

IODP Proposal Coversheet

Continental Margin Methane Cycling: Rio Grande	Received for: 2019-01-28
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Title

Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)

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Keywords

microbial methanogenesis, hydrates, carbon cycle

Area

Brazil Atlantic margin

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Yes

Abstract

Enormous quantities of microbial methane occur in continental margin sediments. This methane exists as dissolved gas, free gas, or gas hydrate. However, its abundance and importance remain poorly understood, because of major open issues regarding the formation and flow of methane. These include reaction pathways and rates of microbial methanogenesis; the influence of sediment lithology, temperature, and organic matter composition upon methanogenesis; the relative importance of shallow versus deep methanogenesis; the cycling of carbon and its sequestration as carbonate in the sediment; and carbon release from the sediment column back to the ocean. These outstanding problems demand new drilling that enables linking microbiological experiments done at near *in situ* conditions, a vast array of geochemical analyses, and detailed physical property measurements within a framework of reaction-transport modeling. Such study would directly address Challenge 13 (What properties and processes govern the flow and storage of carbon in the subseafloor?) and Challenge 5 (What are the origin, composition, and global significance of subseafloor communities?) in the IODP 2013-2023 science plan.

Widespread microbial methane implies globally relevant processes. However, past drilling clearly demonstrates a high degree of heterogeneity in methane abundance and distribution at individual locations and between regions. This reflects differences in key parameters that affect the formation and flow of methane. The Rio Grande Cone, offshore Brazil, represents a spectacular natural laboratory for understanding how carbon cycles in methane-charged sediment. Seismic reflection profiles show a prominent bottom-simulating reflector spanning ~45,000 km². Multibeam bathymetry and near-bottom surveys display areas with pockmarks near the upper limit of the methane hydrate stability zone. Piston cores recovered samples of gas hydrate and authigenic carbonate. Analyses of pore water and gas from these cores have determined shallow (~3-10 mbsf) subbottom sulfate-methane transitions related to anaerobic oxidation of methane, as well as a microbial origin for the gas. All information indicates a large region of the seafloor with a dynamic microbial methane system.

We propose five sites that sample the variation in methanogenesis and carbon cycling at different water depths (~600-3000 m) and different locations across the margin. The measurement plan consists of high-resolution sampling for microbiology and geochemistry, extensive pressure coring, APC-T temperature measurements, infrared core imaging, and downhole logging. Methanogenesis rates will also be measured in microbiological experiments where sediment samples are inoculated in biomass recycle reactors that reproduce the starved conditions experienced *in situ* and in separate incubation experiments done under *in situ* pressure.

Scientific Objectives

The overall scientific goal is to substantially improve our understanding of biogeochemical and physical processes that lead to widespread methane occurrence in continental margin sediments and that couple to the overlying ocean over time. We will determine the amount and distribution of methane across a region where basic observations suggest that key parameters differ in space and time. The proposed study will address outstanding questions on carbon cycling in continental margin sediments: we will estimate in situ methanogenesis rates by comparing the results of microbiological experiments and reaction-transport modeling, test whether observations require a deep methane source, investigate how methanogenesis rates are related to sediment type, temperature, age and composition of organic matter, characterize the time-dependent organic matter input driven by paleoceanographic changes, clarify the role of methane in the complex set of near-seafloor biogeochemical reactions relevant to the global carbon cycle, and constrain the flux of carbon from the sediment back to the ocean. The planned measurements of in situ methane concentration from pressure core sampling will provide key constraints to the modeling and the estimated methanogenesis rates will inform the quantification of methane amounts in continental margin sediments. Additional benefits will include a comparison of in situ methane estimates based on N₂ and Ar with PCS data, a set of combined incubation and extraction-based measurements of H₂, and constraints on how methane and carbon escape the seafloor near the feather edge of hydrate stability conditions.

Non-standard measurements technology needed to achieve the proposed scientific objectives

