The Second Coastal Environmental Assessment Workshop

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Interim review and refinement of the draft Procedures in Russia

Leonid M. Mitnik

V.I. Il'ichev Pacific Oceanological Institute FEB RAS,

Vladivostok, Russia, **mitnik@poi.dvo.ru**

1. Introduction

CEARAC WG3 and WG4 have decided, in the absence of good scientific information, to develop OSPAR-based procedures for assessment of eutrophication status considering that the obtained assessments will provide arguments to limit or if possible to reduce unnatural change of the coastal ecosystem.

OSPAR Comission - For the Protection of Marine Environment of the North-East Atlantic. The term 'OSPAR Commission' is used to refer to both the OSPAR Commission and the former Oslo and Paris Commissions. The *1972 Oslo Convention and the 1974 Paris Convention* were replaced by the 1992 OSPAR Convention when it entered into force on 25 March 1998.
http://www.ospar.org/eng/html

1. Introduction. Questions.

OSPAR has developed a harmonized assessment of eutrophication through the **Common Procedure** to identify the regions in which these recommendations apply. This consists of an **Initial Screening Procedure** (a "one-off broadbrush approach") to identify obvious Non-Problem Areas, followed by the application of the **Comprehensive Procedure** to identify whether other waters should be classified as *(Potential) Problem Areas* or *Non-Problem Areas* with respect to eutrophication. The **Comprehensive procedure** is applied as an iterative process, with periodic reassessments and feedback from its application being used to refine the procedure. The screening procedure has been finalized in 2004. The **Comprehensive Procedure** consists of a set of assessment criteria that are linked to form a holistic assessment of eutrophication status (*OSPAR Commission 2005-3*). It is based on a conceptual framework of the eutrophication process and a checklist of qualitative parameters for a holistic assessment. The conceptual framework and these categories take into account interactions and cause and effect relationships.

1. Introduction. Questions.

OSPAR defines "eutrophication" ***as the enrichment of water by nutrients causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned, and therefore refers to the undesirable effects resulting from anthropogenic enrichment by nutrients.***

In the NOWPAP region, increased runoff and discharge of nitrogen and phosphate from land since the sixties (?) have caused higher their concentrations in rivers and coastal waters, reaching a maximum in the late eighties and early ninetieth (?). While consistent data sets on nutrient concentrations for the period 1960-1990 are not available to prove these trends, estimations and extrapolations of known nutrient concentrations allow the nutrient enrichment to be estimated. The anthropogenic fraction of the total nutrient input in the NOWPAP seas is estimated to be ?? % for phosphate and ?? % for nitrogen in 1985? In 1992?, it was estimated that riverine inputs of phosphate and nitrogen were still ?? to ?? times and ?? to ?? times the natural range, respectively.

It is necessary to have assessment of the winter concentration of phosphorus in the past decades.

1. Introduction.

All the available data have to be gathered to implement a comprehensive monitoring scheme. To this purpose, the capacity of **ocean color imagery** to complete the conventional *in situ* data set collected in coastal networks should be evaluated.

HABs can be quick events that begin and end within a few days or they may stay for several weeks; they can occur on a relatively small scale or cover hundreds of square kilometers of the ocean's surface and thus **can be mapped from satellites**.

Among the most challenging aspects of eutrophication research is **investigation of the physical oceanography** that influences bloom initiation and development in complex, rapidly changing coastal environments. Fields of physical parameters can be derived from satellite observations.

1. Introduction.

Remote sensing from airplanes and satellites offers the opportunity to detect large-scale changes in the biological properties of the NOWPAP seas (e.g. use of color data and fields of physical parameters), to detect changes in coastal areas and to detect and monitor accidental pollution (EEA/UNEP, 1999). Therefore, eutrophication can be an important aspect of these activities.

Remote sensing and automatic buoys are recommended among the supplementary techniques for monitoring eutrophication in the framework of the MED POL medium/long term strategy (Document UNEP(DEC)/MED/WG.231/14).

Multidisciplinary, multi-scale *in situ* and **remote sensing** observations of the coastal areas and adjacent sea in the NOWPAP region provide a lens through which eutrophication genesis and evolution are viewed and assessment of eutrophication status is performed.

Table 1 Survey data/information collected from monitoring organizations

Survey area	Governing organization	Survey title	Aim	Survey period	Main survey parameters	Survey frequency	No. of survey points
Peter the Great Bay	PUGMS POI FEB RAS	GSN (State Observation Network) Complex research	To monitor water quality To monitor hydrological, biological fields, river discharge, sea ice, sedimentation	From 1962 From 1975	tºC, S‰, DO, nutrients, tºC, S‰, DO, chl *a*, nutrients, fronts, currents, eddies, sea ice, atmospheric parameters, sediment composition	Depend on survey point category Several times from May till November Every 10 days	25 10-30 stations
Amursky Bay (part of the PGB)	IBM FEBRAS	Monitoring of HAB	To assess the seasonal patterns	From 1991	Species composition, density, tºC, S‰		1

Collective monograph "*Monitoring of Peter the Great Bay*" will be published in September-October. Table 1 will be modified. New data will be included.

2.11. Types of data sources which should not be used for the assessment procedure:

i) Surveys conducted at very limited frequency
ii) Data that are not directly related to eutrophication
iii) Surveys that are not conducted at regular locations and frequency
iv) Surveys that are not conducted for monitoring water quality and aquatic organisms
v) Surveys that employ uncommon analytical methods

Conditions stated in i), ii), iii) and v) can be useful, especially when there are high-resolution individual images and/or time series of satellite remote sensing data (images).

Additions:

There are:

• ground stations that receive satellite ocean color and infrared data

• nowcast/forecast data assimilative models

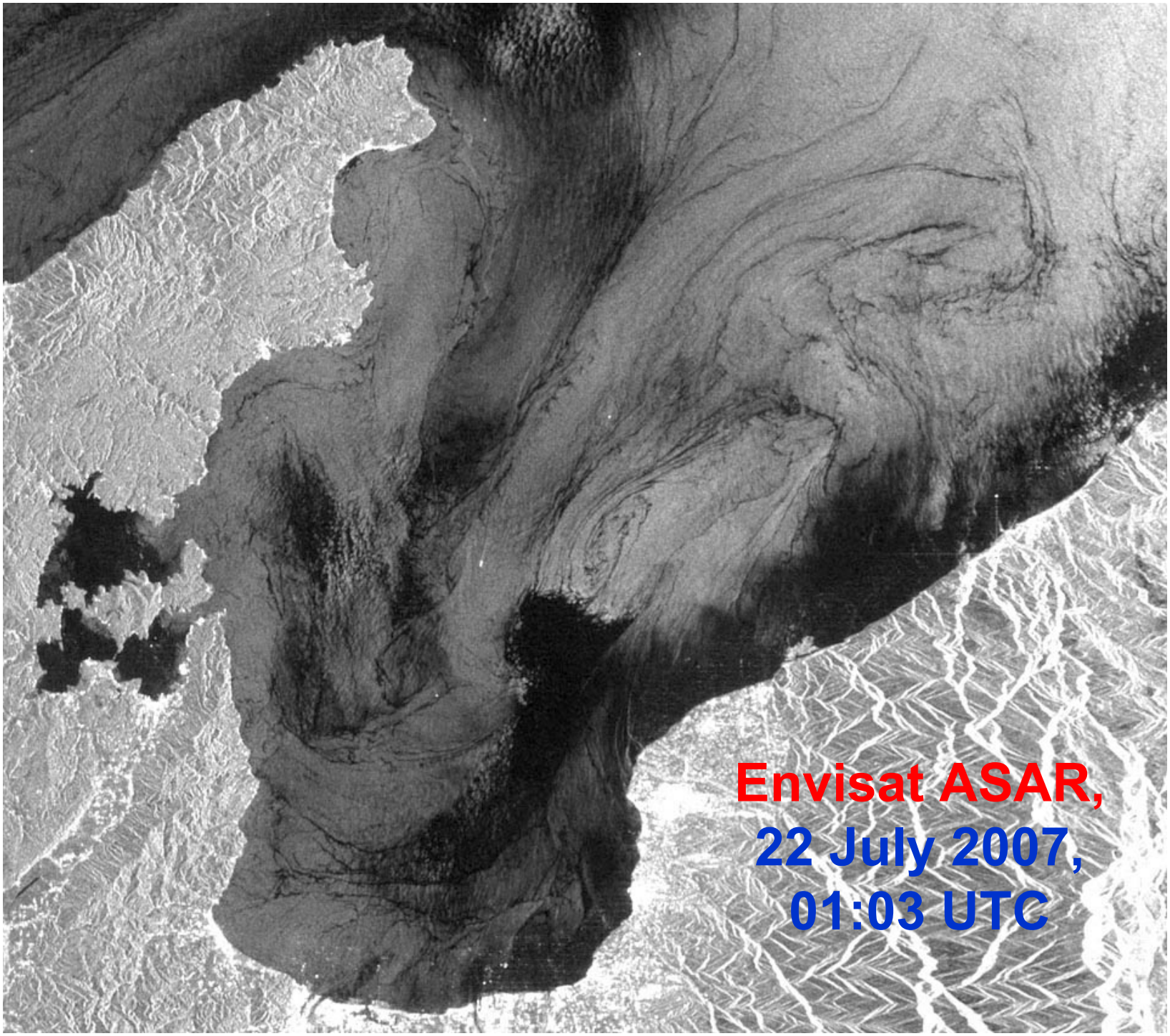
• **coastal panoramic video cameras** and surface current radars (in several places)

