Russian Academy of Sciences
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Atlantic Branch

Environmental researches and monitoring activities in the South-Eastern Baltic Sea

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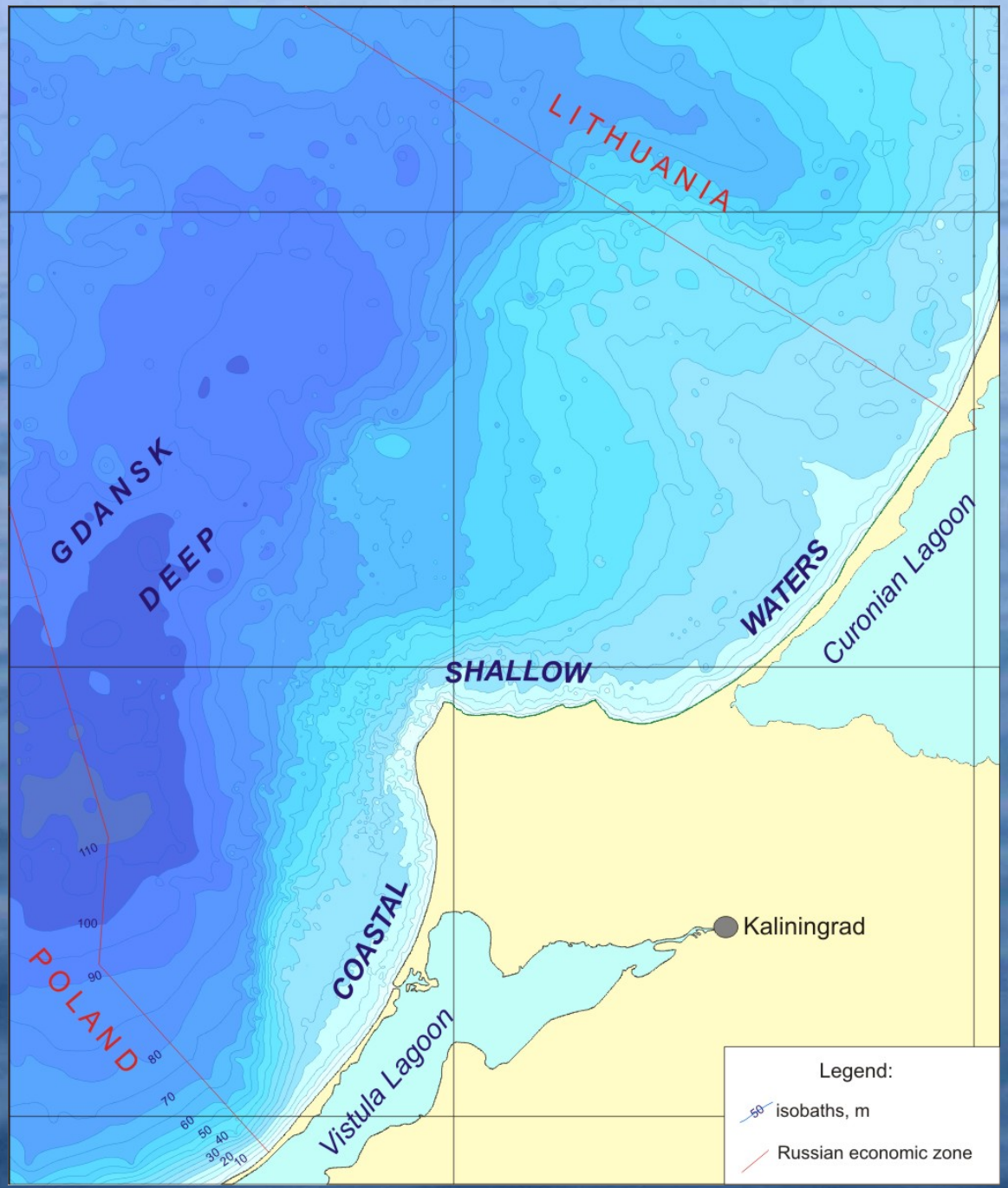
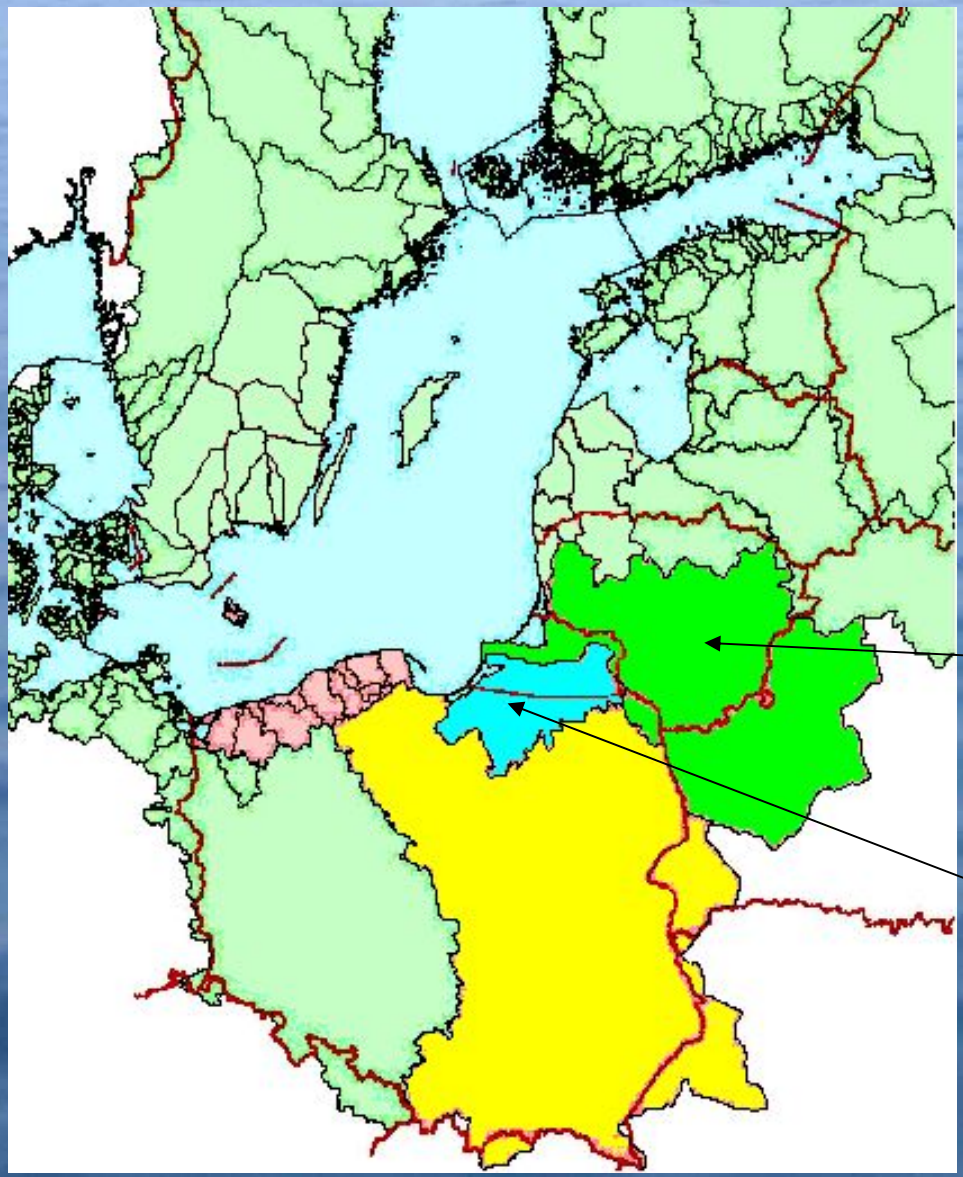
LITHUANIA
RUSSIA
POLAND
Legend
frontiers
exclusive economic zones
territorial waters

BATHYMETRY



Within Russian economical zone bathymetry is divided into Gdansk Deep (till 110 m) and coastal shallow waters (till 30-40 m) connected with Gdansk Deep slope

Transboundary water basins in the South-Eastern Baltic



Kaliningrad Oblast belongs to two large catchments of the:

- Curonian Lagoon (Lithuania-Russia);

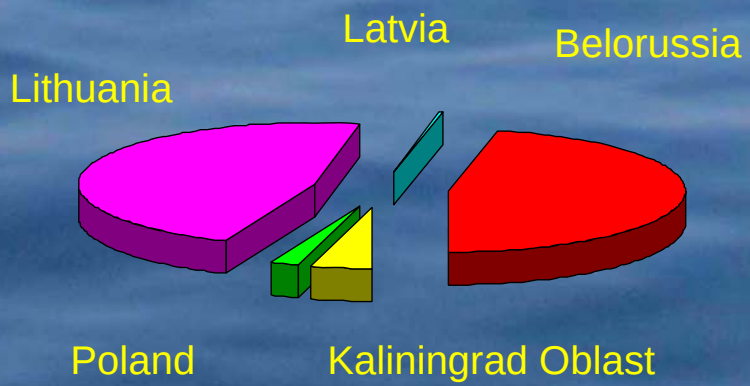
- Vistula Lagoon (Poland-Russia).

