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## Foreword

The International Polar Year (IPY) took place in 2007–2008. During the IPY, the China Program for IPY 2007–2008 was launched and, in 2008 and 2010, Arctic cruises were undertaken. The two cruises explored some marginal seas, including the Bering Sea, the Chukchi Sea, and the Beaufort Sea. However, the focus of the cruises was the central Arctic Ocean, particularly the southern and northern sections of the Canada Basin. The R/V *XUE LONG* icebreaker reached 85°25'N close to 147°W in 2008, and in 2010 reached 88°26'N close to 170°W. During this second cruise, an onboard helicopter reached the North Pole. Multidisciplinary observations included physical, chemical, biological, and geological oceanography, sea ice physics, atmospheric physics, and chemical analysis. Opportunities to study the central Arctic Ocean are limited; therefore, the data collected during these cruises were invaluable for understanding the rapid changes taking place in the central Arctic.

This special issue, “Summertime ocean and sea ice in the central Arctic”, focuses on scientific issues in the far north. Observations of the long-term variation in near-surface warm water showed an extended spatial distribution in recent years. Measurements of the heat content of the upper Arctic Ocean in 2008 were compared with measurements made in 2003. The comparison revealed that retreating sea ice and Arctic warming have induced widespread warming of the upper ocean and an increased Pacific inflow. Total alkalinity (TA) and total dissolved inorganic carbon (DIC) in water samples were analyzed, and the relationship of these CO<sub>2</sub>-related factors to salinity, melting water, river water, and biological production was examined. Total alkalinity was also used to identify the fractions of sea ice meltwater, river runoff, and seawater in the upper Arctic Ocean. Data from a time-series observation of oceanic nutrients were used to examine the impact of changes in nutrient levels on phytoplankton in the ice-ocean interface. The observed reduction in nitrogen levels associated with ice melting was reported to be a potentially limiting factor for primary productivity. Stable oxygen and carbon isotopes,  $\delta^{18}\text{O}$  and  $\delta^{13}\text{C}$ , in the planktonic foraminifera, *Neogloboquadrina pachyderma*, sampled from the surface sediment, were analyzed to trace the distribution of the water mass coming from the Pacific. Terrigenous substances in the sediment core taken from the Alpha Ridge, north of 84°N were investigated to reconstruct mid- to late-Quaternary variations in sedimentation, provenance and related climate changes. Melt ponds on the sea ice were of special interest and were observed in detail using a newly integrated instrumentation system. The data obtained from this system were analyzed to investigate the mechanism of evolution of these sea ice melt ponds. Tropospheric ozone (O<sub>3</sub>), ultraviolet B radiation (UVB), aerosol light scattering coefficients, and aerosol black carbon (BC) in the atmosphere were measured along the cruise line and decreasing levels with increasing latitude were observed.

The limited number of papers published in this special issue cannot cover all achievements published elsewhere. However, we hope the volume will encourage further studies in the central Arctic and will also direct attention to the scientific issues to be investigated in the upcoming Arctic cruises in 2012 and 2014.

Guest Editor: Zhao Jinping  
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