Gas hydrate and methane fluxes in the Okhotsk Sea and methane extraction from it

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International projects:
KOMEX – Russia-Germany (1998-2004)
CHAOS – Russia-Japan-Korea (2003-2006)
SAKHALIN Russia-Japan-Korea (2007-2012)

г. Владивосток
2009

Purpose

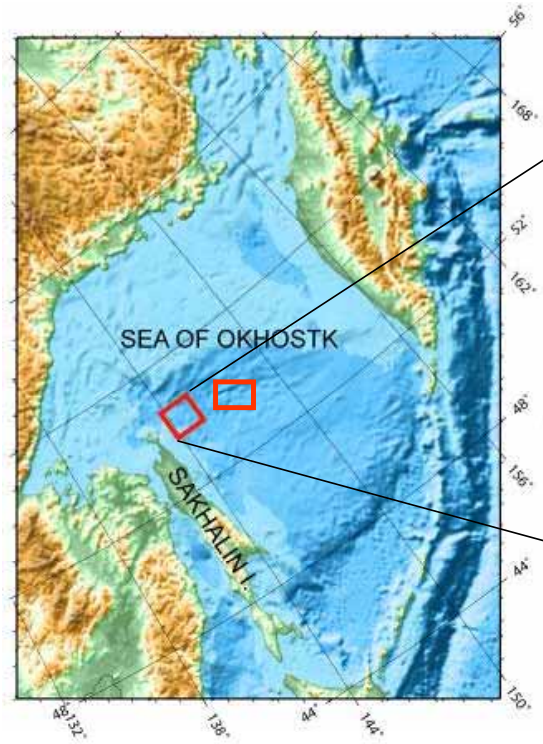
- -To study flux of methane and gas hydrate in the Okhotsk Sea.
- -To develop method to search it and to prepare innovation plan of methane mining from gas hydrate.
- -To investigate influence of methane flux and gas hydrate on the environment and Global Climate change.

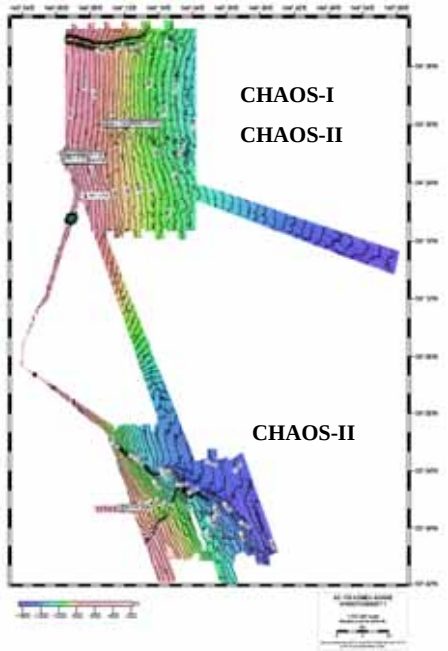
tasks

- -To carry out expedition in the Okhotsk Sea. In it there are study: - geophysics (seismic profiling and sonar survey),
- -geology sampling (sediment and water),
- -hydro acoustic survey.
- -To measure gas in samples of sediment and water and
- -To study morphology of structures and bottom surface and biology society in it.
- To interpret complex of geology, geophysics, gas geochemistry etc.


Sakhalin Slope Gas Hydrate Project
2007-2012
SSGH-07
Russia-Korea-Japan

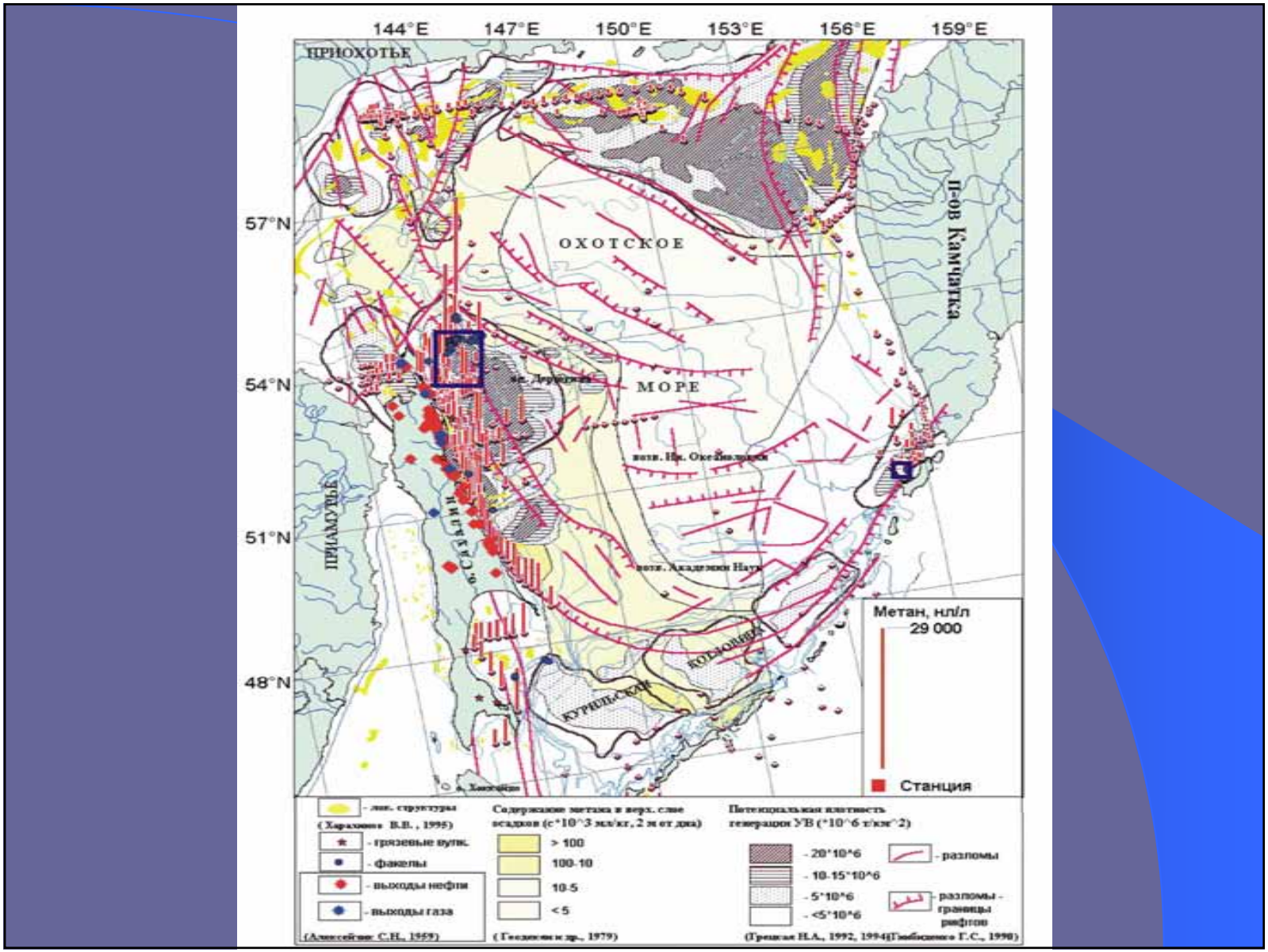
Study area of CHAOS I (2003) & II (2005)



