



## Oil spills monitoring using remote sensing

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One of the problems in order to create an operational integrated space-based monitoring and emergency system is an absence of various pilot researches to develop methodological principles for the unified algorithm of monitoring on international level. To contribute to this need a pilot research on Oil Spills Monitoring in the Black and Azov Seas was conducted by *SSPC Pryroda* and *GIS Analyst Center* with a support of *European Space Agency* under the ERUNET project within the framework of collaboration of GMES. The objectives of the research were to: appropriate SAR images for oil spills detecting; specify of

the remote sensing needs for space-based monitoring of oil spills; create databases and schemes of oil spills dissemination in the Black and Azov Sea (in 2002 – 2004); provide the recommendations for the development of oil pollution modeling complex for the Ministry of Ukraine of Emergencies.

On the first stage of the research the physical-chemical characteristics of oil pollution and etalon characteristics of the oil spill were studied. The average size of an oil spill is about 0.5 km<sup>2</sup>. Satellite images should have a proper resolution to detect it, so ENVISAT and ERS-2 images with resolution 25 – 12 m were selected as a basis. The satellites SAR (Synthetic Aperture Radar) images do not depend on cloud coverage, season and daytime. Oil, discharged in the water, damps gravity-capillary waves and changes the slope angle. Thus, oil spills could be viewed on the SAR images as black spots on an unpolluted sea surface.

On the second stage every dark spot on the image was analyzed in detail. In particular, the following information was taken to the account: year period (probability of formation of ice); wind speed (required wind speed – 2-14 m/c ); spot form and size (large areas are either areas with low wind or natural oil); geographical location; ship presence nearby; etc. However, the similar effect of dark spots on the SAR images

can cause the row of other ocean and marine phenomena, such as atmospheric front, wind shadow, currents, calm zones, rain, topography, sewerage flowing, ice, internal waves and other. Therefore, the synergetic analysis with visible and infrared images consideration was conducted as a second stage of the project to confirm the results of the research. AVHRR (NOAA) images and SeaWIFS data were selected as reference data. The complex information was studied, such as, temperature of water of marine surface, concentration of chlorophyll, marine flows and meteorological parameters. The features of oil spill presence were the following: temperature and vapor minimum; absence of chlorophyll concentration maximum; sea surface albedo minimum; etc.

The scheme of oil spills dissemination was designed. It shows high correlating with the scheme of transportation roads.

As a result the recommendations for the development of oil pollution modeling complex for the Ministry of Ukraine of Emergencies was conducted.