Calculations Model of the Ice Abrasion Depth Volume Worn Material

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ABSTRACT

The main reserves of oil and gas in Russia are concentrated in the Arctic seas' shelf with severe climate and ice conditions. It creates serious obstacles for the shelf’s development. One of the possible effects of ice is abrade the impact of ice cover.

Nowadays there are various methods of calculation of the ice depth of abrasion, most of which are based on the determination of the empirical dependence of its intensity (mm / km).

In this paper we propose an algorithm to calculate the depth of ice abrasion by volume of the abraded material obtained on the basis of the distribution function of the parameters of the ice regime, that determines the novelty of this research.

KEY WORDS: Shelf, ice abrasion, model.

INTRODUCTION

The main volume of oil and gas in Russia is concentrated in the offshore zone of Arctic seas with harsh climate and extreme ice conditions that create serious obstacles to the development of technical means for offshore infrastructure; one of the possible effects of ice is ice abrasion.

The first experimental data related to ice abrasion resistance were published in 1967 and were related to studying of rock failure damage by the movement of glaciers.


STATEMENT OF THE PROBLEM

Currently various methods for calculating the depth of ice abrasion are offered, most of which are based on determination of empirical dependence of its intensity (mm / km) (Uvarova T.E. 2011a, 2011b).

In this paper we propose an algorithm to calculate the depth of ice abrasion in terms of volume abraded material $V\Delta$, obtained on the base of distribution function of ice regime parameters, which determines the novelty of this research.

The Model for calculating the depth of ice abrasion in terms of volume abraded material

MAIN ASSUMPTIONS:

1. Ice cover is a combination of ice formations that are uniformly distributed over the water area and characterized by the following parameters: thickness $H$, the drift velocity in the directions $V$, diameter $D$, temperature $T$, , ice drifting rhumb (drift direction) $Rumb$, sea level $Z$.

2. Ice parameters are independent random variables that are presented as monthly or every ten days histograms, based on long-term series of observations in a particular area of marine waters.

3. 10% of the ice cover thickness is above sea level and 90% of it is below sea level.

4. Construction’s abrasion from the ice formations is possible in the danger zone of abrasion, which is limited in terms of sector of ± 90 degrees from the direction of ice formation’s movement.

The possibility of contact of the ice formation of any thickness at any level of the sea is determined by multiplying the probability of thickness and sea level for each level of the sea $Zi$ separately. The overall probability of the joint distribution of the thickness of the ice cover and the sea level is obtained by looking over all possible