Vistula and Curonian Lagoons

Curonian Lagoon

Catchment area - 100 ths km^2:

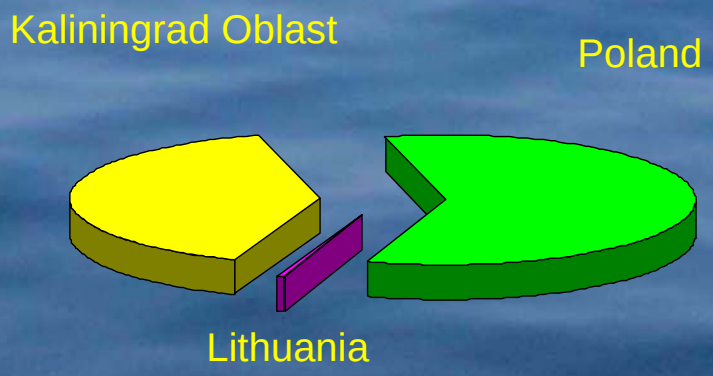
within Kaliningrad Oblast – 4.2 ths km^2,
within Poland – 1.9 ths km^2.
winthin Lithuania – 46.7 ths km^2,
within Belorusia – 47.2 ths km^2,
within Latvia – of 100 km^2



Vistula Lagoon

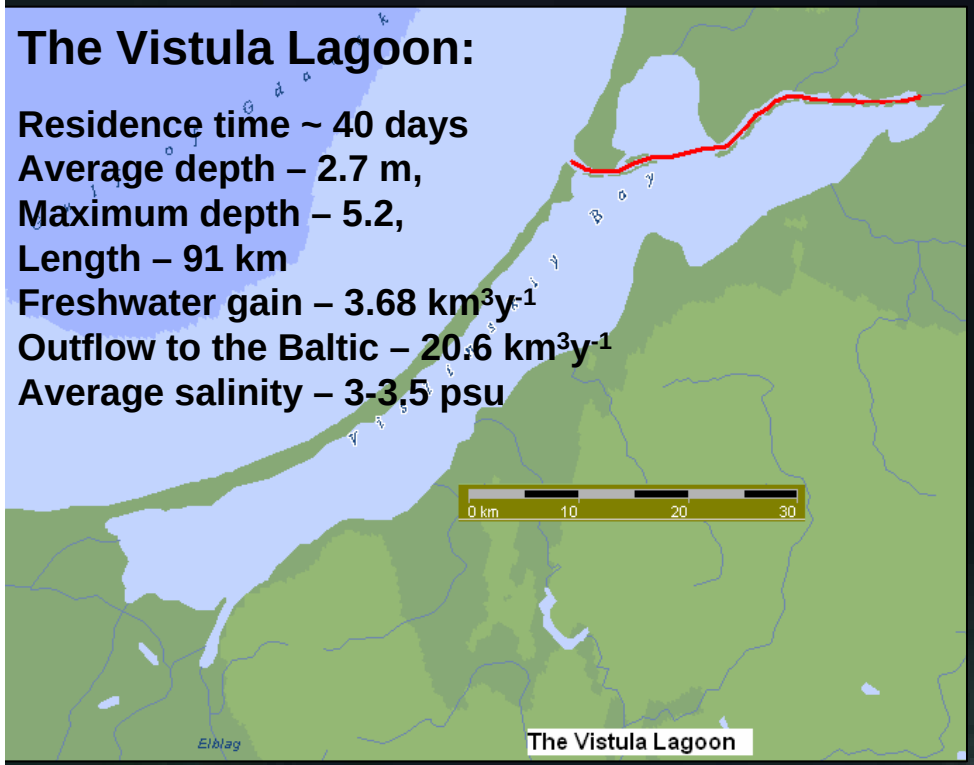
Catchment area - 23.5 ths km^2:

within Kaliningrad Oblast – 8.7 ths km^2,
within Poland – 14.7 ths km^2,
within Lithuania – of 100 km^2.



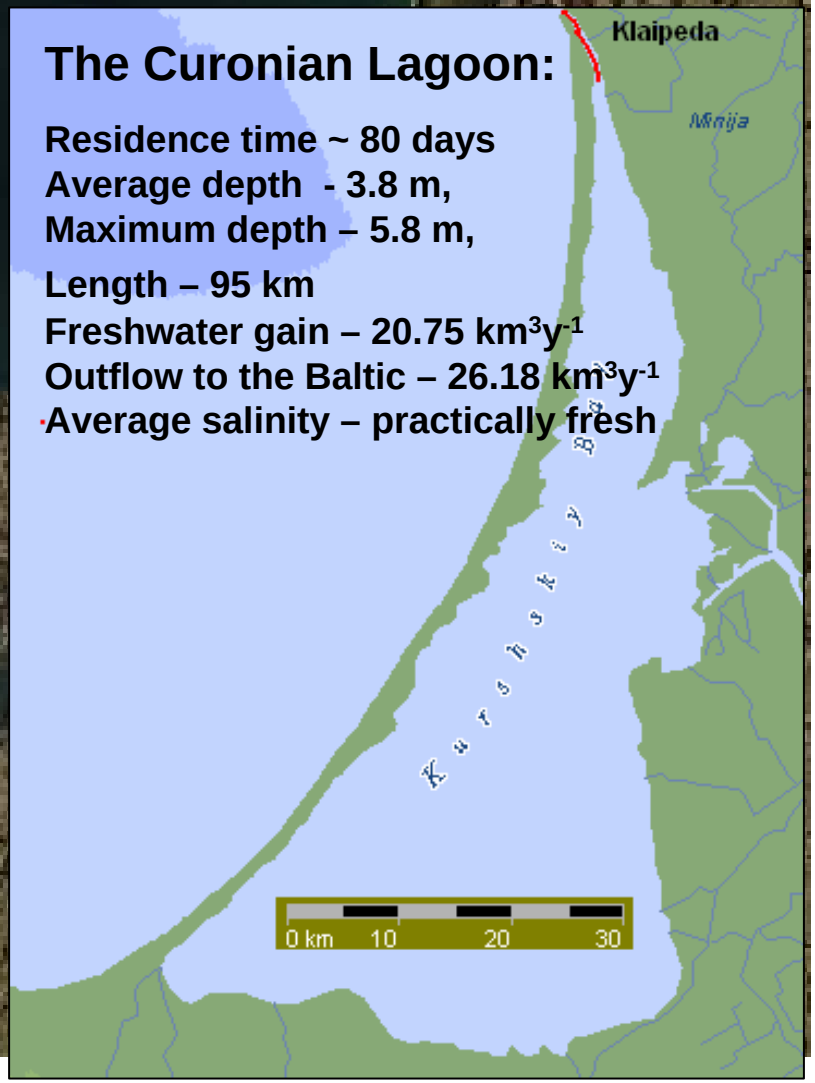
The Vistula Lagoon:

Residence time ~ 40 days
Average depth – 2.7 m,
Maximum depth – 5.2,
Length – 91 km
Freshwater gain – 3.68 km^3y^{-1}
Outflow to the Baltic – 20.6 km^3y^{-1}
Average salinity – 3-3.5 psu



The Curonian Lagoon:

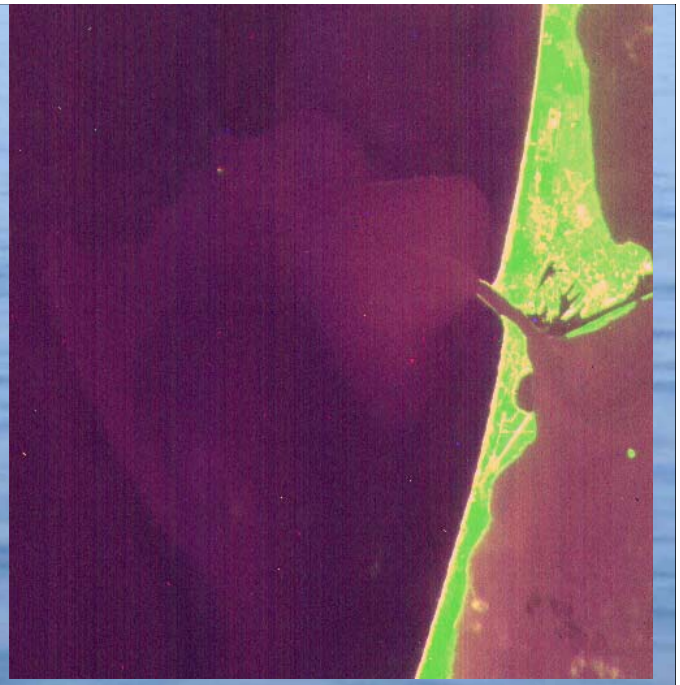
Residence time ~ 80 days
Average depth - 3.8 m,
Maximum depth – 5.8 m,
Length – 95 km
Freshwater gain – 20.75 km^3y^{-1}
Outflow to the Baltic – 26.18 km^3y^{-1}
Average salinity – practically fresh

