

The Supplementary Information contains details and discussion regarding several analyses conducted in support of our main-study conclusions. Specifically, the Supplementary Information contains the following seven sections (including three supplementary tables): 1. Marine airmass source attribution and covariation in Greenland [MSA] records; 2. Comparison of data infilling methodologies for [MSA]-PC1 computation; 3. Satellite-derived net primary productivity (NPP) products and temporal trends (A.D. 1998 – 2017); 4. Processing of Continuous Plankton Recorder survey data; 5. Comparison of [MSA]-PC1 to regional sea ice behavior; 6. NOAA Global Surface Seawater DMS Database measurements; 7. Defining the subarctic Atlantic SST “warming hole” and calculation of the observational AMOC index.