Proposed Sites

(Total proposed sites: 16; pri: 5; alt: 11; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Sed	Bsm	Total	Brief Site-Specific Objectives
RGC-01C primary	-32.94865 -49.88057	1159	500	0	500	Sample a "stratigraphic" methane hydrate setting in the extensional domain of the Rio Grande Cone. This site will allow for investigating microbial methanogenesis where fluid flow is likely not to be significant and address our scientific objectives on constraining the of microbial methanogenesis pathway, vertical distribution, and rate, and on characterizing reactions at the SMTZ. This site is located on the axis of the cone where sedimentation rates are expected to be the highest and will be triple-cored for a paleoceanographic reconstruction.
RGC-09B alternate	-33.012 -49.80825	1219	500	0	500	Alternate site with same site-specific objectives as RGC-01C.
RGC-02C alternate	-33.21597 -49.66411	1368	500	0	500	Alternate site with same site-specific objectives as RGC-01C.
RGC-03C primary	-33.65803 -50.15192	1505	500	0	500	Sample a "stratigraphic" methane hydrate setting in the extensional domain of the Rio Grande Cone. This site will allow for investigating microbial methanogenesis where fluid flow is likely not to be significant and address our scientific objectives on constraining the of microbial methanogenesis pathway, vertical distribution, and rate, and on characterizing reactions at the SMTZ. This site is located on the southern flank of the RGC where sediments are thinner and sedimentation rates are likely lower than at the location of primary Site RGC-01C.
RGC-04C alternate	-33.5006 -50.34727	914	500	0	500	Alternate site with same site-specific objectives as RGC-03C.
RGC-11A alternate	-33.66913 -50.16478	1484	500	0	500	Alternate site with same site-specific objectives as RGC-03C.
RGC-07C primary	-33.58388 -49.22675	2972	800	0	800	Sample a "stratigraphic" methane hydrate setting in the deepwater contourite SE of the Rio Grande Cone. This site will allow for investigating microbial methanogenesis where fluid flow is likely not to be significant and address our scientific objectives on constraining the of microbial methanogenesis pathway, vertical distribution, and rate, and on characterizing reactions at the SMTZ. This site will be also triple-cored for a paleoceanographic reconstruction.
RGC-08C alternate	-33.92741 -49.81531	2664	800	0	800	Alternate site with same site-specific objectives as RGC-07C.

Site Name	Position (Lat, Lon)	Water Depth (m)	Sed	Bsm	Total	Brief Site-Specific Objectives
RGC-12A alternate	-33.46151 -49.09352	2993	800	0	800	Alternate site with same site-specific objectives as RGC-07C.
RGC-16A alternate	-33.15918 -48.9736	2938	800	0	800	Alternate site with same site-specific objectives as RGC-07C.
RGC-10B primary	-32.77458 -49.85012	1299	500	0	500	Sample a location near pockmarks on the middle slope of the Rio Grande Cone. This site will allow for determining the variation in methanogenesis in a location where fluid advection may be important for a comparison to "stratigraphic" settings.
RGC-06C alternate	-32.79565 -49.87302	1257	500	0	500	Alternate site with same site-specific objectives as RGC-10B.
RGC-15A alternate	-32.74982 -49.92467	1219	500	0	500	Alternate site with same site-specific objectives as RGC-10B.
RGC-05C primary	-33.43466 -50.45741	607	200	0	200	Sample a location near pockmarks on the upper slope of the Rio Grande Cone at the feather edge of the MHSZ. This site will allow for determining the variation in methanogenesis in a location where fluid advection may be important and where hydrates may be actively dissociating, providing key observations on the portion of the marine hydrate reservoir that is most sensitive to climatic change.
RGC-13A alternate	-33.42207 -50.44317	608	200	0	200	Alternate site with same site-specific objectives as RGC-05C.
RGC-14A alternate	-33.44959 -50.47509	607	200	0	200	Alternate site with same site-specific objectives as RGC-05C.

IODP - EPSP Safety Review Report

EPSP meeting, 12 February 2019, College Station, Texas, USA.

Proposal: 910-Full2

Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)

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1. SUMMARY OF THE SCIENTIFIC OBJECTIVES

Our overall objective is to elucidate processes that control distribution of methane in continental margin sediments and to quantify carbon fluxes between these sediments and the ocean. In particular, microbial methane generation takes place beneath the sulfate-methane transition zone (SMTZ) in a depth interval that is only accessible by ocean drilling. We will estimate in situ methanogenesis rates by incubation experiments and reaction-transport modeling, investigate how methanogenesis relates to sediment lithology, temperature, age and composition of organic matter, and clarify the role of methane in the complex set of biogeochemical reactions at and above the SMTZ. As most of the controlling factors (e.g., sediment and organic carbon supply) are affected by the oceanographic setting, a paleoceanographic reconstruction focused on changing fertilization sources and hydrographic conditions will be essential to understand the input to methanogenesis.

