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COORDINATED OBSERVATIONAL AND MODELING STUDIES ON THE BASIC STRUCTURE AND VARIABILITY OF THE ARCTIC SEA ICE-OCEAN SYSTEM

Hiroyasu Hasumi *(The University of Tokyo, Japan)*

hasumi@aori.u-tokyo.ac.jp

In this subject we aim to understand the role of the Arctic sea ice-ocean system in the global climate change. For this purpose, we clarify the mechanisms which control formation and variability of the Arctic oceanic structure by coordinated observational and modeling studies. In doing so, we develop a numerical model of the Arctic sea ice-ocean system which adequately represent such mechanisms. By applying the developed model and dataset, we also aim to construct a projection system for the Arctic sea ice distribution and contribute to the achievement of the strategic target 4 “Projection of sea ice distribution and Arctic sea routes.” In the observational part, we develop algorithms for satellite data analysis and conduct mooring observation in a thin-ice area. By combining these activities, we construct high-precision datasets for sea ice thickness and drift which can be utilized as boundary conditions, input data, and validation data for high-resolution Arctic Ocean models and the Arctic sea ice projection system. The mooring observation is also to be used for capturing formation and descending processes of dense water. In the modeling part, we try to understand the basic structure and variability of the Arctic sea ice-ocean system which are related to mid to long term climate changes and properly model it. The modeling is focused on micro scale processes which are associated with transport and mixing of water masses with widely different properties, such as riverine runoff, the Pacific water, and Atlantic water, in the Arctic Ocean. Sea ice processes and associated water mass transformation and dense water formation/descent are also targeted. In the Arctic sea ice projection system part, we construct a modeling system which is especially optimized for projection of Arctic sea ice changes by selectively applying special high resolution around the Arctic region and by developing a new system for sea ice assimilation.