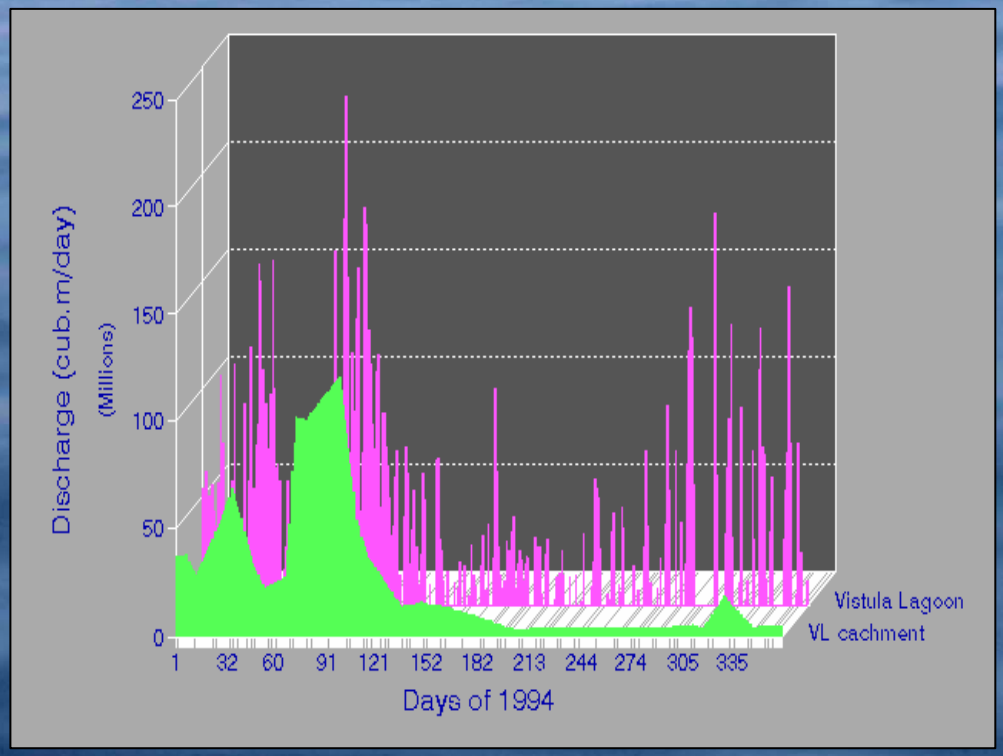


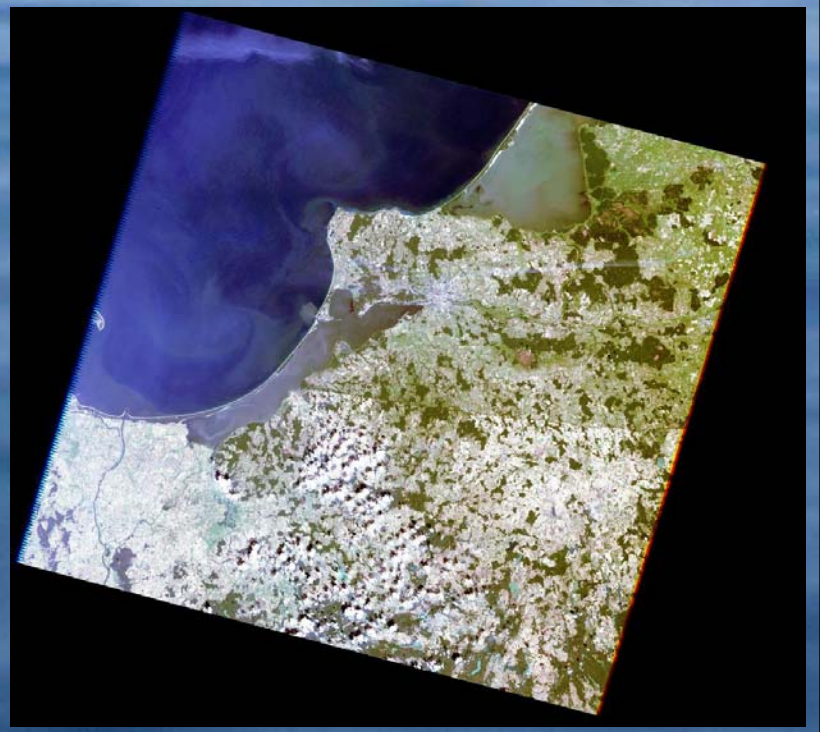
Importance for the Baltic:

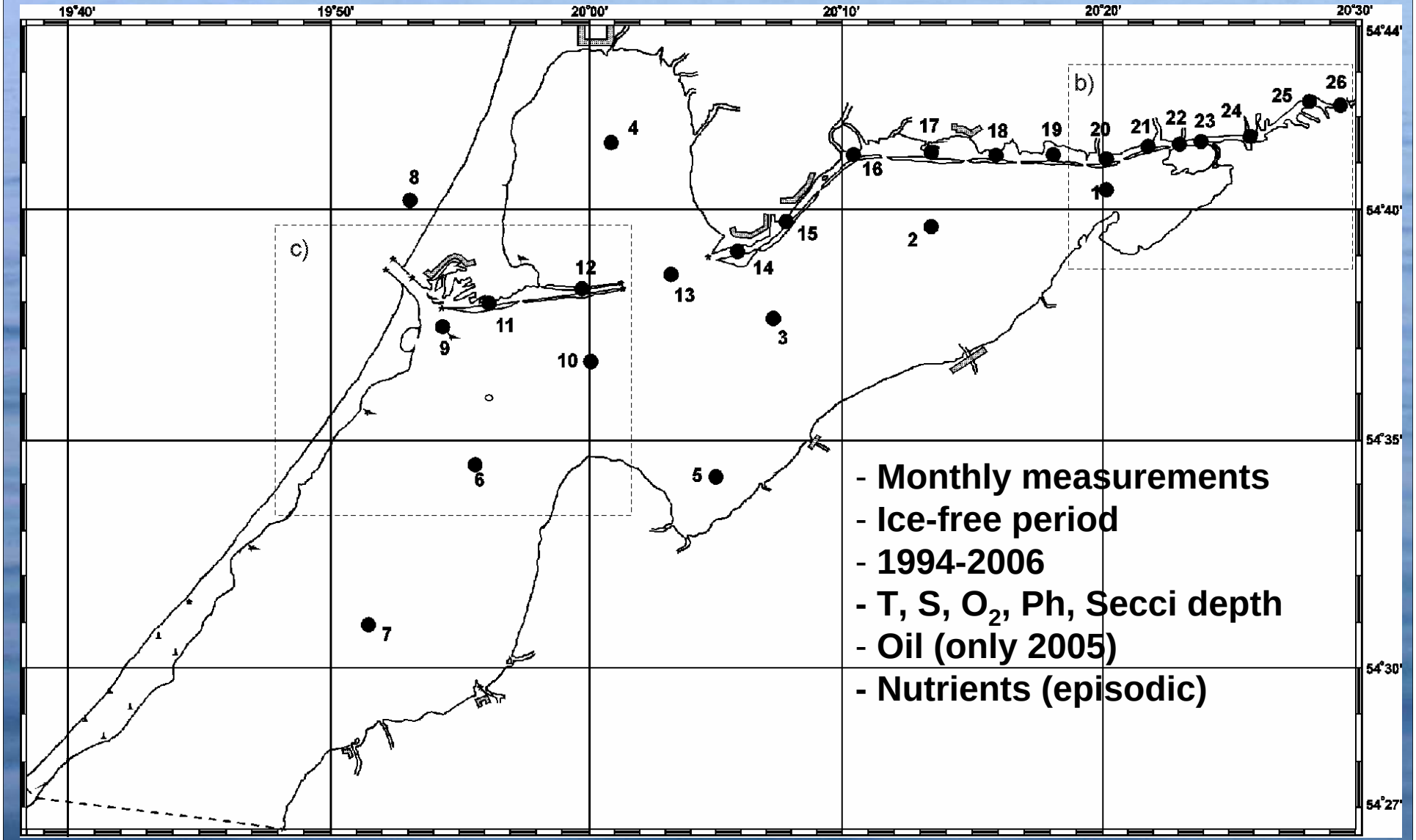
Lagoons accept seaward flow from main part of the South-Eastern Baltic catchment and keep the water and its content inside the lagoon pool during a residence time of 1-3 months

Lagoons modify a temporal variations of the water discharge and, consequently, sediment, nutrient and pollution load toward the Baltic Sea