Specific objectives are:

1. To determine the prevailing **microbial methanogenesis pathways**, in particular the relative importance of carbonate reduction and acetate fermentation;
2. To establish the **vertical distribution of microbial methane generation** in the top few hundred meters of sediment, investigating changes in microbial abundance and the influence of the amount and composition of particulate organic carbon (POC) and of sediment characteristics;
3. To compare **methanogenesis rates** predicted by reaction-transport modeling constrained by pore water geochemistry with rates estimated from incubation experiments conducted at near in situ conditions;
4. To contrast **variations of microbial methane generation and hydrate abundance in different settings**: “stratigraphic” locations dominated by sediment accumulation, near-pockmark locations where pore water advection may be significant, and the feather edge of the MHSZ where methane hydrates are most sensitive to climatic perturbations;
5. To determine the different **reactions leading to chemical and isotopic changes at the SMTZ**, how these reactions vary depending on the setting (e.g., for different methane fluxes), and how they affect the carbon flux from the sediment back into the ocean;
6. To characterize the **time-dependent input of POC** by providing a record of past productivity and sedimentation at the RGC in response to changes in continental outflow and large-scale **paleoceanographic variability**.

2. LOCATION OF SITES, SEISMIC LINES, AND REGIONAL SEAFLOOR BATHYMETRY MAP

Five primary and eleven alternate sites for scientific drilling are proposed in the 910-Full2 proposal. The location of the sites is shown in Fig. 2.1 and details about water depth, sediment depth and site-specific objectives are in Table 2.1.

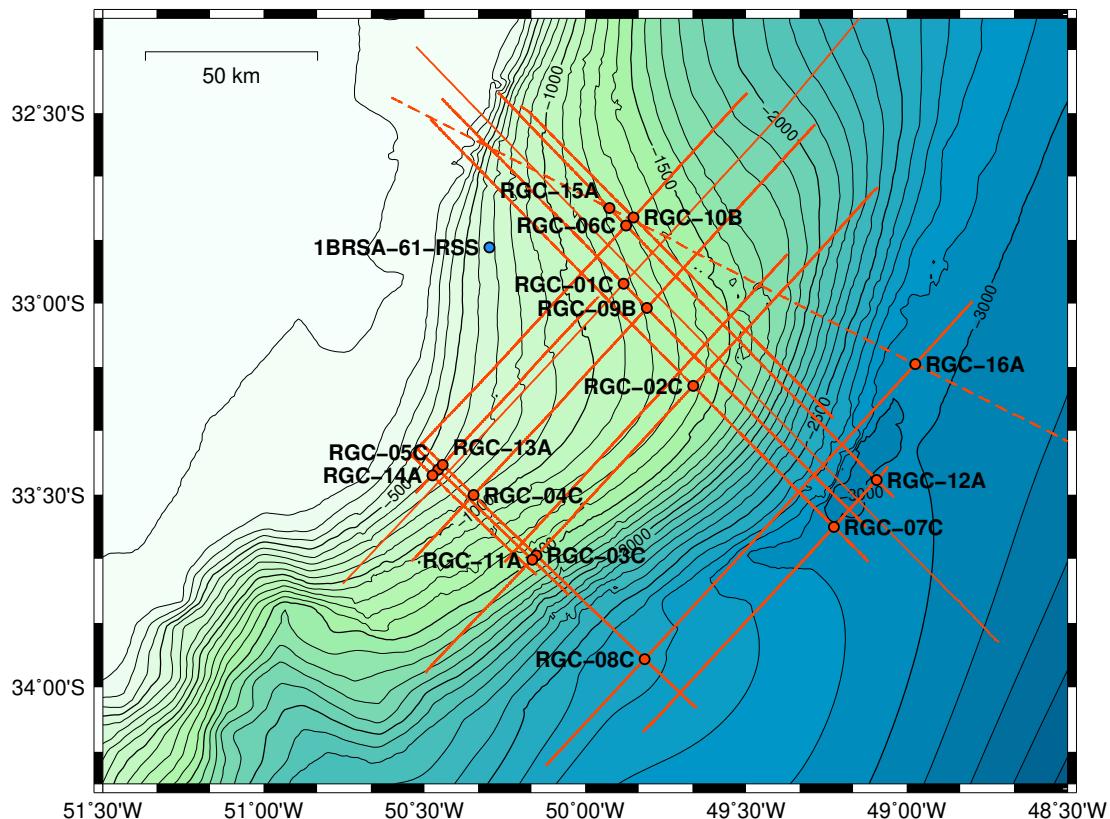


Fig. 2.1 Bathymetric map of the Rio Grande Cone showing the proposed drilling sites (red dots) in the 910-Full2 proposal. A nearby oil exploration well (1BRSA-61-RSS) is also shown (blue dot). Solid red lines show the location of seismic reflection lines provided by the Brazilian Petroleum Agency; the dashed red line is METEOR seismic reflection line GeoB01-159.

