

Integrated Study of the Pechora Bay and Coastal Waters of the Pechora Sea on the Basis of Different Time Multi-spectral and Radar Satellite Data Set

Leontina Sukhacheva

Institute of Remote Sensing Methods for Geology (VNIKAM)

vniikam@mail.wplus.net

The Pechora Bay of the Barents Sea represents semi-closed shallow reservoir separated from the sea by a natural morphological boundary - sea mouth bar, marked by a chain of barrier islands named Guliaevsky Coshki. The area of the Pechora Bay is about 6500 km², average water volume - about 35 km³. Length of a Bay in a meridian direction makes up approximately 80 km, maximal width - 130 km. The Pechora Bay is located behind a polar circle - between 680 and 690 N, and ice period as a rule is observed since October till June. Due to severe climatic conditions it is difficult to conduct a field observations in this region, moreover extensive shallows, especially in western part of the bay, makes almost impossible (or very expensive) receiving of traditional ship-borne data. For this reason a bottom topography and hydrological regime of the Pechora Bay at present still insufficiently investigated. The Pechora Bay has an important economic potential in fishing and oil-gas industry. Thus the possibility of using passive and active remote sensing techniques for the Pechora Bay study would be very helpful for solving problems related to economical development and environment protection. Due to its independence from illumination and clouds coverage conditions, the remote sensing SAR technology is of special interest.

In this study the following satellite data set has been used: the LANDSAT/MSS three images for July 1973, September 19, 1980 and July 1, 1983; LANDSAT/TM for August 2, 1987; two JERS-1/SAR images from August 5, 1994 and August 8, 1997; two RESURS-4/MSU-S images from August 20 and 25, 1998; the Terra/MODIS image for August, 10 2001. The radar JERS-1/SAR from August 5, 1994 and multi-channel RESURS01-N4/MSU-S image from August 20, 1998 both correspond to a high tidal phase. The patterns of a variability of surface waves spectrum, modulated by influence of tide currents and bottom relief, revealed from these two images are rather alike.

Processing of available remotely sensed data set has been made using modern software, including GIS technology. Thematic interpretation of satellite images have been made with support of regionally knowledge - data on subject collected mainly from literature (reference books, books, articles, reports, historic data and others), available cartographic materials, including existing bottom topography maps, tidal data and concomitant hydrological/meteorological characteristics.

The following results received in this study will be illustrated and discussed:

- peculiarities of water dynamics in the Northern Pechora Bay during high tide phase;
- bottom topography features - more precise information about disposition and configurations of the bottom shallows, a banks and underwater swells (situated near coast and between the straits);
- spatial characteristics of a mouth bar of the Pechora River;
- disposition and configuration of the channel being prolongation of the Pechora River;
- peculiarities of the Pechora River water dispersion in the sea;
- patterns of suspended matter distribution in the Pechora Bay and sea coastal waters;
- evidence of anti-cyclonic eddy in the north-western part of the Bay;
- the inter-tidal sandy plates and mud flats;
- for appreciation of depth and creation a map of bottom topography (on the basis of the JERS-1/SAR image) the additional field measurements and subsequent theoretical investigations are needed.

Thus the results obtained showed the effectiveness of using remote sensing technology (especially the SAR data possibilities) for monitoring of northern water environment. The new knowledge obtained for the region of the Pechora Bay can be used for hydrodynamics modeling, for water resources management and environment protection, for planning the oil and gas drilling operations, for ensuring measures of sustainable development of northern areas.