海洋–大気–陸の観測ネットワークによる強まる北極水循環の実態解明
Amplification of Arctic hydrologic system explained by ocean-atmosphere-land observational network

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The areal extent and thickness of the Arctic sea ice have significantly decreased during recent decades. The shrunk sea ice cover and reduced sea ice thickness apparently increase heat and moisture fluxes from the ocean to atmosphere mainly in autumn and early winter, which may locally increase air temperature, moisture, and cloud cover, and in turn remotely cause anomalous climate and weather, such as cold and snowy winters, in the subarctic and mid-latitude terrestrial regions. Consequently, there might be related changes in the hydrological regime and its thermal conditions. In fact, the declined sea ice induced snowy winters contributed to increases in summer river discharge, whose relationships had identified by statistical analysis and model simulations. However, there were no yet observations demonstrating the feedback of the declining sea ice to the Arctic hydrologic regimes. Isotope is a useful tool to figure out the questioned realities. We have an observational plan that simultaneously monitors oxygen and hydrogen isotope ratios of water vapor in both ocean by research vessel and land. Although the observations help understanding about the variations of isotopic ratio of the moisture in individual areas, it is limited in tracking the routes that moisture flows to the terrestrial area from the ocean. Therein, observations by flying boat can specify dynamics and transporting routes in the atmosphere of water vapor sourced from the oceanic surface. Dynamics of the moisture in the terrestrial system will be identified by a land surface model coupling an isotope model for water flux. Moreover, the combination of global isotope climatic model with the observational network makes it possible to assess the sea-ice decline induced changes in the Arctic hydrologic system. This research plan is probably the first challenge to explain the amplification of the Arctic hydrologic system under climate changes, based on the observational results.

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