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
RGC-01C <u>(Primary)</u>	-32.94865 -49.88057	1159	500	0	500	Sample a "stratigraphic" methane hydrate setting in the extensional domain of the Rio Grande Cone. This site will allow for investigating microbial methanogenesis where fluid flow is likely not to be significant and address our scientific objectives on constraining the of microbial methanogenesis pathway, vertical distribution, and rate, and on characterizing reactions at the SMTZ. This site is located on the axis of the cone where sedimentation rates are expected to be the highest and will be triple-cored for a paleoceanographic reconstruction.
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RGC-05C <u>(Primary)</u>	-33.43466 -50.45741	607	200	0	200	Sample a location near pockmarks on the upper slope of the Rio Grande Cone at the feather edge of the MHSZ. This site will allow for determining the variation in methanogenesis in a location where fluid advection may be important and where hydrates may be actively dissociating, providing key observations on the portion of the marine hydrate reservoir that is most sensitive to climatic change.
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Table 2.1 Details of each of the sixteen drilling sites in the 910-Full2 proposal.

3. RESULTS OF ANY INDUSTRY AND/OR PREVIOUS SCIENTIFIC DRILLING

The Rio Grande Cone is located in the Pelotas Basin, a basin in which the petroleum exploration is at an immature phase. There is no active oil or gas production in the Pelotas basin at present. Possible petroleum plays are related to Aptian and Turonian source rocks and turbidite sandstones of Albian (Porto Belo Formation), Cenomanian-Turonian (Atlântida Formation), and Paleocene ages (Imbé Formation). Those units are typically in a much deeper location than the bottom of the proposed sites in the 910-full proposal (Zalan, 2017). There are only 20 stratigraphic or exploration wells, mostly in the onshore or shallow water (shelf) portions.

Only one well is located in the Rio Grande Cone (1BRSA-61-RSS; see Fig. 2.1). There is little available information about this well, which did not reach its main objective (Oligocene reservoirs). The well was stopped at a depth of 2365 mbsf and showed no evidence of hydrocarbons (National Petroleum Agency, 2003). Another well ~50 km north of the Rio Grande Cone (2-BPS-6A-BP) reached a depth of 2568 mbsf and also showed no evidence of hydrocarbons. Although mature source rocks have been founded in the basin (Zalan, 2017), Cenomanian/Turonian source rocks with TOC = 4.2% in well 2-BPS-6A-BP proved to be immature (National Petroleum Agency, 2003).

Remarkable and continuous bottom simulating reflectors (BSRs) are widespread in the Rio Grande Cone area. Shallow gas hydrates (seafloor to <20 mbsf) with biogenic methane have been recovered in the area and the migration of shallow gas might be related to gravitational sliding of the Rio Grande Cone and the formation of a series of normal faults in a mid-slope extensional domain. Pockmark fields formed in the area where those faults reach the seafloor (Miller et al., 2015; Fig. 4.1).

4. POSSIBLE ENVIRONMENTAL ISSUES

One potential environmental issue is related to the location of three drilling sites (primary Site RGC-10B and alternates RGC-06C and RGC-15A) in a pockmark field on the mid-slope at ~1250 m water depth (pockmark area A of Miller et al., 2015). A chemosynthesis-based community has been identified in one of the pockmarks (Giongo et al., 2016), and to avoid disturbing benthic communities or tapping into a high-fluid flow conduit we located Site RGC-10B ~1km away from a fault outcrop and a pockmark imaged by shipboard and AUV bathymetry (Fig. 4.1). Reflection seismic data do not show evidence of major faulting, gas chimneys, or blanked-out zones at the site location. We also located with the same criteria two alternate sites in this pockmark area (RGC-06C and RGC-15A). Similar locations in the general vicinity of pockmarks and methane vents have been successfully and safely drilled by the JOIDES Resolution in the past, e.g., Site U1328 of IODP Exp. 311 (Riedel et al., 2006).