• fleet of autonomous underwater vehicles (new technique).

These systems will allow the mean behavior in marine ecosystems to be defined while also *providing real-time data that will allow adaptive sampling*. The ability to adaptively sample the environment will allow scientists to decide ***when, where and what samples*** to collect, to develop the new approaches to measure *critical biological processes and the geographic boundaries of those processes*. This adaptive sampling capability will open an exciting new era for biologists, which, at present, can only gather a limited number of labor-intensive samples.

2-5. Division of assessment area into sub-areas

When dividing the assessment area into sub-areas, factors such as location of estuaries and typical values of river discharge, SST and salinity distribution, underwater topography, ocean/tidal currents, fishery activities, location and amount of aquaculture farms, red- tide events and monitoring locations should be considered.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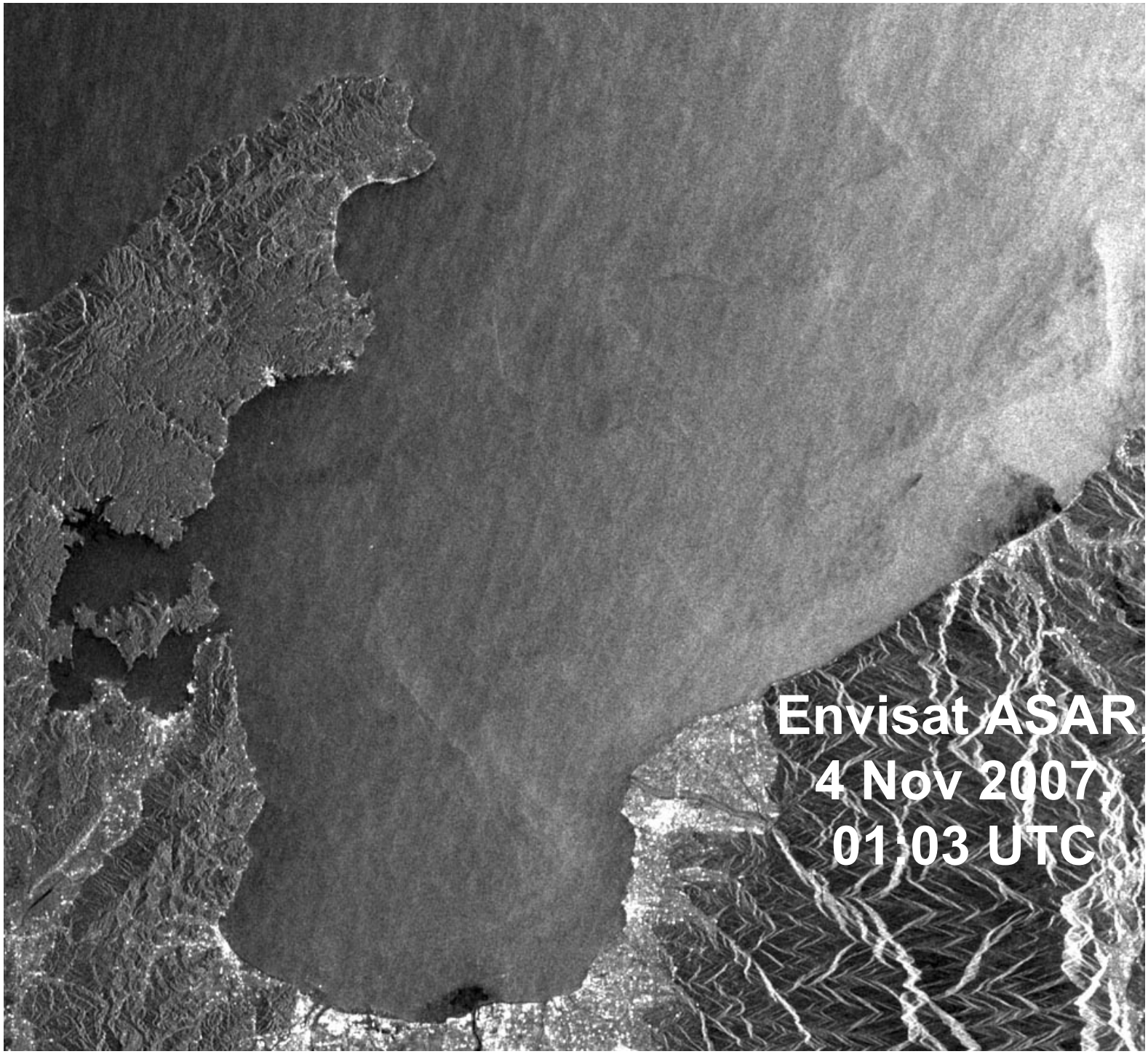
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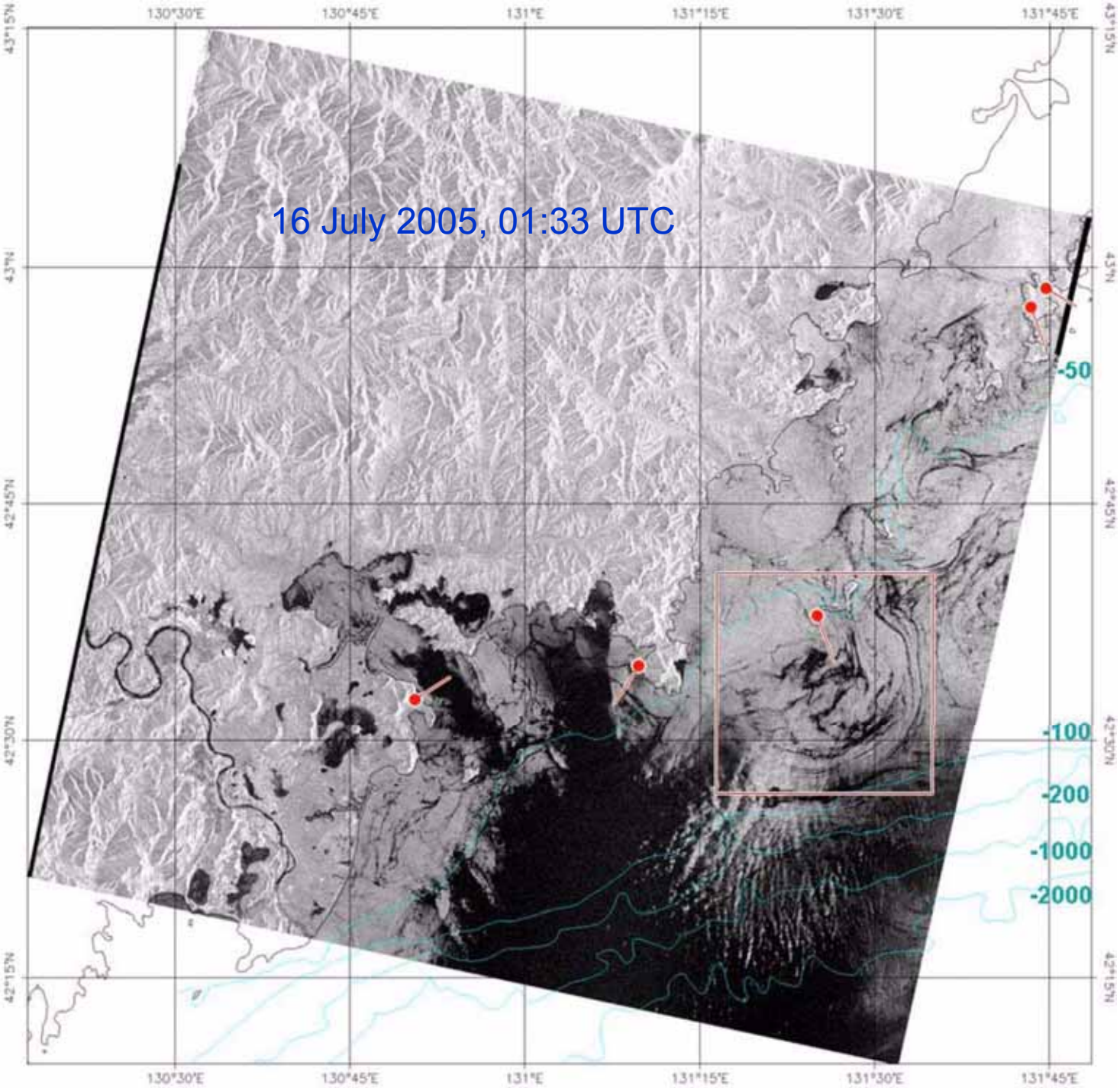
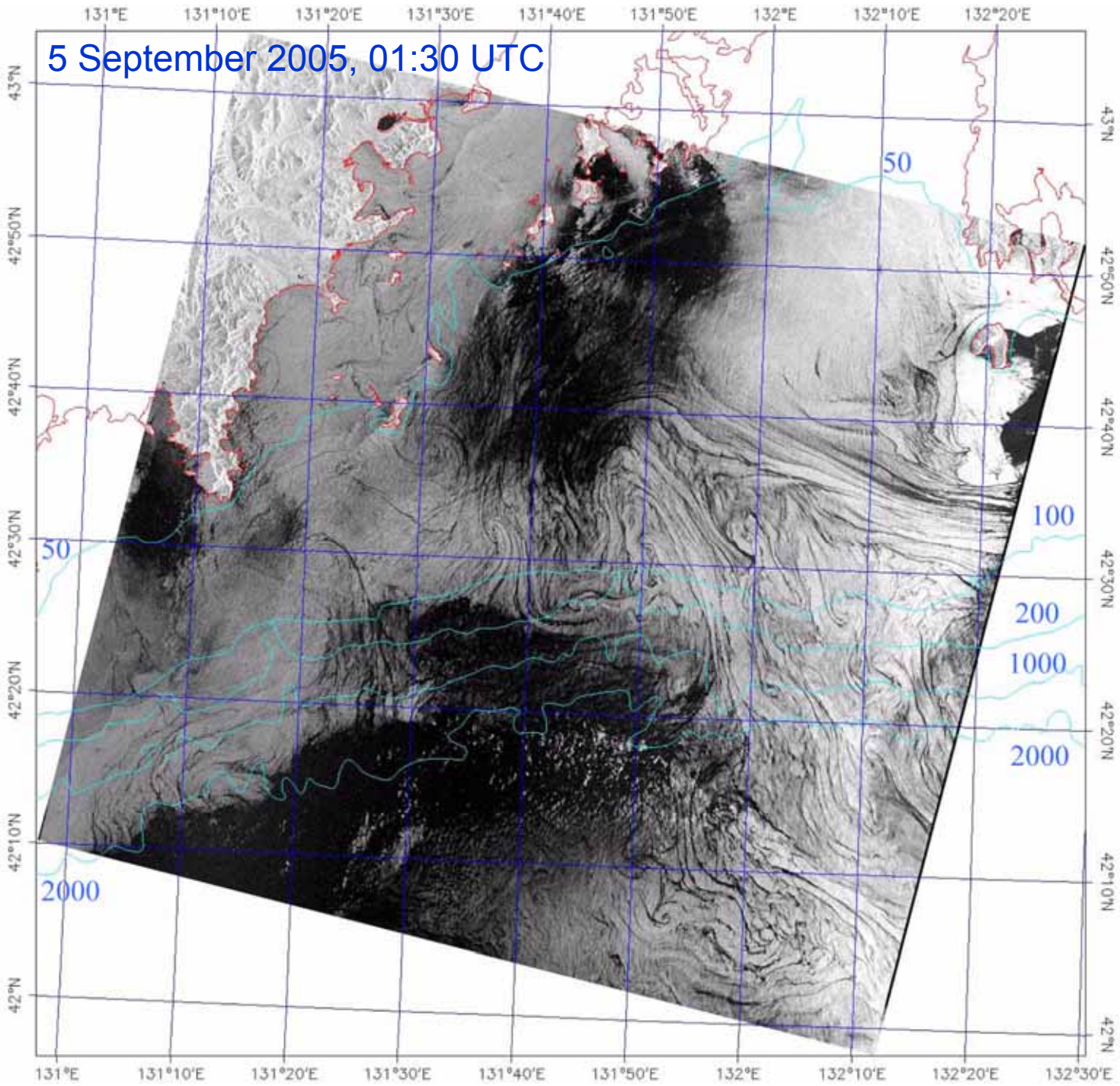


Envisat ASAR

image of Peter the Great Bay showing eddy structures and spirals formed by natural films. Wind speed 2-5 m/s.

