Determination of the design ice ridge based on data of expedition studies in the northeastern Barents Sea

Aleksey K. Naumov, Yury P. Gudoshnikov, Elena A. Skutina
State Institution “Arctic and Antarctic Research Institute”
St. Petersburg, Russia

ABSTRACT

For the last few years the State Institution “Arctic and Antarctic Research Institute” (SI “AARI”) has been organizing annual complex ice research expeditions in the northeastern Barents Sea. One of the main aims of these surveys is to investigate the ice cover characteristics necessary for design of offshore structures. This work is devoted to investigation of ridged features of the Barents Sea and construction of a “design ice ridge” – some virtual object the characteristics of which will be taken into account in calculations of loads on engineering structures for their design.

KEY WORDS: Barents Sea; ice ridge; ice ridge sail; ice ridge keel.

INTRODUCTION

The results of the expedition studies in the northeastern Barents Sea carried out in 2001 and 2003 – 2005 were used as initial data for the analysis of ridged features and construction of “design ridges” in the Barents Sea. The survey areas are outlined in Fig. 1.

Measurements of ice blocks comprising ice ridges were also made at the ice stations. A total of 1138 ice blocks were measured during the expedition studies.

Aerial photography was carried out for producing photo-schemes and obtaining stereo-pairs. An analysis of the photo-schemes allowed estimating the distribution of ice ridges on ice floes. Based on the results of photogrammetric processing of pictures, three-dimensional models of the upper surface of ridged features were constructed (Borodulin et al., 2004). As a result, data on geometrical characteristics of ice ridge sails were obtained. The number of ice ridges surveyed using stereo-surveying is 285. It is however noted that for some of them the sail length was not determined when the ice ridge was beyond the picture limits.

Application of side-scan sonar allowed us to determine ice ridge keel drafts (Zubakin, Krinitsky et al., 2004). In the course of the studies, data on the draft of 475 ice ridges were collected. In 2005, interferometer was also used for a sonar survey, which made it possible to determine in addition in some cases the keel length and width. Characteristics of the keels of 9 ice ridges were determined by means of interferometer.

So, in the course of the AARI expedition studies in the northeastern Barents Sea in 2001 and 2003 – 2005, a large amount of data were collected both in general on ice ridges and on their individual characteristics.