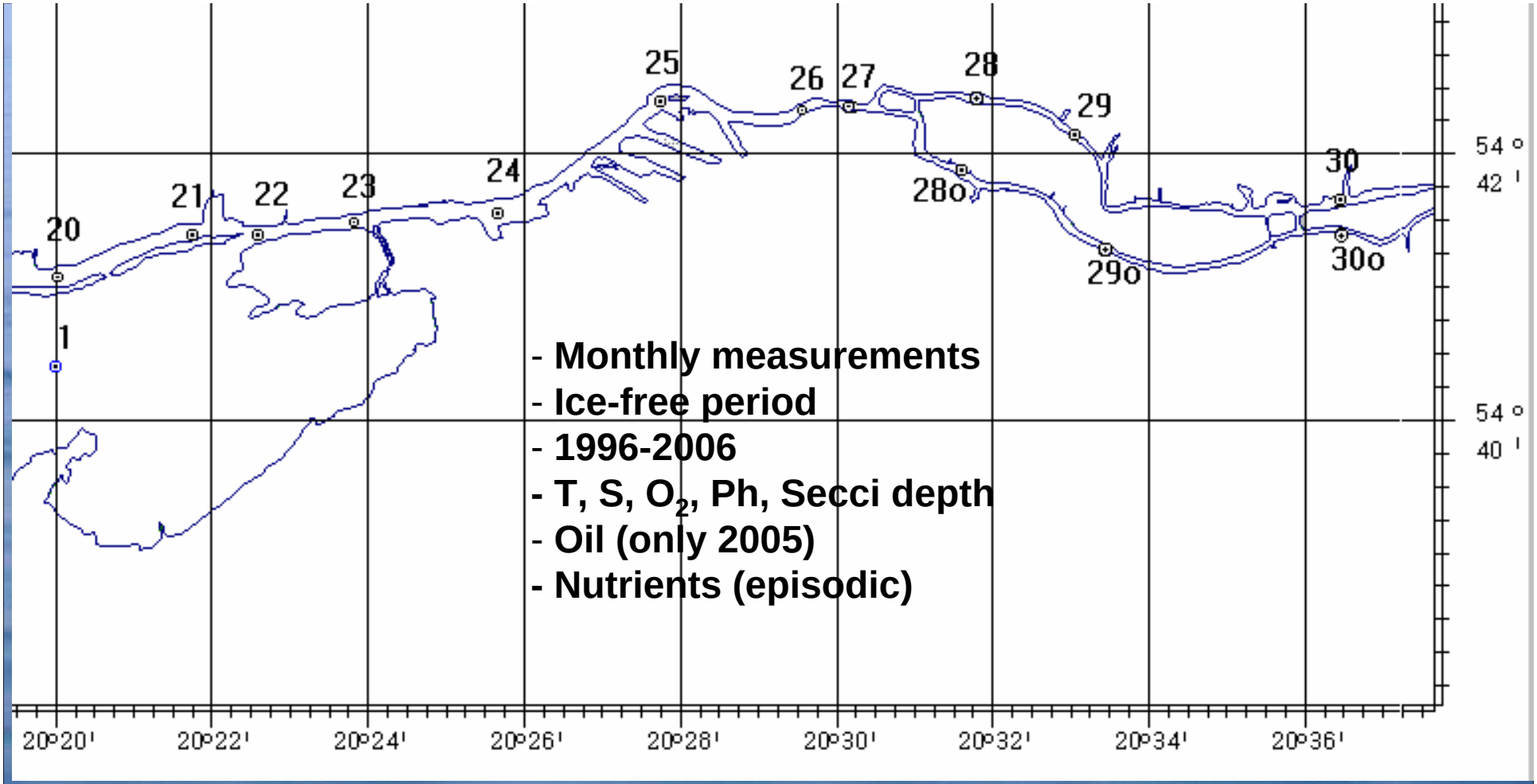




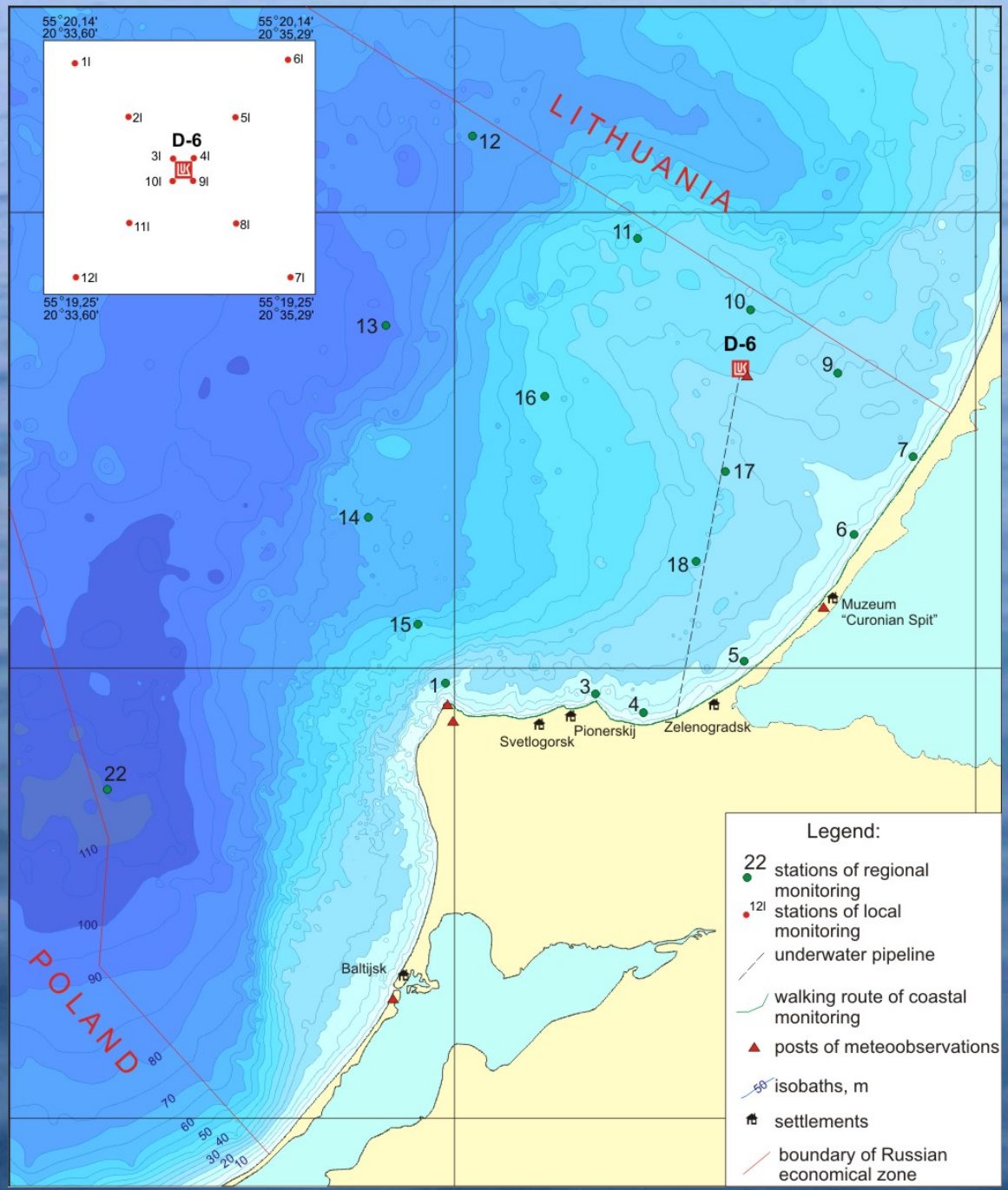




Monitoring design for scientific monitoring in the Russian part of the Vistula Lagoon



Monitoring design for scientific monitoring in the low stream of the Pregolia River

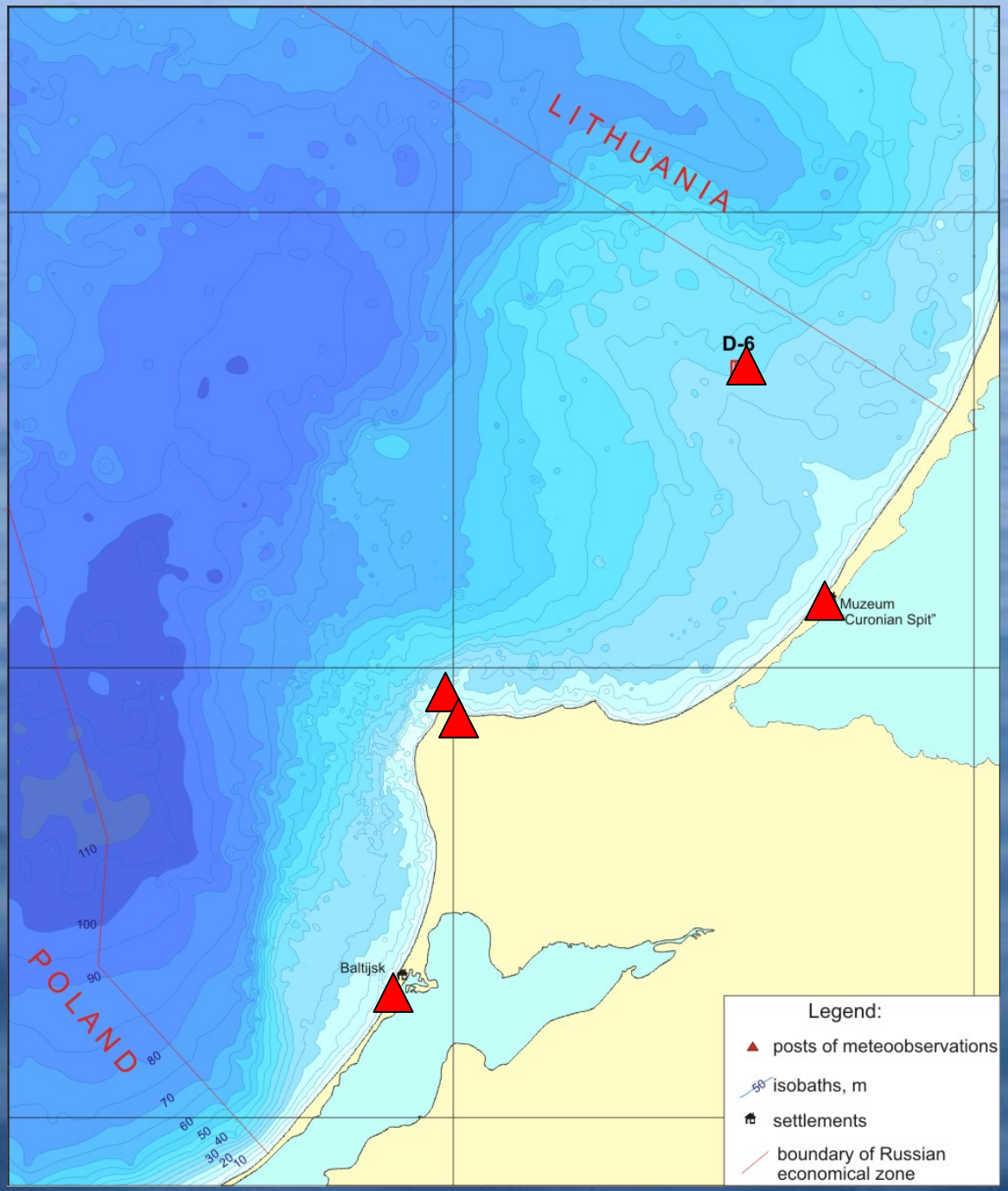


The ecological monitoring may be subdivided into local and regional based on its functions, scale and observation period. The local monitoring was carried out near the offshore ice-resistant fixed platform (OIFP), while the regional monitoring covered the eastern part of the Russian Exclusive Economic Zone in the South-Eastern Baltic Sea.