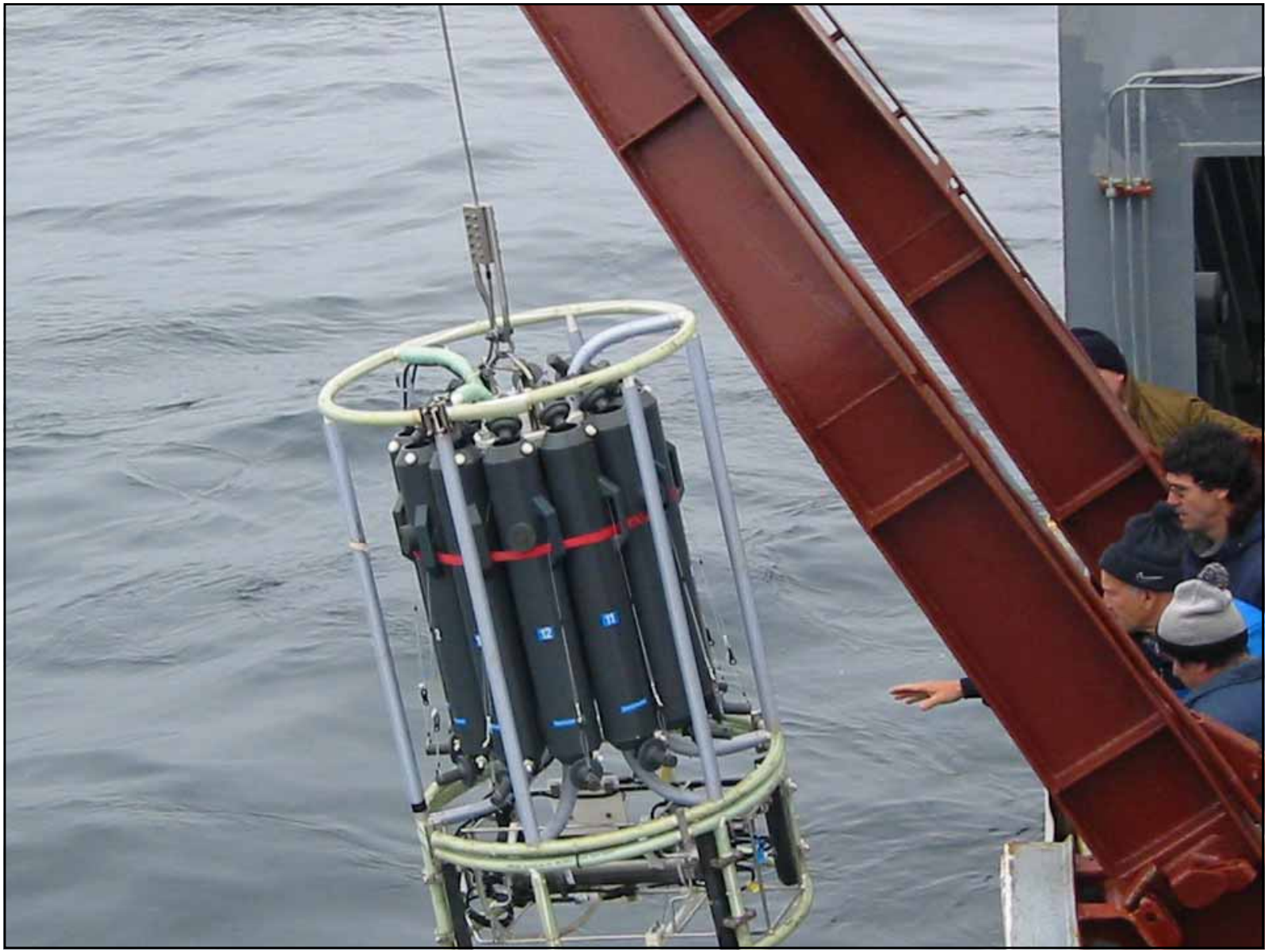


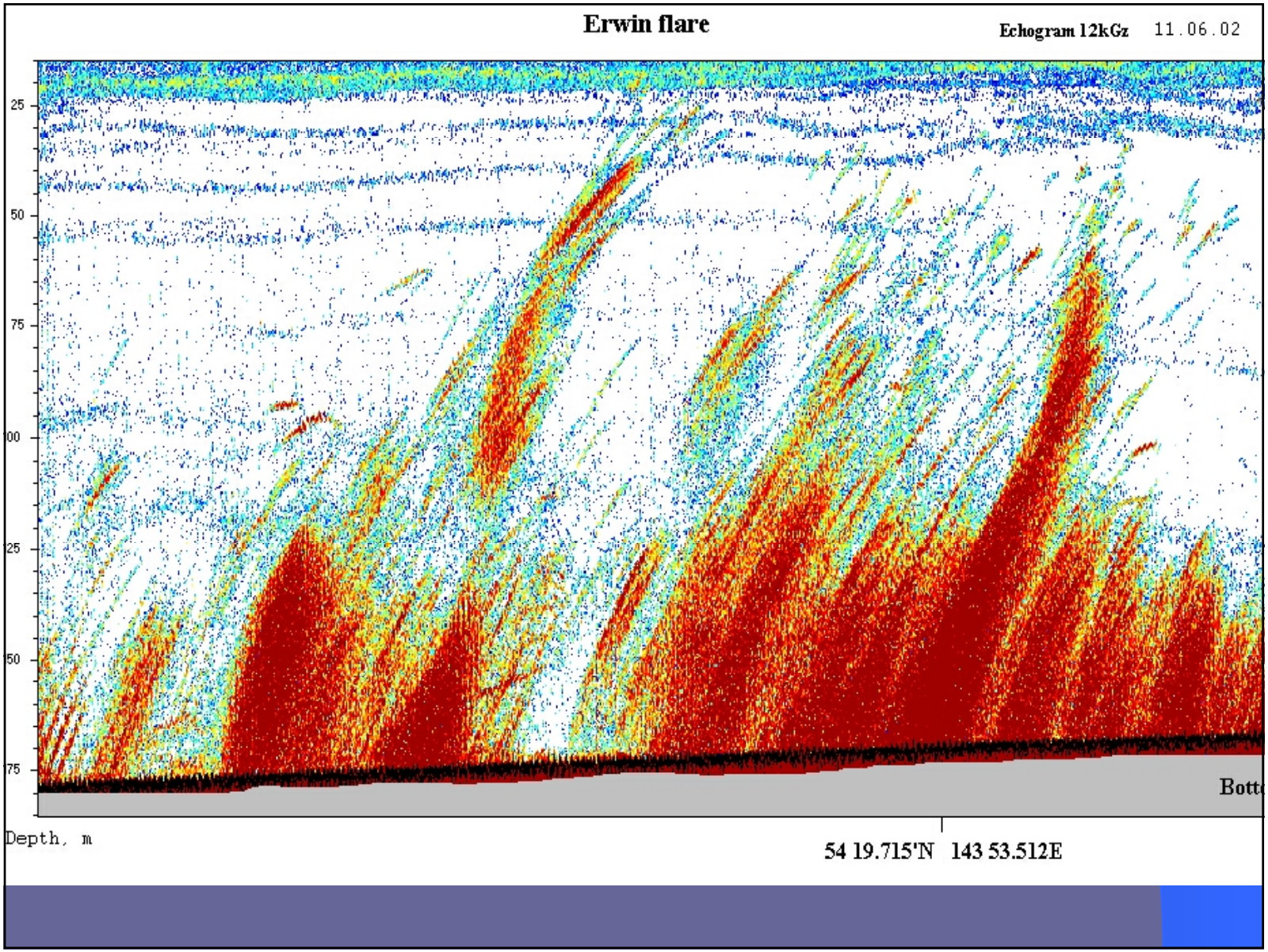
Seafloor mapping

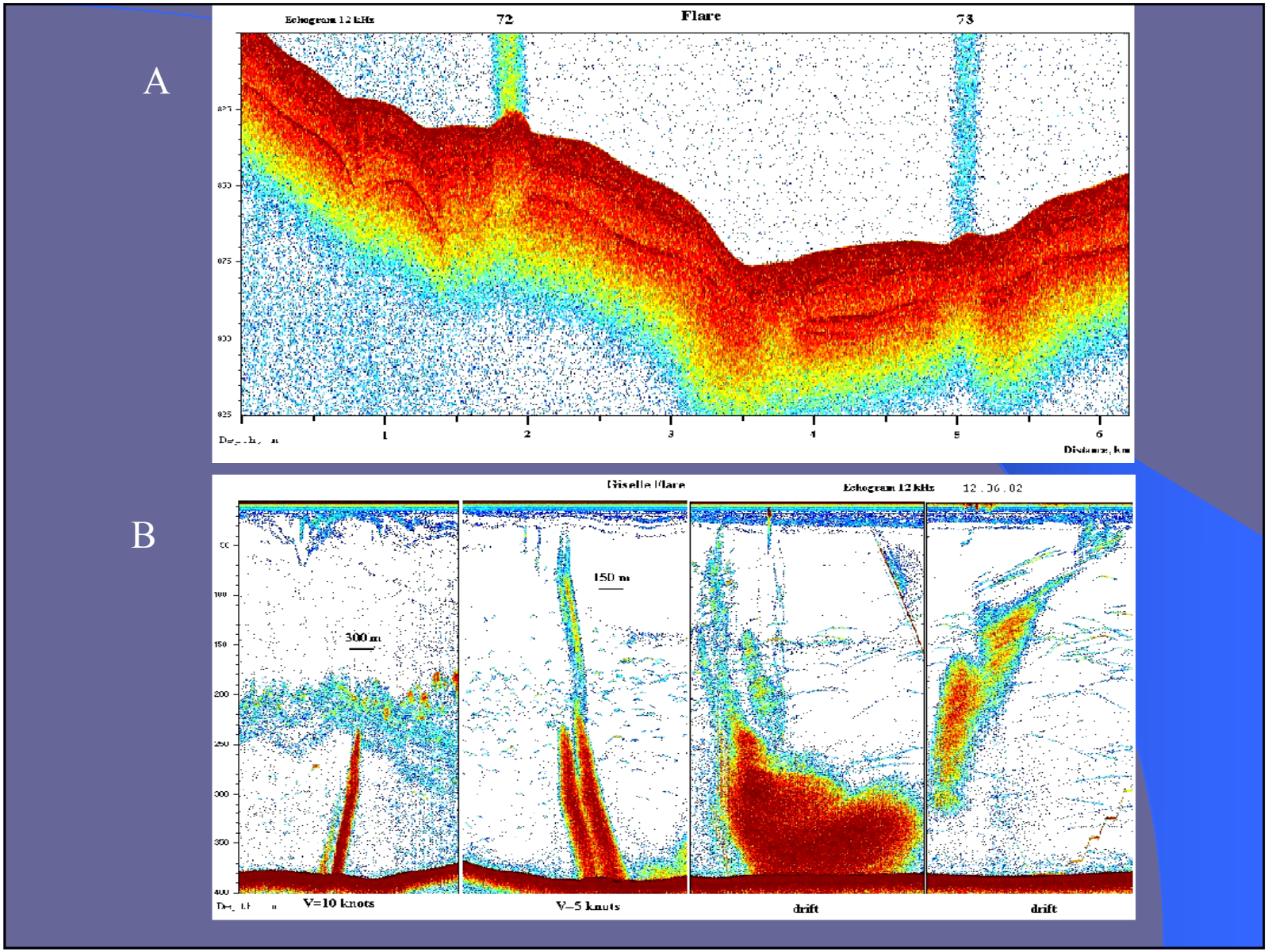
KOPRI

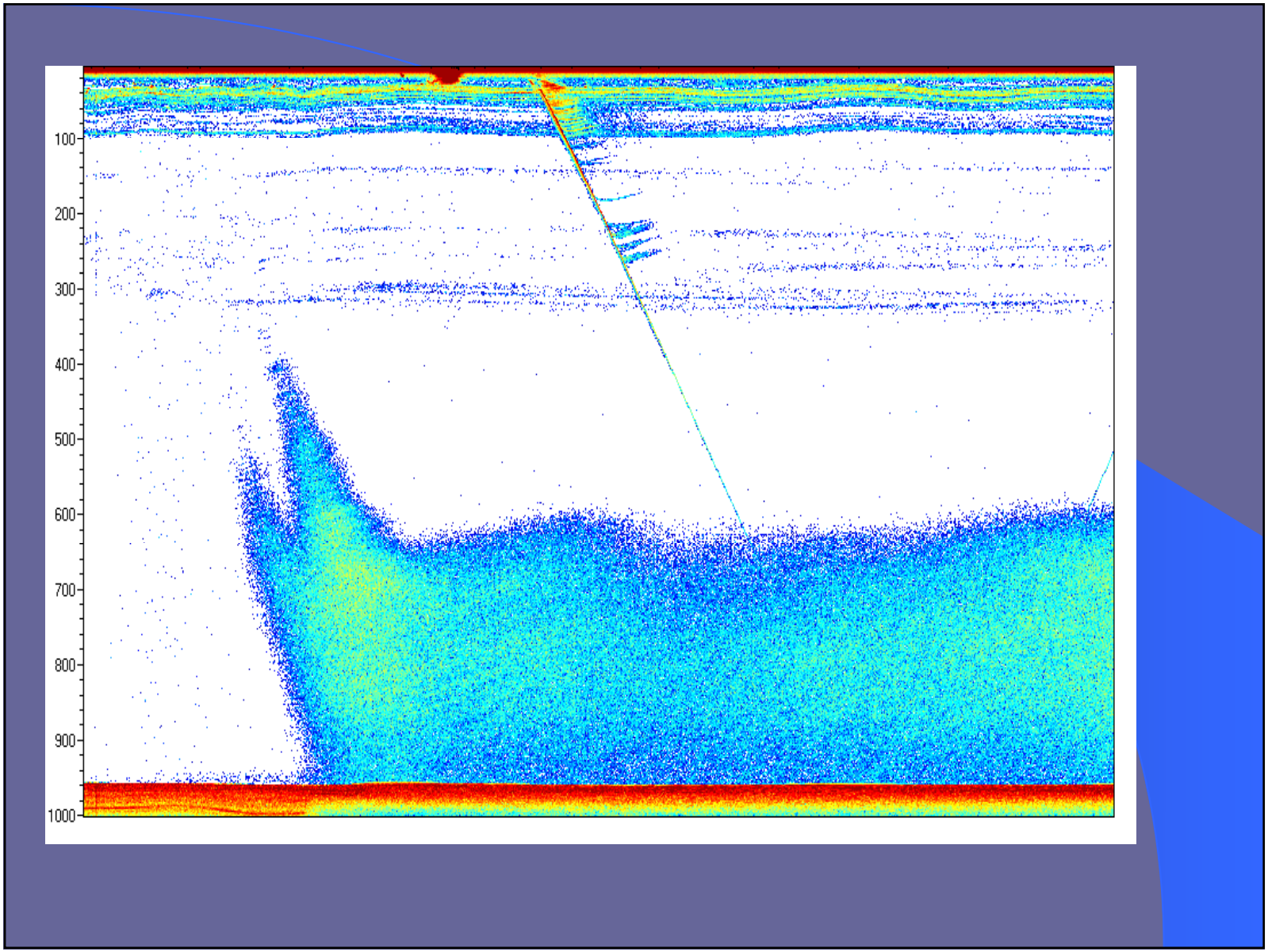

144°E
147°E
150°E
153°E
156°E
159°E
57°N
54°N
51°N
48°N
ПРИОХОТЬЕ
ОХОТСКОЕ
МОРЕ
П-ов Камчатка
ПРИАМУРЬЕ
Метан, нл/л
29 000
Станция
КУРИЛЬСКОЕ

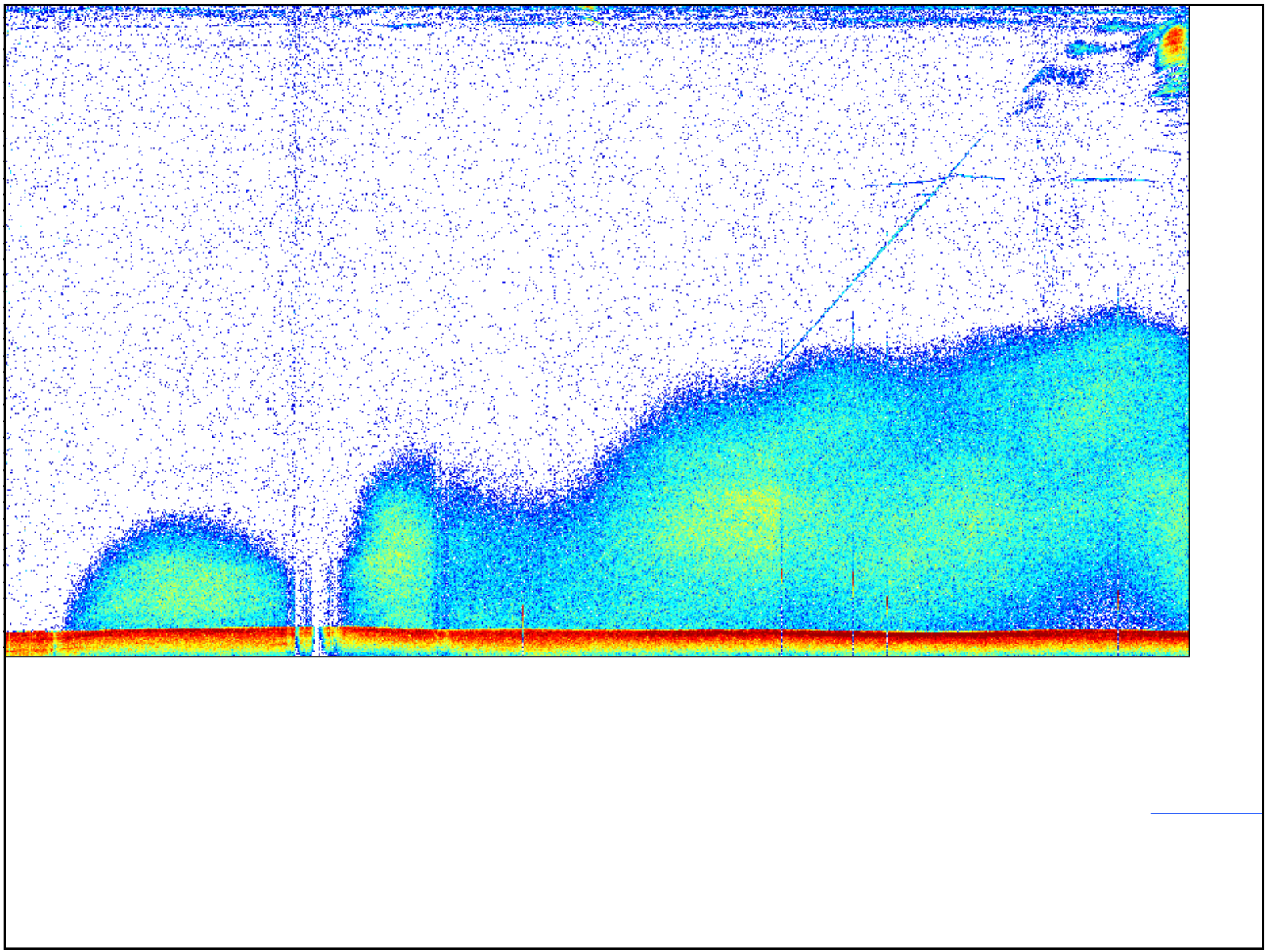
Газогидраты в донных осадках впадины Дерюгина Охотского моря (08.2004 г.)

