AMOC heat transport variability induced by mesoscale processes in the subpolar North Atlantic

Xiaopei Lin[1,2] , Jian Zhao[2], Amy Bower[2] and Jiayan Yang[2]

1, Physical Oceanography Laboratory/CIMST, Ocean University of China and Qingdao National Laboratory for Marine Science and Technology, Qingdao 266100, China.

2, Woods Hole Oceanographic Institution, Woods Hole, MA, U.S.A.

Abstract

The ocean's role in global climate change largely depends on its heat transport. Therefore, understanding the oceanic Meridional Heat Transport (MHT) variability is a fundamental issue. Prevailing observational and modelling evidence suggests that MHT variability is primarily determined by the large-scale ocean circulation. Here, using new *in situ* observations in the eastern subpolar North Atlantic Ocean from OSNAP project and an eddy-resolving numerical model, we show that energetic mesoscale eddies with horizontal scales of about 10-100 kilometers profoundly modulate MHT variability on time scales from intra-seasonal to interannual. Our results reveal that the velocity changes due to mesoscale processes produce substantial variability for the MHT regionally (within sub-basins) and the subpolar North Atlantic as a whole. The findings have important implications for understanding the mechanisms for poleward heat transport variability in the subpolar North Atlantic Ocean, a key region for heat and carbon sequestration, ice-ocean interaction and biological productivity.