

## Formation of the severe ice conditions in the southwestern Kara Sea

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### ABSTRACT

Present work is devoted to the study of natural conditions influencing formation of the heaviest ice seasons in the southwestern Kara Sea. The generalized indices characterizing the state of ice during the natural ice cycle (autumn – winter – summer) were estimated on the base of analysis of the natural and statistical criteria and the from year to year continuance of natural conditions. 10 severe years were chosen and detailed analysis of their ice and synoptic conditions was performed. Peculiarities of formation of the severe ice conditions were studied taking into account the multiyear experience of performing the ice regime summaries, accumulated in the course of development of the Russian Arctic seas. The unique and the fullest joint AARI database along with the data of the National Ice Center (USA) was used.

**KEY WORDS:** Ice cover; severe ice conditions; criteria, large-scale atmospheric processes.

### INTRODUCTION

The main factors limiting the effective economic activity in the Arctic are the ice cover and anomaly of its development (Spichkin et al., 1995). This study is focused on the investigation of environmental conditions favoring the formation of the most severe ice years in the southwestern Kara Sea (SW Kara Sea) and the immediate area of Rusanovskoe and Leningradskoe gas condensate fields (GCF). The following heuristic sequence was performed in order to gain the correct and objective solution of the task: analysis of the level of knowledge about the studied area → choice of criteria that refer the year to the "heavy" type → analysis of ice conditions formation by the chosen criteria → expert's review of the obtained results (Yegorov, Spichkin, 1999-a; Yegorov, Spichkin, 1999-b). The SW Kara Sea belongs to the most well-studied regions of the Russian Arctic seas (fig. 1).

### THE USED DATA

The following data were used while performing the present project:

- 1) Meteorological and ice observations of the polar station situated on Belyi Island (since 1933);
- 2) Distribution of ice cover characteristics of the SW Kara Sea in

summer (since 1932), in autumn (since 1942) and in winter (since 1946);

3) Satellite images of the ice cover condition in the Kara Sea (since the beginning of 1970th).

4) Besides, ice charts from two ice centers from records of the WMO project "Global Digital Sea Ice Data Bank" (GDSIDB) were used (JCOMM, 2007). One of them is AARI of Agency on Hydrometeorology and Environmental Monitoring (ROSHYDROMET) of Russian Federation and another is the National Ice Center of USA. Original information is complete enough to create necessary basis for choosing of criteria that can refer the year to the "heavy/severe type".

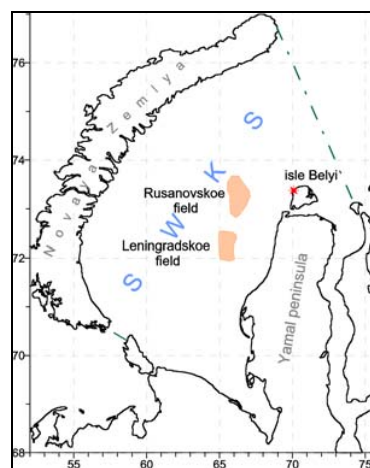


Fig. 1 Southwestern part of the Kara Sea; boundaries are marked by dotted line. Popova HMS (Belyi Island) is denoted by asterisk.

### SELECTION OF THE MOST SEVERE YEARS

Criteria for choosing should associate as much as it possible with the existing natural pattern in order to be representative and objective. Firstly, they should be different for winter and for summer. Secondly, they should take into account the natural continuity between the ice conditions of the periods of ice cover increase and decay (Borodachev, 1998). In winter period, ice thickness is the main parameter. The