In the frames of the regional monitoring the intact monitoring of the coastal and onshore zones of the Curonian Spit (Russian-Lithuanian natural-cultural unit of UNESCO world heritage) has been fulfilled.

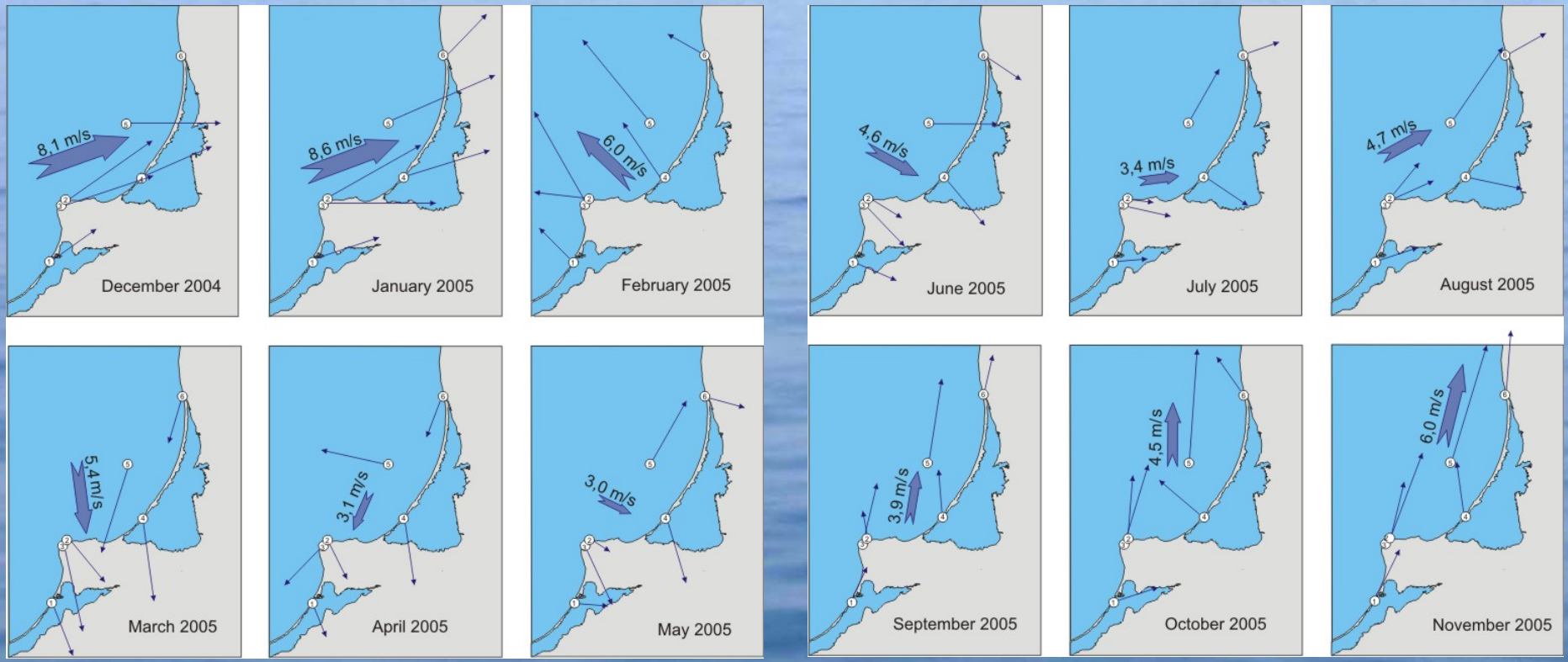
Registered indices	Methods of registration (determination)	samples analysis			direct registration in marine environment			visual observation
		sediments	water	biota	in ship motion	in monitoring points	on POSP	
Oil products content in the water and sediments.	Fluorimeteric method	✓	✓					
Oil-fuel pollution of the seashore.	Visual surveys,weighing	✓						
Ba, Cd, Cu, Hg, Pb, Cr content in the bottom sediments.	Atomic absorption, atomic-emissive method	✓						
Bottom microrelief and sediment type.	Sonar profiling, sampling and description of sediment samples	✓			✓			
Grain-size distribution, ignition losses, moisture of sediments.	Grain-size analysis, weight method	✓						
Content of the hydrocarbon gases in the bottom sediments.	Chromatography	✓						
Species composition, benthos abundance and biomass	Mash rinsing, determination, counting and weighing	✓						
Meteorological indices: air temperature, wind speed and direction.	measuring by standard instruments, registration by automatic hydrometeo-rological station					✓	✓	
Water temperature.	Hydrophysical probe				✓	✓		
Salinity.	Hydrophysical probe (electroconductivity)				✓	✓		
Currents.	Acoustic doppler current profiler				✓	✓	✓	
Soluble oxigen.	Titrimetric method of Winkler		✓					
Biochemical oxigen demand (BOD).	On the basis of Winkler method, dark exposure		✓					

Registered indices	Methods of registration (determination)	samples analysis			direct registration in marine environment			visual observation
		sediments	water	biota	in ship motion	in monitoring points	on POSP	
Concentrations of the biogenetic matters (nitrites, nitrates, phosphates).	Spectrophotometry		✓					
Suspended matter concentrations.	Method of filtration		✓					
Content of chlorophyl “a”	Spectrophotometry		✓					
Abundance, biomass and species composition of phytoplankton	Sample processing by standard methods		✓					
Primary production and bacterial destruction of the organic matter and assessment of oil components effect on it.	Radiocarbon method, model experiments		✓					
Abundance, biomass and species composition of live and dead zooplankton fractions and its abnormal forms.	Microscopy		✓					
Abundance and biomass of bacterial plakton, probable abundance of bacteria oxidizing oil hydrocarbons, intensity of microbial transformation of oil.	Method of limit dilution, model experiments		✓					
Abundance and condition of ichthyoplankton.	Microscopy			✓				
Species composition, abundance, biomass and pathology of the fish.	Trawl surveys			✓				
Content of the polycyclic aromatic hydrocarbons (PAH) in the water and benthos.	Chromatography		✓	✓				
Content of the synthetic surface-active substances (SSAS).	Fluorimeteric method		✓					
Ornithological indices: species composition, mortality, ornithocenosis structure and indicated species of the birds.	Visual observations and surveys							✓



METEOROLOGY

Meteorological information in the monitoring area was collected at the automatic hydrometeorological stations located on the offshore platform and in the Curonian Spit, at meteorological posts located on Taran cape and in Donskoye, as well as at the meteorological station in Klaipeda. Therefore, the entire monitoring area was covered with continuous meteorological observations.



Legend

Observation posts:
① - Baltic Spit
② - Taran cape
③ - Donskoe
④ - National park
⑤ - OIFP
⑥ - Klaipeda

