

SUBSATELLITE EXPERIMENTS IN A NORTH-EAST PART OF THE BLACK SEA

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The results of field experiments carried out in 2007, 2008 in a north-east part of the Black sea in region of city Gelendzhik, are given. Experiments targeted the development of a bottom topography remote (radar and optical) diagnostics. Experimental area is characterized by abrupt depth dumping (fall 50 - 1250 m), and irregularity of a bank vault (numerous canyons). Such bottom topography in the presence of alongshore current creates favorable conditions for hydrodynamic perturbations on thermocline and corresponding anomalies on sea surface and in atmospheric surface layer characteristics. The simultaneous measurement of atmospheric near-surface layer, sea surface and sea bulk parameters synchronously with reception of the radar image from the satellite ENVISAT was feature of the given experiment. The ground-based measurements were carried out simultaneously from high coast by means X-band radar and from R/V "Aquanaut" (Institute of Oceanology RAS). The meteorological conditions during observations varied considerably. The wind velocity changed from 0 up to 10 m/c, heaving - from 0 up to 4 balls. The short-term atmospheric precipitation were observed.

The bottom topography was measured by echo-sounder. Investigation of the hydrological characteristics was carried out by combined SVP-CTD probe. The current field was measured by ADCP. The surface wave characteristics in length range 4 mm - 1 m were measured by X and Ka radar and two-dimensional optical spectrum analyzer. Air temperature, relative humidity, atmospheric pressure, wind velocity and direction were measured. Sonic anemometer-thermometer for recording horizontal and vertical components of the wind and temperature fluctuations in the surface layer was used.

It was explored, how the features of bottom topography cause variability of surface waves, the dependence of surface wave variation on their length and propagation direction. Change of location of surface wave intensification and weakening areas in a shelf region depending on diurnal cycle is detected on marine surface radar panoramas. Surface wave transformation, in turn, gives a variability of mesoscale component of meteorological fields in atmospheric near-surface layer [1, 2]. Heat and momentum turbulent fluxes above surface waves were determined by eddy correlation technique [3]. Surface wave transformation leads to change in the turbulent structure of the atmospheric near-surface layer. The measurements have shown that in all cases when anomalies were present at the surface the structure of the atmospheric turbulence changed. Therefore, we may conclude that the features of bottom topography can be reflected in the surface wave characteristics and atmospheric near-surface layer.

The joint processing of the satellite image (SAR signal intensity) sections along a tracks and wind, surface wave and current in sea upper layer parameters measured from the research vessel "Aquanaut", was carried out. The connection of current field heterogeneities with a bottom configuration in region of depth dumping is investigated. The correlation of radar signal with current speed in near-surface region is observed also. For example, the slicks are observed in region of the current maximal gradient, which in our experiments placed above depth dumping. The comparison of satellite sections to the 3 cm radar (VV polarization) data has shown their good agreement on time interval one hour. At comparison of radar panoramas received from the satellite (wave-length 5,6 cm, VV polarization) and from the vessel (wave-length 3 cm, HH polarization) was shown their similarity, in particular slick bands are mapped equally. The examples of feature comparison of the radar satellite images (slicks, wind fronts etc.) with a variability of atmospheric near-surface layer and sea bulk parameters also are considered. It was found, that the presence of features on the satellite images is always connected with variability of measured physical characteristics.

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