

Remote wave measurements using autonomous mobile robotic systems

Andrey Kurkin, Denis Zeziulin, Vladimir Makarov, Vladimir Belyakov, Dmitry Tyugin, and Efim Pelinovsky
Nizhny Novgorod State Technical University n.a. R.E. Alekseev, Nizhny Novgorod, Russia (aakurkin@gmail.com)

The project covers the development of a technology for monitoring and forecasting the state of the coastal zone environment using radar equipment transported by autonomous mobile robotic systems (AMRS). Sought-after areas of application are the eastern and northern coasts of Russia, where continuous collection of information on topographic changes of the coastal zone and carrying out hydrodynamic measurements in inaccessible to human environment are needed.

The intensity of the reflection of waves, received by radar surveillance, is directly related to the height of the waves. Mathematical models and algorithms for processing experimental data (signal selection, spectral analysis, wavelet analysis), recalculation of landwash from data on heights of waves far from the shore, determination of the threshold values of heights of waves far from the shore have been developed.

There has been developed the program complex for functioning of the experimental prototype of AMRS, comprising the following modules: data loading module, reporting module, module of georeferencing, data analysis module, monitoring module, hardware control module, graphical user interface.

Further work will be connected with carrying out tests of manufactured experimental prototype in conditions of selected routes coastline of Sakhalin Island. Conducting field tests will allow to reveal the shortcomings of development and to identify ways of optimization of the structure and functioning algorithms of AMRS, as well as functioning the measuring equipment.

The presented results have been obtained in Nizhny Novgorod State Technical University n.a. R. Alekseev in the framework of the Federal Target Program «Research and development on priority directions of scientific-technological complex of Russia for 2014 - 2020 years» (agreement № 14.574.21.0089 (unique identifier of agreement - RFMEFI57414X0089)).