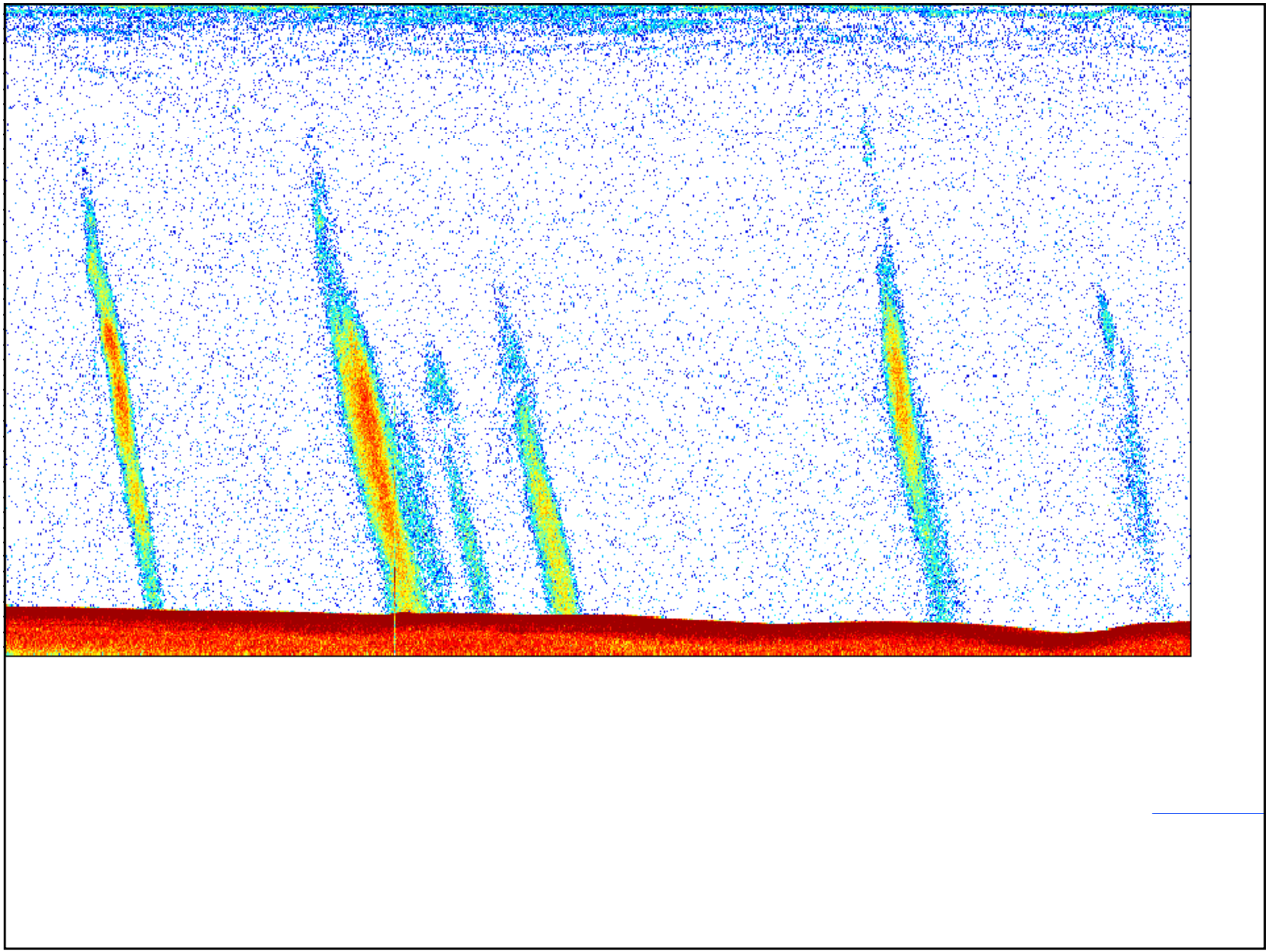


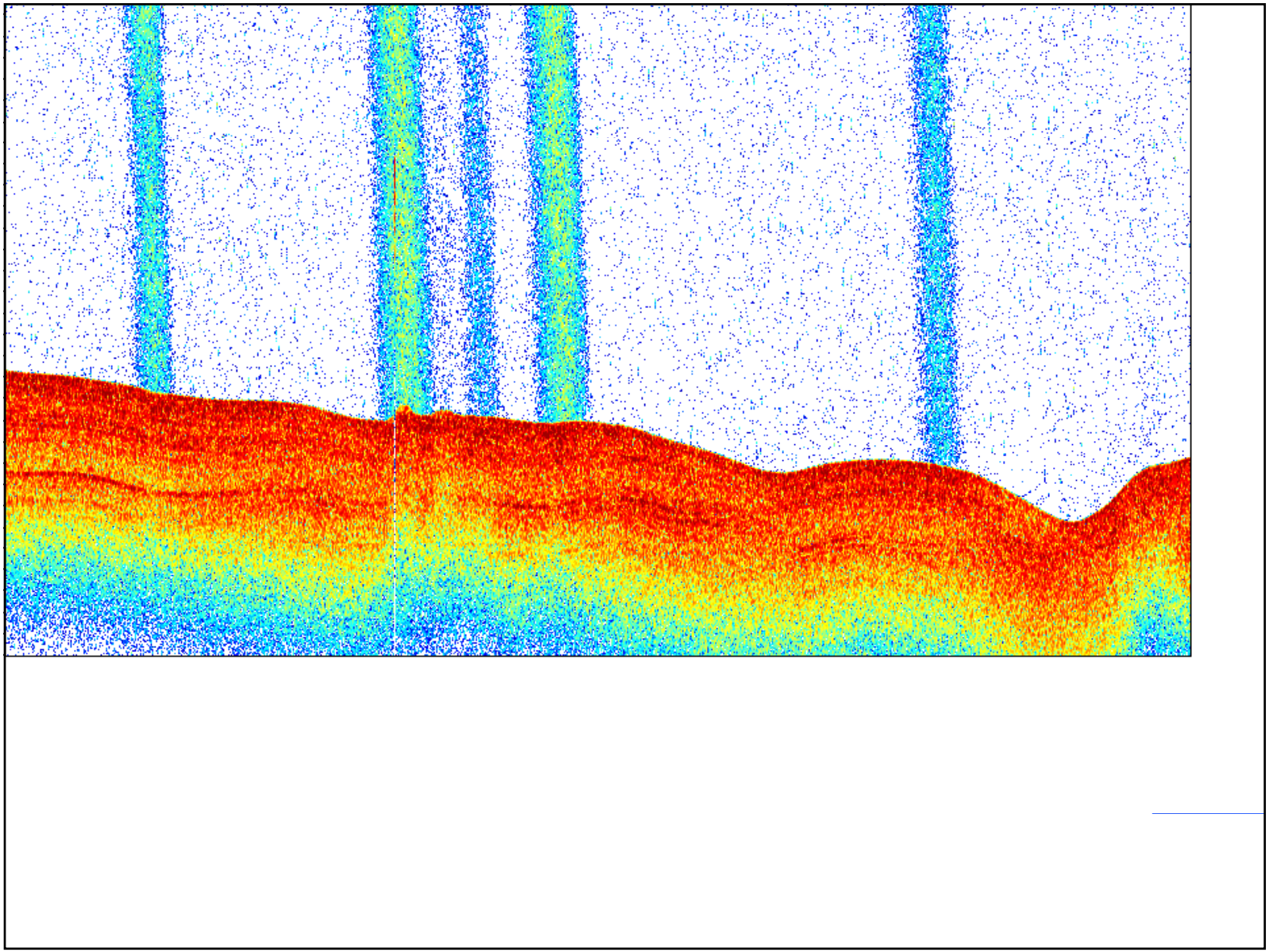

Erwin flare
Echogram 12kGz 11.06.02
25
50
75
00
25
50
75
Depth, m
54 19.715'N 143 53.512E

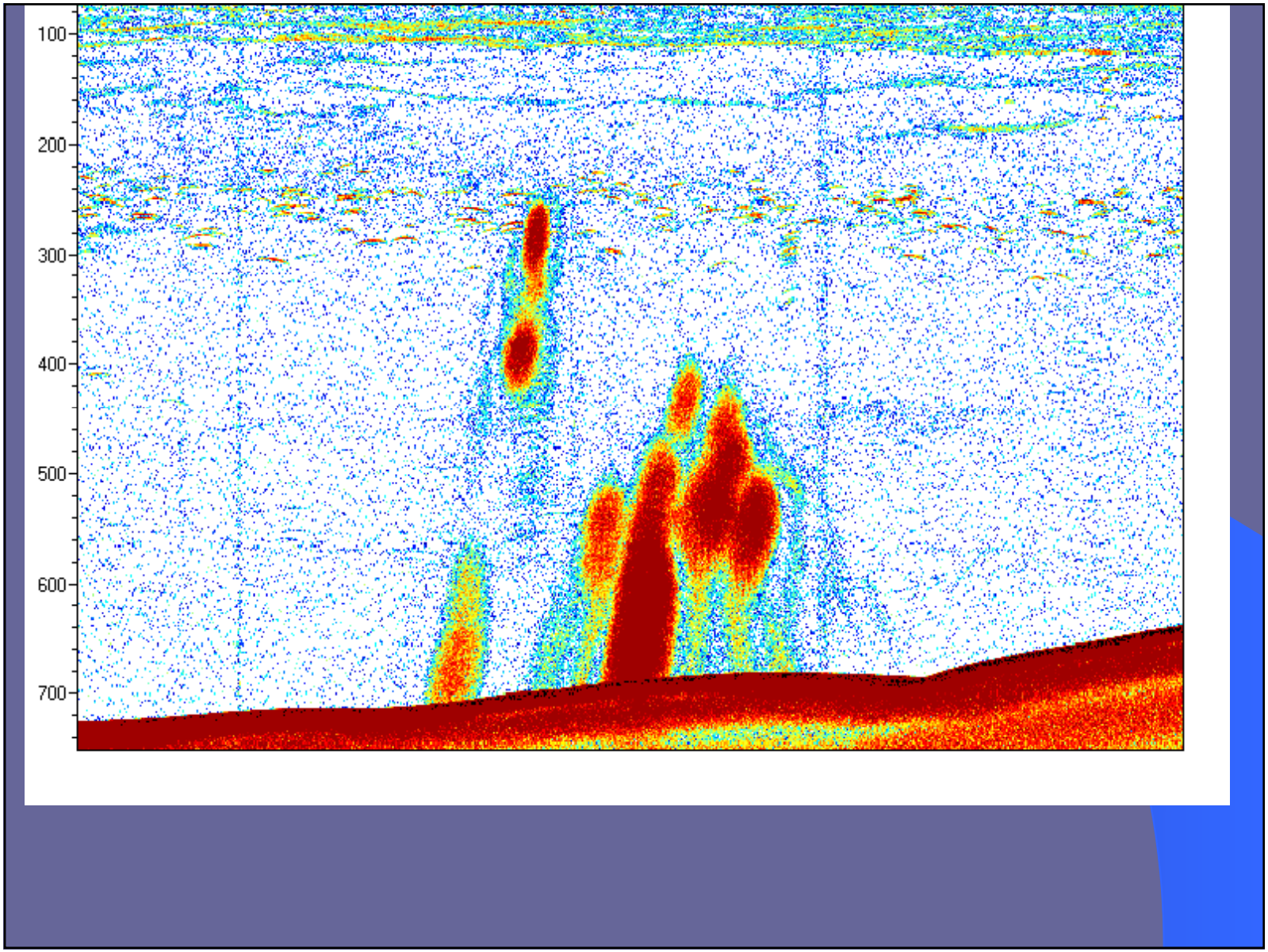

A
Echogram 12 kHz
72
Flare
73
Distance, km
B
Giselle Flare
Echogram 12 kHz
12.06.02
300 m
150 m
V=10 knots
V=5 knots
drift
drift

