Characteristics of Icebergs in Their Calving Sites in Russian Arctic: Results of Airborne and Direct Studies during IPY 2007/08

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ABSTRACT

In the recent years, the presence of icebergs in the seas of Russian Arctic has received increased scientific attention. Offshore development of carbohydrates deposits at the shelf will need to address the problem of icebergs as they seriously threaten offshore hydrotechnical structures. From 2003, AARI together with Institute of Geography of Russian Academy of Science perform annually studies on icebergs and icebergs-producing glaciers in the Barents Sea area for development of Shukman gas condensate field. Field observation and work experience were documented in the project called “Formation, dynamics and decay of icebergs in the western sector of Russian Arctic” that was part of International Polar Year (IPY) program of 2007-2008. Up to the current moment, two marine expeditions (2007 and 2008) were carried out onboard research vessel “Mikhail Somov” to study icebergs calving regions which are: Franz Josef Land, coasts of Novaya Zemlya from the Barents Sea side and the Kara Sea side and the region of Severnaya Zemlya. During the expeditions aerial photo survey and airborne radar sounding of the iceberg-producing glaciers and the largest icebergs were taken along with measurements of vertical distribution of the ice temperature through the annual active layer of icebergs and glaciers, and measurements of albedo and observations on reduce of the short-wave solar radiation in the upper 3-meters layer of some glaciers and icebergs. This report contains the main results of the surveys and some preliminary analysis.

KEY WORDS: airborne iceberg observations, the Barents Sea, glacier and icebergs characteristics, energy-balance observations, the Kara Sea, polythermal glaciers, iceberg radio echo sounding, temperature measurements.

INTRODUCTION

Comprehensive study of icebergs and glaciers in the northeastern Barents Sea and in the Kara Sea were carried out in 2007-2008. The project is called “Formation, dynamics and decay of icebergs in the western sector of Russian Arctic” and was included into Russian National Scientific Program of the International Polar Year activities in 2007/2008. It logically continues researches of the iceberg distribution over the Barents Sea that had been performed by Arctic and Antarctic Research Institute (AARI) together with Institute of Geography of Russian Academy of Science (IG RAS) during 2001-2007 while carrying out engineering, hydrometeorological and ice surveys aimed on development of Shokman gas condensate field (SGCF) (Zubakin et al., 2005, Kubyshkin et al., 2006, Buzin et al., 2008a, Buzin et al., 2008b). The most prominent event, recorded throughout activities of 2001-2007 was appearance of the large icebergs accumulation in May 2003 in the immediate area of Shokman GCF. Since then, a special attention has been paid to the problem of icebergs risk in this region. Two marine expeditions onboard RV “Mikhail Somov” were carried out during the IPY 2007/2008 program. The first expedition was carried out in September-October 2007; it included studies of icebergs and glaciers in the region of Franz Josef Land and that of the northern part of the Barents Sea coast of Novaya Zemlya. The second expedition took place in September-October 2008; in the regions previously mentioned and in the glaciers in the northern part of the Kara Sea coast of Novaya Zemlya and icebergs in the Krasnoy Army Strait (Severnaya Zemlya Archipelago). Both expeditions collected aerial photographic data of icebergs and glaciers fronts, aerial radar sounding of glaciers and some icebergs, temperature measurements throughout icebergs and glaciers thickness and energy-balance surface observations. Estimates of flow speed of the surface layer of ice at three glaciers were obtained by means of wooden stakes frozen into ice. Their initial positions was estimated by GPS in September 2007 and the final positions in September 2008.

Remote observations (aerial photo survey and radar sounding) were performed from the board of Mi-8 helicopter, stationed onboard the vessel. The same helicopter was used at transporting scientific personnel to icebergs and glaciers for carrying out ice stations. Table 1 contains information describing ice stations and scope of work for each. As for glaciers, all the stations situated in several hundred meters to several kilometers from glaciers fronts (depending on presence and amount of glacier cracks).