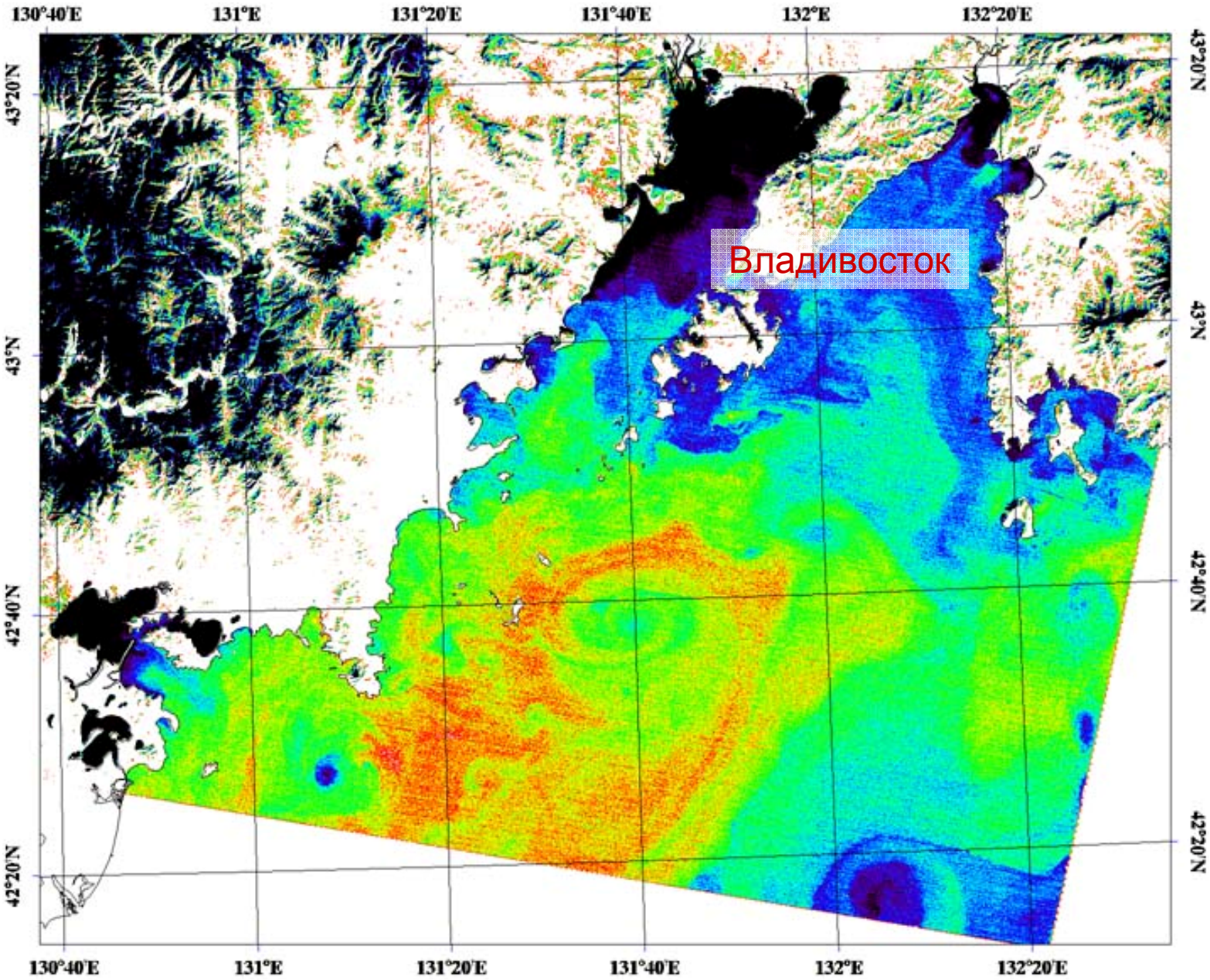


Envisat ASAR image of Peter the Great Bay. Filamentary slicks show numerous organized structures, visualizing the sea surface circulation. Blue lines indicate depth contours.

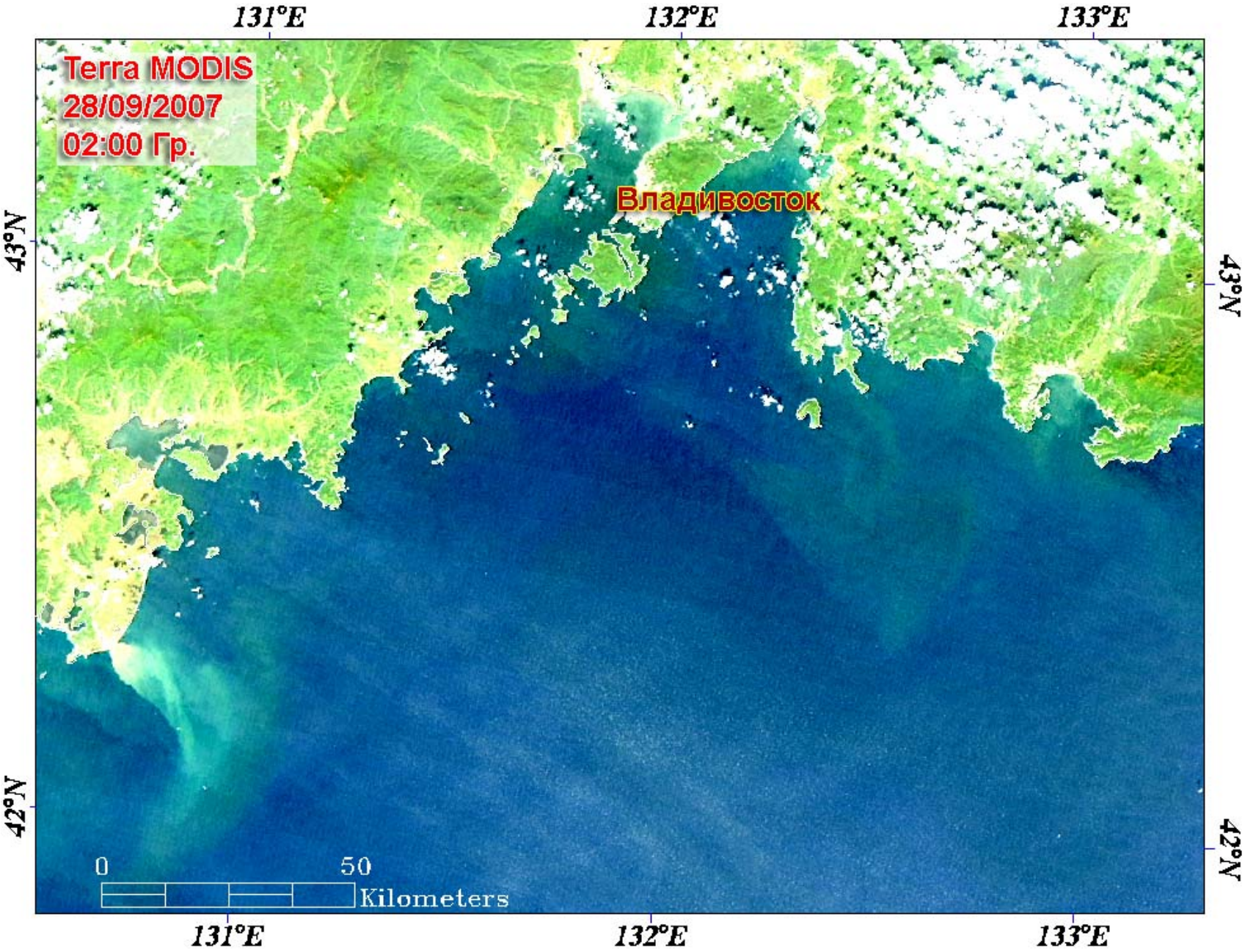
Satellite monitoring of Peter the Great Bay

