

Challenges for unexplored frontiers in the Southern Ocean

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The processes and the mechanism of the various kinds of interactions should be elucidated to understand the changes in the Southern Ocean and the Antarctic ice sheet from the viewpoints of giant reservoirs of heat, water and carbon dioxide, which drive changes in the global climate. Especially, the field observation data around ice shelf and sea ice areas is essential to understand the processes and the mechanism of the interactions between ice sheet and ocean. However, the field observation data around ice shelf and sea ice areas is very poor because of the difficulties with the observation. The acquisition of the field observation data in the unexplored area around the boundary between ice sheet and ocean is vital to understand the interactions between the Southern Ocean and the Antarctic ice sheet.

Unmanned research instruments and vehicles, especially such as underwater robots, namely ROV (Remotely Operated Vehicle) and AUV (Autonomous Underwater Vehicle), are urged to acquire the field observation data in the unexplored area. The underwater robots are widely used in the oceanographic observation in recent years associated with the development of robotics. The unmanned research vehicles should be applied to obtain the oceanographic and geological observation data around unexplored field, under ice shelf, sea ice and the surrounding areas. Moreover, the observation instruments accompanied with the unmanned research vehicles should be developed. We are progressing with preparation of AUV that can operate under sea ice to help understanding the interaction between ice and ocean. The outline of unmanned research vehicles and the development of the observation instruments in the unexplored area is introduced, and the future plan of observation is also discussed.

Keywords: Southern Ocean, Antarctic ice sheet, unmanned research vehicles, sea ice, ice shelf