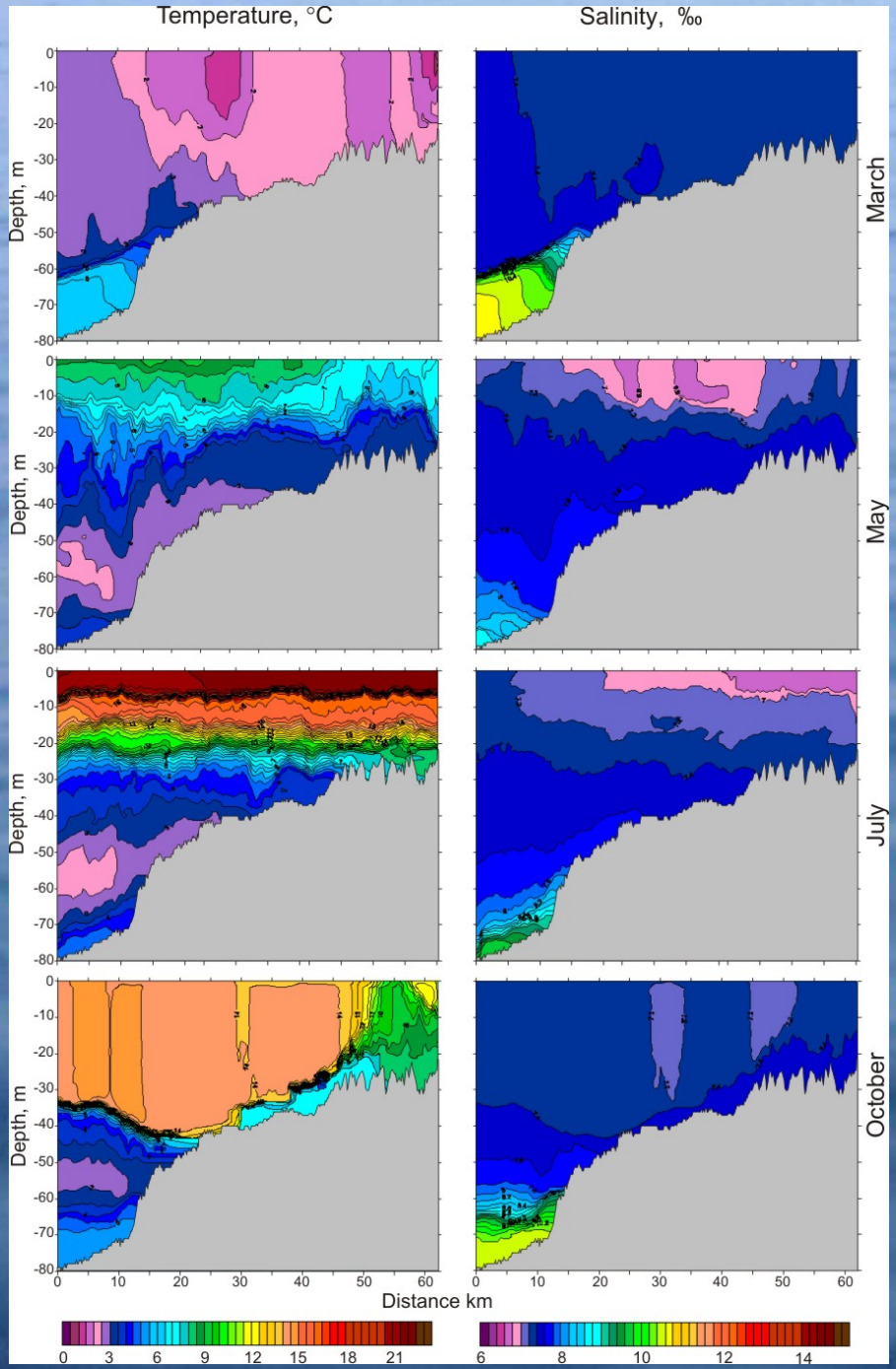
4 m/s
8 m/s
12 m/s
- speed and trend of resultant vectors (in scale)

5 m/s
- mean speed and trend of air masses transport (in scale)

METEOROLOGY

Monthly resultant wind in the monitoring area

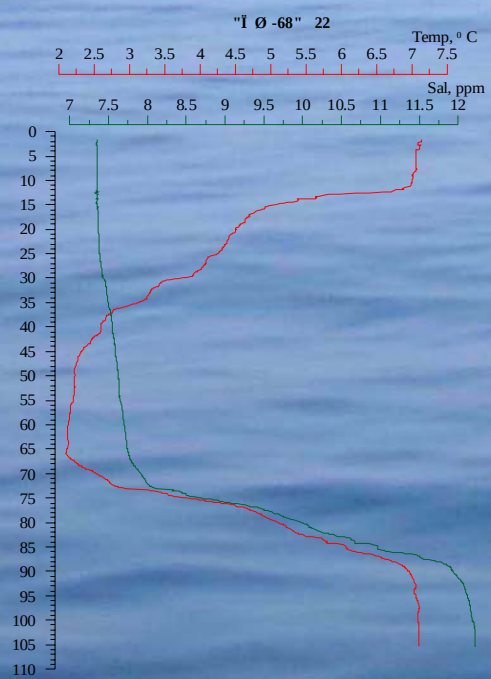
The total annual atmosphere transport was directed from the south-west to the north-east (230°), but during the year the wind direction and strength varied considerably

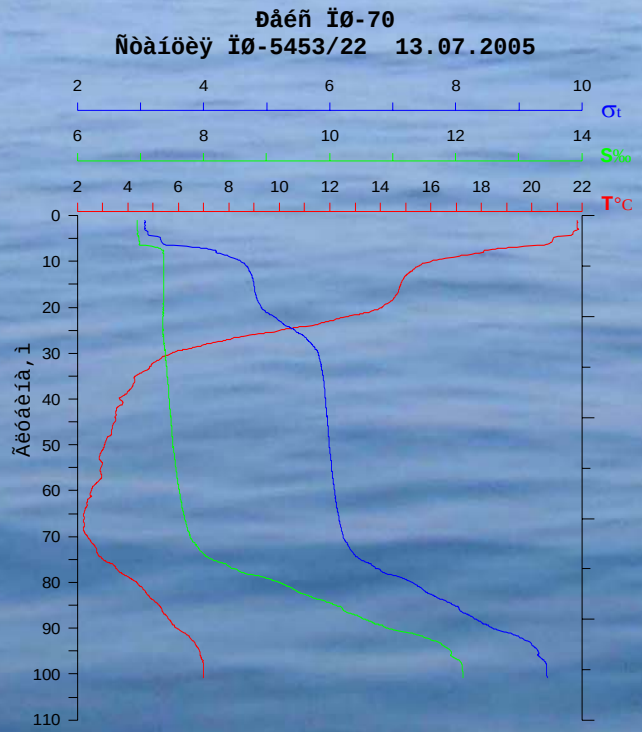


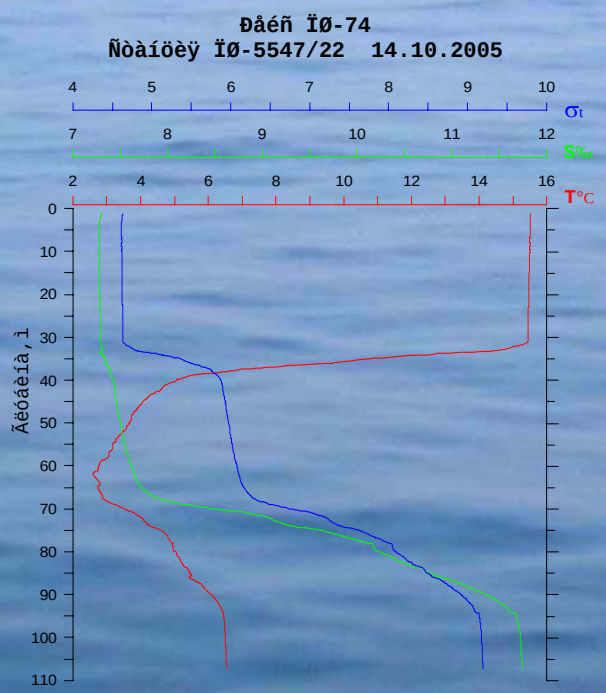
HYDROLOGY

By the example of the hydrophysical transect, extended along the Russian-Lithuanian boundary, the important features of the seasonal and meso-scale (a period from several hours to several days) variability of the sea temperature-salinity structure, including upwelling of deep waters and internal waves were revealed.