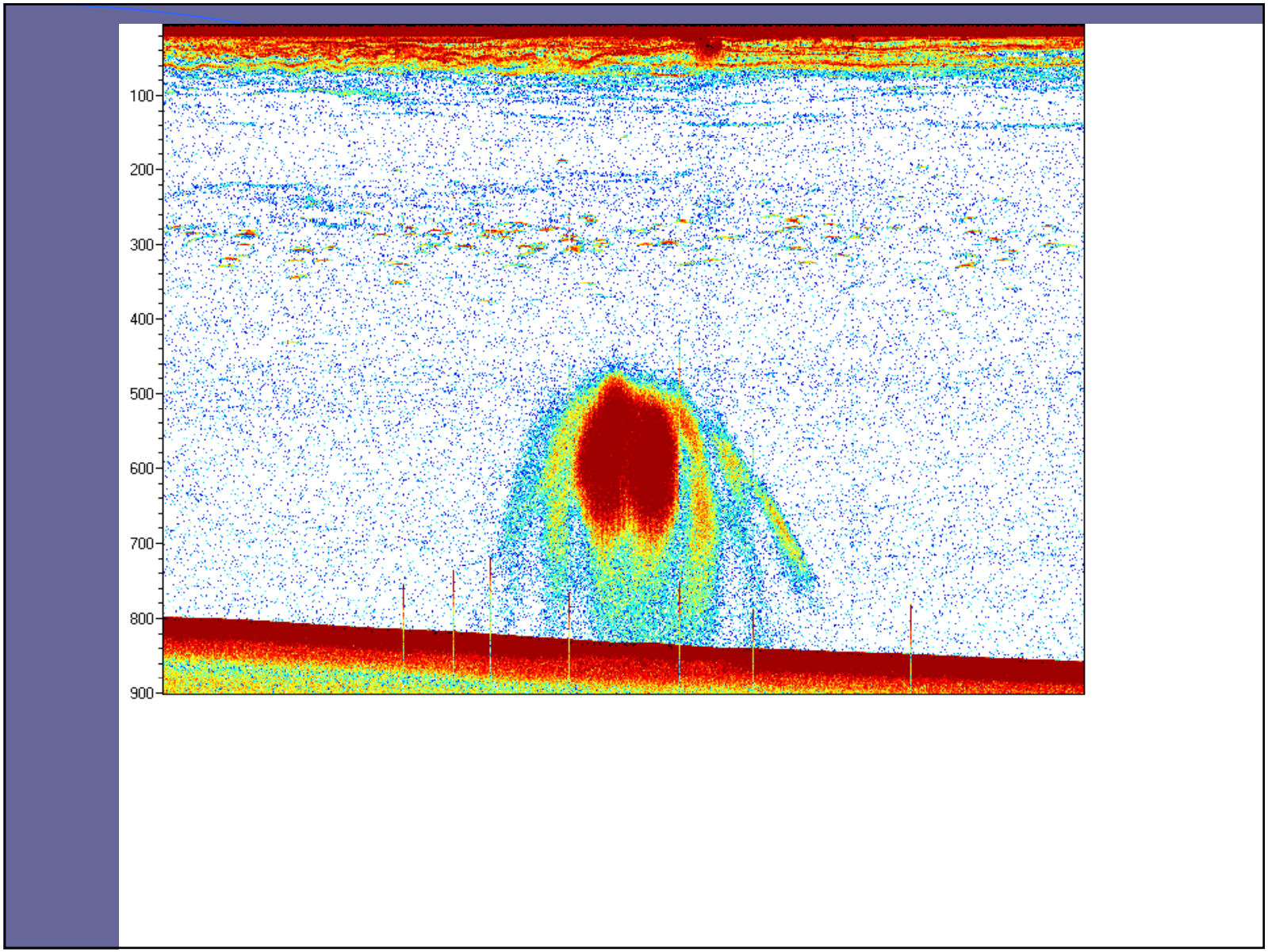


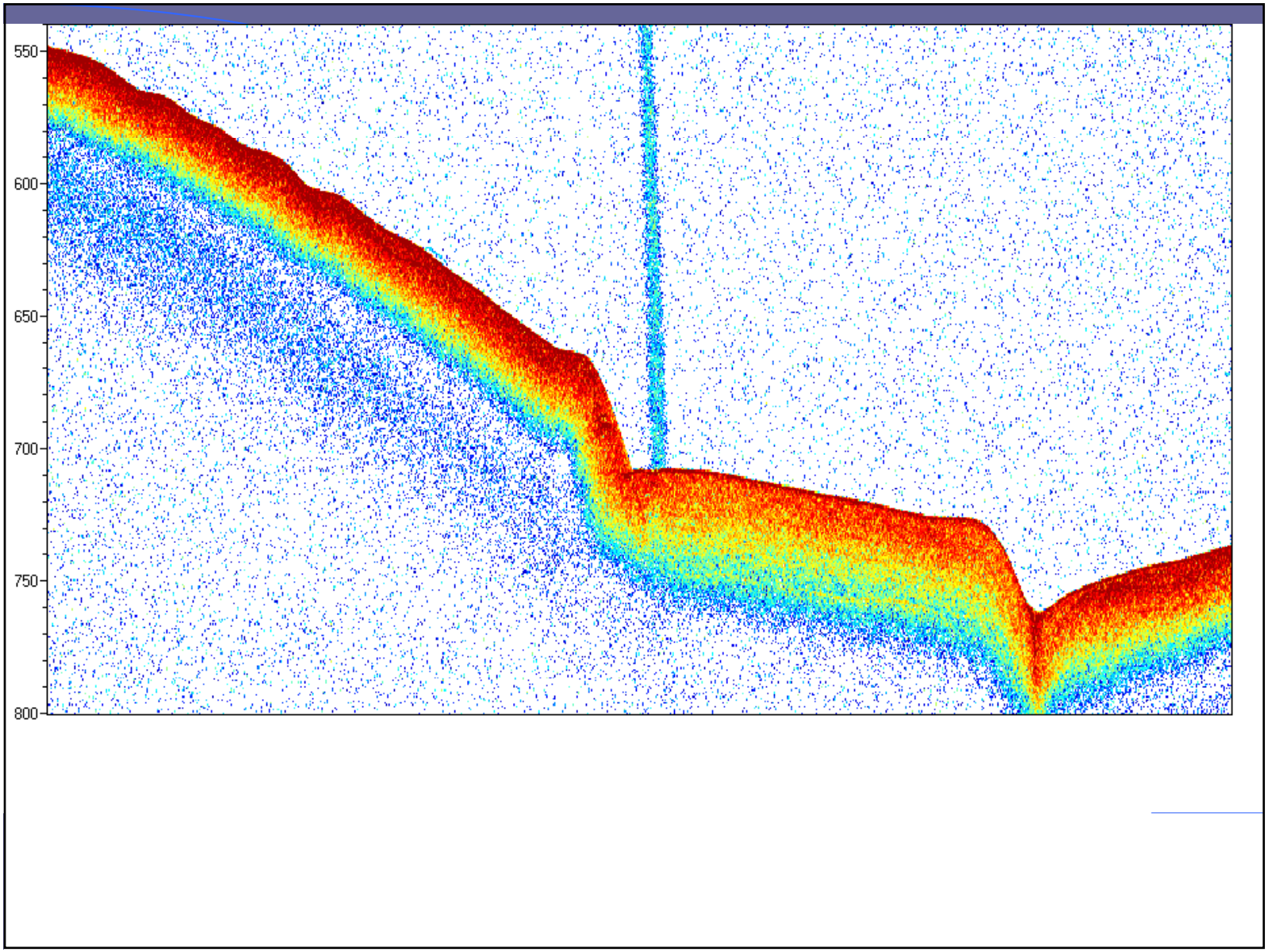




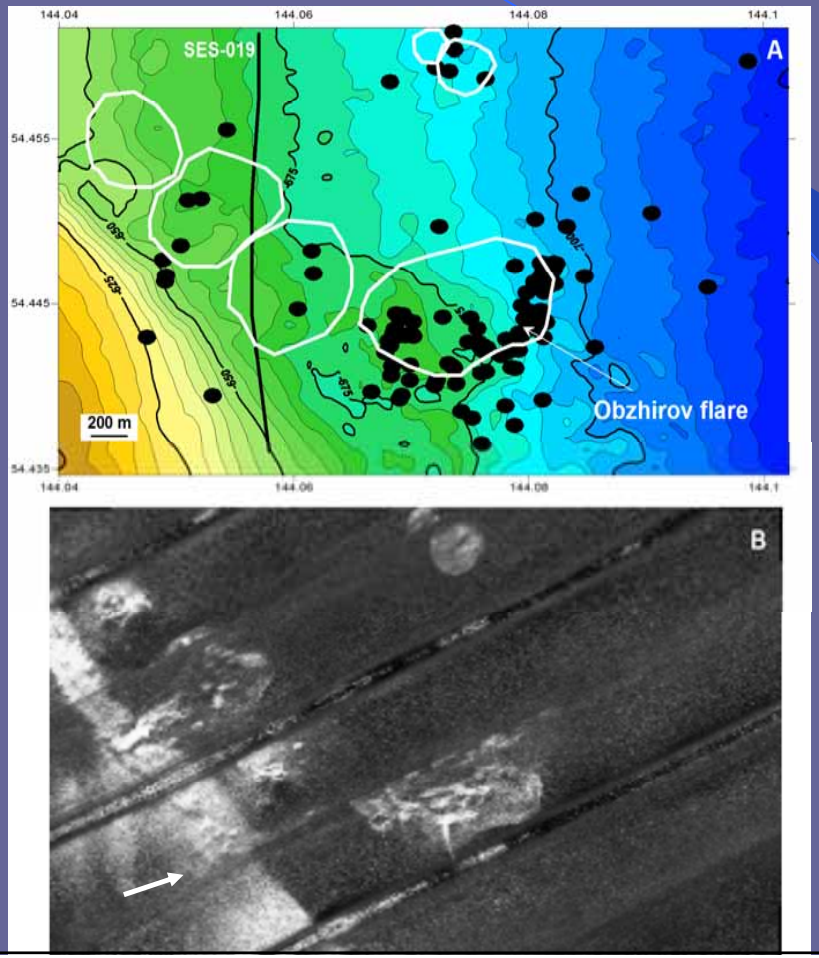








-A, Methane flux (black point)
-B, sonar survey



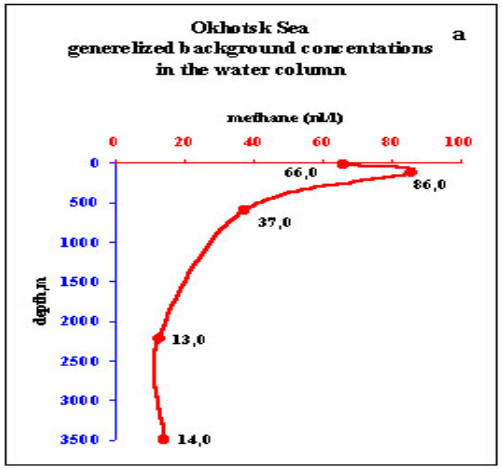


Fig. 2. Background methane concentrations in the water column of the Okhotsk Sea

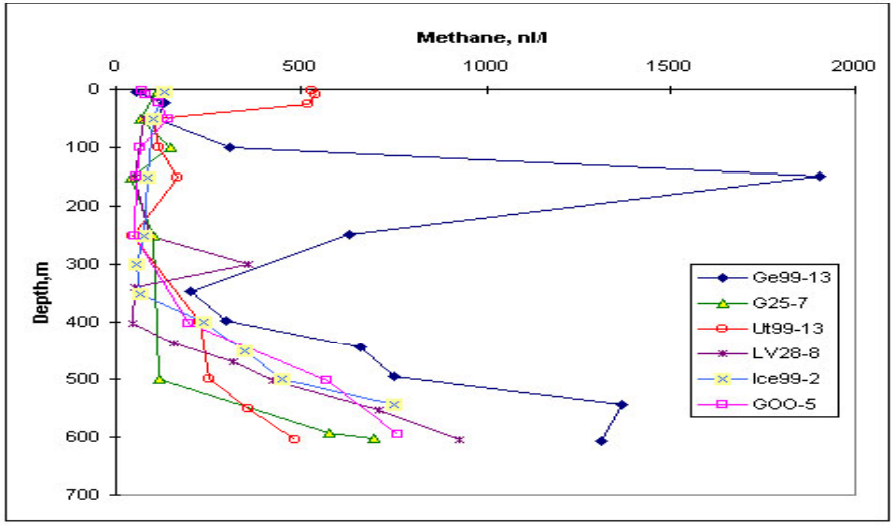
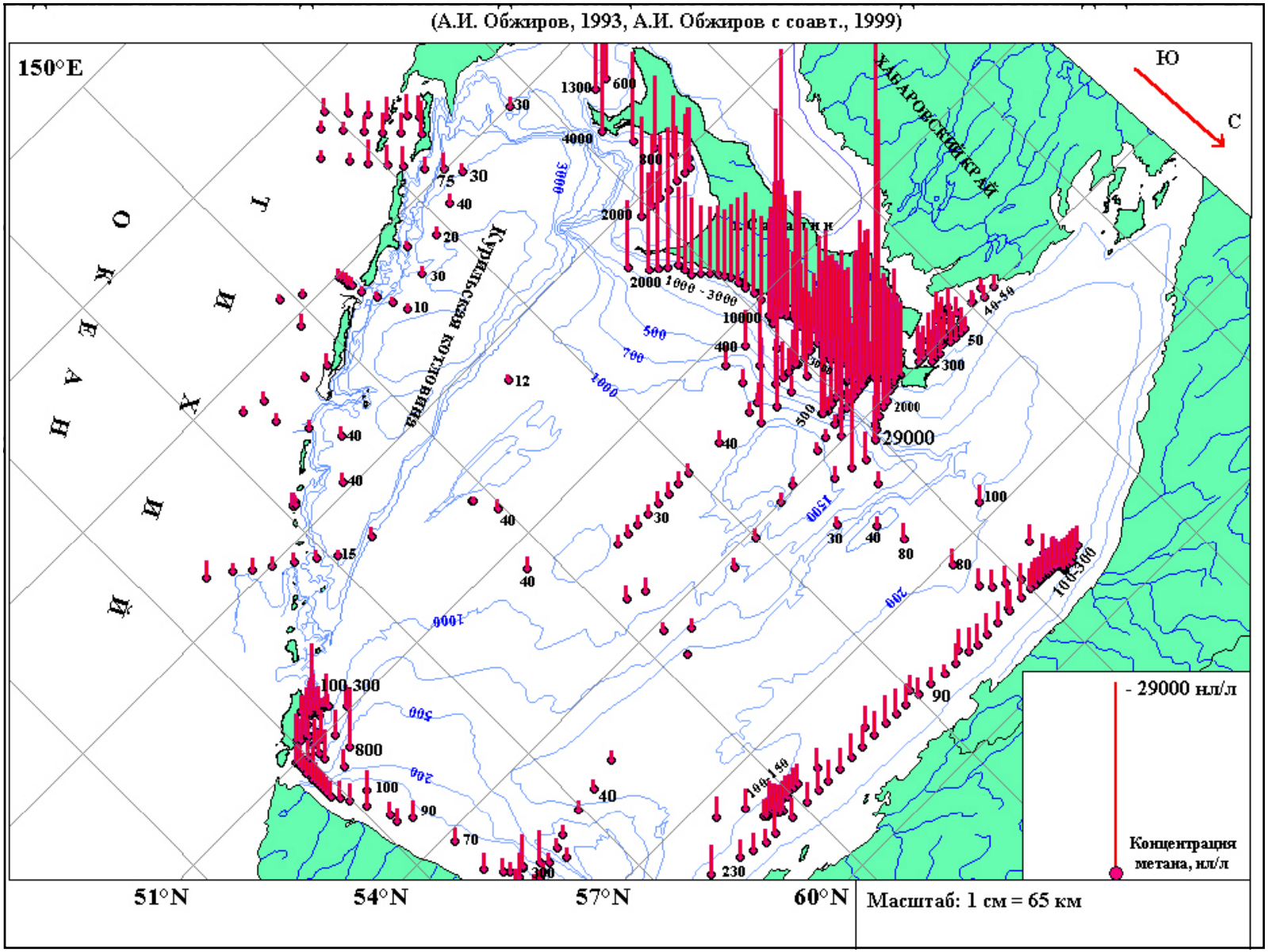
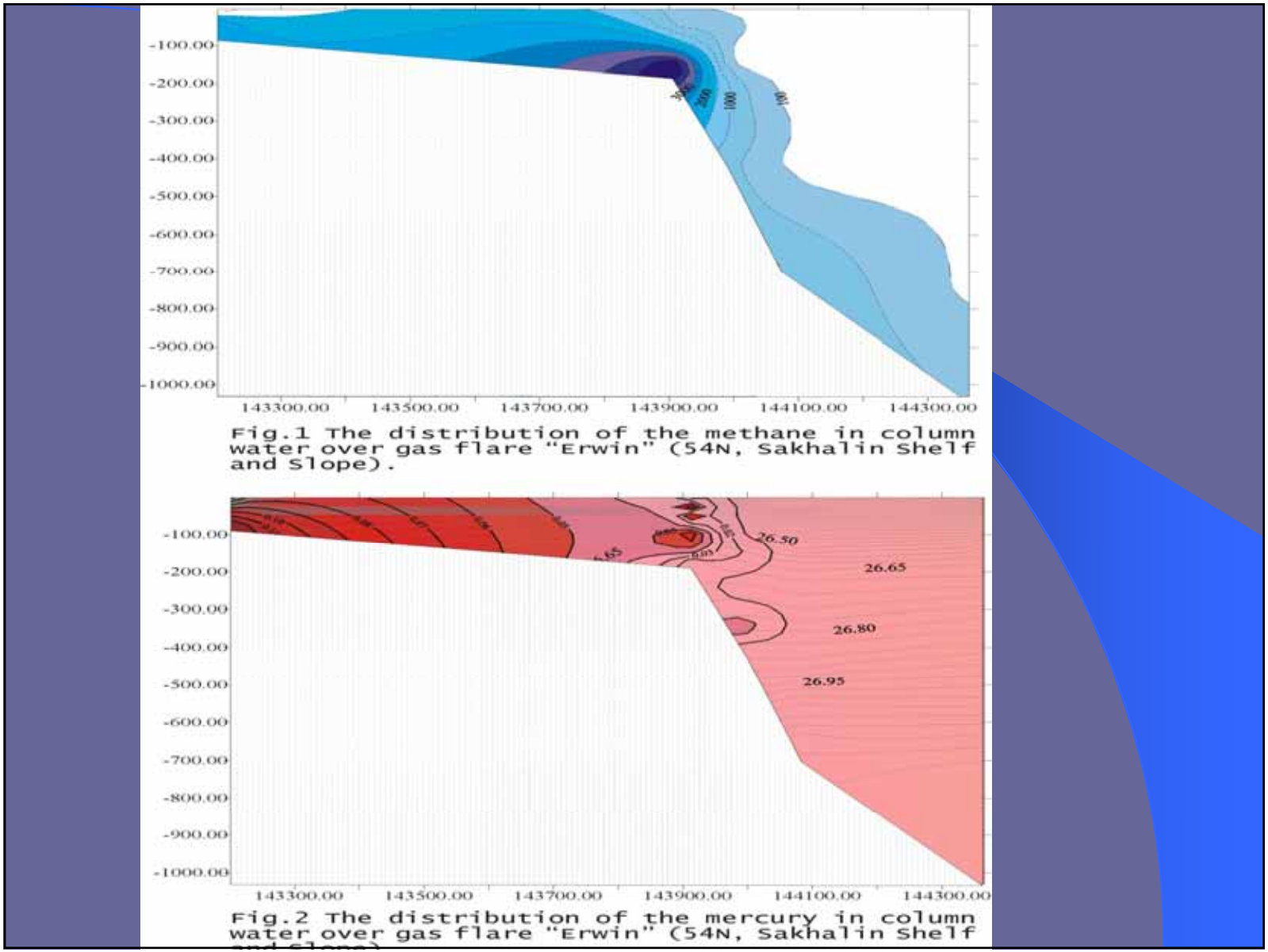
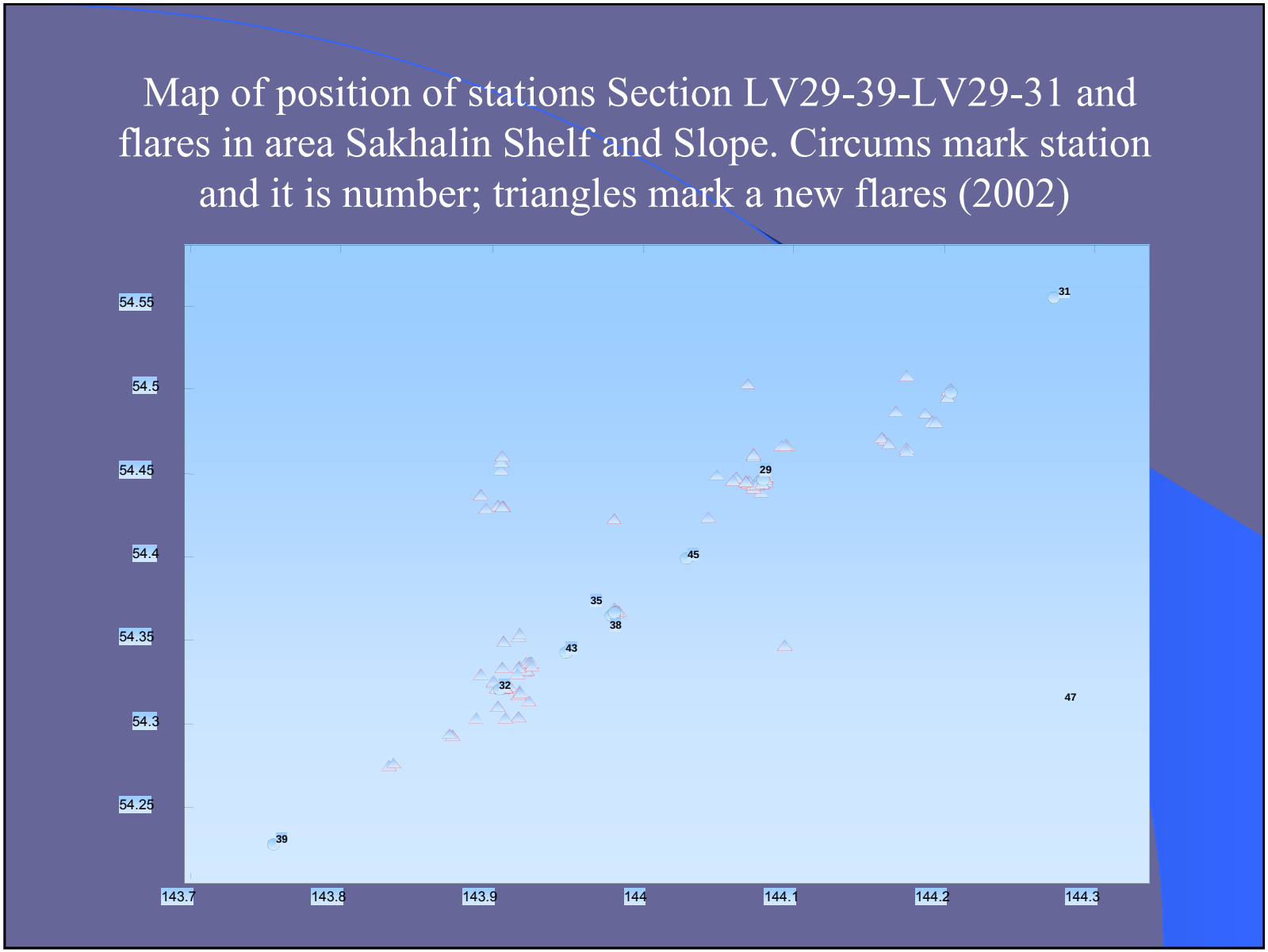