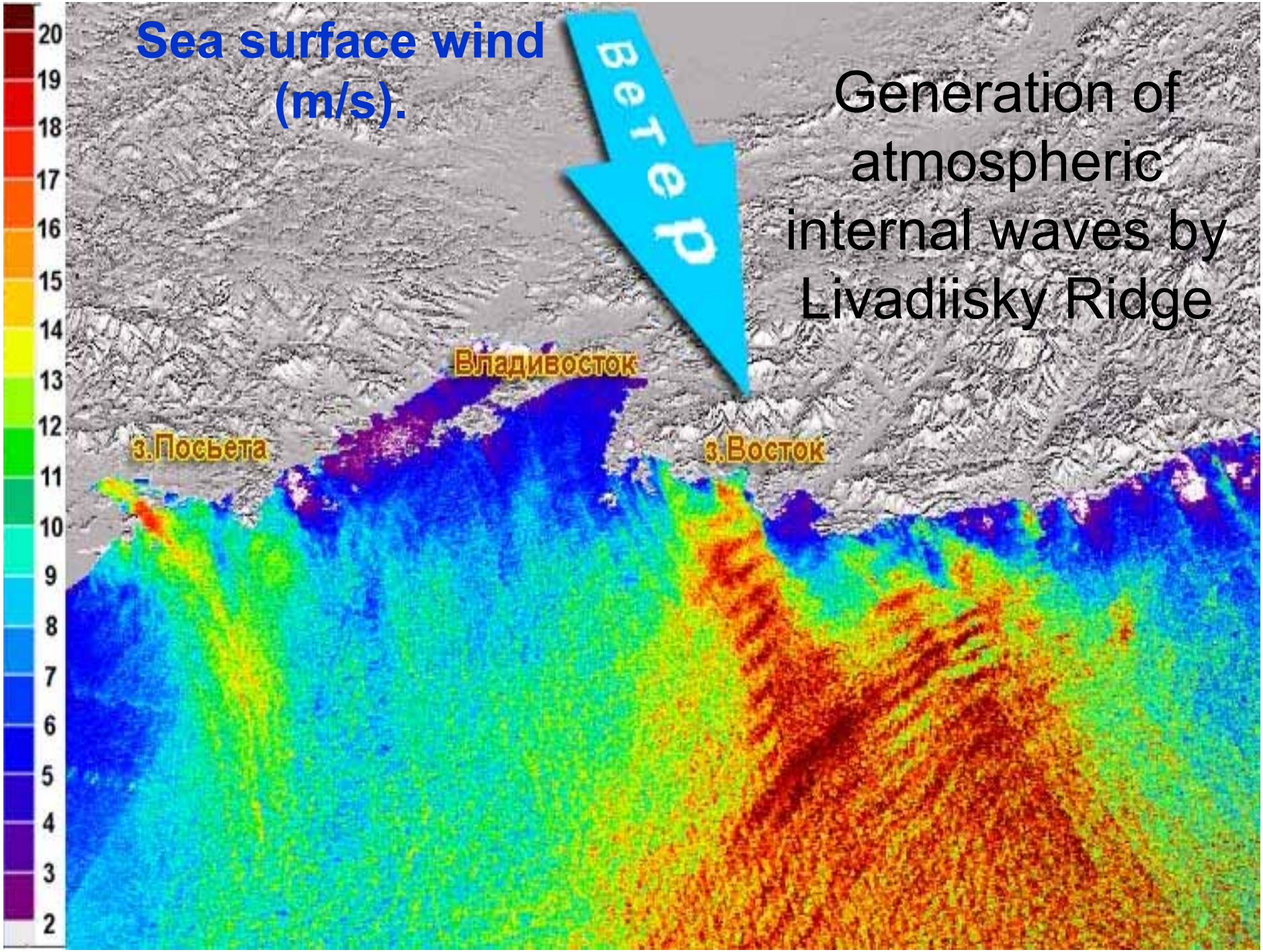
- Sea surface temperature
- River discharge
- Sea surface wind
- Ships and oil pollution
- Sea ice
- Surface currents

