A Three-Dimensional Hydrodynamic Model of Tide and Wind Currents in the Baidaratskaya Bay of the Kara Sea

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ABSTRACT

A three-dimensional hydrodynamic model of the Baidaratskaya Bay is used to examine the response of the region to forcing along its open boundary and wind stress over the area. The model has resolution of the order of two miles and hence can resolve some features of the nearshore region. The model is forced with nine tidal waves along its open boundary and with wind stresses on the sea surface. A semi-implicit finite difference scheme is applied to the numerical algorithm. The calculations of the tidal oscillations were made and amplitude and phase distribution of tidal waves along estuary were obtained to describe the main tidal characteristics in the region. Cotidal charts of main tidal waves were obtained. The specific attention were given to the projected underwater gas pipeline crossing region. The main tide features, such as HAT, LAT and so on of this region were obtained. Ellipses of tidal surface and bottom currents are presented. The calculations of wind currents were obtained and compared with observations.

KEY WORDS: Pipeline crossing, bay, mathematical simulation, tide, wind currents

INTRODUCTION

The interest that has been expressed in the past years to the Baidaratskaya Bay of the Kara Sea is determined by the key role of the bay in the Yamal gas transport project (Fig.1).