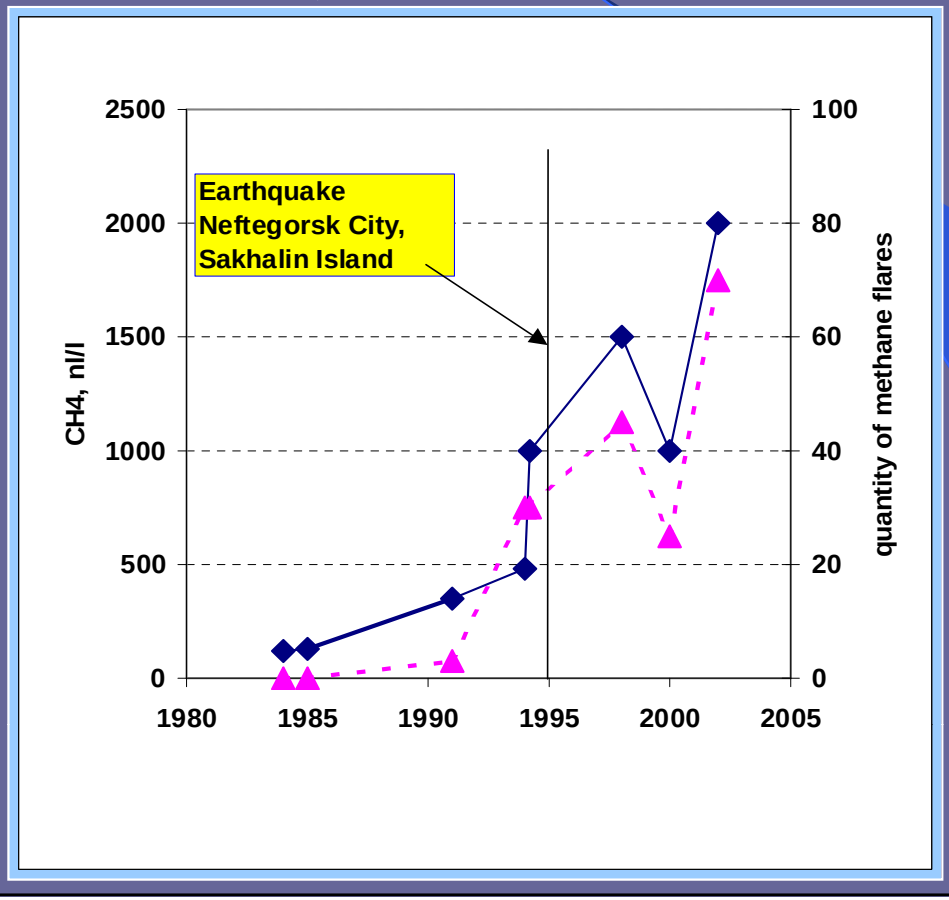
Fig. 3 Methane distribution in water column in area near "Obzhirov" Flare in the different expedition and different seasons: Ge99-13 - August 1999, G25-7 - November 1998, Ut99-13 - May 1999, LV28-8 - September 1998, Ice99-2 - March 1999, G00-5 - May 2000. Methane was measured in the same point (area see red square on the fig. 1). Methane anomalies are observed in different layers: surface, intermediate and bottom.

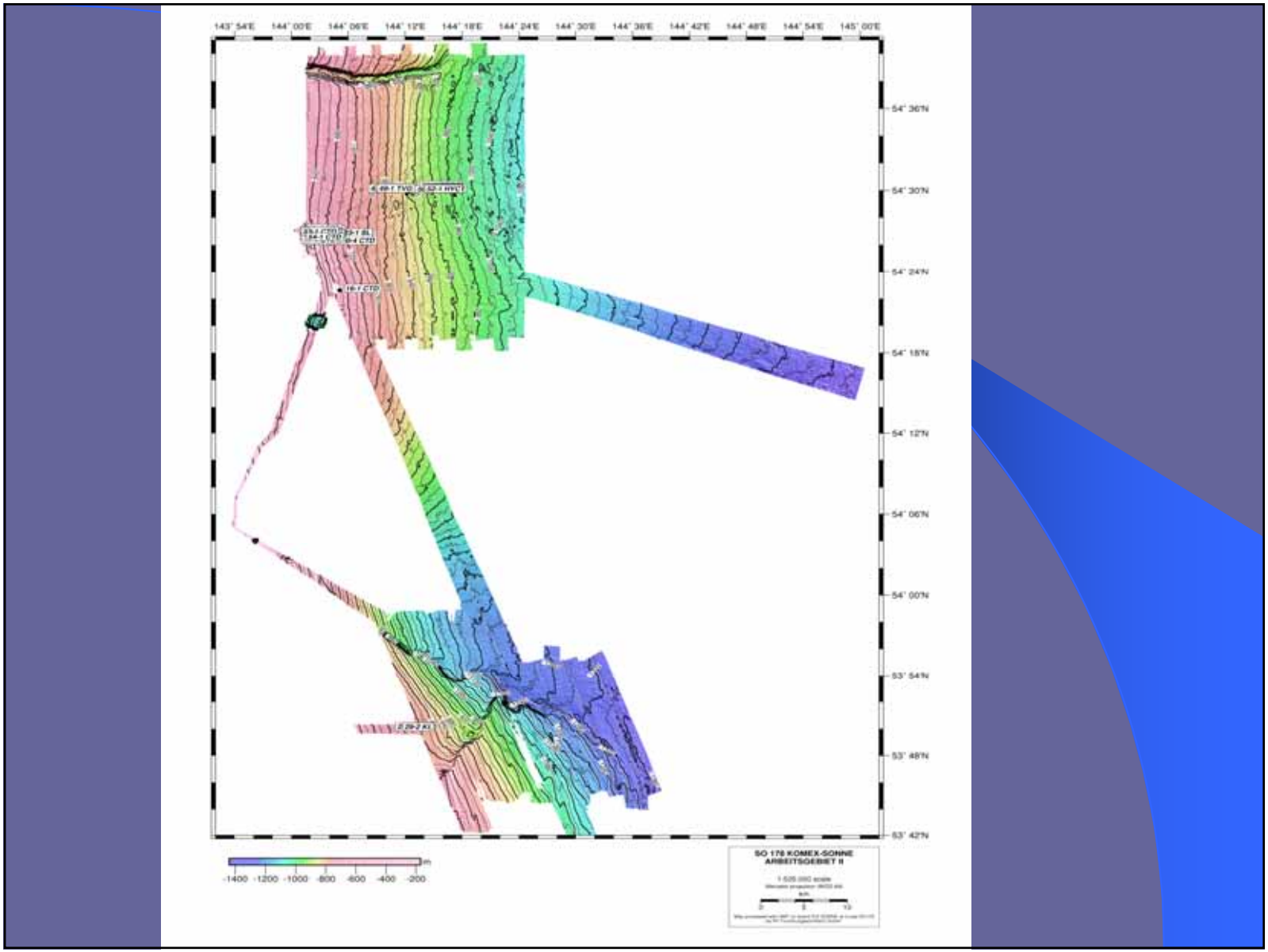

(А.И. Обжиров, 1993, А.И. Обжиров с соавт., 1999)
150°E
Ю
С
ХАБАРОВСКИЙ КРАЙ
Курильская котловина
ОХОТСКОЕ МОРЕ
29000
- 29000 нл/л
Концентрация метана, нл/л
51°N
54°N
57°N
60°N
Масштаб: 1 см = 65 км

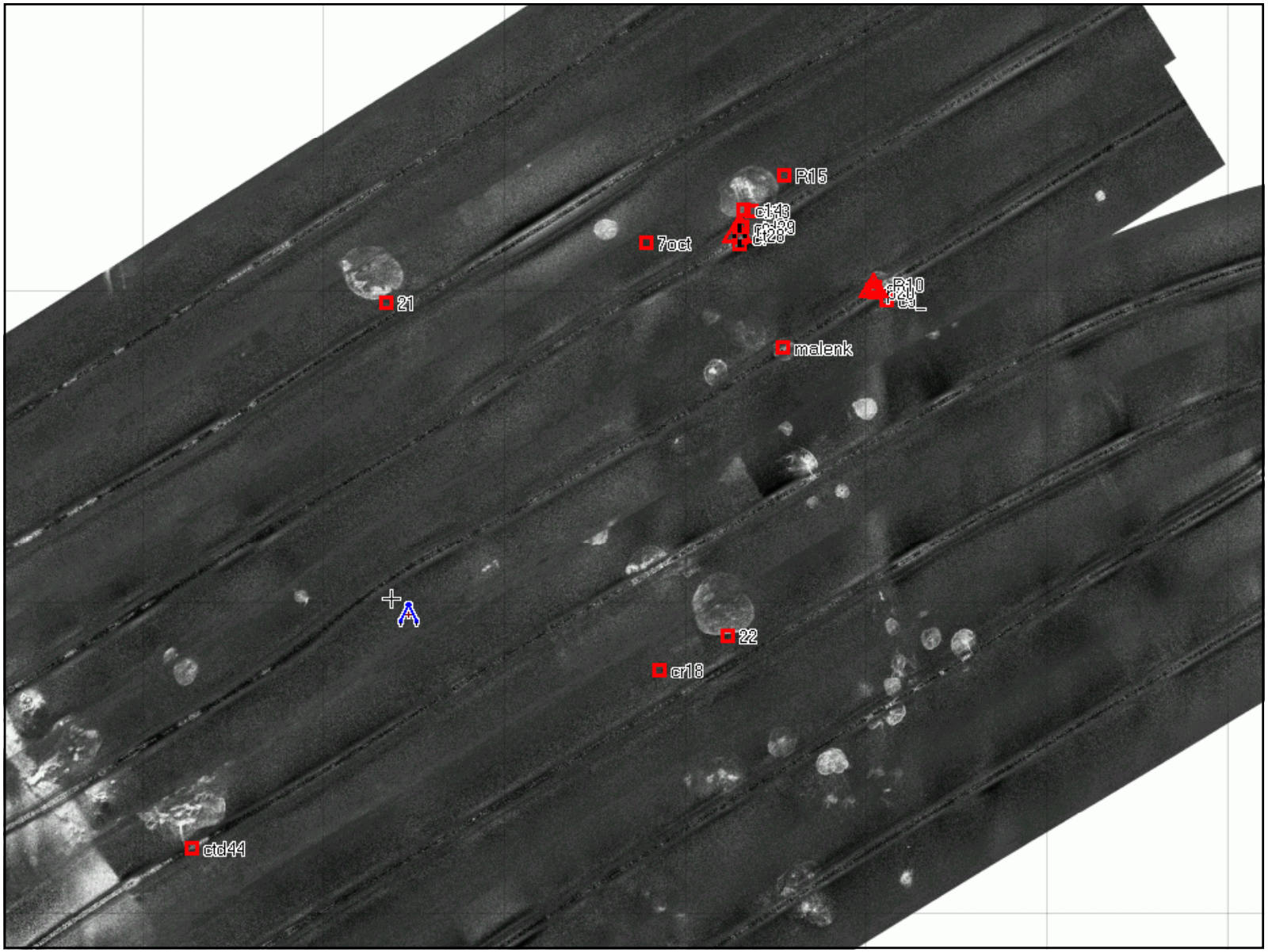

-100.00
-200.00
-300.00
-400.00
-500.00
-600.00
-700.00
-800.00
-900.00
-1000.00
143300.00
143500.00
143700.00
143900.00
144100.00
144300.00
Fig.1 The distribution of the methane in column water over gas flare "Erwin" (54N, Sakhalin Shelf and Slope).
26.50
26.65
26.80
26.95
Fig.2 The distribution of the mercury in column water over gas flare "Erwin" (54N, Sakhalin Shelf

