

## Conditions for formation of extremely severe ice seasons in the Barents Sea in the second part of the XX century

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### ABSTRACT

Ice cover significantly hinders development of hydrocarbon deposits in the North-Eastern part of the Barents Sea shelf. Analysis of 10 seasons with the most severe ice conditions is presented in this article for the period from early 1950-s till the present time. This period is covered by good quality information, which allows a reliable assessment of ice regime components. Analysis of selected seasons is given, and conditions of their formation are described. Conditions of formation of extremely severe seasons depend on development of synoptic processes, presence of residual ice during the preceding period and decreased heat content of water incoming with the Nordkapp Current to the Barents Sea.

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

### INTRODUCTION

Development of hydrocarbon structures of the northeast part of the Barents Sea is complicated by ice cover, which makes it difficult to develop and construct production facilities and conduct transport operations creating risks for operating these fields. The Shtokman gas-condensate field (SGCF) is located at the latitude 73° 40' N (northern boundary) along the meridian 43° E in the southern part of the northeastern region (Fig. 1). In the extremely severe years, ice of different thickness, concentration and hummock and ridge concentration is observed in the SGCF area for 5–6 months.

The main features of ice conditions of the Barents Sea are known (Vinje, 1985; Vinje, 2001; Zubakin, 1987; Zubakin et al., 2004). Recent publication of Mironov (2004) contains information on ice conditions of the different regions of the Barents Sea, the paper by Buzin (2006) is describing the main features of ice regime of it's the north-eastern part. However, assessments of these publications describe mainly "mean" climatic conditions. Undoubtedly, knowledge of mean parameters of ice conditions is important. However, understanding of forming of the extreme ice conditions is necessary for successful exploitation of hydrocarbon fields in the Barents Sea. This publication is in many aspects a pioneering one for this region and for the entire Russian Arctic.

Choice of the second part of the 20<sup>th</sup> century for estimation of the extreme ice conditions is not random. First, this period, called by investigators as the Arctic warming period (1930s-1950s), ended by the end of the 1950s. Second, which is the main – the study period is covered by information of acceptable quality level (regular airborne ice reconnaissance from 1955 to 1992 and satellite information from 1970 up to the present time), which allows us to make a reliable assessment of ice regime components.

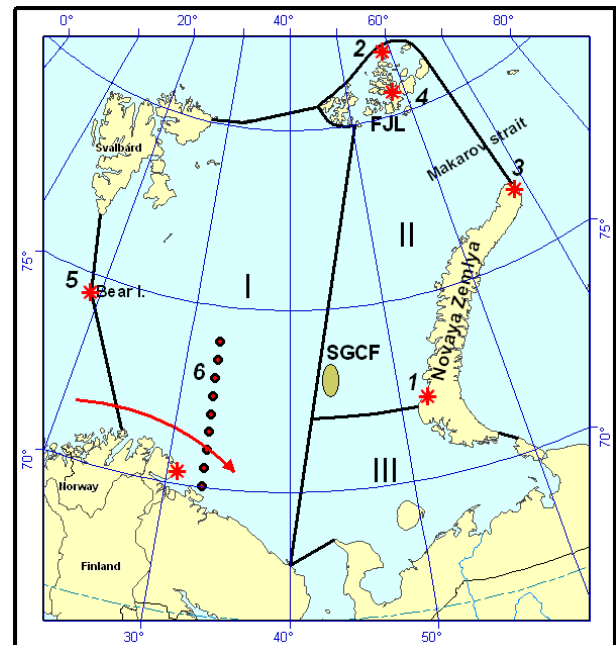


Fig. 1. Parts of the Barents Sea – I) North-Western, II) North-Eastern and III) South-Eastern. Asterisks denote the polar stations: 1) Malye Karmakuly, 2) Rudolf Island, 3) Cape Zhelaniya, 4) Hayes Island, 5) Bear Island; Transect (#6) – Kola meridian, red arrow – Nordcapp current.

As it follows from (Zakharov, 2004; Zubakin et al., 2006), the Arctic warming period was followed by cooling periods and more severe ice conditions. For the XX-th century Zakharov (2004) distinguishes four