Sea surface temperature



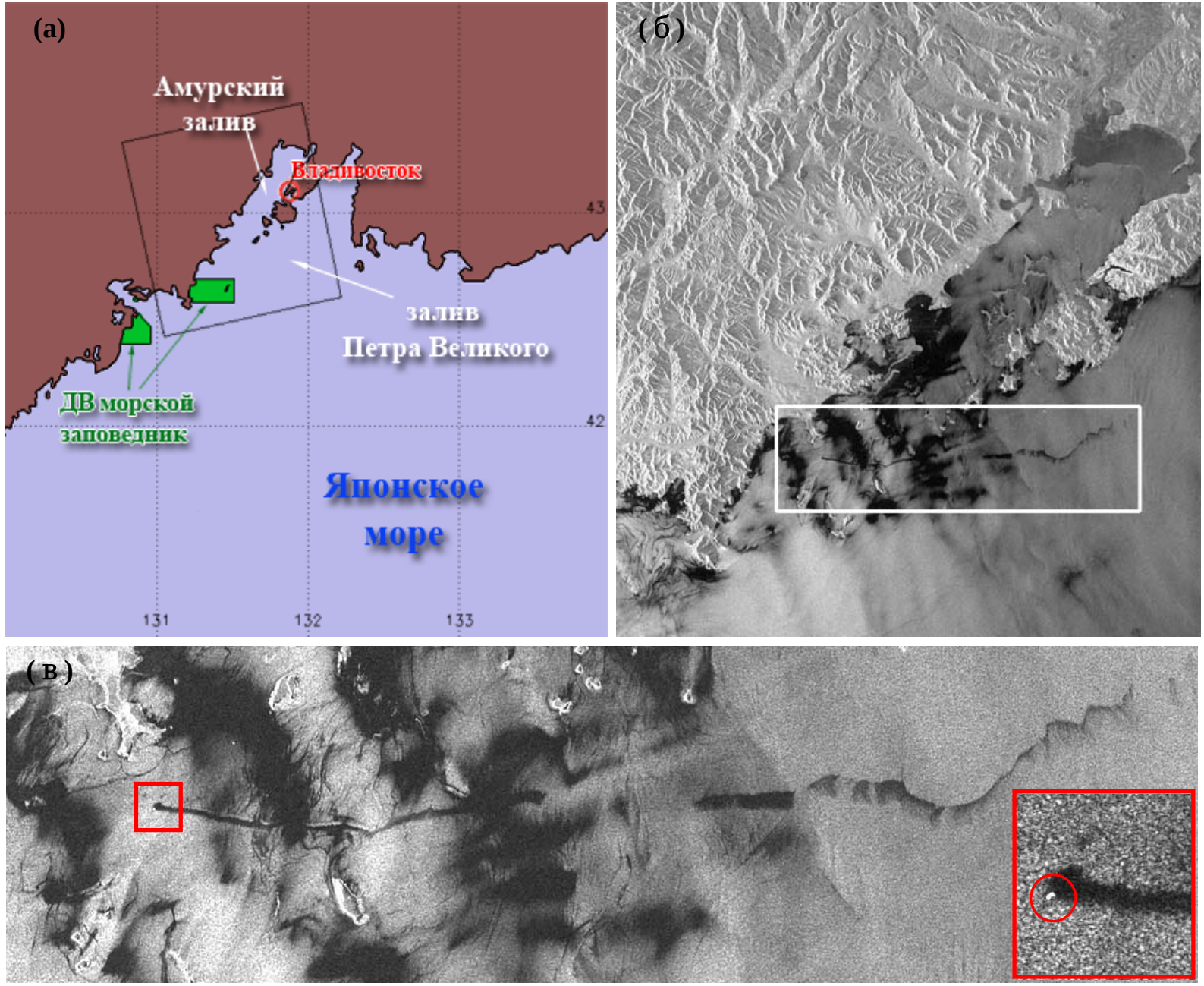
Tumangan river discharge



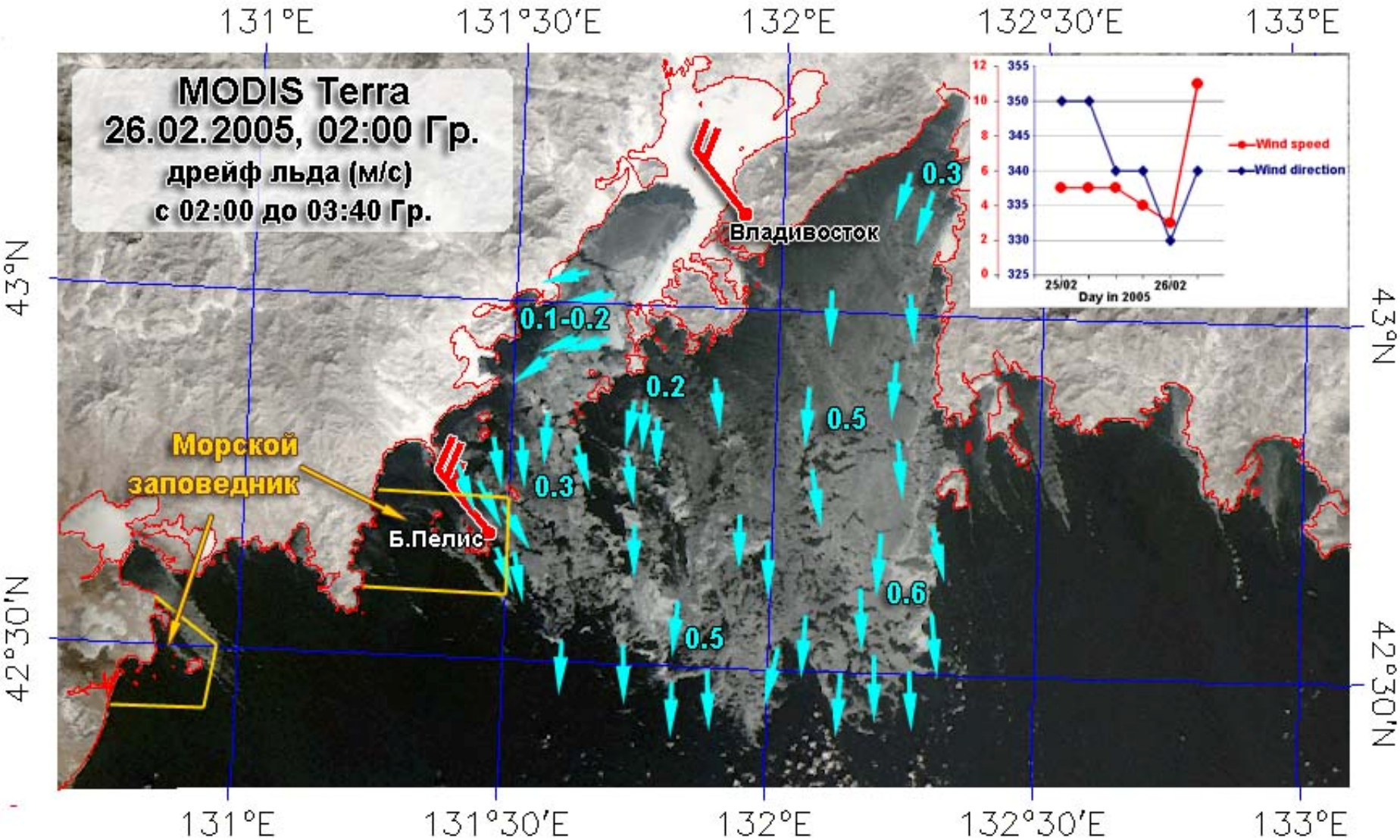


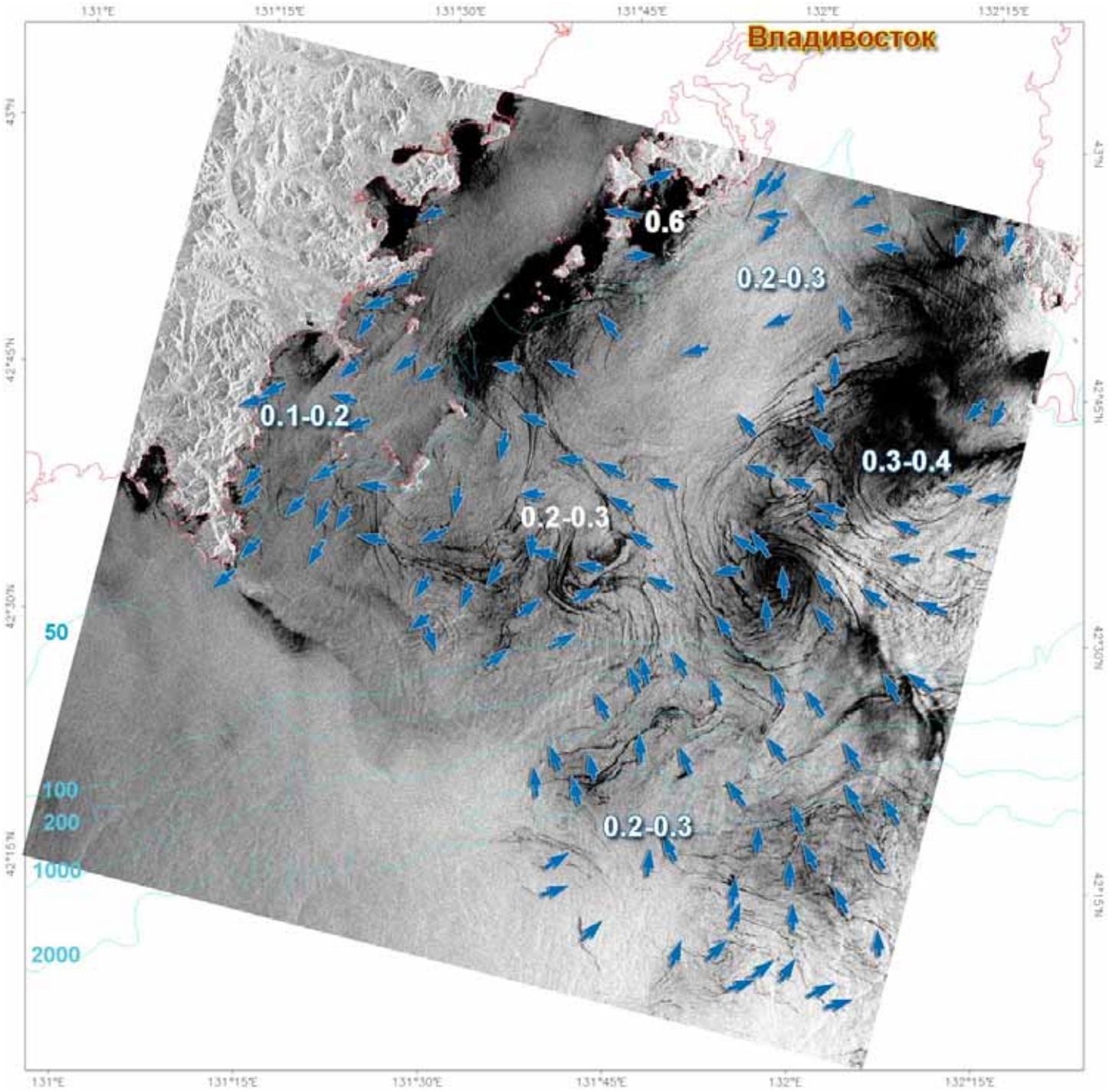
Generation of atmospheric internal waves by Livadiisky Ridge

