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VARIABLE PATHWAY OF THE PACIFIC WATER IN THE PACIFIC SECTOR OF THE ARCTIC OCEAN

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In the Pacific sector of the Arctic Ocean, drastic reduction of sea ice during summer has been observed, especially, since 2007. Causes for the reduction of sea ice are thought to be 1) the ocean heat content in the surface mixed layer, 2) Pacific Summer Water (hereafter, PSW) usually found in the subsurface (~50 m water depth) layer and 3) the low pressure system carrying ice pack away from main ice pack resulting in efficient melt of sea ice (Parkinson and Comiso, 2013). All of them may have an impact on the suppression of sea ice growth, but it is hard to identify the contribution of each to sea ice reduction, simultaneously. However, based on the time series of sea ice concentration measured by the satellite microwave remote sensing and results from the hydrographic surveys, we believe that the PSW is a primary suspect for sea ice reduction. Moreover, from the view point of specific of heat, the PSW contains large amount of heat, so that we need to understand where and when the PSW is delivered in the Arctic Ocean.

The PSW is coming through the Bering Strait (July) and the Barrow Canyon (September to October), and then enters in the Canada Basin (during winter). In the Canada Basin, there is the clockwise Beaufort Gyre driven by the sea surface stress. Due to the clockwise circulation of the Beaufort Gyre, the PSW is delivered to the Chukchi Border Land. Hence the spatial distribution and strength of the Beaufort Gyre is the key to understand where and when the PSW is delivered. The variability of the Arctic Ocean circulation during winter is still unclear due to heavy sea ice cover. As mentioned above, the ocean circulation during winter is needed to elucidate where and when heat and freshwater are transported. In this study, we utilized observational dataset of the Cryosat-2/SIRAL (the Synthetic Aperture Interferometric Radar Altimeter) to derive the basin-scale ocean circulation in the Arctic Ocean. SIRAL measurements made us possible to estimate ocean surface topography. After detiding and applied corrections, monthly Absolute Dynamic Topography retrieval from Cryosat2/SIRAL show that the circulation of the Arctic Ocean is quite variable due to changes in sea surface stress resulted from changing sea ice motion, which is estimated from microwave sensors (Aqua/AMSR-E and GCOM/AMSR2). Quick response of the ocean circulation indicates that wind-induced sea ice motion is both the driving force and deterrent force for the ocean circulation. From our satellite data analysis, we will propose the future direction of the Arctic Ocean study.