



USING SATELLITE IMAGES
for TESTING SIMULATION MODELS OF
CONTAMINANT TRANSPORT
in the PETER the GREAT BAY of the SEA of JAPAN
Mishukov V.F., Kalinchuk V.V., Plotnikov V.V.

V.I.II'ichev Pacific Oceanological Institute FEB RAS
vmishukov@poi.dvo.ru

The purpose of this work is a calculation field currents, migration and transformation of impurities on the waters of the Peter the Great Bay, under the influence of wind, tide outlets and non-regula currents in real time or at any given time.

The relevance of the work is connected with the APEC Summit due in 2012, the construction of the Aquarium, Far eastern federal university DVFU and health-resort-recreation zone.

The following conditions requires for the spa zone :

- 1)the existence of pure marine waters for health-resort-recreation;
- 2)the existence of diverse fauna and flora both on shore and at sea, for active tourism and scuba diving;
- 3)availability of convenient access roads.

Special simulation model was developed in POI to calculate the fields of currents and admixture

The model allows to calculate:

- 1) speed and direction of wind currents;*
- 2) speed and direction of summary currents;*
- 3) speed and direction of impurities drift;*
- 4) quantities of oil on the sea surface, the evaporated oil, oil dispersed in the water and the oil emulsion , discarded oil ashore;*
- 5) average chemical composition of oil at sea;*
- 6) change in density, pressure of spreading and viscosity of oil ;*
- 7) make recommendations on the use of chemical and mechanic tools.*

Panel of model control

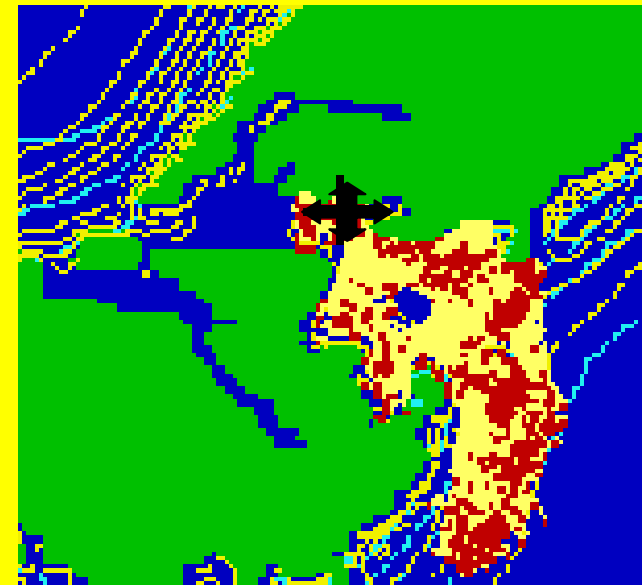
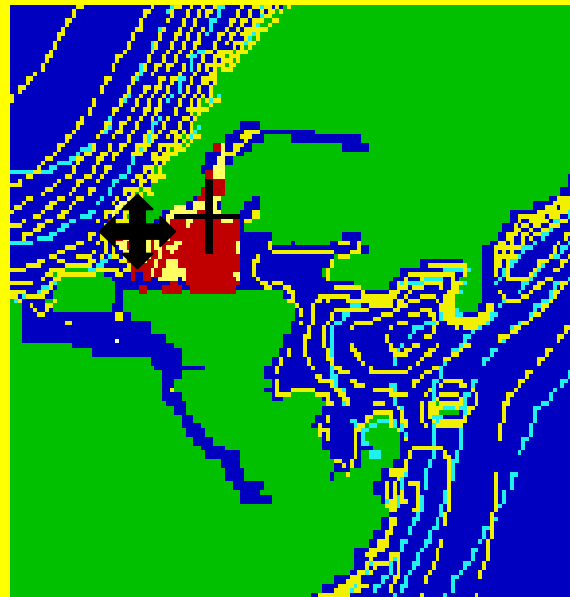
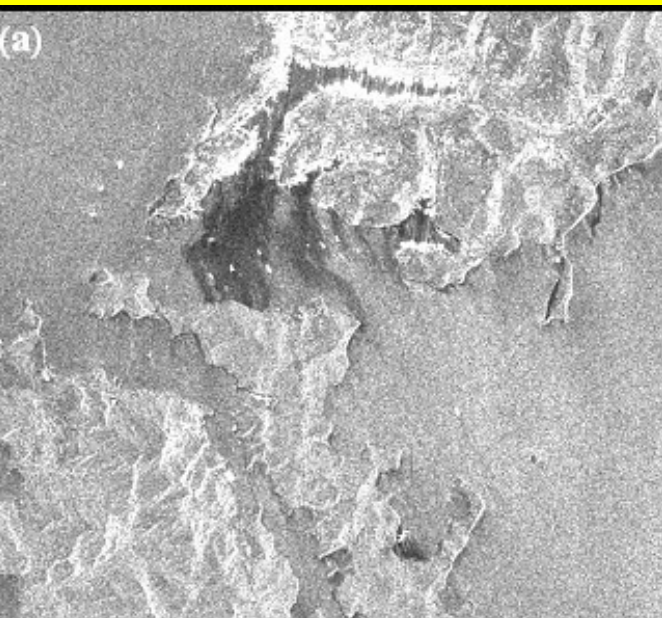
(C)2006 Mishukov & Yarosh v. 6.1

Расчёт	Дата выпуска	16/02/07	Плотность воды	1024.00	<input checked="" type="radio"/> Струя <input type="radio"/> Пятно
Стоп	Время выпуска	12.00	Температура воды	20.00	<input type="checkbox"/> Мультивыпуск
Выход	Координаты выпуска, с.ш.	43.06	Козфф. ветрового дрейфа	0.025	<input type="checkbox"/> Карта глубин
	в.д.	131.88	Козфф. дрейфа по течению	0.50	<input type="checkbox"/> функция тока
	Глубина выпуска, м	1.0	Козфф. гориз. турб.	0.20	<input type="checkbox"/> Течения
	Продолж. вых. маркеров, ч	3.0	Козфф. вертика. турб.	0.0020	<input type="checkbox"/> Вывод карт
	Интервал вых. маркеров, м	1.0	Вероятность прилипания	0.001	<input type="checkbox"/> Цветные карты
	Кол-во маркеров на 1 вып.	1	Объём выпуска	1.00	<input type="checkbox"/> Концентрация
	Максим. время прогноза, ч	3.0			
Период контр. вывода, ч	3.0				
			Вид примеси	Нефть	
				Растворённая	
				Взвешенная	
				Нефть	
				Пузырьки	

A) radar picture with ERS-2 (www.gis.poi.dvo.ru) the distribution of oil films on the waters of the Bosphorus Strait on 04.09.91 and the simulated motion of oil slicks (light yellow area and line) on the waters from a source

B) in the area of the Golden Horn Bay (black cross) and

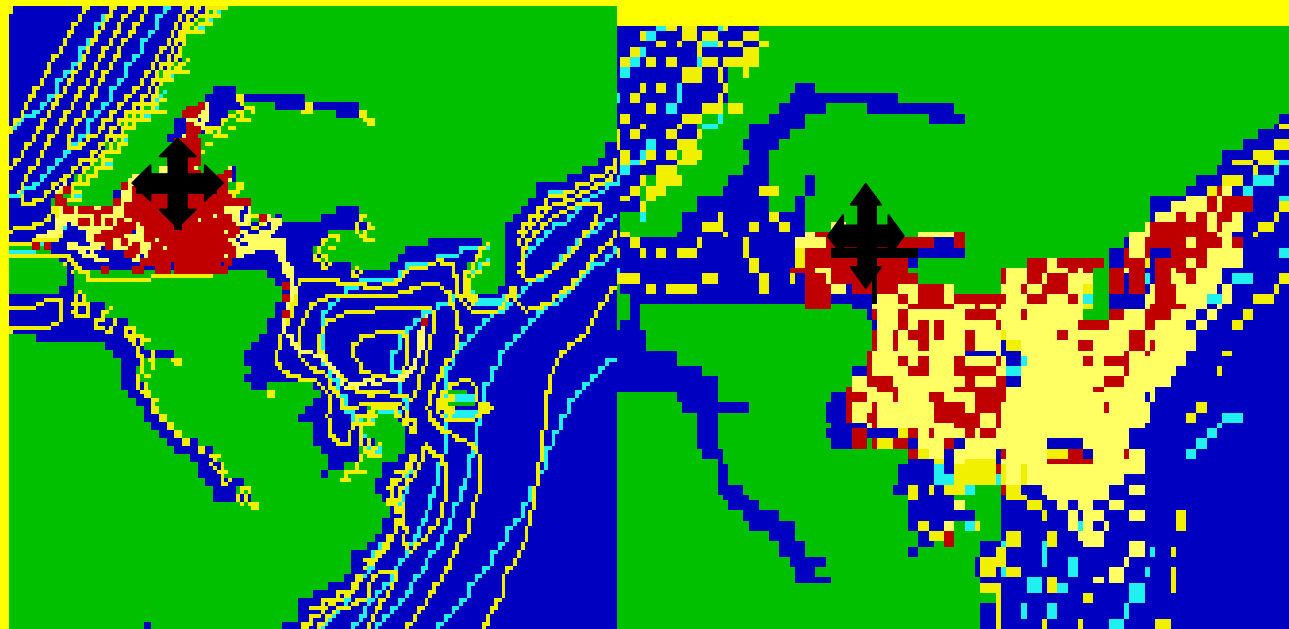
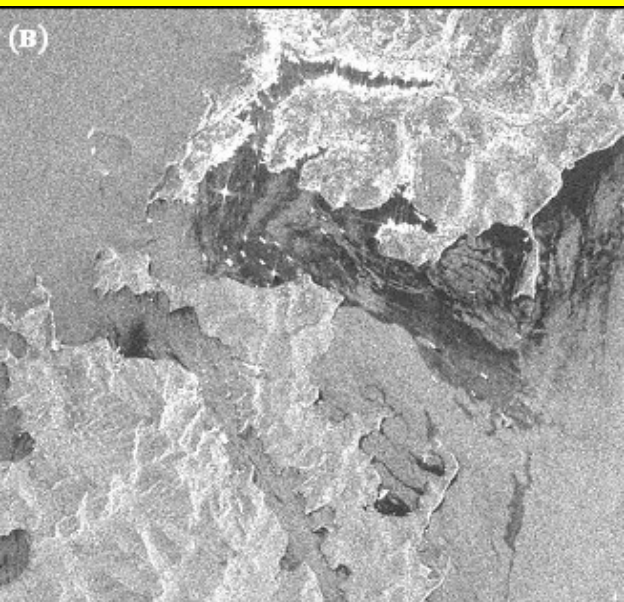
C) the Ulis Bay (black cross) from 03.09.91 to 04.09.91 in real wind conditions and distribution of spots at the end of the calculation (red squares)



