**Linked variations between the Gulf Stream, AMOC, and Gyre Circulation**

Analysis of observational records have shown strong linkages between AMOC at 26°N and Gulf Stream strength and position as defined by satellite altimetry. In previous work, we show that an increase in AMOC at 26°N leads to a Northward shift of the Gulf Stream west of the New England Seamounts while the Gulf Stream strength increases downstream of the New England Seamount. These relationships hold on both interanual time scales and for the decadal trend. However, long observational estimates of AMOC within the subpolar gyre are not currently available to extend this analysis to the linkages between AMOC, the Gulf Stream, and the barotropic circulation in the subpolar gyre. Here, we examine these relationships in a state of the art high resolution ocean model, POP (Parallel Ocean Program), and its coupled counterpart, CESM (Community Earth System Model). The ocean model has 0.1° horizontal resolution that allows mesoscale eddies to be resolved in mid-latitudes giving a much better representation of both the mean and variability of the path and strength of the Gulf Stream and North Atlantic currents. We will present results from an ocean-ice 20-year hind cast simulation as well as a 150 year-long coupled simulation.

We first examine the relationship between the Gulf Stream position and strength and AMOC at 26°N in the models. We then investigate the linkages between AMOC in the subpolar gyre and the Gulf Stream and North Atlantic Current. Yeager (2015) showed that AMOC and the barotropic circulation are linked through bottom pressure torque (BPT) and that the BPT can be diagnosed through the vertical velocity one grid cell above the bottom. Yeager (2015) finds that while the large-scale patterns of BPT are similar between a low resolution (1° horizontal resolution) and high resolution (0.1°) simulations, there are distinct differences in the separated Gulf Stream and the North Atlantic Current. We employ the vertical velocity diagnostic to probe how realistic variations of the Gulf Stream and North Atlantic are mechanistically linked to changes in subpolar North Atlantic AMOC and barotropic circulation.