Foreword

The Southern Ocean breeds a special ecosystem. The evolution and adaptability of Antarctic marine organisms is a key research field of the Scientific Committee on Antarctic Research. The study of the Antarctic marine ecosystem is also one of the tasks of Chinese National Antarctic Research Expedition (CHINARE). However, the early investigations by Chinese scientists mainly focused on plankton and benthos, as well as their environmental variables. Since 2019, financially supported by National Polar Special Program "Impact and Response of Antarctic Seas to Climate Change" (IRASCC), the research objects have been gradually expanded to large marine animal, such as birds and mammals, and other related disciplines. Some results of the study on Southern Ocean ecosystem based on the IRASCC and CHINARE are presented in this special issue.

In this special issue, nine articles are merged, following the theme of "Marine Ecosystem and Climate Change in the Southern Ocean", and other several solicited papers will be published in the subsequent issues after their acceptance. The first four papers focus on phytoplankton and protozoa in Amundsen Sea and adjacent waters in summer. Zhang et al. present the size-fractionated distribution and vertical structure of phytoplankton, and the phytoplankton communities among polynya, ice zone, and offshore waters are compared. Feng et al. study the relationships between environmental factors and phytoplankton biomass and community structure. The phytoplankton community structure and biomass in the study area show high spatial variation and are sensitive to environmental changes. Wang et al. consider the tintinnid diversity and horizontal distribution in surface waters of Ross Sea and polynya in Amudsen Sea, and eight tintinnid species are identified and the dominant species show obvious horizontal distribution characteristics. Xue et al. focus on the transparent exopolymer particles (TEP) and its response to the changes in phytoplankton communities caused by melting sea ice, and reveal that the low-iron Haptophyta is a main factor affecting TEP.

Another four papers focus on the related environmental factors of the Southern Ocean. Wang et al. provide the study result of redox-sensitive trace element, productivity-related proxies (total organic carbon and opal), and total nitrogen and $CaCO_3$ contents from bulk surface sediments of the Ross Sea to the Amundsen Sea. Chen et al. study the dissolved and particulate ^{210}Po and ^{210}Pb around Prydz Bay, and their results show that the distribution of ^{210}Po and $^{210}Po/^{210}Pb$ activity ratio in the upper water is mainly affected by biological absorption or particle adsorption. Wang et al. introduce the gaseous elemental mercury (GEM) concentrations along the cruise track based on several CHINARE cruises, and find the significant rising GEM concentrations over the equatorial

Central Indo-Pacific region rather than the Southern Ocean. Yang et al. identify an oceanic submesoscale eddy and a shelf break front in northeast of the South Shetland Islands, Antarctic Peninsula from seismic oceanography data.

The ninth paper by Chen et al. reports a suitable site in the southeast Prydz Bay to calibrate scientific echo sounders (SESs) based on its weak wind and surface current, and its ice-free coverage during Antarctic cruises in austral summer. The *in situ* calibration of SESs in the Southern Ocean is crucial for the accuracy of the biomass estimation.

We expect that this issue will provide a forum and be a new step for the Southern Ocean ecosystem researches. We would like to acknowledge all the authors for their valuable contributions and all the reviewers for their efforts to ensure high standards of the submitted manuscripts. We are also grateful to Dr. Huigen Yang, Dr. Ad H. L. Huiskes as Editors-in-Chief, and Mr. Xiaoliang Ling as Assistant Editor for their encouragement to make this special issue possible.

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