A) radar picture with ERS-2 (www.gis.poi.dvo.ru) the distribution of oil films on the waters of the Bosphorus Strait on 04.10.91 and the simulated motion of oil slicks (light yellow area and line) on the waters from a source

B) in the area of b. Golden Horn Bay (black cross) and

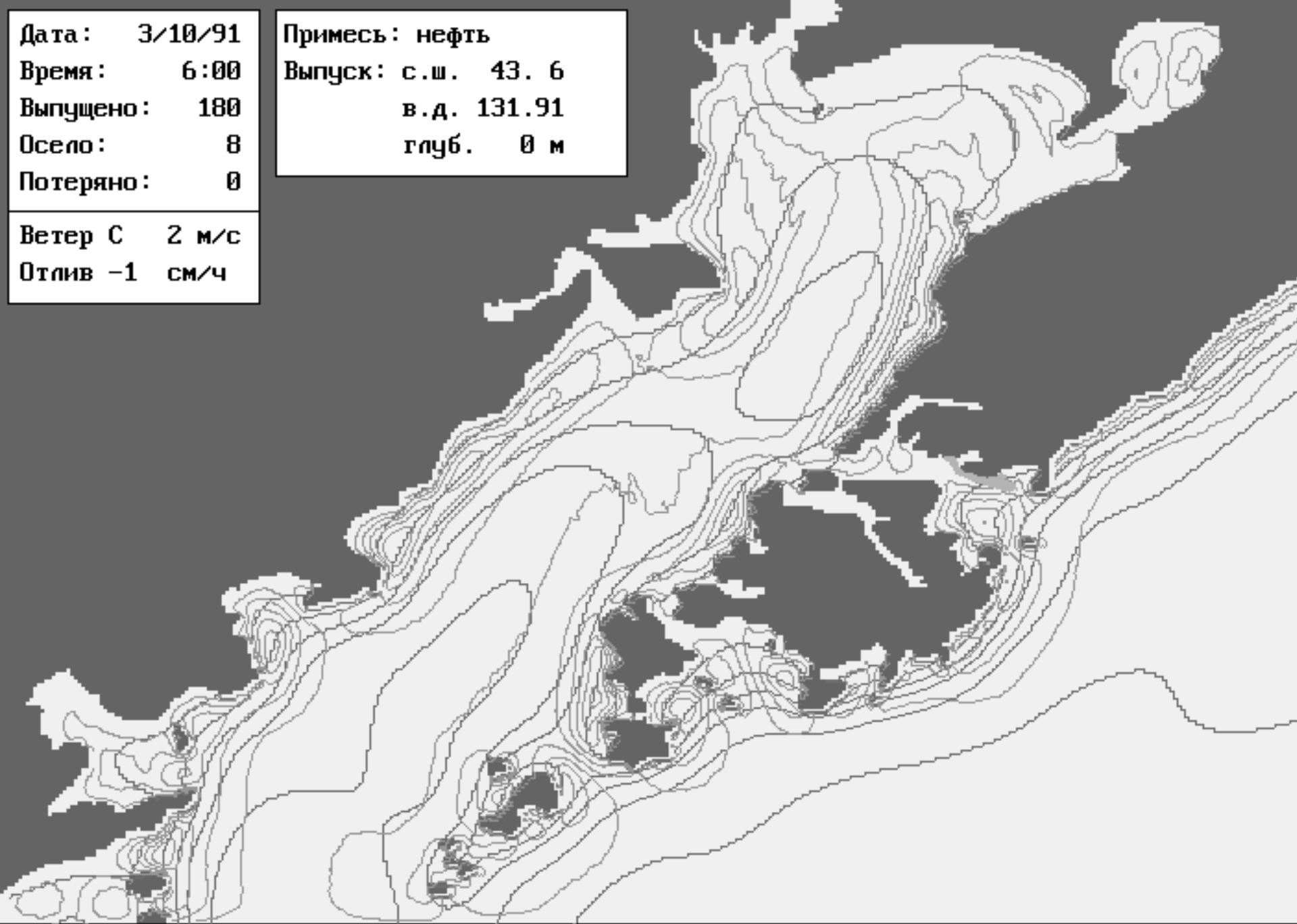
C) the Ulis Bay (black cross) from 03.10.91 to 04.10.91 in real wind conditions and distribution of spots at the end of the calculation (red squares)



Дата: 3/10/91
Время: 6:00
Выпущено: 180
Осело: 8
Потеряно: 0

Примесь: нефть
Выпуск: с.ш. 43.6
в.д. 131.91
глуб. 0 м

Ветер С 2 м/с
Отлив -1 см/ч

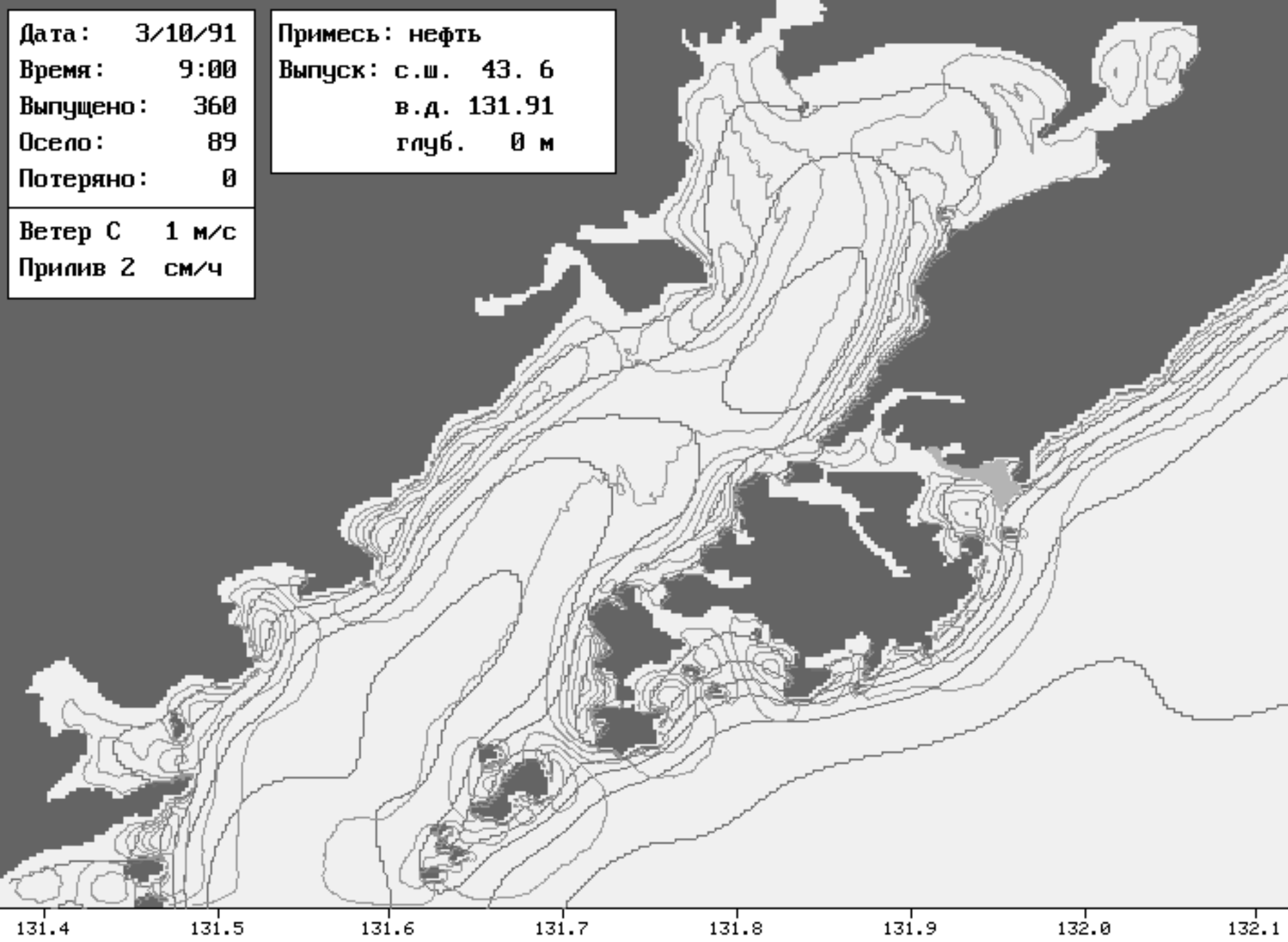


131.4 131.5 131.6 131.7 131.8 131.9 132.0 132.