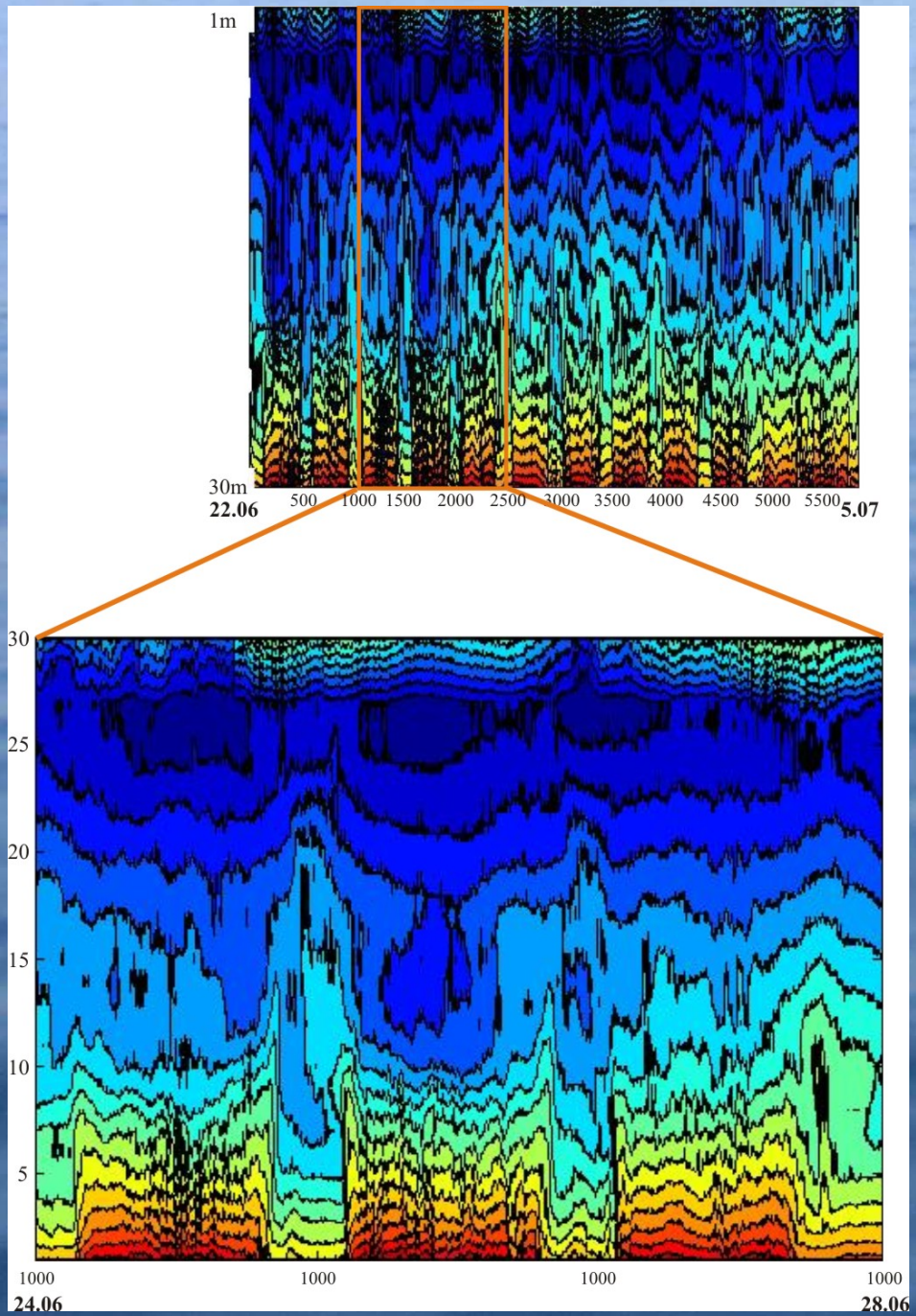
HYDROLOGY





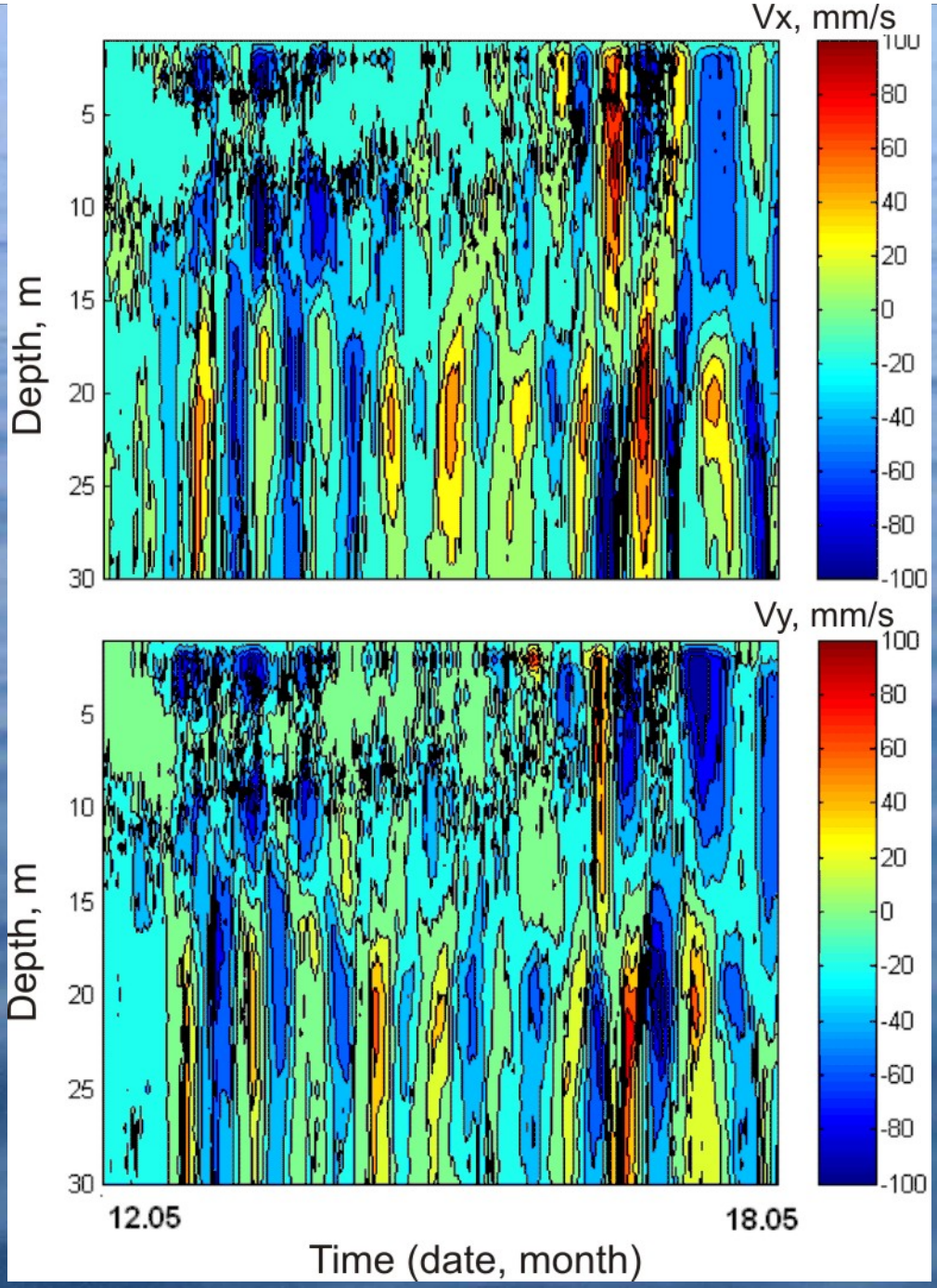


During surveys four-three times a year vertical CTD profiles are fulfilled.
P-1 station near Russian-Polish frontier.



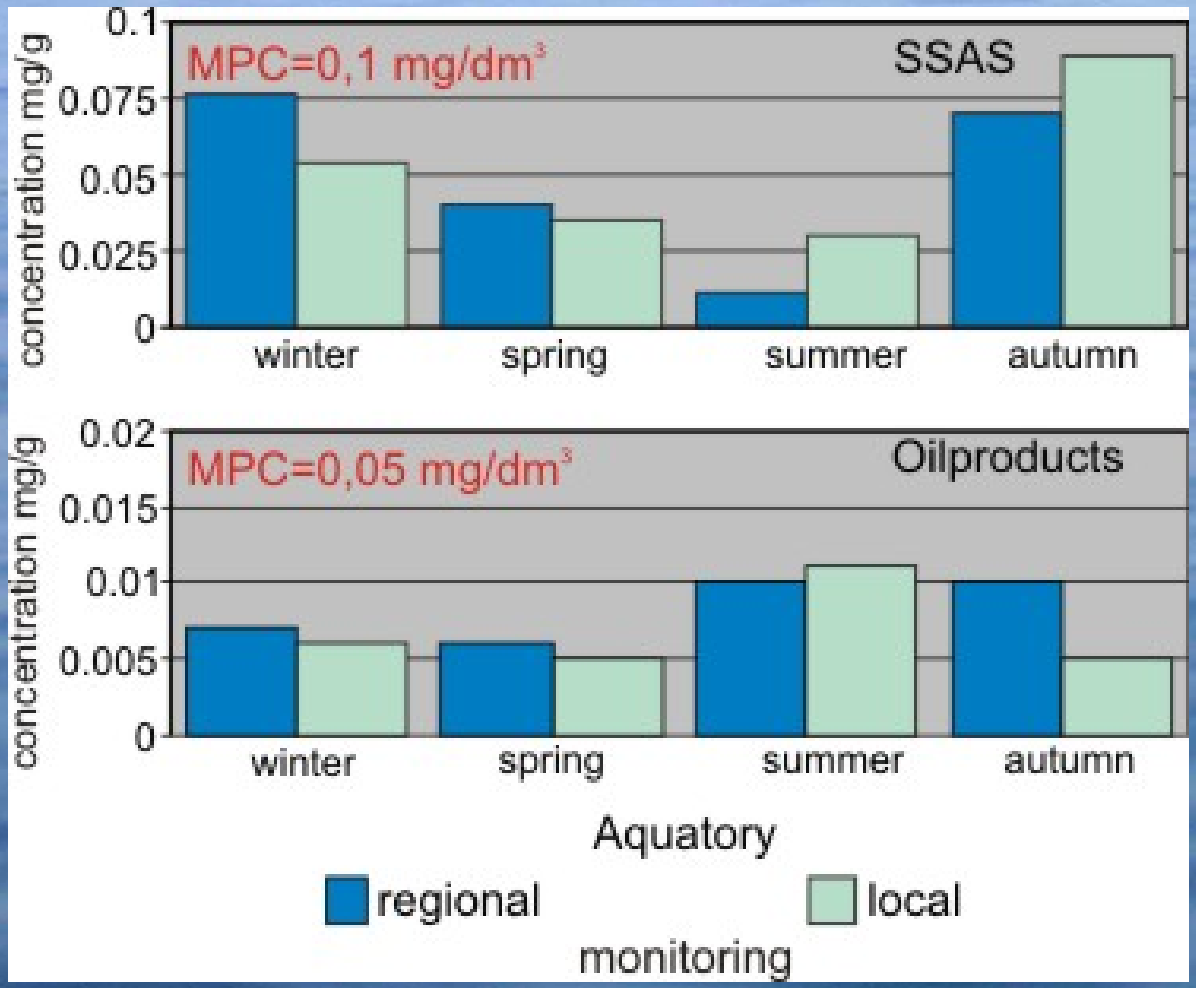
Near the offshore platform the autonomous acoustic bottom station (ADCP) continued permanent measurements of currents and suspended matter concentrations

