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Natural modes of variability in the A1B scenario: Atmospheric forcing anomalies associated with NAO

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A global fully coupled climate scenario run based on the Max Plank Institute Ocean Model (MPIOM) is used to disentangle the effect of internal climatic modes, e.g. the North Atlantic Oscillation (NAO), from climate change signals in the North Sea. By placing one grid pole on Central Europe, enhanced spatial resolution for the European seas was obtained (up to 4 km in the German Bight). This allows a regional scale resolution within the global model, without the inherent problems of prescribed lateral boundary conditions. Furthermore, it provides sufficient resolution to study the leading modes of variability in the circulation and climate of the North Sea, as well as their connection to exchange processes with adjacent parts of the North Atlantic.
The North Atlantic Oscillation (NAO) is the dominant mode of winter climate variability affecting the North Sea with amplitudes comparable to the climate change signal. Here we investigate in the fully coupled scenario run how the NAO impact the surface heat fluxes, which comprises the sum of the four components: net surface solar radiation, net surface thermal radiation, sensible heat flux, and latent heat flux. In particular, we analyzed NAO+ and NAO- composites. The results show that the largest contributions to the net radiation balance are attributed to the sensible heat flux and the latent heat fluxes. The highest anomalies in both variables are found over the Norwegian Trench which are related to mixed layer dynamics, circulation changes, and changing in the mean wind field. This modification in the mixed layer dynamics, and mean wind fields will be further investigated.