Дата: 3/10/91
Время: 9:00
Выпущено: 360
Осело: 89
Потеряно: 0

Примесь: нефть
Выпуск: с.ш. 43.6
в.д. 131.91
глуб. 0 м

Ветер С 1 м/с
Прилив 2 см/ч

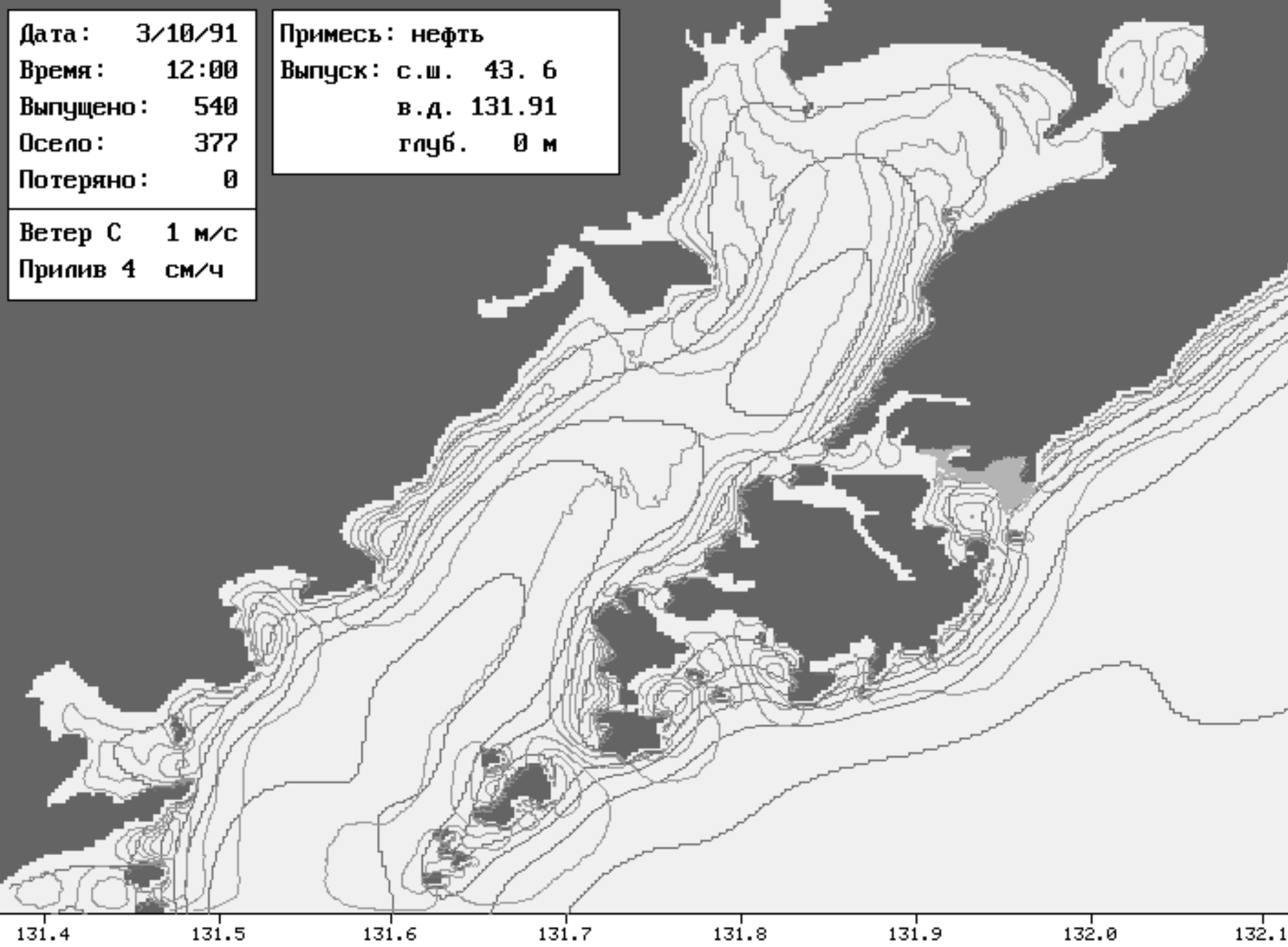


131.4 131.5 131.6 131.7 131.8 131.9 132.0 132.1

Дата: 3/10/91
Время: 12:00
Выпущено: 540
Осело: 377
Потеряно: 0

Примесь: нефть
Выпуск: с.ш. 43.6
в.д. 131.91
глуб. 0 м

Ветер С 1 м/с
Прилив 4 см/ч

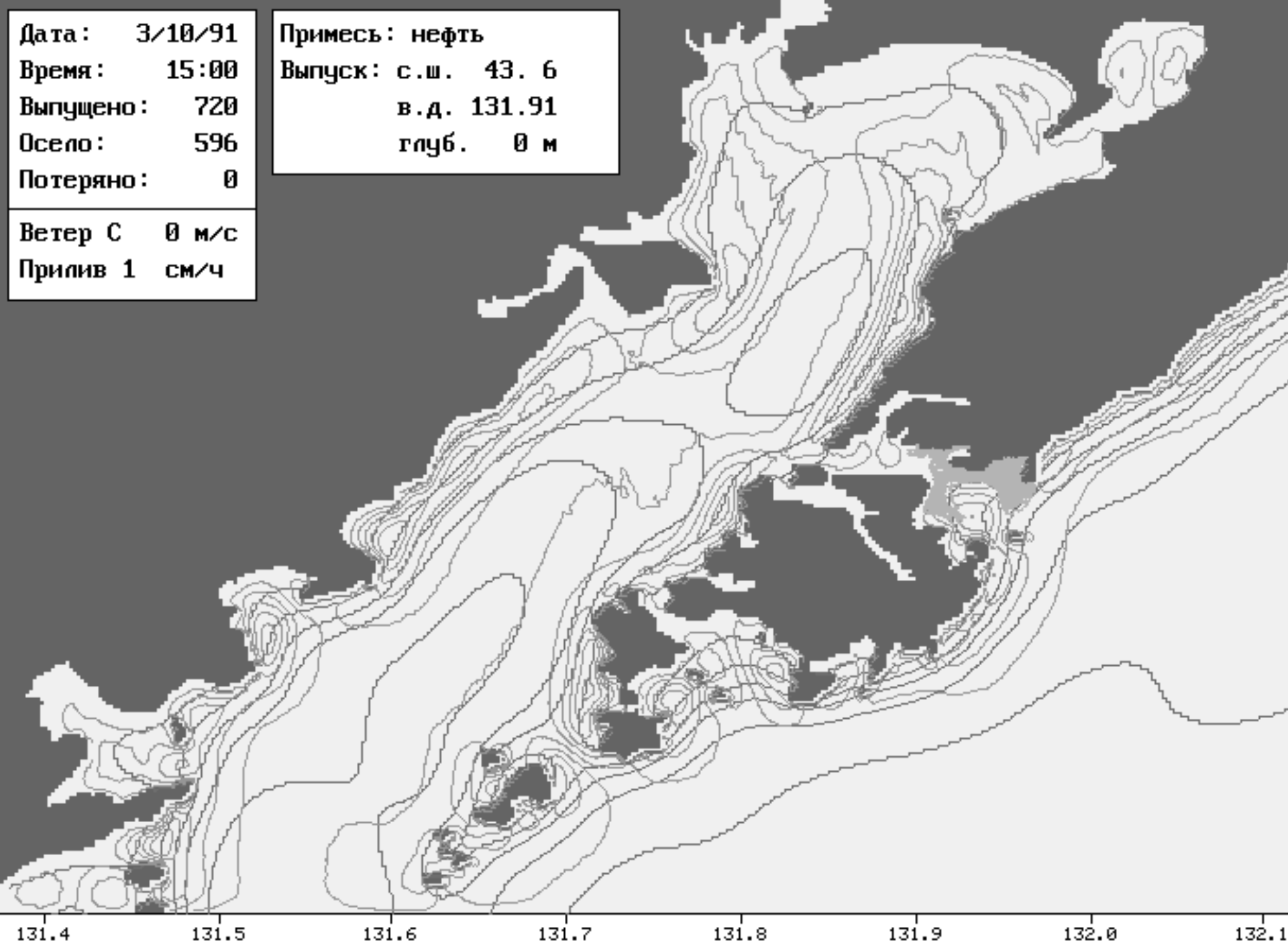


131.4 131.5 131.6 131.7 131.8 131.9 132.0 132.1

Дата: 3/10/91
Время: 15:00
Выпущено: 720
Осело: 596
Потеряно: 0

