

Brief annotation of project RNF 14-17-00555

The aim of the project is to develop techniques for the retrieval of pollution parameters and investigate the affect of marine dynamic and circulation processes on its propagation on the basis of complex analysis of satellite data and quantitative assessment of environmental status of Russian seas.

Our experience long-term experience in combined satellite survey of various areas of the World Ocean shows that the tasks of the satellite monitoring of the sea state and sea surface pollution of are closely interrelated because pollutants become part of marine environment and evolve according to its intrinsic mechanisms. Keeping in mind the complexity and high costs of field experiments, we may assume that variety of real-ocean situations and impact of huge amount of atmospheric and oceanic factors yield to some fragmentarity in description of real processes in the areas of interest.

Our activity will concern primarily oil pollution of the sea surface and also suspended and bio-organic matter associated with phytoplankton photosynthesis as well as anthropogenically induced rise in algae biological productivity. Integral estimates of ecological state of sea areas will be made based on satellite remote sensing data in different ranges.

Considerable effort will be devoted to investigation of the impact of dynamical and circulation processes and natural factors (current meandering, vortical activity, sea level variation, surge and upwelling, temperature and wind regimes, precipitation, river outflows) on variability of spatial and temporal distributions and intensity of sea water pollution manifested in satellite images.

An important facet of the project will be improving the techniques and developing the tools for determining pollution types and scales as well as obtaining their quantitative estimates.

Particular emphasis will be laid on improving the discrimination algorithms for sea pollution of different origin based on their manifestations in remote sensing data.

Elaboration of scientific foundation and methodology of quantitative assessment of ecological state of marine environment and solving the problem of estimation of pollution parameters and dynamic characteristics of seawater medium on the basis of complex analysis of satellite data in enclosed (Black, Baltic and Caspian) as well as in adjacent (Barents, Kara) seas of Russia is a crucial task today. These seas are the most affected by oil pollution because of large-scale exploration and production of sea shelf oil and gas accompanied by building and operation of marine platforms, coastal terminals, hydrocarbon storages, sea bottom pipelines, seismic and drilling activities, increase in ship traffic, etc.

Scientific novelty of the proposed project consists in the following.

1. The project suggests to solve the problem of detection and propagation forecast of anthropogenic and biogenic pollution based on joint analysis of different satellite sea surface remote sensing information, including hyperspectral data. Theoretical grounds and algorithms for reliable recognition and quantitative assessment of anthropogenic and biogenic pollutants of the sea surface will be elaborated on the basis of joint analysis of all available satellite data in microwave, visible and infrared ranges.

2. The task of pollution propagation forecast will be solved in consideration of the influence of dynamic and circulation processes, primarily meso- and submesoscale structures.

3. Assessment of the ecological states of the Black, Caspian and Baltic Seas for the first time will be performed based on the vast archive of satellite data accumulated over more than past 10 years.

4. Finalized techniques will be adjusted to assess the ecological state of Russia's Arctic seas, first of all Barents and Kara.