Clouds, aerosols, and atmospheric circulations over the Southern Ocean

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Recent rapid changes in sea-ice decline and loss of ice sheets in polar regions are considered to influence the people living in the mid-latitudes through sea-level rise and extreme weather. However, the climate model used to understand the polar regions' past, present, and future has significant challenges in reproducing sea surface temperature, ocean circulation, and atmospheric circulation, particularly in the Southern Ocean. One of the critical factors is the inability to adequately represent the phase of clouds (liquid water cloud or ice cloud) responsible for the climate system's energy budget. Therefore, it is essential to understand the unique cloud formation process over the Southern Ocean. On the other hand, in the real world, extreme weather phenomena frequently occur in the wake of ocean heat waves, and it is necessary to make precise predictions. Especially in the Southern Hemisphere, there is little observation data for numerical forecasting, so it is desirable to provide high-quality observation data. To this end, it is necessary to consider a sustainable observation system that contributes to forecasting. This project will conduct observational research to elucidate the state of cloud formation processes over the Southern Ocean by the Research Vessel Shirase and a predictability study applying the data from the atmospheric radar system "PANSY" at Syowa Station. This presentation will introduce the shipboard meteorological observation system for the Japanese Antarctic Research Expedition (JARE) in the austral summer of 2022/2023 and the preliminary results of the predictability study using PANSY data.

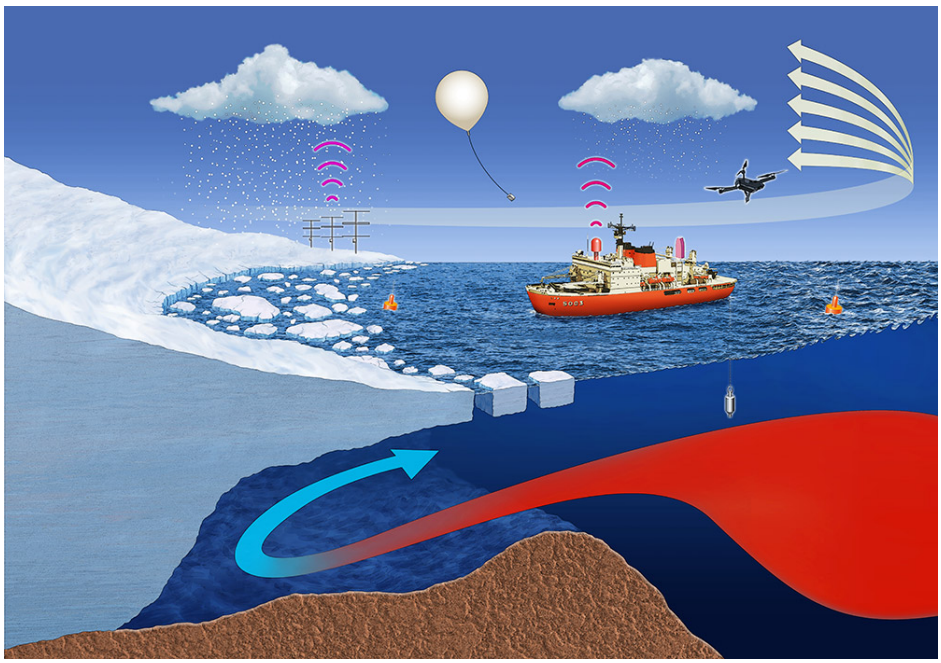

Figure 1. A schematic figure of this research project.