Theme 2: The marine environment and responses to climate changes

Invited speaker

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Changing climate and changing seas: what does it mean for Europe?

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Abstract

Beyond reasonable doubt, climate change has already impacted all oceans and seas of Europe and beyond. Within the past 25 years, seawater temperatures from the surface to the deep sea have increased, with enclosed seas such as the Baltic, the Mediterranean and the Black Sea warming more rapidly than the open ocean. In the Arctic, warmer waters have resulted in a decrease in the area and thickness of sea-ice. Warming waters, together with mass additions from melting ice-sheets and increased landward winds at several locations, have also contributed to sea-level rise. The combination of sea-level rise and increased winds, have contributed to the erosion of 15% of the European coasts. Many marine species, including zooplankton, benthos and fish, have migrated northwards, resulting in local increases in biodiversity and changes in the marine food web. Some marine organisms have even been able to cross from the Pacific to the Atlantic via seasonal ice-free passages through the Arctic. Although large climate changes occurred during the geological past, the present rates of change are unprecedented. The warming has been speeding up, especially during the past 25 years during which it has been about ten times faster than the average rate of increase during the previous century. Synthesizing the findings of European research on the impacts of climate change on marine environments reveals that the marine environment is also changing rapidly. Many of the observed changes which are thought to be predominantly a consequence of climate change can be grouped as follows: (i) changes in the physical properties and motions of the sea; (ii) melting of the Arctic sea-ice; (iii) northward movements of marine organisms; (iv) shifts in timing of life-cycle events; (v) cumulative effects of multiple stressors; and (vi) the socio-economic consequences of all these changes.

This presentation summarises the current state of knowledge with regard to general and region-specific impacts of climate change on European marine and coastal environments. Results from long-term studies are used to examine past changes, put recent rapid changes into context, and to forecast likely future ecosystem responses to climate change. Increasing efforts using a multidisciplinary approach considering the most appropriate range in spatiotemporal scales to further understand and predict the inevitable impacts of climate change on marine environments are strongly recommended.