

The variability of the North Atlantic subpolar Gyre and its global impact

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The role of the North Atlantic (NA) subpolar Gyre (SPG) in the climate system deserves further investigations due to its complex coupling with the NA atmospheric circulation, the Atlantic multidecadal variability and the Atlantic meridional overturning circulation. Understanding the interannual to multidecadal variability of the SPG is therefore crucial to better predict the future climate because of its potential impact on the middle and lower latitudes. Here, we use both ERA-20C reanalysis data and the EC-Earth model to understand the SPG variability, the factors controlling it and its remote impact on other parts of the globe. Based on reanalysis data, we show that the SPG variability plays an important role in controlling the September sea ice variability and has contributed to the reduction of sea ice in the past decade. Moreover, the SPG variability has a considerable remote impact on Northern America, Eurasia, North Africa and western Asia. To confirm these findings and understand the dynamical processes involved, we run an ensemble of AMIP-type experiments by using the EC-Earth model and prescribing temperature anomalies in the SPG. We investigate the atmospheric teleconnections and extreme events that are associated with the variability of SPG as well as the linkage between high and low latitudes.

Key words: subpolar Gyre, teleconnection, EC-Earth