Примесь: нефть
Выпуск: с.ш. 43.6
в.д. 131.91
глуб. 0 м

Ветер С 0 м/с
Прилив 1 см/ч

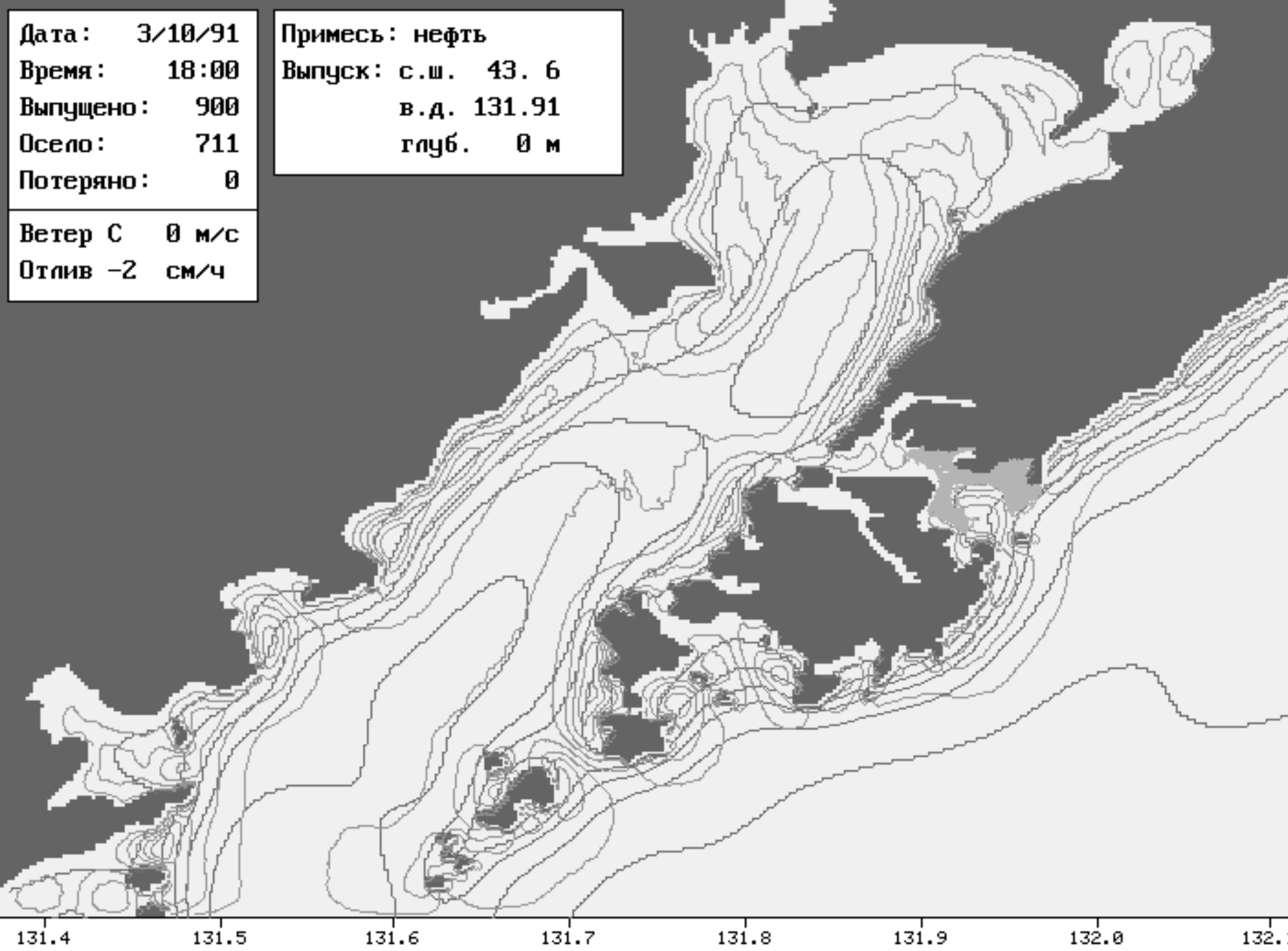


131.4 131.5 131.6 131.7 131.8 131.9 132.0 132.1

Дата: 3/10/91
Время: 18:00
Выпущено: 900
Осело: 711
Потеряно: 0

Примесь: нефть
Выпуск: с.ш. 43.6
в.д. 131.91
глуб. 0 м

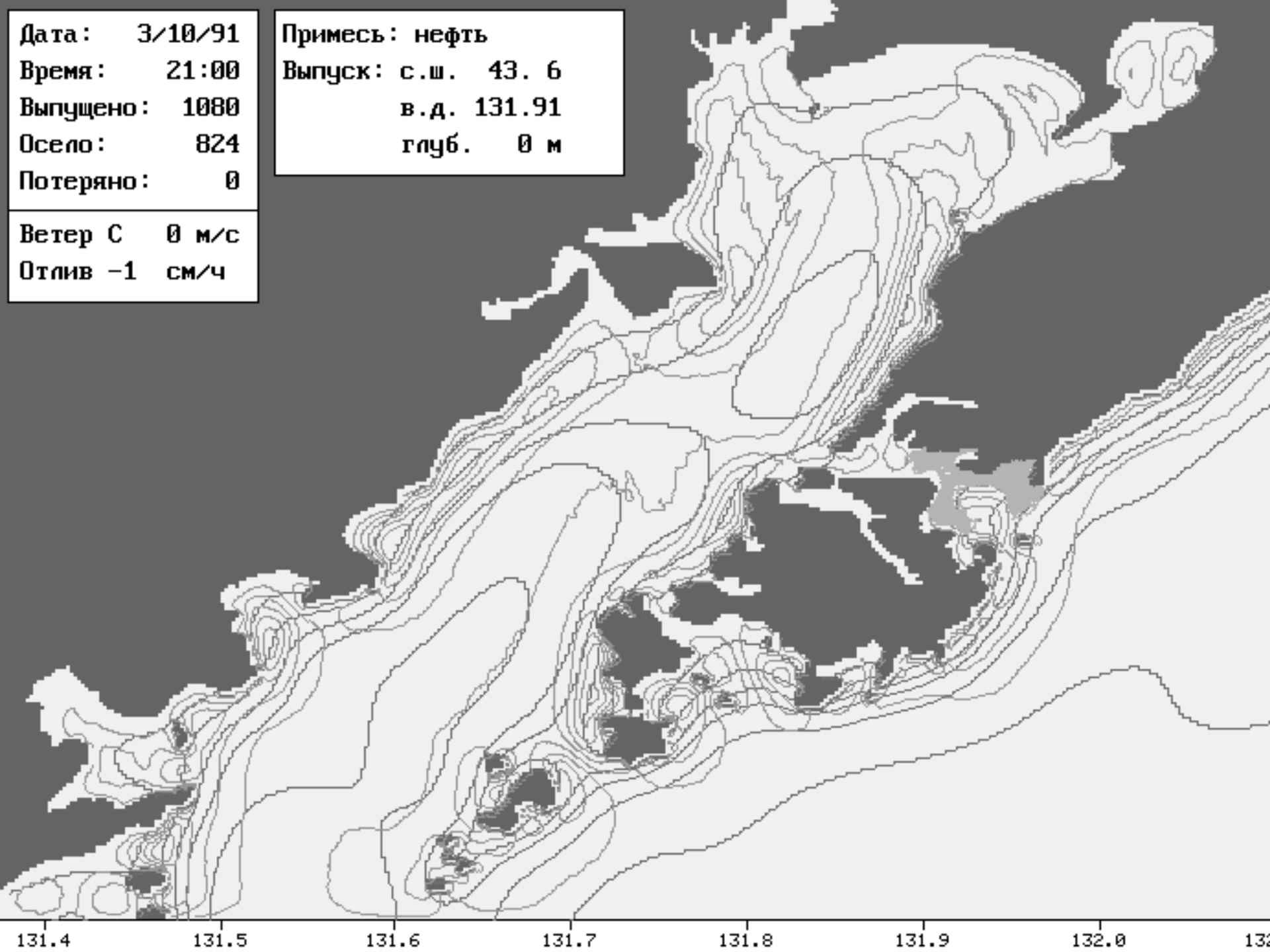
Ветер С 0 м/с
Отлив -2 см/ч



Дата: 3/10/91
Время: 21:00
Выпущено: 1080
Осело: 824
Потеряно: 0

Примесь: нефть
Выпуск: с.ш. 43.6
в.д. 131.91
глуб. 0 м

Ветер С 0 м/с
Отлив -1 см/ч

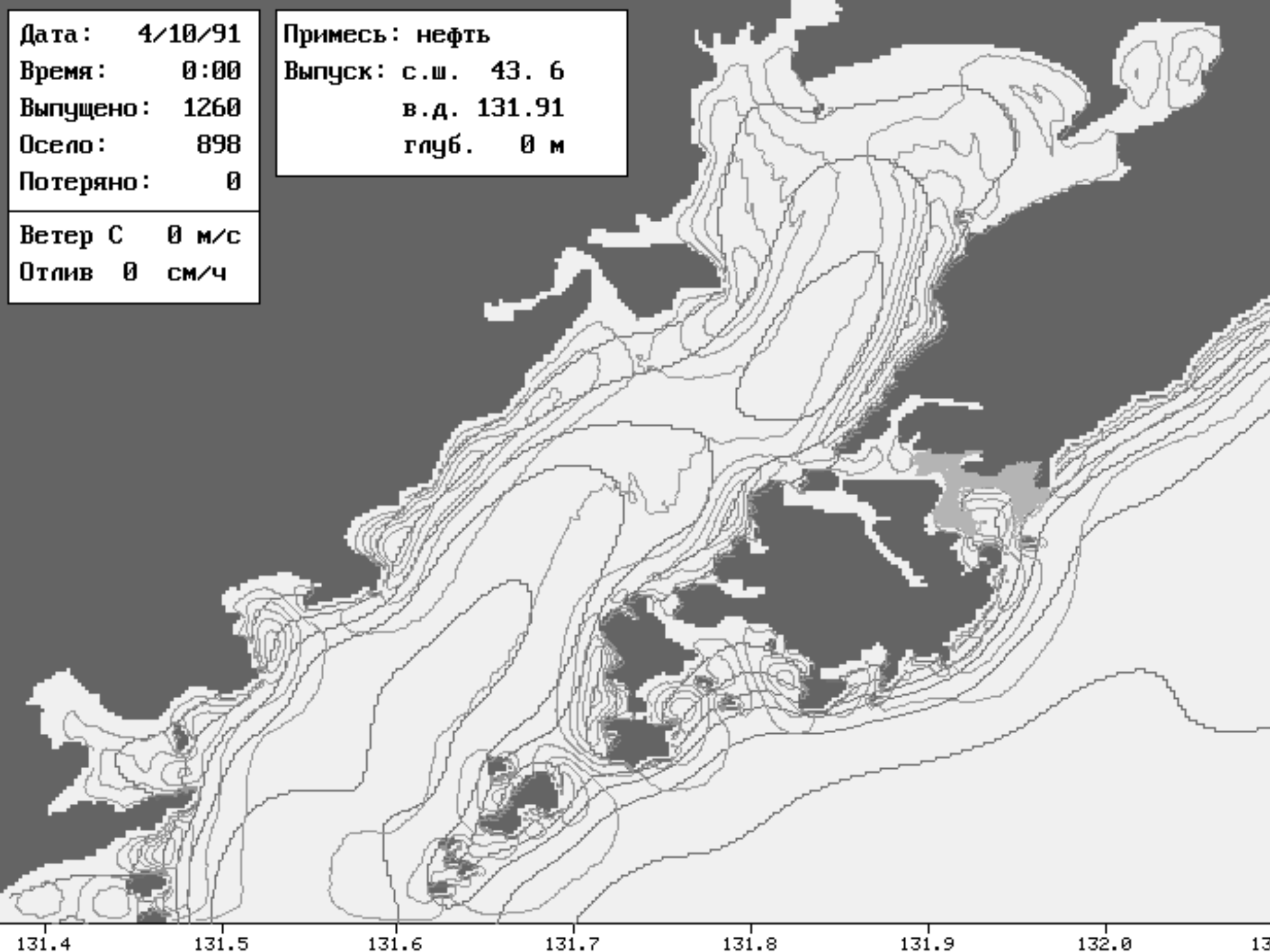


