NELSON CCR Center for Climatic Research

Climate, People, and the Environment Program Seminar Series

CPEP

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Understanding the link between a melting Arctic and the projected decline of the North Atlantic carbon sink

The subpolar North Atlantic covers only 4% of the global ocean area, but plays an important role in the global carbon cycle. As the most intense carbon sink per unit area, the subpolar North Atlantic accounts for 12% of the 1.7 Pg C yr^{-1} of global ocean carbon uptake (Takahashi et al. 2009, Gruber et al. 2009, Schuster et al. 2013). With the use of physical and biogeochemistry output from the Community Earth System Model - Large Ensemble (CESM-LE) project (Kay et al. 2015) we investigate the projected 1990-2100 shift in high intensity air-sea anthropogenic carbon (C_{ant}) fluxes (> 80^{th} percentile) from the subpolar North Atlantic to the Southern Ocean. The high flux intensity regions as a whole constitute a disproportionate share of ocean carbon uptake, responsible for 40% of the global anthropogenic carbon uptake and comprising only 20% of the ocean area. The subpolar North Atlantic is the only high intensity uptake region with projected reduction of anthropogenic carbon uptake. We find evidence that from 1990-2100, the amplification of the Arctic hydrological cycle and resulting changes in freshwater fluxes between the Atlantic and Arctic, drive a reduction in the anthropogenic carbon sink in the subpolar North Atlantic. The biogeochemical properties of Arctic freshwater reduce the sea-air pCO_2 difference (ΔpCO_2) which is proportional to the air-sea flux of atmospheric carbon. Reduction of deep convection allows the surface biogeochemical signal to expand in the subpolar gyre. Using modeled fields of salinity and ΔpCO_2, we compare the results from the CESM-LE to other global climate models included in the Coupled Model Intercomparison Project Phase 5 (CMIP5). We find that the best agreement between the GCMs studied is on the magnitude and trend in the salinity in the subpolar gyre, and we find larger uncertainty in the salinity trends in the Greenland, Iceland, and Norwegian seas.

Tuesday, February 28, 2017 1:00 pm

AOSS Building, Room 811 **1225 W. Dayton St.**

Please join us for coffee at 12:45 in Room 1039