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The sensitivity of physical and ecosystem processes of the northwest European continental shelf to climate change via oceanic, terrestrial and atmospheric vectors.

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The physical and biological processes of shelf seas are strongly constrained by forcing from the atmosphere, ocean and land. Hence these regions might be expected to be highly sensitive to changing climatic conditions. Since these are regions of exceptionally high biological production and socio-economic importance, such changes may have wide ranging implications, e.g. for fisheries and the maintenance of 'good environmental status'. In the EC FP7 project MEECE, we use multi-annual and multi-decadal model simulations of the Proudman Oceanographic Laboratory Coastal Ocean Modelling System (POLCOMS) coupled to the European Regional Seas Ecosystem Model (ERSEM) to investigate how large scale modes of variability and change in the atmosphere and ocean propagate into the hydrodynamics of the northwest European continental shelf and then consequently to its ecosystem. We use forcing from ERA40 to provide observationally constrained present day conditions and compare the resulting simulations with World Ocean Atlas nutrient and Chlorophyll data for validation. For projections into the future, we consider two emissions scenarios from a single model from IPCC AR4 (IPSL-CM4), in a series of 21-year long time-slice simulations representative of projected conditions in 1980-2000 and 2080-2100. The emissions scenarios considered are SRESA1B (a business as usual scenario) and E1 (an aggressive mitigation scenario). Here we focus on the relative importance of the changes in ocean-shelf and riverine nutrient transport, and atmospheric fluxes in controlling the shelf sea primary production, and the time scales over which the signals propagate through both the pelagic and benthic ecosystems. We contrast these changes with those from estimated changes in anthropogenic riverine nutrient loading.