Supplementary materials for Two distinct phases of North Atlantic Eastern Subpolar Gyre and Warming Hole evolution under Global Warming by Ghosh et al.

Fig S1. In colors are the difference of the ensemble mean annual wind driven Sverdrup transport between 2 K GMST warming and 0 K GMST warming levels in the MPI-GE 1% CO2 increase per year experiment. Contours are the ensemble mean annual wind driven Sverdrup transport or the climatology at 0 K GMST warming state. The unstippled regions are statistically significant at p < 0.05.

Fig S2. The difference of the ensemble mean a) annual sea surface salinity (in psu) and b) annual 6 m potential density (in kg/m3) between 4 K GMST warming and 2 K GMST warming levels in the MPI-GE 1% CO2 increase per year experiment. The unstippled regions are statistically significant at p < 0.05.
**Fig S3.** The Hovmuller diagram of the difference of the ensemble mean annual barotropic stream function on a certain year from the year 1 for 1%CO2 increase per year experiment of MPI-GE, averaged over the latitude 40° to 50°N spanning the North Atlantic Ocean basin (60°W to 10°W). Negative (positive) values show enhanced cyclonic (anti-cyclonic) circulation. The differences that are significant at p < 0.05 are unstippled. Units are in Sverdrup (Sv).
**Fig S4.** The difference of the ensemble mean sea ice area (in %) a) between 2K global mean surface air temperature (GMST) warming and 0 K GMST warming levels and between 4K GMST warming and 2K GMST warming levels in MPI-GE 1%CO2 experiment. c) and d) are same as a) and b) but for the Atlantic Meridional Overturning Circulation (AMOC). The contours in c) and d) show the climatologies of AMOC at 0 K and 2K GMST warming state. The unstippled regions are statistically significant at $p < 0.05$. 