



Fresh Water in the Arctic Ocean: Results from the 2008 Winter Hydrographic Surveys

M. McPhee (1), A. Proshutinsky (2), J. Morison (3), and M. Steele (4)

(1) McPhee Research Co. Naches WA USA (mmcphree@hughes.net), (2) Woods Hole Oceanographic Institute, Woods Hole, USA (aproshutinsky@whoi.edu), (3) University of Washington, Seattle, USA (morison@apl.washington.edu), (4) University of Washington, Seattle, USA (mas@apl.washington.edu)

Based on an aerial hydrographic survey conducted in March and April, 2008, supplemented by unmanned drifting ice-tethered profilers (ITPs), we report that the precipitous decrease in minimum Arctic ice extent observed in the past few years has been accompanied by significant changes in upper ocean salinity, especially over the Canada Basin, where the anticyclonic Beaufort Gyre has traditionally maintained one of the major freshwater reservoirs of the world ocean. Our winter measurements corroborate and extend observations of increased summer freshwater content (FWC) first detected during the joint WHOI-IOS-JAMSTEC expedition in 2003 and monitored since. From surveys spanning major portions of the deep Arctic basins, we find that in the southeast quadrant of the Canada Basin, anomalous FWC (i.e., the change relative to PHC 3.0 winter [March-April-May] climatology based predominantly on conditions in the 1970s) has increased by as much as 11 m. Large anomalies are confined to the Canada Basin, but smaller positive anomalies were observed at all stations on the Pacific side of the Lomonosov Ridge. In the eastern Arctic, anomalies were negative, reaching values as low as -5 m.

Freshwater changes have also substantially changed steric levels. An east-west line of stations extending about 800 km across the Canada Basin, centered near 75degN, 150degW, nearly bisected the traditional Beaufort Gyre. In contrast to the domed climatological dynamic topography typical of the Gyre, the 2008 survey showed a monotonic rise in dynamic height as far east as 135degW, indicating a northward surface geostrophic flow component across the entire section, with large impact on freshwater transport.