Ships. Oil pollution



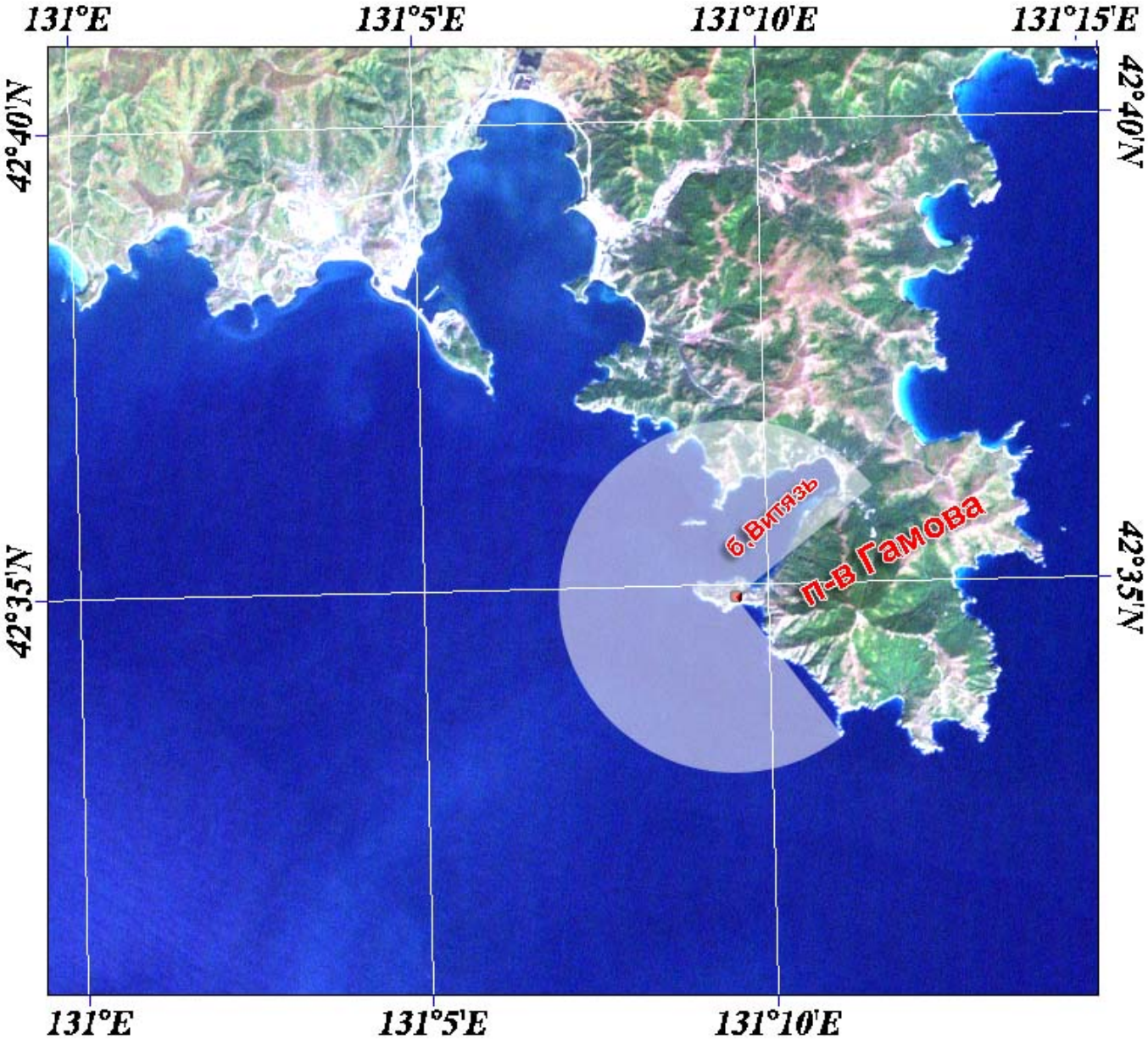
Ice drift in Peter the Great Bay



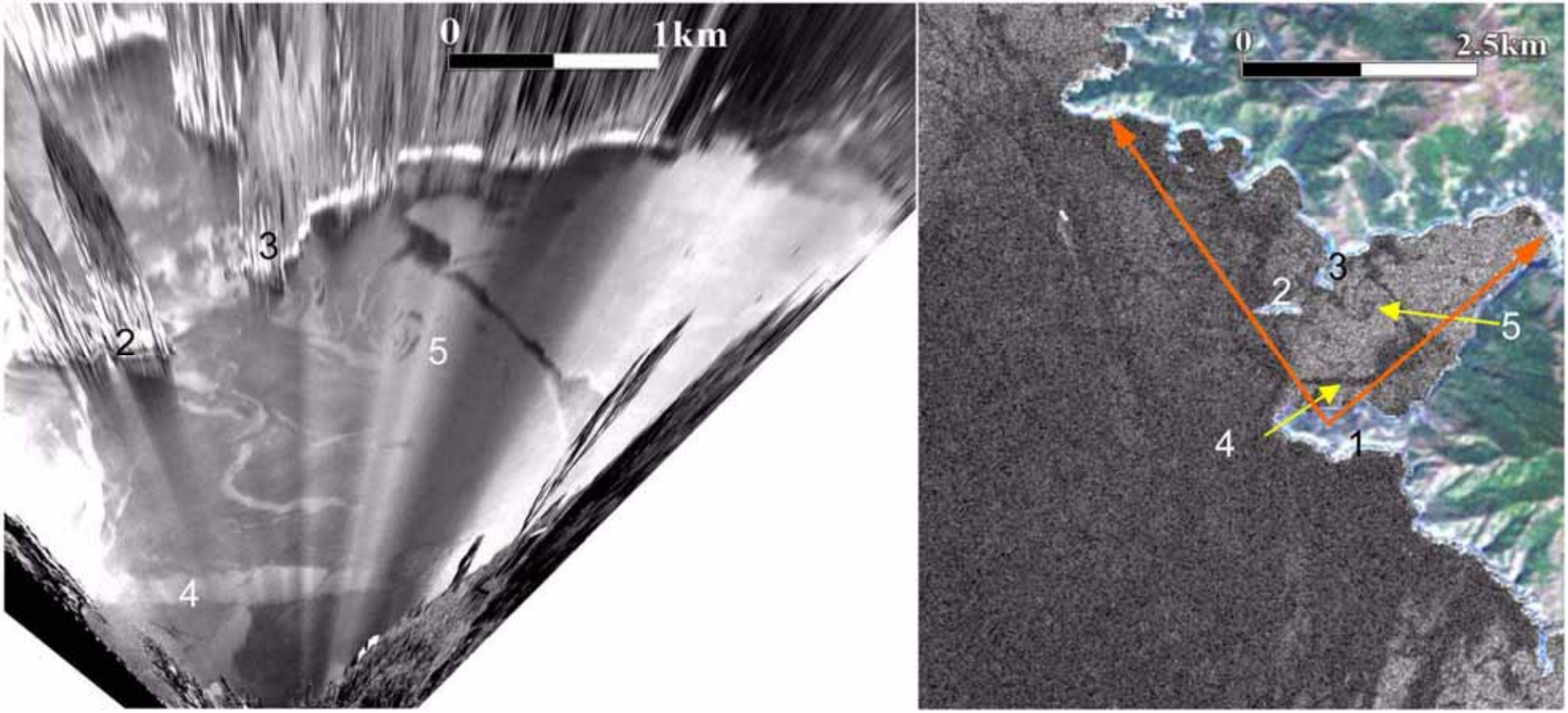


Surface currents (m/s) in Peter the Great Bay retrieved from Envisat ASAR and ERS-2 SAR images. 20.09.2004