131.4 131.5 131.6 131.7 131.8 131.9 132.0 132.1

Дата: 4/10/91
Время: 0:00
Выпущено: 1260
Осело: 898
Потеряно: 0

Примесь: нефть
Выпуск: с.ш. 43.6
в.д. 131.91
глуб. 0 м

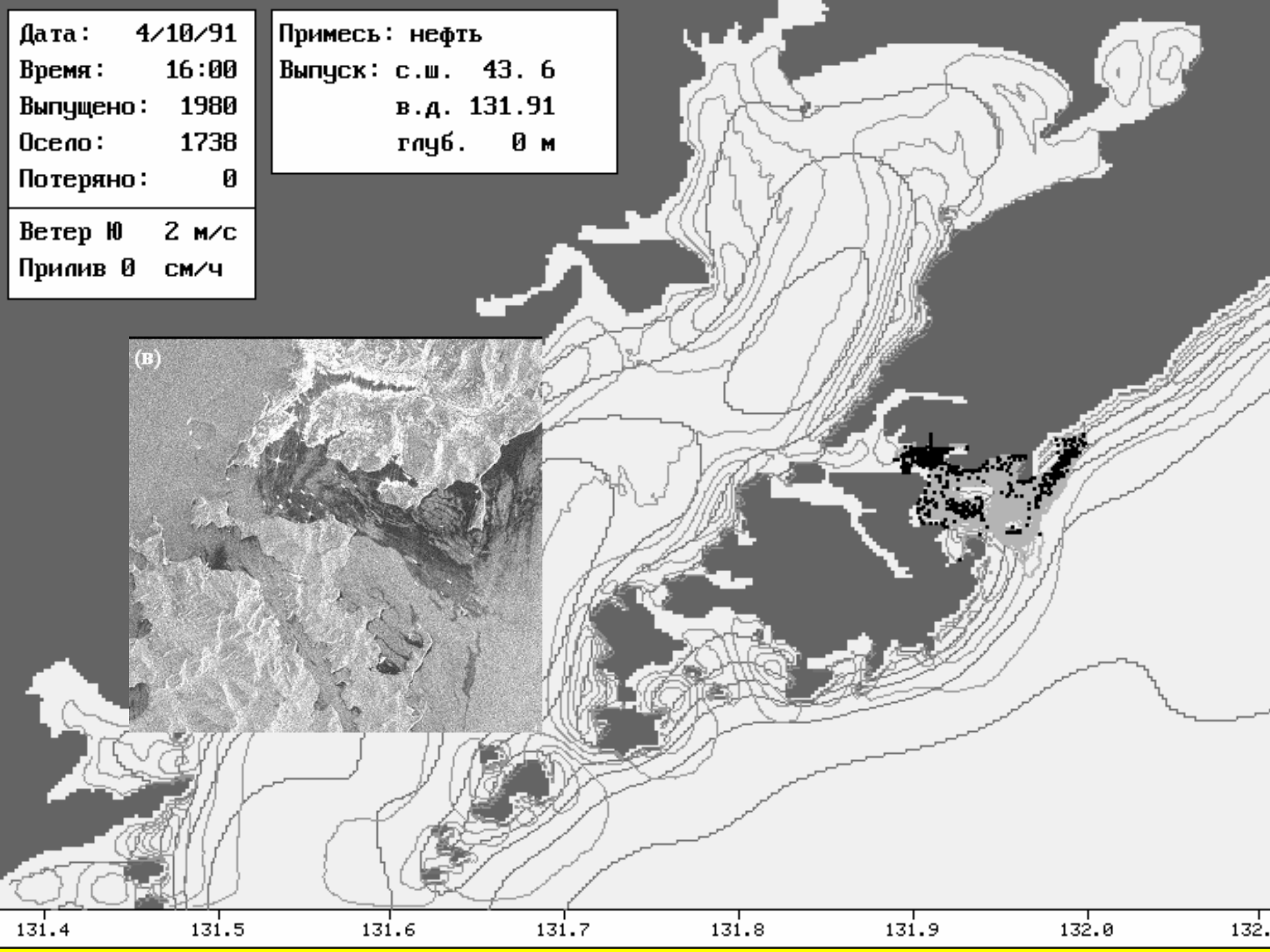
Ветер С 0 м/с
Отлив 0 см/ч



Дата: 4/10/91
Время: 16:00
Выпущено: 1980
Осело: 1738
Потеряно: 0

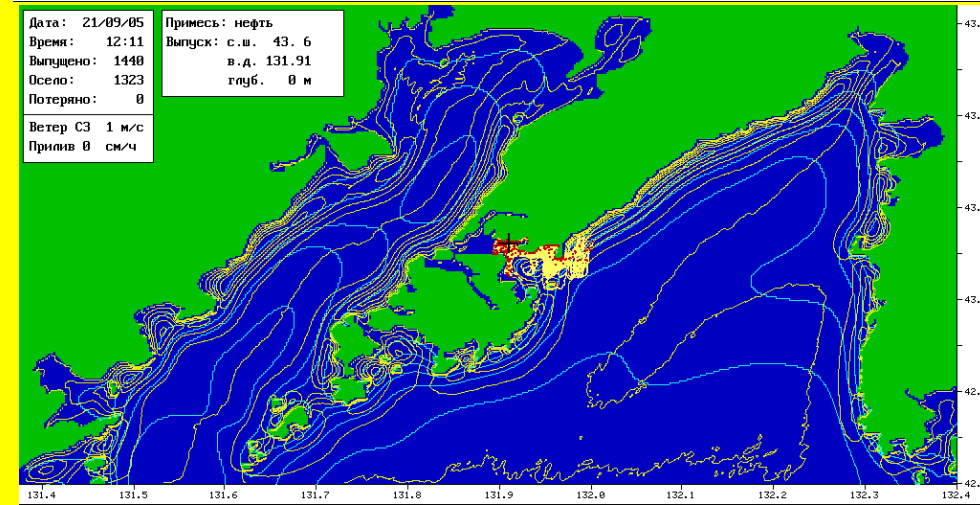
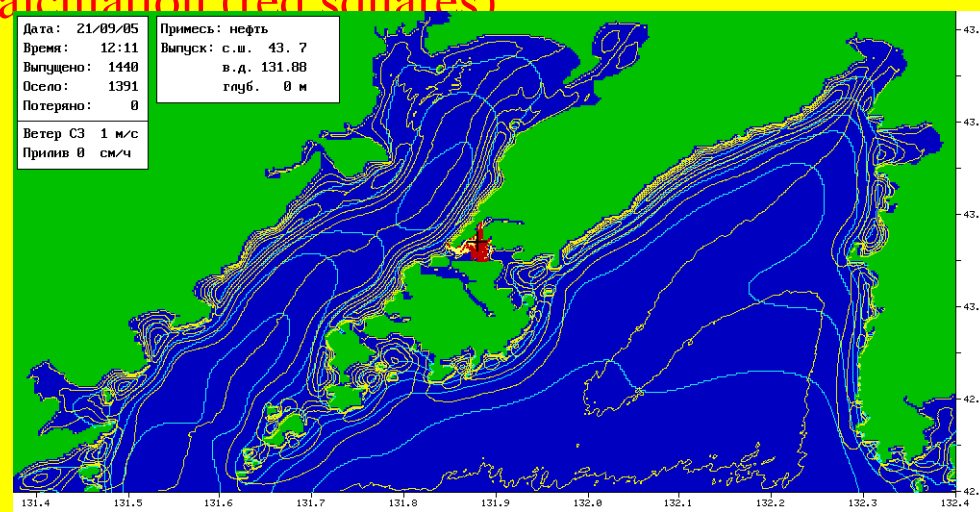
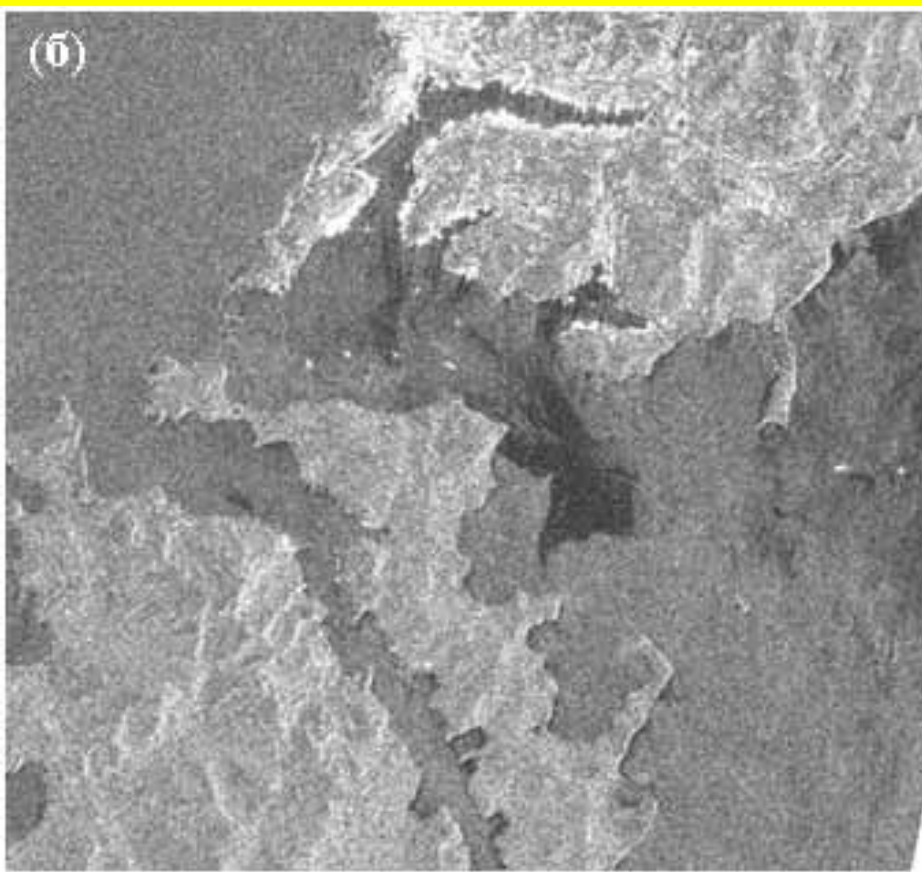
Примесь: нефть
Выпуск: с.ш. 43.6
в.д. 131.91
глуб. 0 м

Ветер Ю 2 м/с
Прилив 0 см/ч



