

Complex of remote sensing methods for scientific studies and engineering surveys on the shelf of the Arctic Seas

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Lately in connection with the plans of developing new hydrocarbon fields, increasingly more attention is paid to the offshore zone of the Arctic Seas. The development of the offshore fields requires a comprehensive approach to investigating the natural conditions in the area of their location. One of the major places in this complex belongs to remote sensing methods of environmental studies. They are widely used in the expedition activities both during the winter and summer periods and in shallow water and in the open sea. Beginning from the second half of the 1990s, the "Arctic-shelf" Laboratory of the SI AARI is involved in regular expedition activities in the eastern Barents Sea. The applied complex of remote sensing methods includes a large range of technical equipment allowing us to obtain characteristics on many environmental components. Relative to the development of the offshore mineral fields, this primarily concerns ice and hydrometeorological conditions of the Arctic Seas. With respect to technical equipment, the remote sensing methods used can be divided into the following types. 1. Spaceborne. Receiving satellite images in the visible and IR ranges provides information on clouds and ice conditions and allows analyzing synoptic and ice conditions in the operation area and locating icebergs. The obtained information helps in planning further actions.

2. Airborne. Visual airborne ice reconnaissance supplements and specifies similar satellite data. Due to laser profiling, radar, video and aerial photo-stereo survey of the ice cover, geometrical characteristics of the upper ice surface and ice features (ice ridges, stamukhas and icebergs) are estimated. Based on the results of repeated surveys, the dynamic characteristics of the ice cover and icebergs are calculated. 3. Acoustic. Sonar survey in the wintertime allows estimating the geometry of the underwater ice cover surface. During the summer period, similar observations give an idea about the results of seabed gouging by ice features. Doppler current meters are widely used. They allow obtaining characteristics of currents over long time with high resolution by time and depth with the instrument deployment at the upper or low boundary of the investigated layer. At specific modifications of the instruments, it is also possible to obtain the wind wave parameters. The acoustic ice profilers (sonars), deployed on the seabed, help to estimate the geometric characteristics of the underwater portion of the drifting ice cover. 4. Diving. Underwater photo- and video- surveys substantially supplement instrumental observations of the lower ice cover surface, results of seabed gouging by ice features, etc.

In conclusion, it is noted that the enumerated remote sensing methods applied in the field studies could also be used not only at the field development stages. In fact, they are easily applicable for any practical and research purposes related to the development of the shelf zone of the Arctic and other seas and water areas.