Survey by a panoramic video camera from POI Marine Station Cape Shults

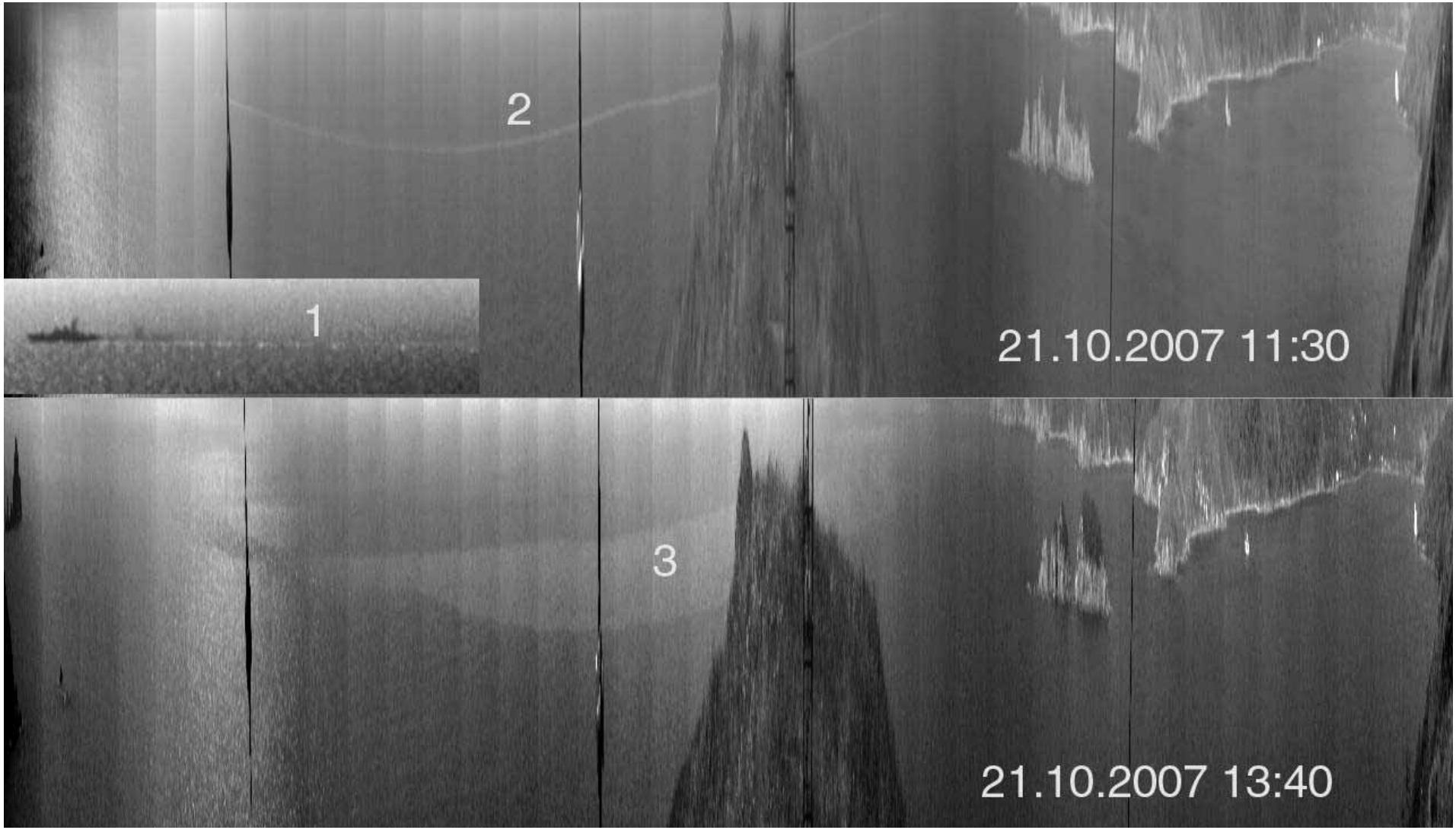


Simultaneous Envisat ASAR and ground-based optical observations of biogenic and artificial slicks in Vityaz Bay, taken on 5 September 2005 at 01:30 UTC.

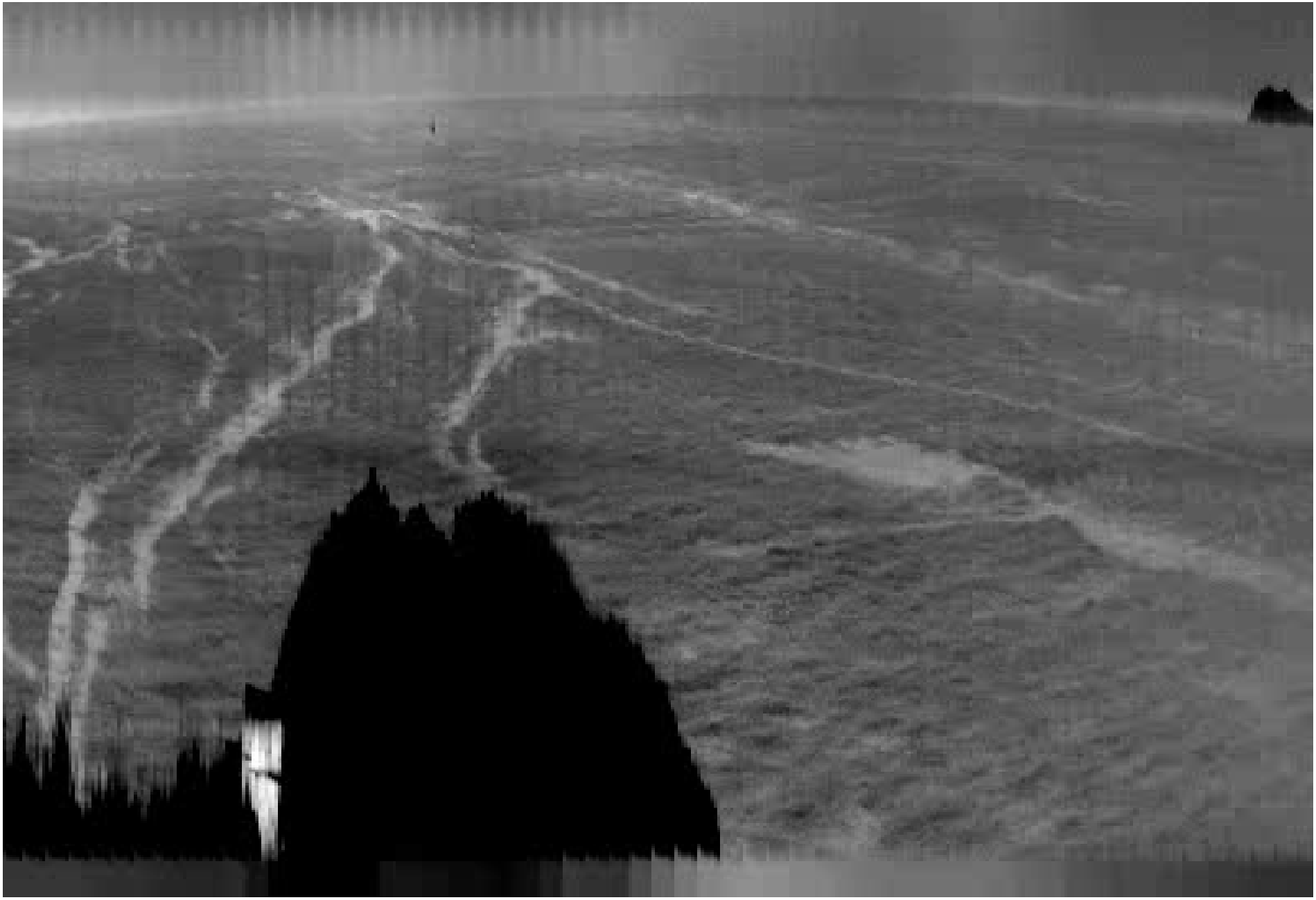


(a) Panoramic image obtained with a video camera from Cape Shults (transformed into planar coordinates). (b) Envisat ASAR image fragment: (1) Cape Shults, (2) an island, (3) a cape on the opposite side of Bay, (4) an artificial slick band formed by oleic acid, and (5) a cyclonic slick spiral formed by biogenic film. Red arrows in (b) - the boundaries of the panoramic image.

Evolution of oil pollution recorded by panoramic video camera: 1 – ship, 2 – oil pollution at 11:30, 3 – oil pollution at 13:40. S > 9 км^2



Internal waves and slick bands



Glossary and Abbreviations

Aqua
American satellite launched in May 2002 with spectroradiometer MODIS and Advanced Microwave Scanning Radiometer (AMSR-E) and ASTER
Algae
comparatively simple chlorophyll-bearing plants, most of which are aquatic, and microscopic in size
Anthropogenic

Bloom
an unusually large number of organisms of one or a few species, usually algae, per unit of water
CEARAC
Special Monitoring and Coastal Environmental Assessment Regional Activity Centre
Chemical oxygen demand (COD)
is chemical oxygen demand, the oxygen equivalent of the organic matter content of a sample that is susceptible to oxidation by a strong chemical oxidant. COD is an indicator of organic pollution.
Chlorophyll (Chl)
is the pigment common to all marine photosynthetic organisms.
Chl-a
Chl *a* is an indicator of phytoplankton biomass and can be estimated on a global or regional scale using remotely sensed ocean color techniques.
Concentration
the quantifiable amount of a substance in water, food or sediment
Criteria (water quality)
scientific data evaluated to derive the recommended quality of water for different uses

Please, add

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