe *et al.*, 2009). Intensified seasonal thermohaline stratification could lead to accumulation of organic matter in bottom layers, causing oxygen depletion in some areas. Increased stratification will also enhance the development of flagellates, utilising nutrients from deep layers.

Increasing temperature and its impacts on stratification and algal blooms have been investigated by (Peperzak, 2003) who showed the importance of increasing temperature and stratification in doubling the growth rate of harmful algae, concluding that the risk of harmful algae blooms due to climate change will increase rather than decrease in the future.

Are there any OSPAR regional differences?

Shelf sea stratification is most important in OSPAR Regions II and III. In Regions I (Arctic Waters), IV (Bay of Biscay/Iberian Coast) and V (Wider Atlantic), areas of stratification that are controlled by bottom mixing are less evident, primarily due to the restricted shelves.

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