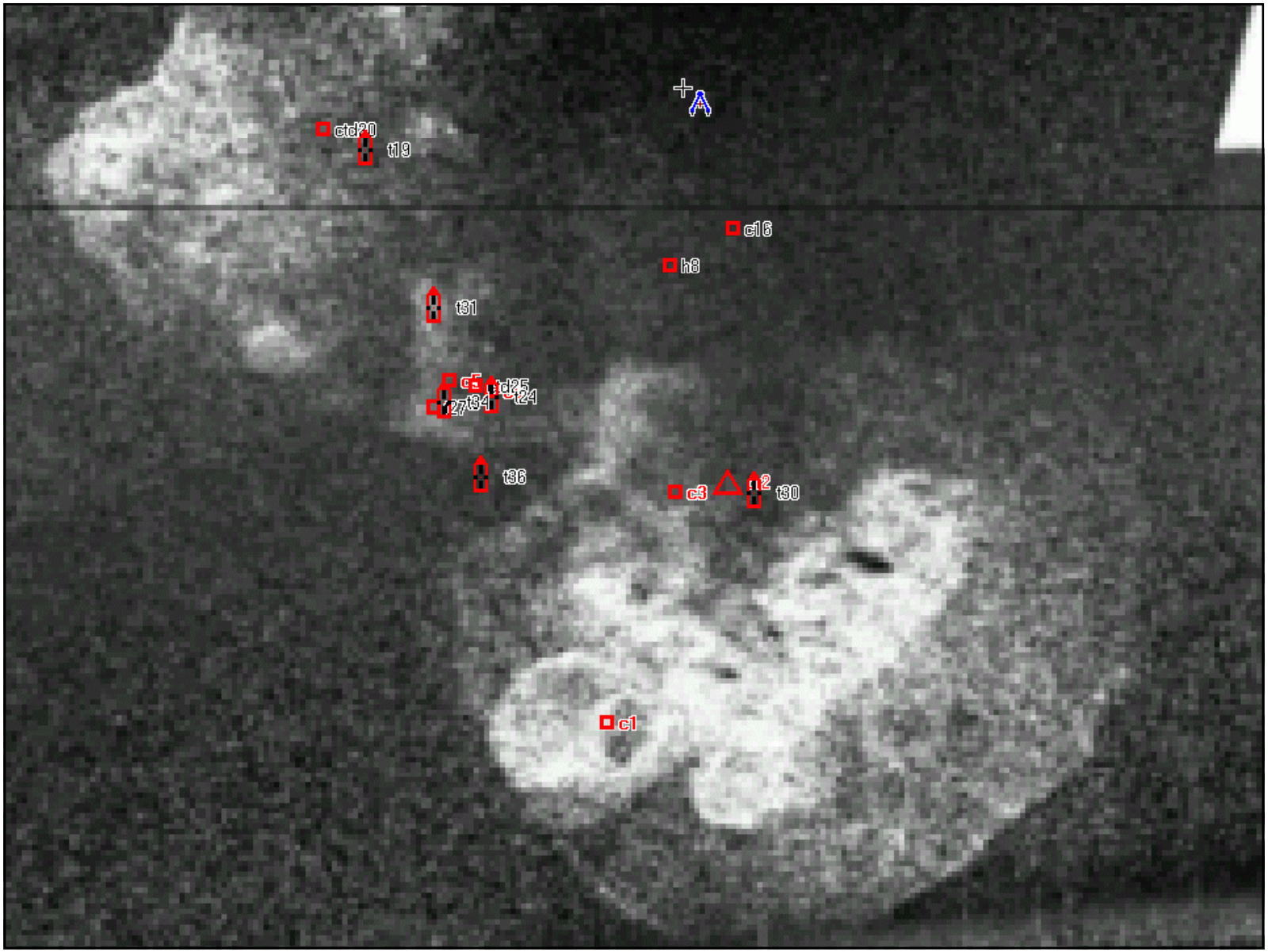

Map of position of stations Section LV29-39-LV29-31 and flares in area Sakhalin Shelf and Slope. Circums mark station and it is number; triangles mark a new flares (2002)
54.55
54.5
54.45
54.4
54.35
54.3
54.25
143.7
143.8
143.9
144
144.1
144.2
144.3
31
29
45
35
38
43
32
47
39

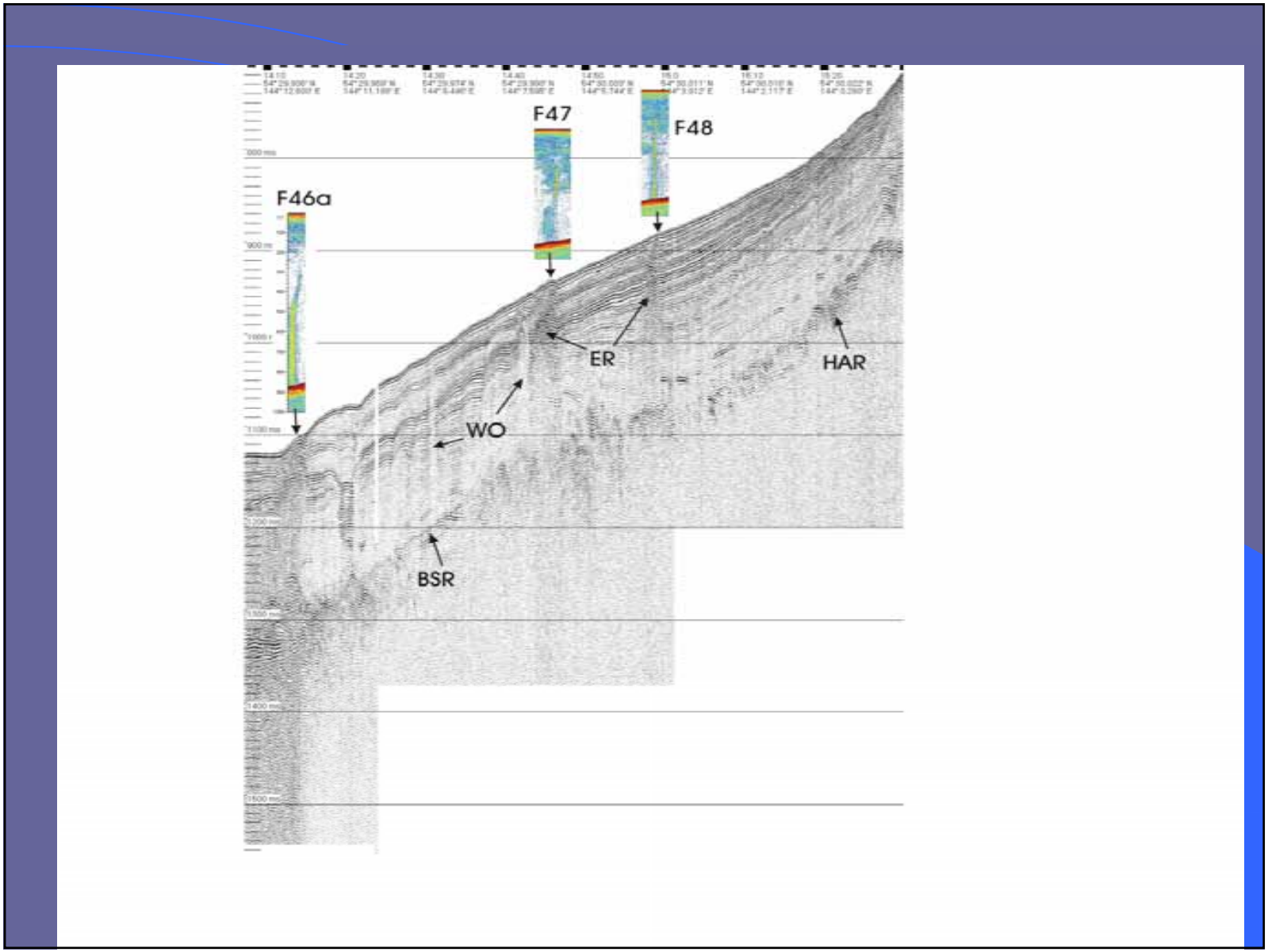
Variations of methane concentration in water and quantity of methane flares on a North-East shelf and slope of Sakhalin Island, Sea of Okhotsk.

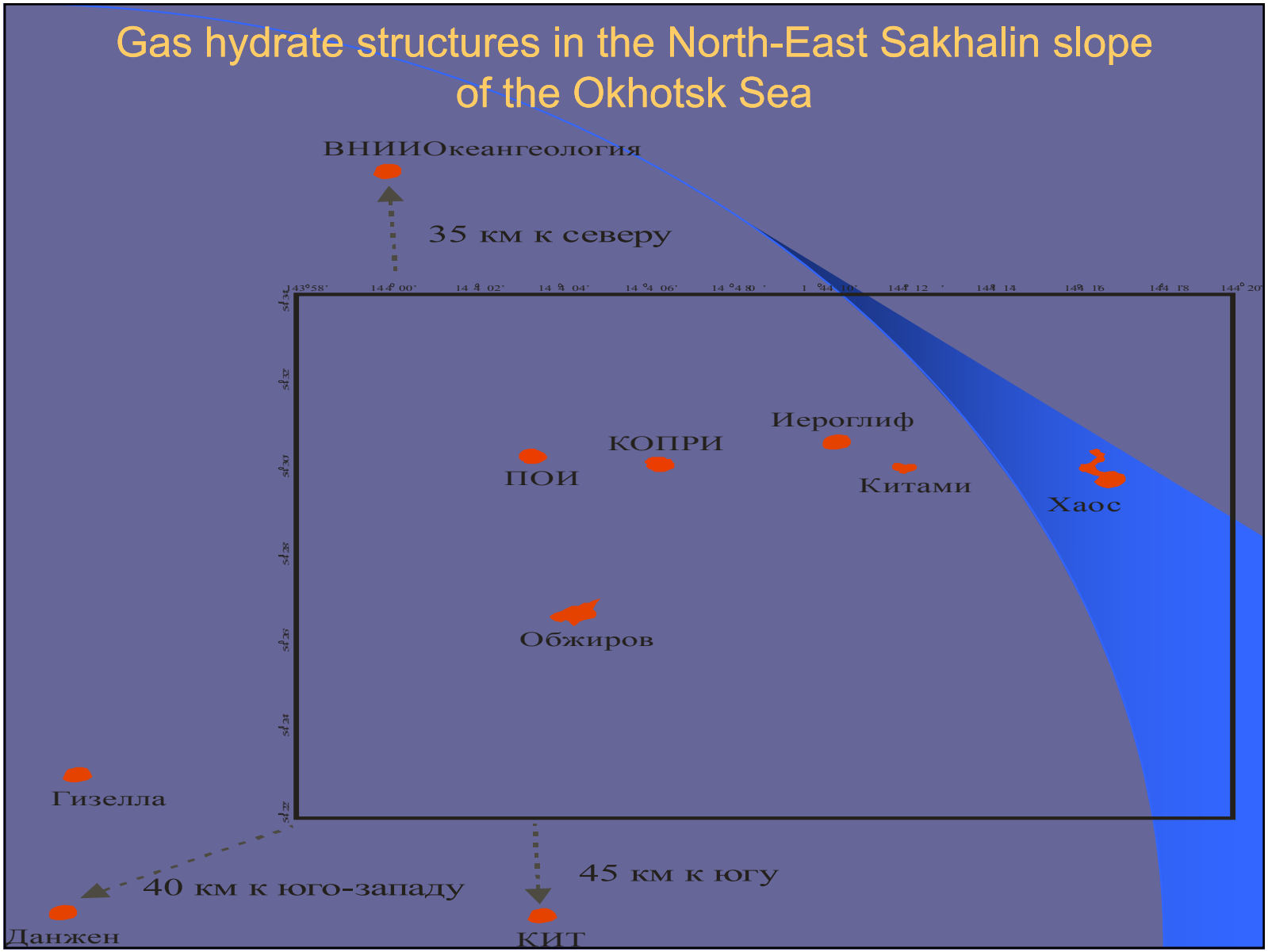


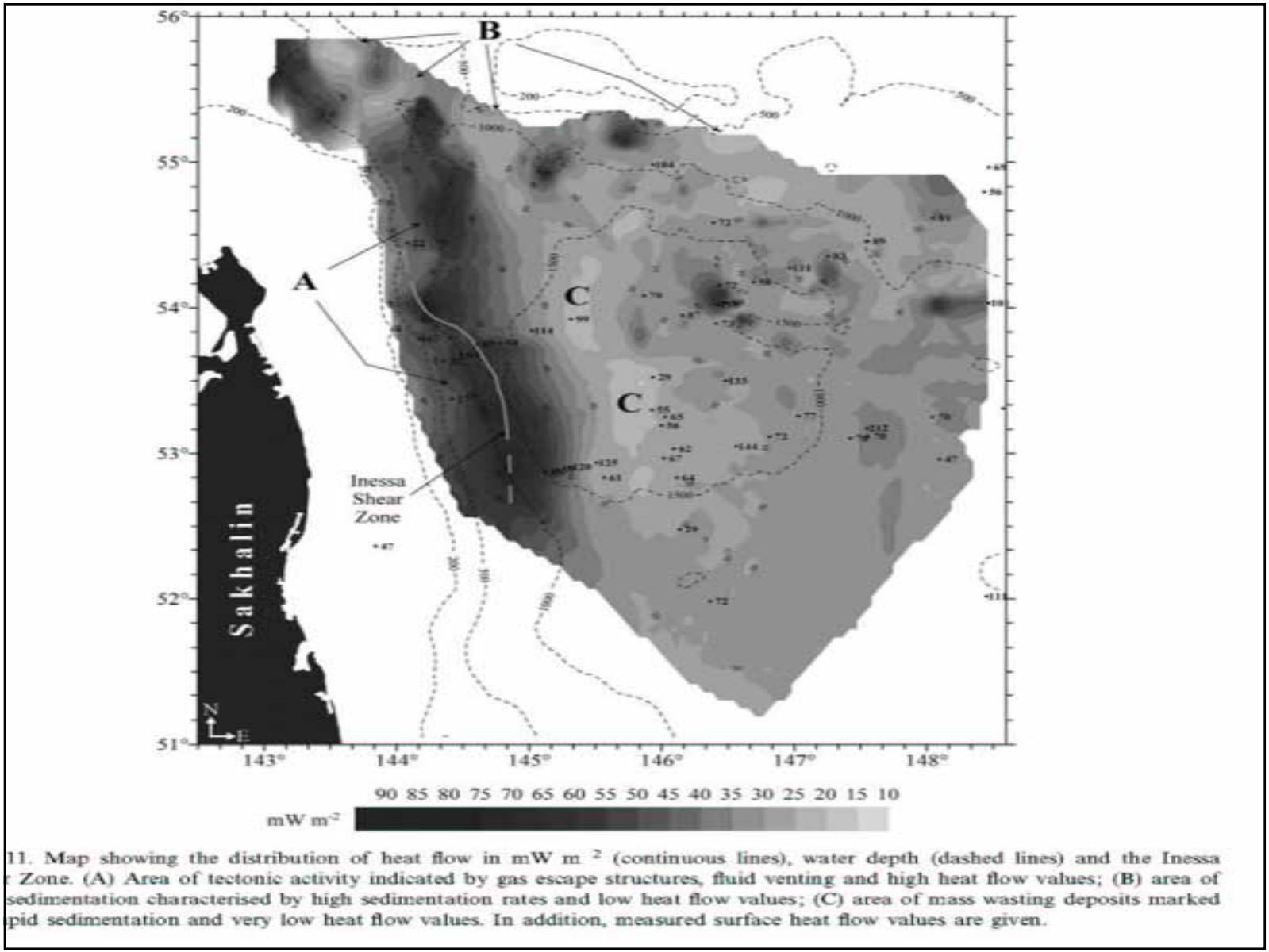

143° 54'E
144° 00'E
144° 06'E
144° 12'E
144° 18'E
144° 24'E
144° 30'E
144° 36'E
144° 42'E
144° 48'E
144° 54'E
145° 00'E
54° 36'N
54° 30'N
54° 24'N
54° 18'N
54° 12'N
54° 06'N
54° 00'N
53° 54'N
53° 48'N
53° 42'N
-1400 -1200 -1000 -800 -600 -400 -200
SO 178 KOMEX-SONNE
ARBEITSGEBIET II



