

Modelling Seasonal and Year-to-Year Changes in the Ecosystems of the NE Atlantic Ocean and the European Shelf Seas

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Abstract

The usefulness and limitations of models of natural systems have recently been summarised by Oreskes et al. (1994) who have argued that the primary value of models is heuristic, providing guidance for further study. A number of simple (mainly one-dimensional) models of the marine ecosystem are reviewed in this context. It is shown that many aspects of the balance of CO₂ and of the phytoplankton seasonal succession that were observed along 20°W during the North Atlantic Bloom Experiment in 1989 can be represented by such models and these make additional predictions about how the system operates. Examination of data from the Continuous Plankton Recorder Survey indicates that these models may be applicable to the conditions during most years but may not be suitable for the western North Atlantic. In a second example, the problem of modelling the observed climatic connection between the latitude of the Gulf Stream and zooplankton abundances around the UK is considered. This climatic signal appears to become manifest in the zooplankton via the annual cycle of thermal stratification. It is shown that this process can be replicated by forcing existing models of the shelf-seas plankton with three decades of meteorological observations. These calculations reveal the aspects of year-to-year differences in weather to which the planktonic ecosystem is sensitive.