A) radar picture with ERS-2 (www.gis.poi.dvo.ru) the distribution of oil films on the waters of the Bosphorus Strait on 21.10.2005 and the simulated motion of oil slicks (light yellow area and line) on the waters from a source

B) in the area of b. Golden Horn Bay (black cross) and C) the Ulis Bay (black cross) from 20.10.2005 to 21.10.2005 in real wind conditions and distribution of spots at the end of the calculation (red squares)

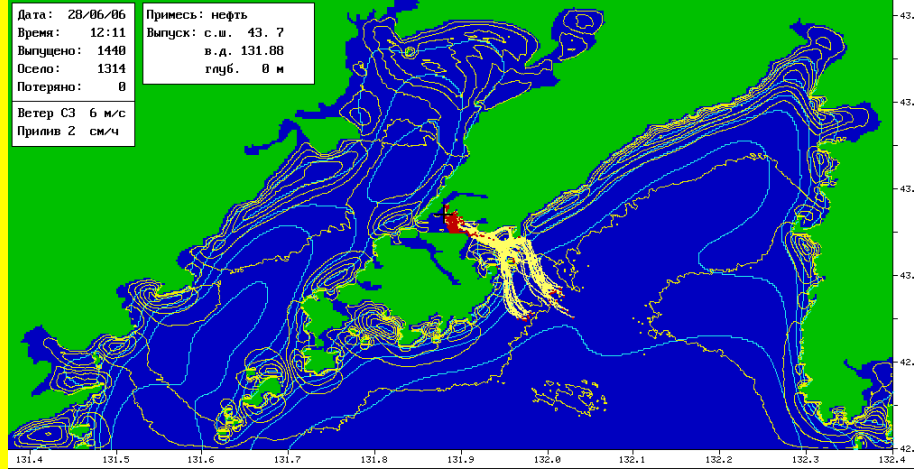
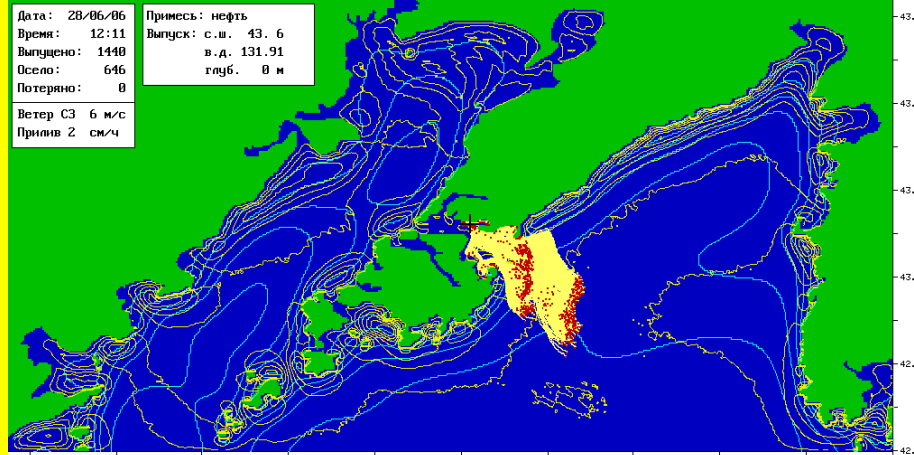
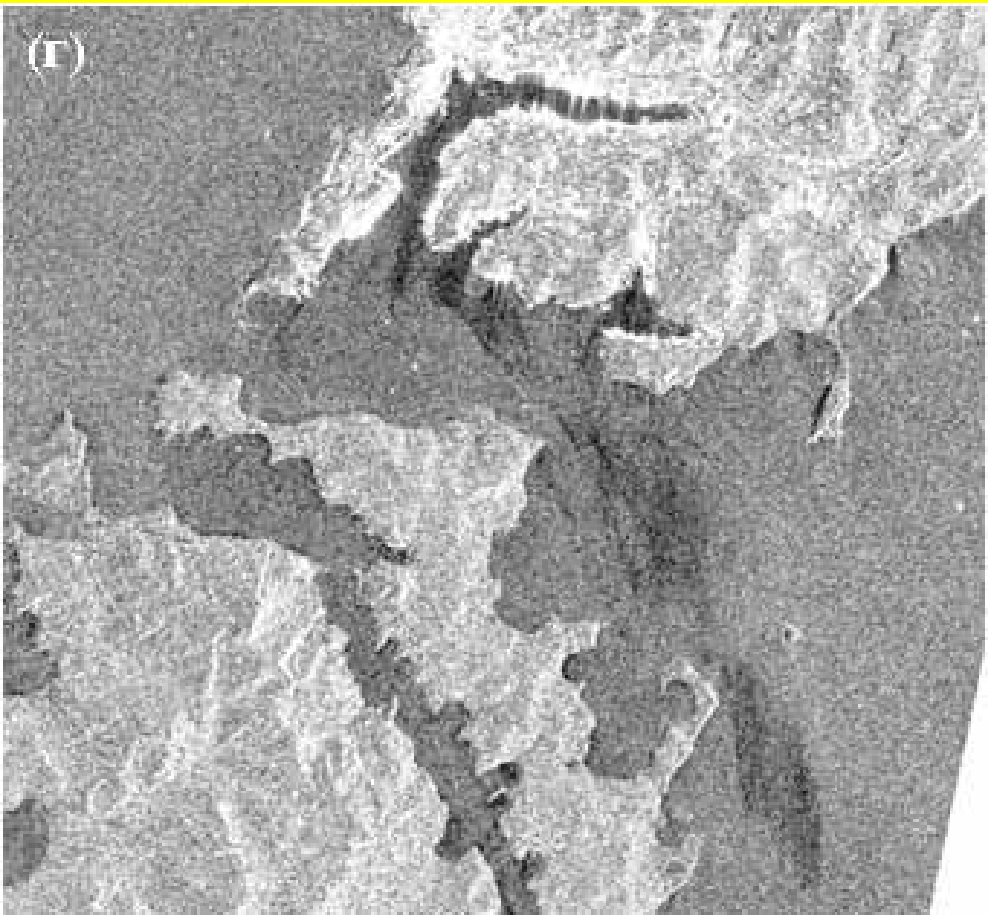