Variability of suspended matter concentration near OIFP by ADCP data (in sound-scattering intensity units). Concentration increases from blue to red part of spectrum



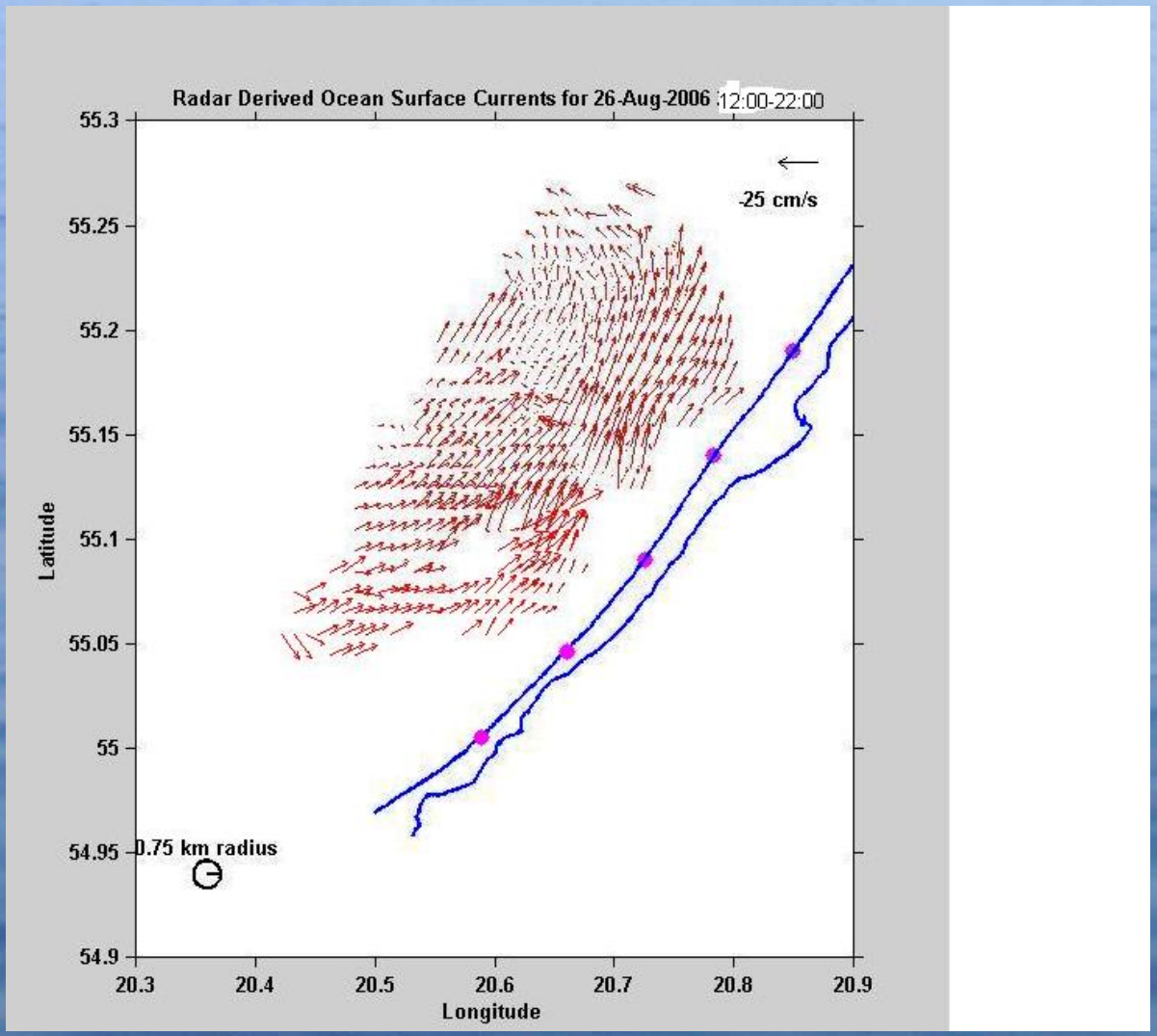
Currents variability near OIFP in May 2005: latitudinal (Vx) and meridional (Vy) components of currents velocity. Positive meaning of Vx and Vy corresponds to current stream eastward and northward accordingly.

CONTAMINATION



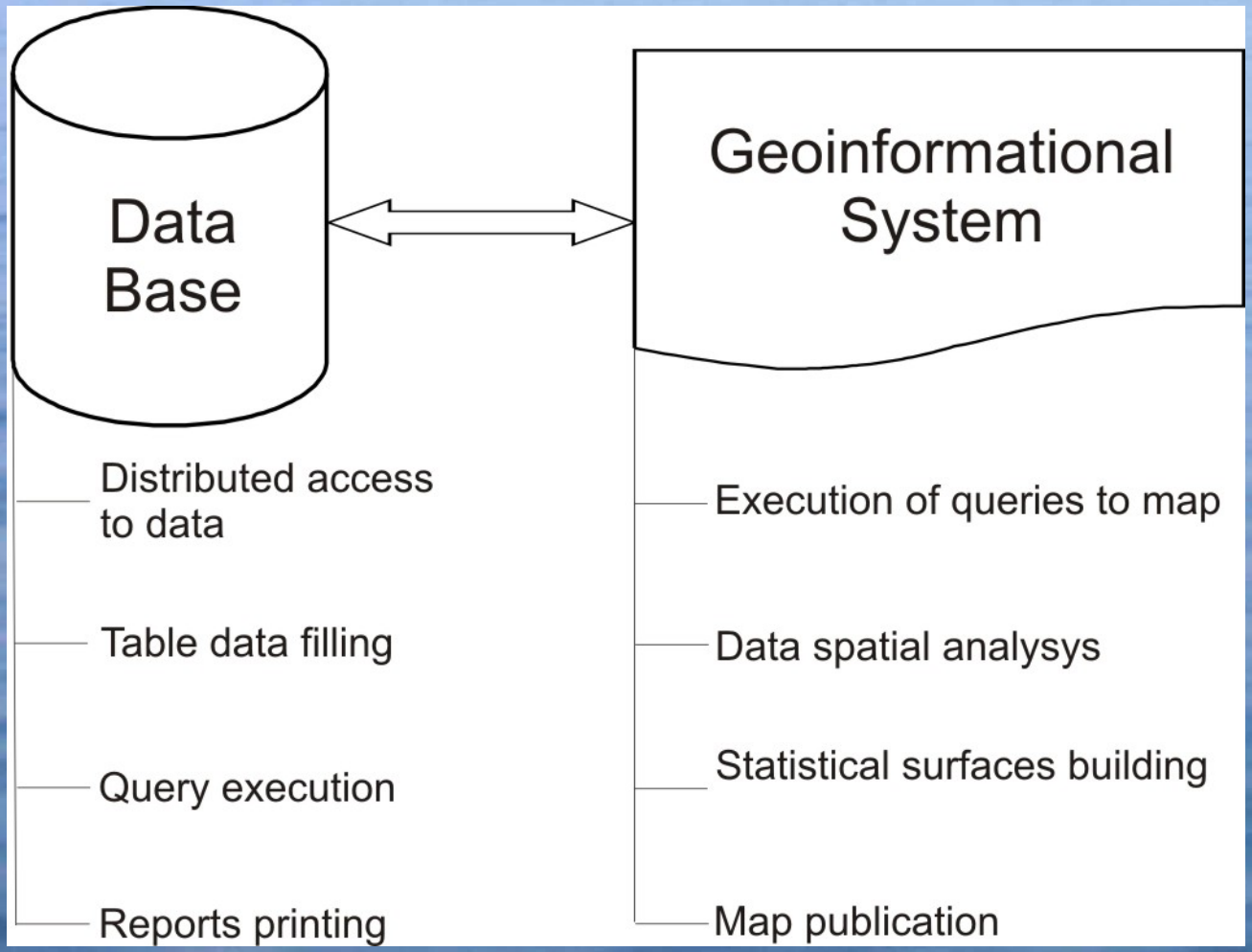
The mean monthly synthetic surface-active substances (SSAS) values showed that in summer SSAS concentration in the water was lower than in other seasons

The mean monthly OP values showed that in summer OP concentration in the water was higher than in other seasons



Dopler radio-locator CODAR Sea Sonde

Currents field near Curonian Spit 26.08.2006



DATA BASE

Scheme of monitoring data arrangement

Data base is realized in MicroSoft Access.
The software ArcGIS 9.0 is applied in developing the special geoinformation system (GIS).
The external database has been created for data collection and storage (*.mdf format), since it allows to use the data not in this GIS only, but also with other applications, such as Surfer, Grapher, Excel and others.

CONCLUSIONS:

1. Researches and scientific monitoring activities are covered the inner coastal waters (lagoons and river mouths), coastal zone and the Baltic Sea within Russian sector in the South-Eastern Baltic
2. Monitoring activities are very strong, but mostly faced to regional needs
3. There is a low interconnection between scientific monitoring activities of ABIORAS (as well as other Kaliningrad scientific institutions/universities) and existed monitoring design of the State Hydrometeorological Service
4. New technologies of monitoring (remote sensing, automatic continuous measurements on buys and bottom platform) already started to be developed, but more strong efforts are desired to reach the needed level of operationality