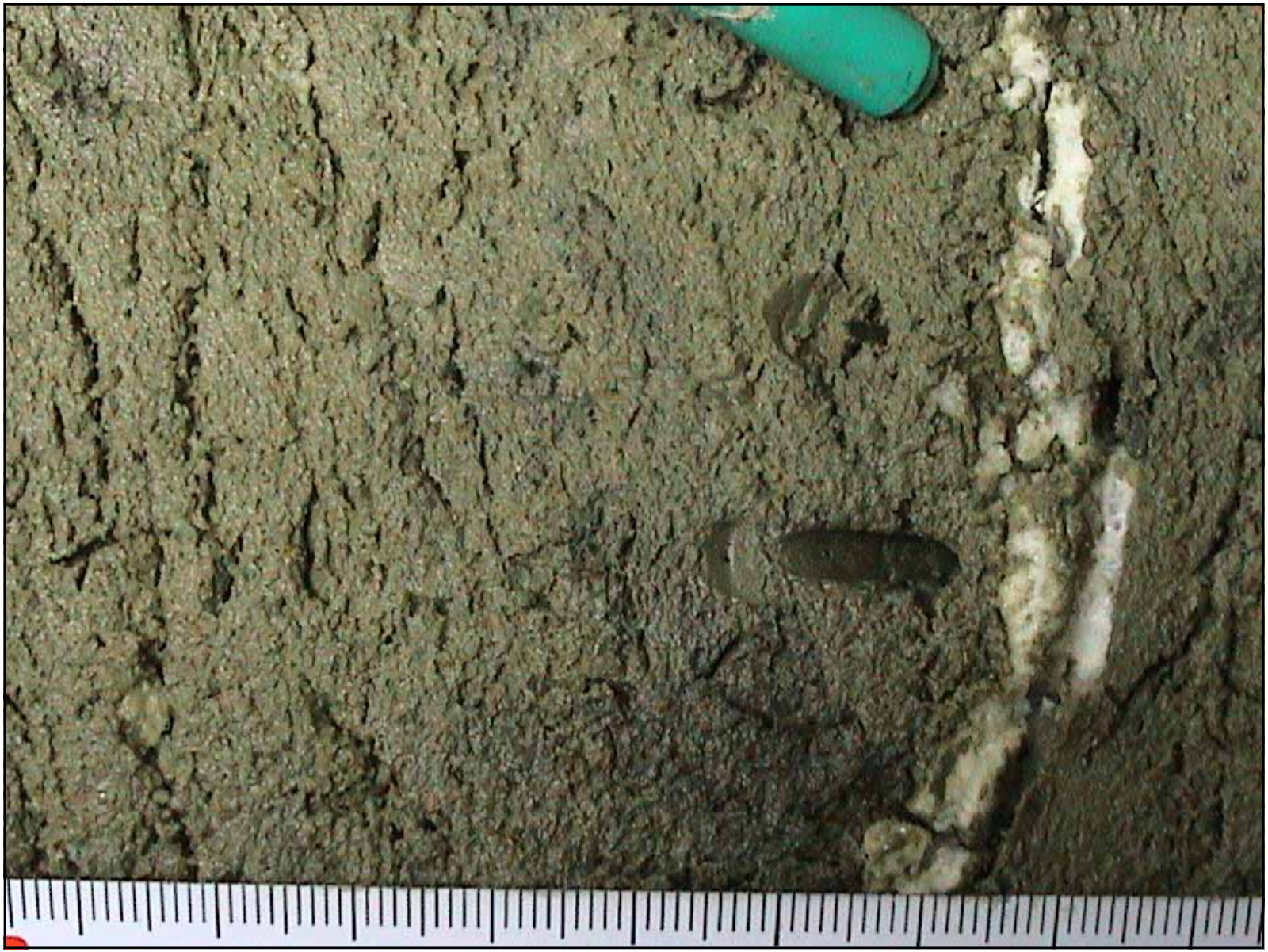


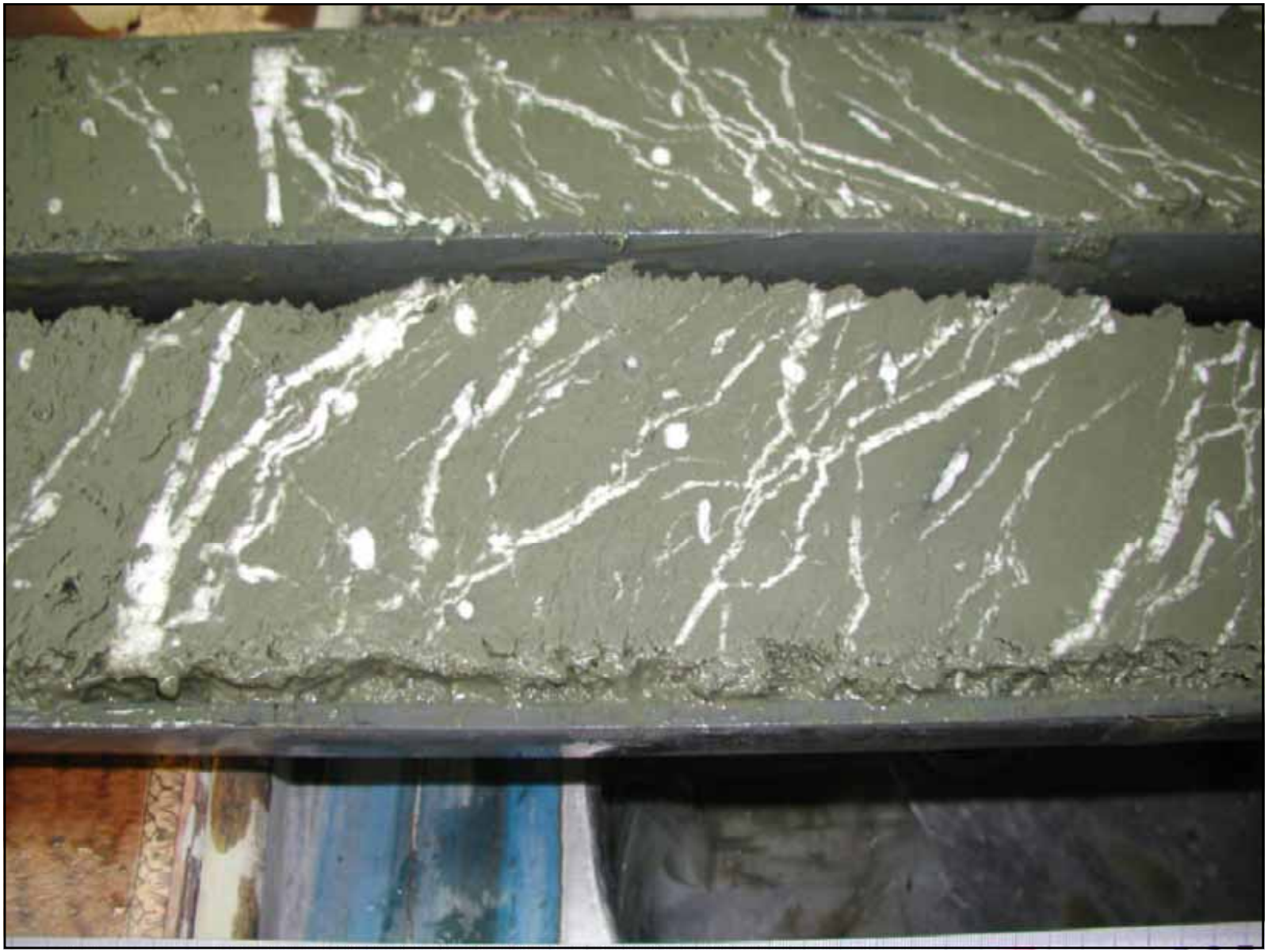


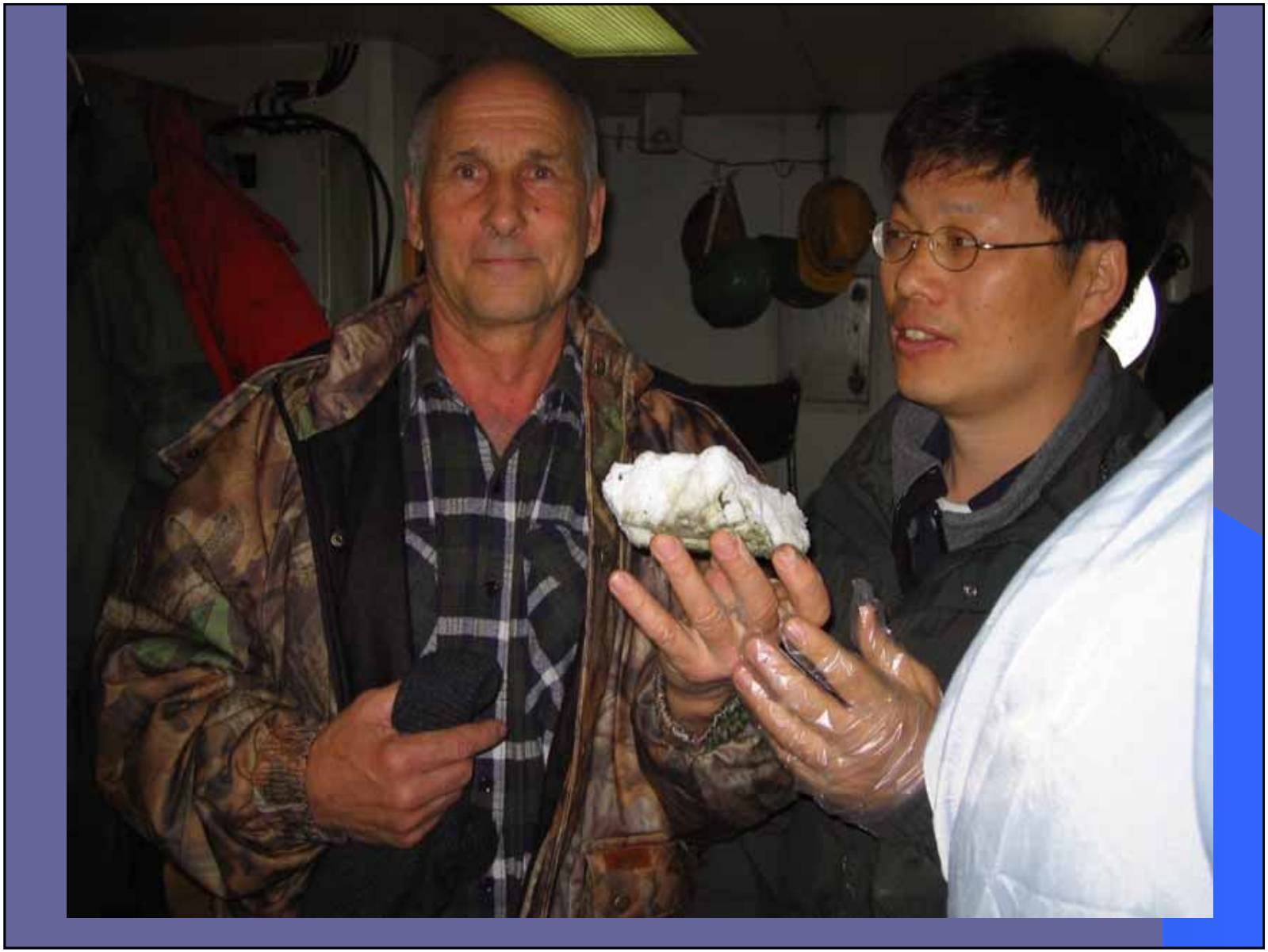

Gas hydrate structures in the North-East Sakhalin slope of the Okhotsk Sea
ВНИИОкеангеология
35 км к северу
Иероглиф
КОПРИ
ПОИ
Китами
Хаос
Обжиров
Гизелла
40 км к юго-западу
45 км к югу
Данжен
КИТ



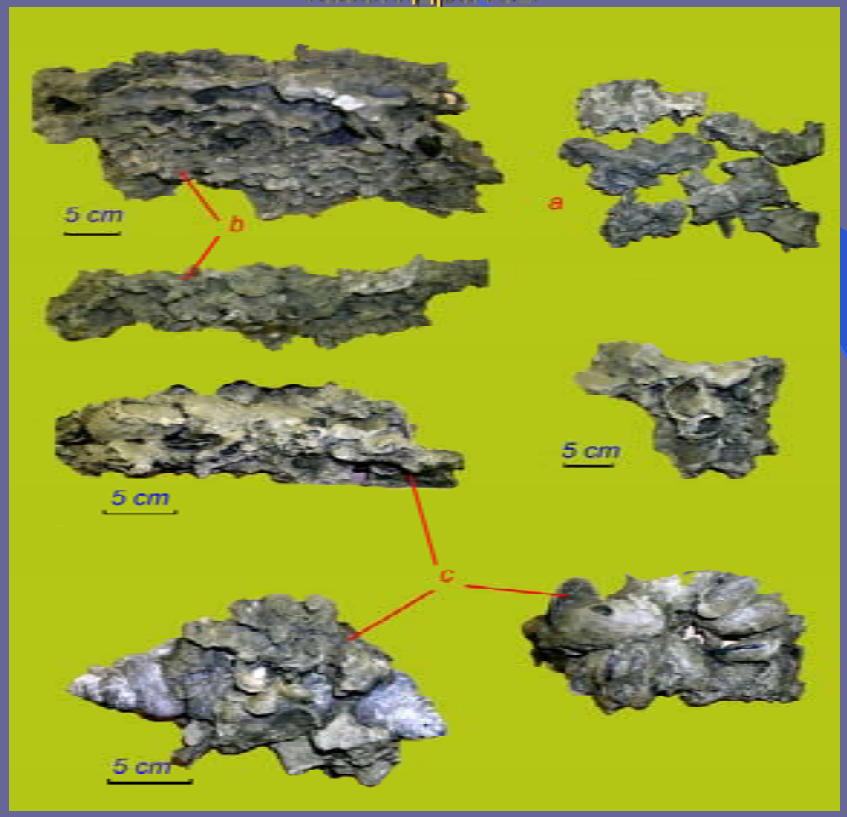
11. Map showing the distribution of heat flow in mW m $^{-2}$ (continuous lines), water depth (dashed lines) and the Inessa t Zone. (A) Area of tectonic activity indicated by gas escape structures, fluid venting and high heat flow values; (B) area of sedimentation characterised by high sedimentation rates and low heat flow values; (C) area of mass wasting deposits marked pid sedimentation and very low heat flow values. In addition, measured surface heat flow values are given.