A) radar picture with ERS-2 (www.gis.poi.dvo.ru) the distribution of oil films on the waters of the Bosphorus Strait on 28.06.2006

and the simulated motion of oil slicks (light yellow area and line) on the waters from a source

B) in the area of b. Golden Horn Bay (black cross)

C) the Ulis Bay (black cross) from 27.06.2006 to 28.06.2006 in real wind conditions and distribution of spots at the end of the calculation (red squares)

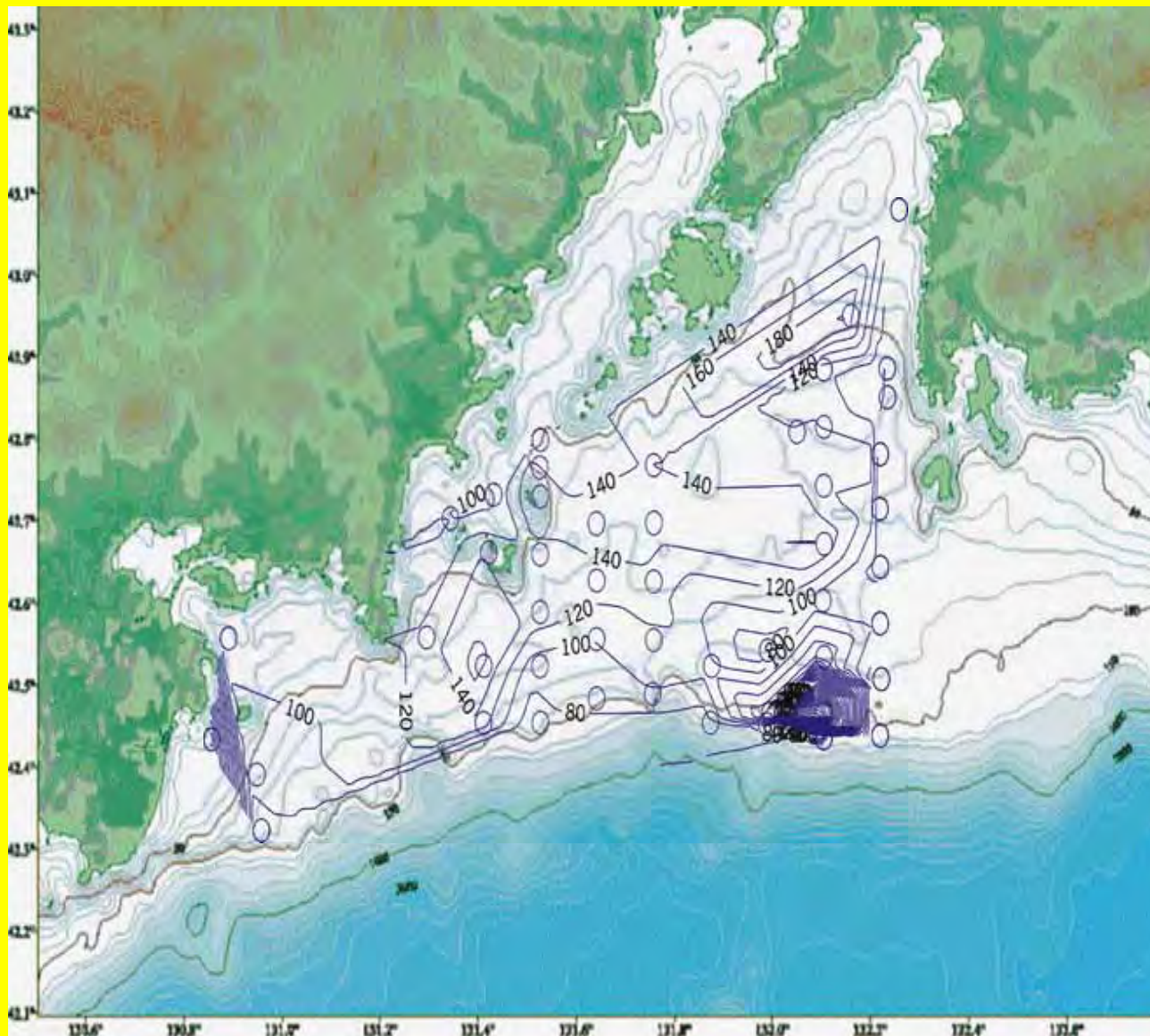






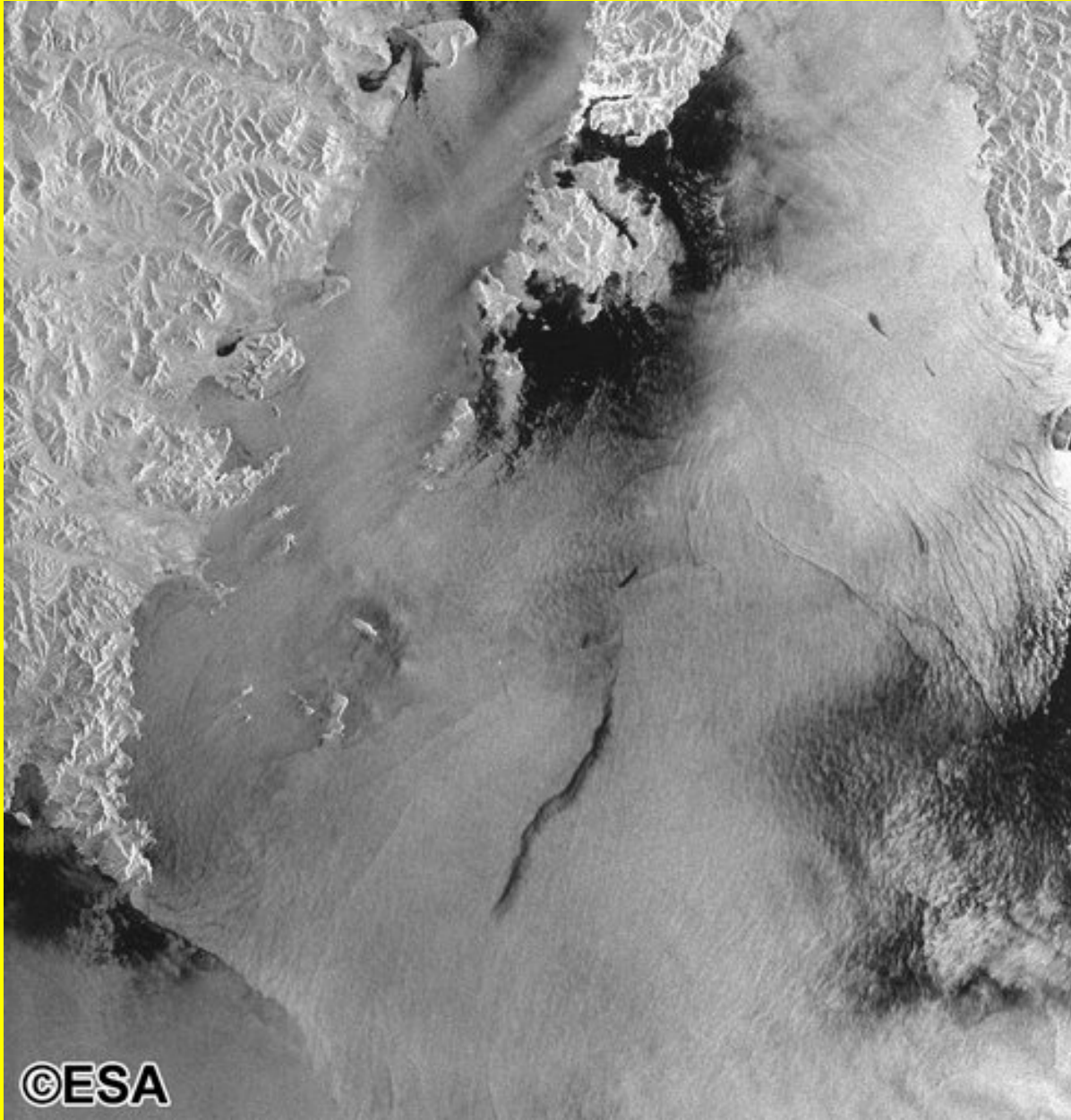
Distribution of oil hydrocarbons in sub bottom water on the Peter the Great bay from natural sources

С.И.



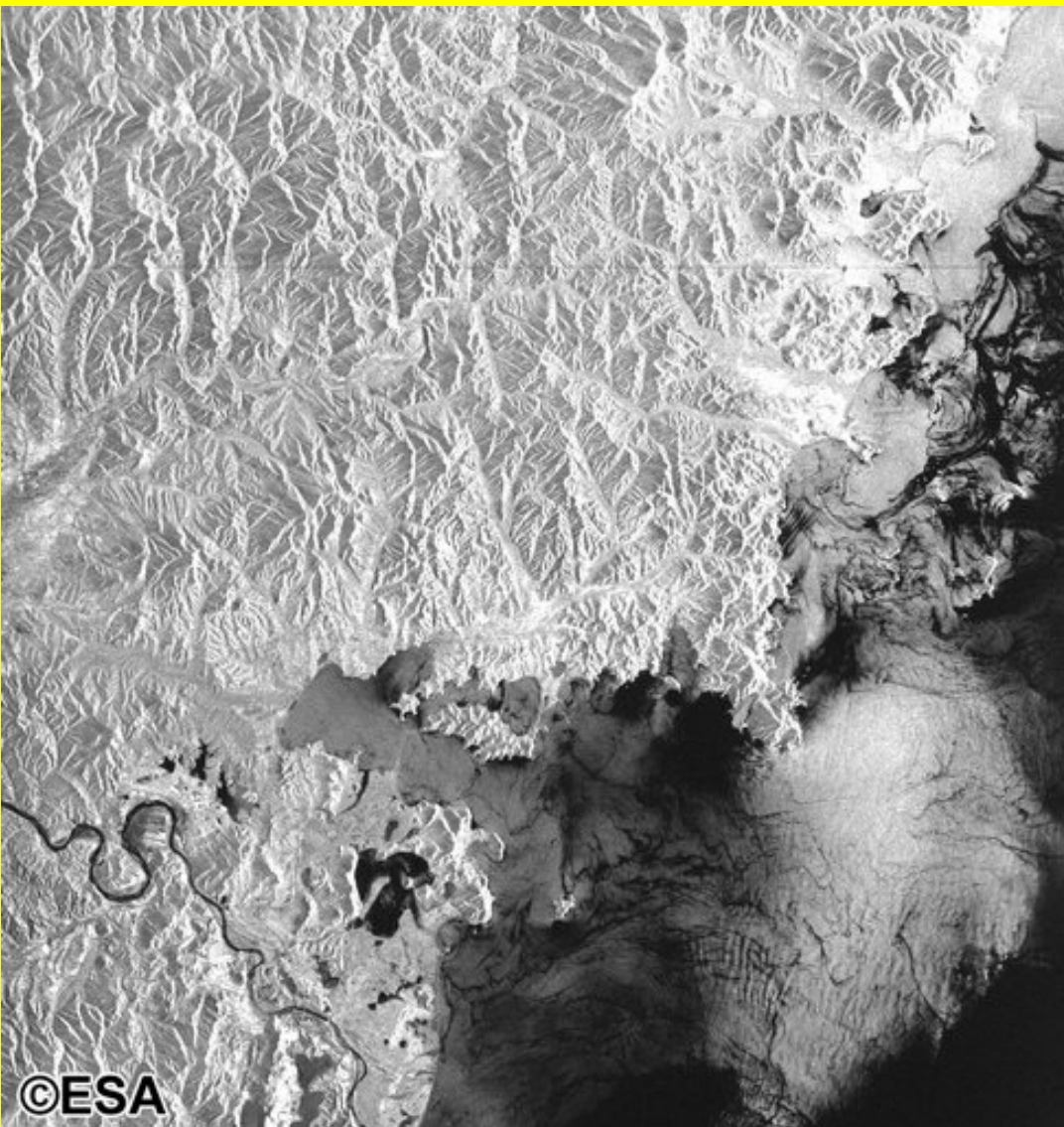
В.Д.

Radar picture with ERS-2 (www.gis.poi.dvo.ru) the distribution of oil films on the waters of the Peter the Great Bay on 22.02.1997

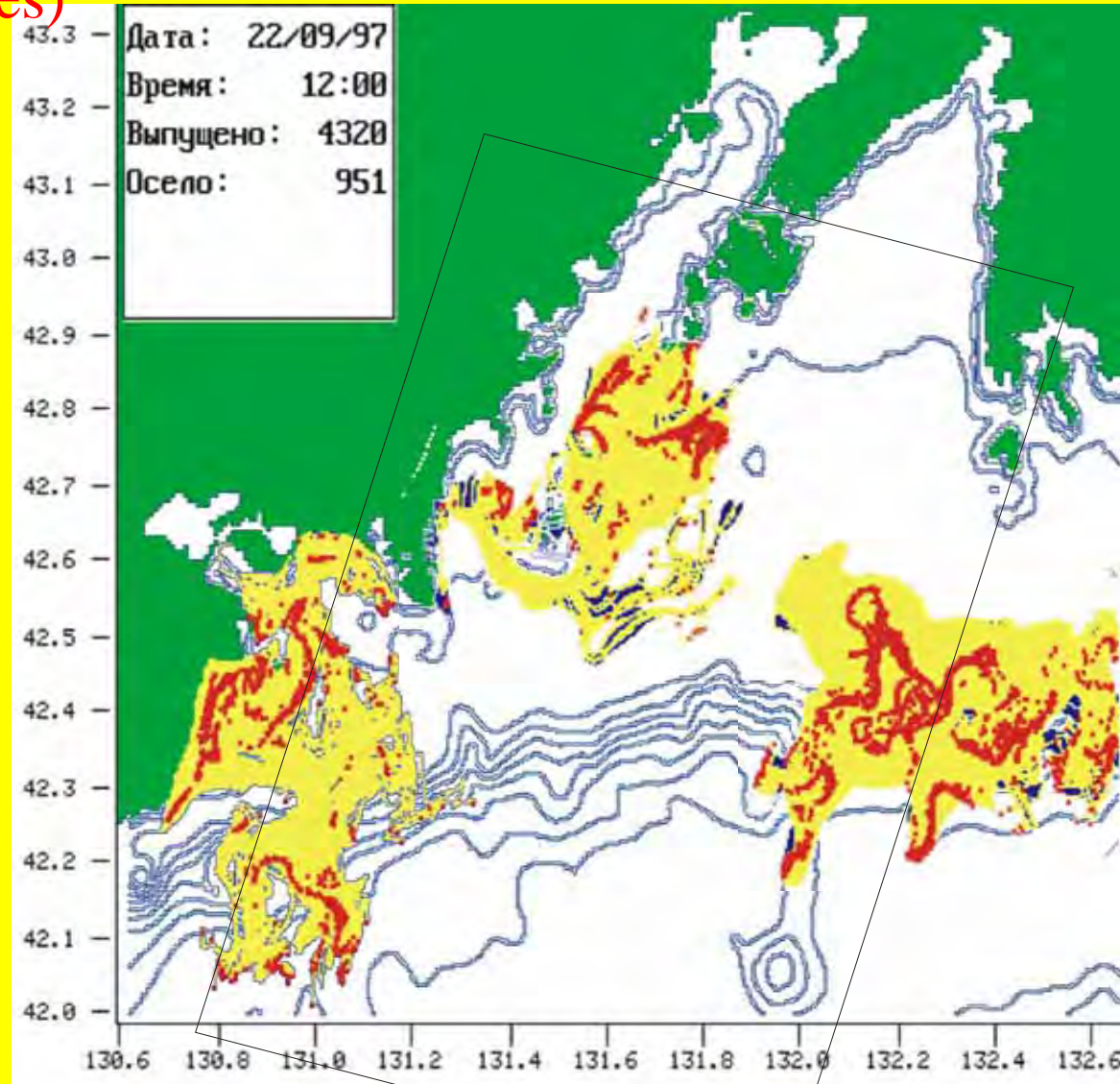


©ESA

Radar picture with ERS-2 (www.gis.poi.dvo.ru) the distribution of oil films on the waters of the Peter the Great Bay (the Pos' et Bay) on 24.04.1999



Simulated motion of oil slicks (light yellow area and line) on the waters from a natural sources from 21.02.1997 to 22.02.1997 in real wind conditions and distribution of spots at the end of the calculation (red squares)



В.д.

Conclusions

The experimental results and the results of simulation modeling showed:

- 1) calculations of currents and fields of impurity distribution on the Peter the Great Bay were performed with using of the morphology maps of the coast and bottom, experimental data on currents and sea levels, river inflow and water exchange with an exposed area of the Sea of Japan;*
- 2) a model of currents and drifting oil slicks were developed on the waters of the Gulf and held its accuracy according to the available experimental data and satellite images;*
- 3) calculation of drift trajectories of oil slicks showed that admixture resulting in traffic mostly went ashore or settles on the bottom and polluted the coastal zone of the Gulf*