Карбонатные конкреции, корки и сцементированные ими ракушки, обнаруженные на западном склоне впадины Дерюгина в районе выхода пузырей метана и поля газогидратов



Ракушки на дне моря в районе выхода пузырей метана и поля газогидратов. Впадина Дерюгина Охотского моря, глубина 700-1100 м

Схема распределения потоков метана на Сахалинском северо-восточном склоне Охотского моря

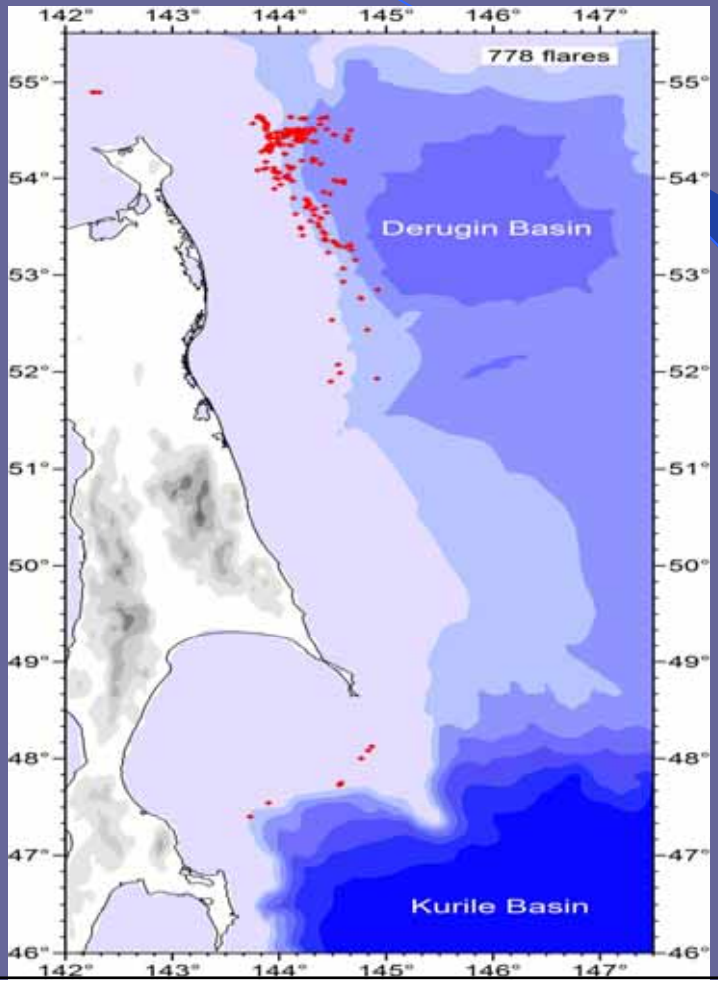
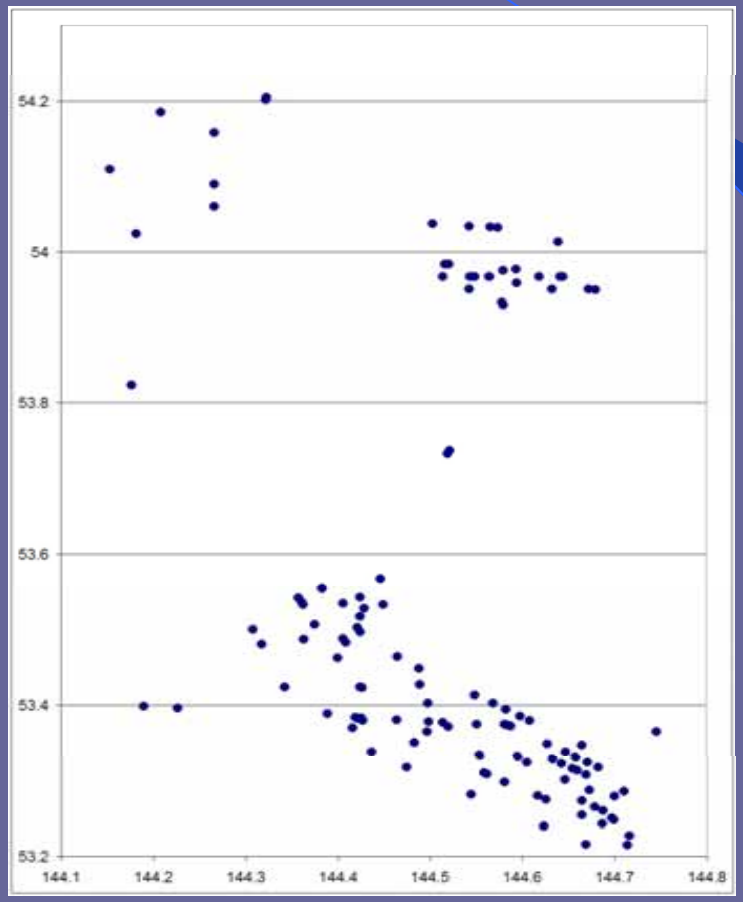
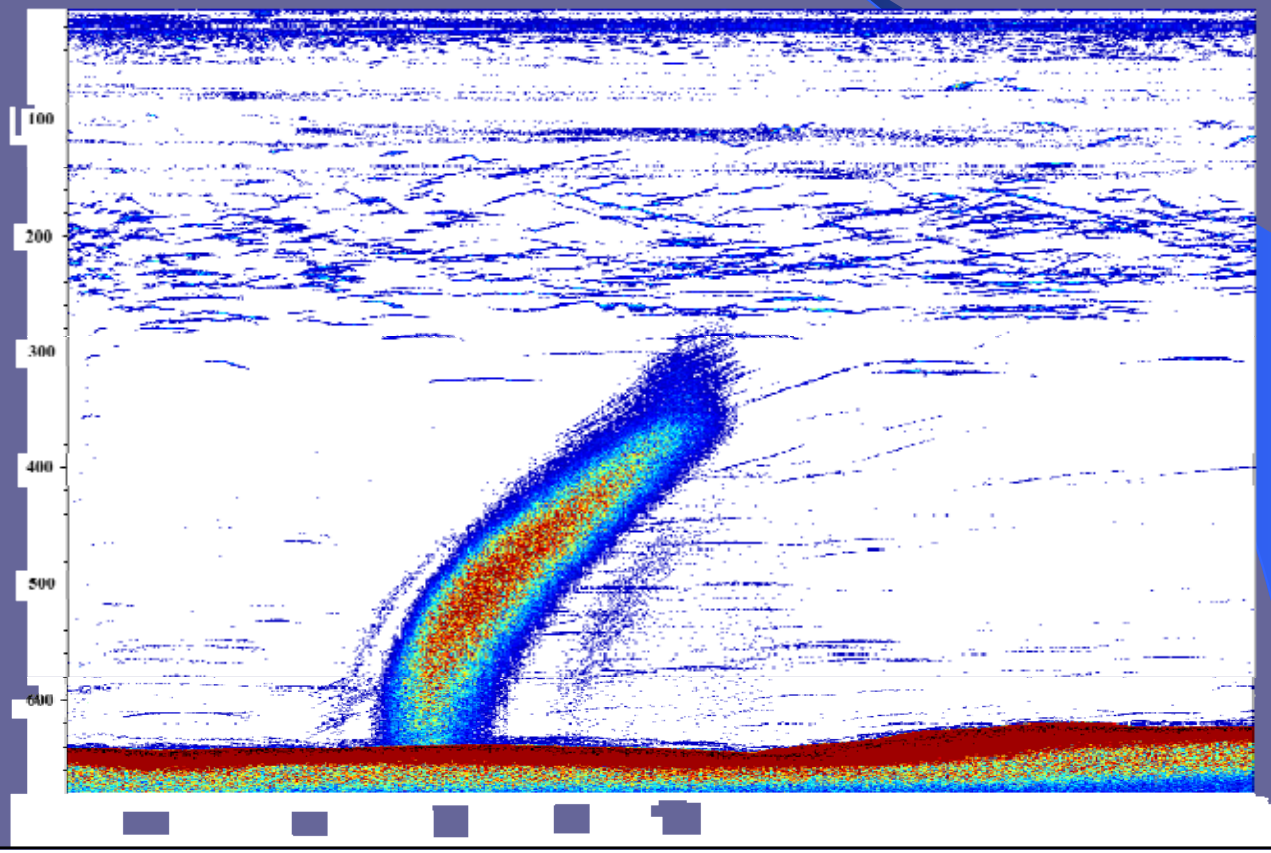


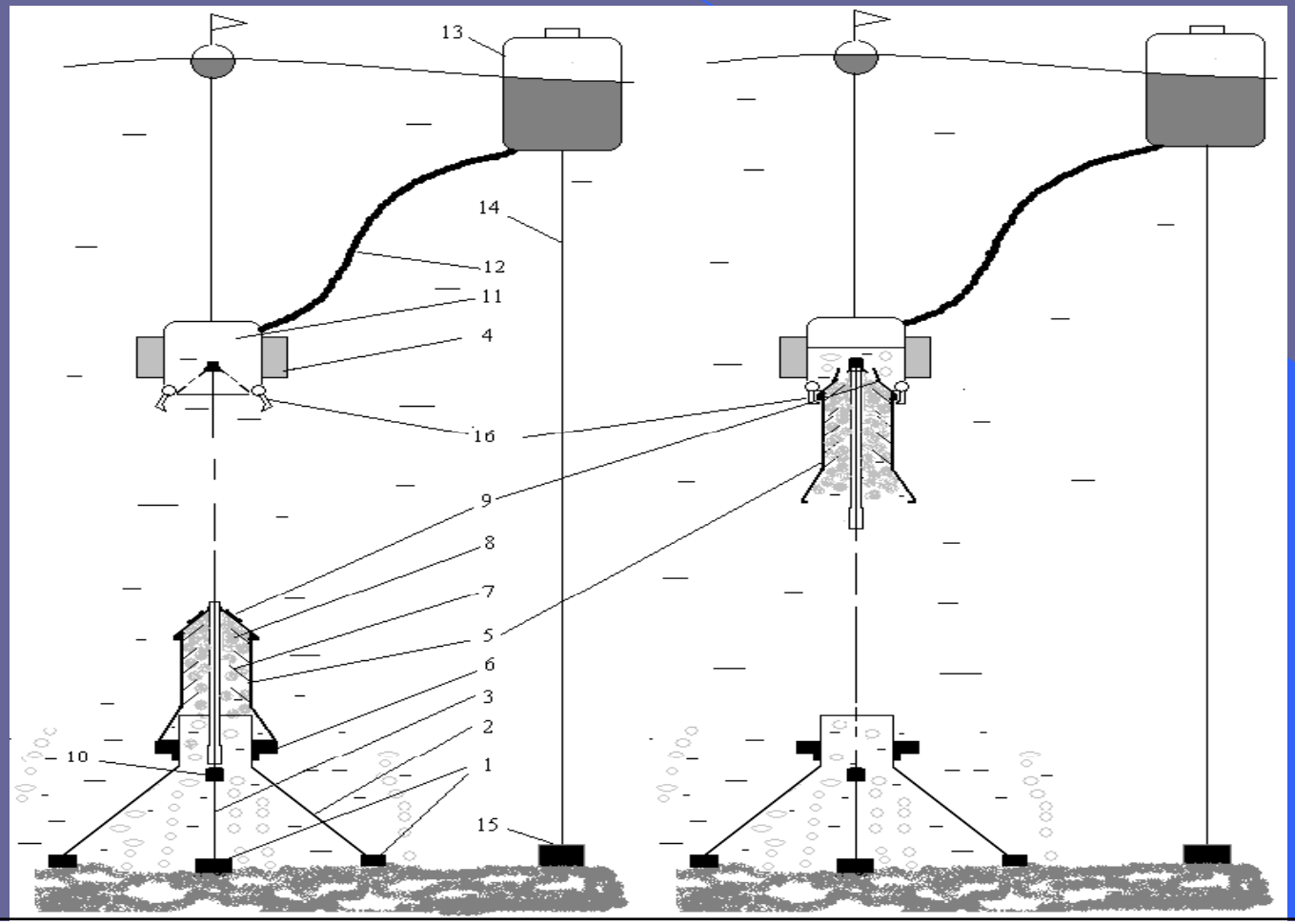
Схема распределения потоков пузырей метана на «северной» и «южной» площадях Сахалинского северо-восточного склона Охотского моря



Methane flux on the South area (LV47-2009, Okhotsk Sea)



Принципиальная схема сбора газа под куполом, отличающаяся от других подобных предложений:
1 - всплывающим коллектором; 2 – постановкой большого количества ловушек газа без их подъема и поочередного отбора из них газа



Conclusion

-Sources of methane are in the main oil-gas diposits and gas hydrate in NE Sakhalin shelf and slope.

-Methane flux is going from sediment to water via zone fault especially in period seismo-tectonic activity. In this case gas come from under gas hydrate layer (BSR) and form a new gas hydrate in surface sediment in the flare area.

РОССИЙСКАЯ ФЕДЕРАЦИЯ

ПАТЕНТ

НА ПОЛЕЗНУЮ МОДЕЛЬ

№ 70377

ГАЗОГЕОФИЗИЧЕСКИЙ КОМПЛЕКС ДЛЯ ОБНАРУЖЕНИЯ ПОДВОДНЫХ ВЫХОДОВ ГАЗОГИДРАТОВ

Патентообладатель(ли): *Тихоокеанский океанологический институт им. В.И. Ильичева Дальневосточного отделения Российской академии наук (ТОИ ДВО РАН) (RU)*

Автор(ы): *см. на обороте*

Заявка № 2007135497

Приоритет полезной модели 24 сентября 2007 г.

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Срок действия патента истекает 24 сентября 2017 г.

Руководитель Федеральной службы по интеллектуальной собственности, патентам и товарным знакам

Б.П. Симонов