Three more sites (primary Site RGC-05C and alternates RGC-13A and RGC-14A) have been located in a pockmark field at depths of 500-600 m, which is near the feather edge of hydrate stability where the methane hydrate stability zone (MHSZ) in sediment eventually disappears (pockmark area E of Miller et al., 2015). A unique feature in the seismic reflection profiles in this area of the RGC is that the BSR is clearly visible all the way to the seafloor. Drilling in this RGC area therefore offers a unique opportunity to obtain key observations and to calibrate modeling in the portion of the marine MHSZ that is most sensitive to climatic change. To avoid disturbing benthic communities, Site RGC-05C and two alternates (RGC-13A and RGC-14A) have been located away from pockmarks imaged by shipboard and AUV bathymetry (Fig. 4.1).

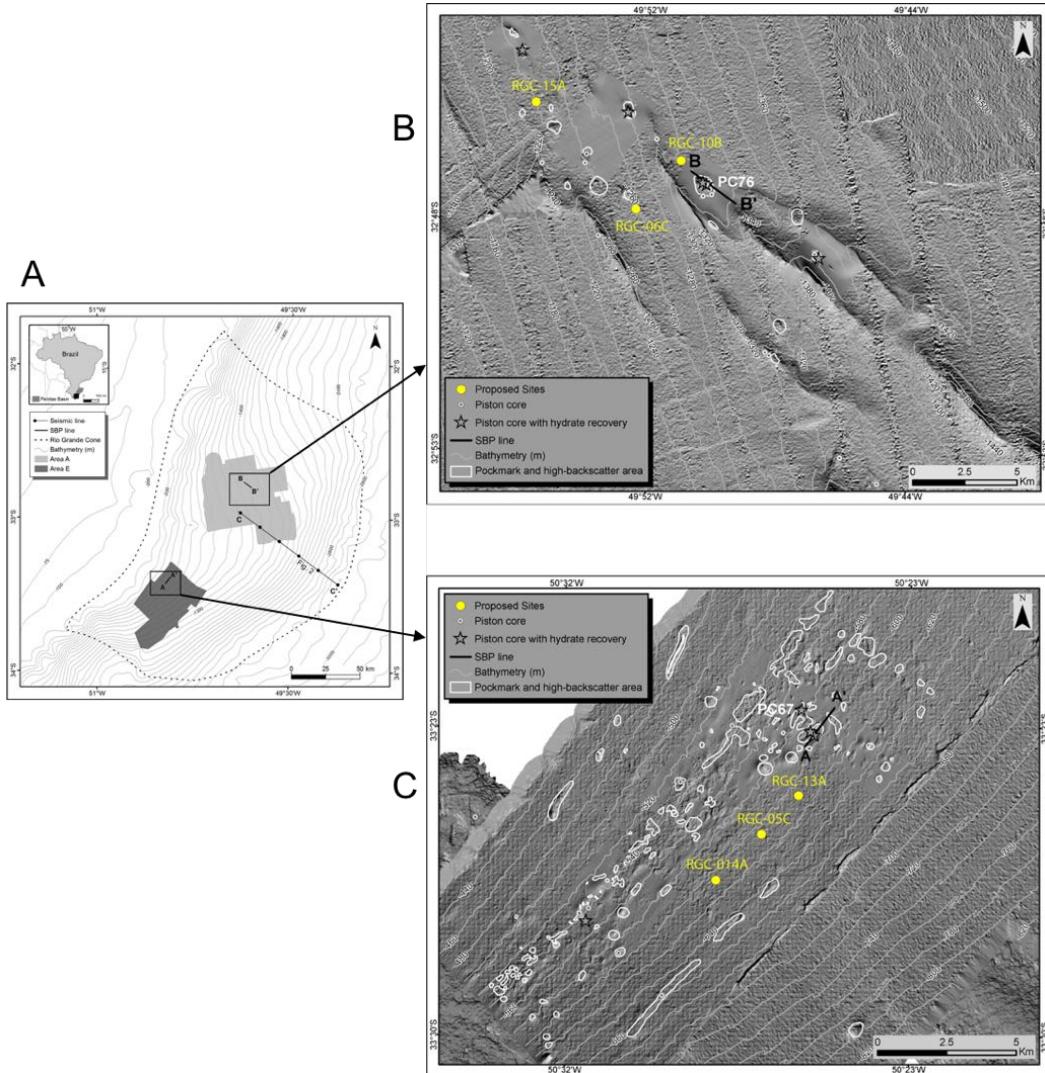


Fig. 4.1 Maps showing: (A) the location of the two pockmark fields mapped in the Rio Grande Cone (light and dark gray areas); (B) detailed bathymetry of the portion of the pockmark field where Sites RGC-10B, RGC-06C, and RGC-15A are located (yellow dots). The chemosynthetic community was found in the pockmark PC76; (C) detailed bathymetry of the portion of the pockmark field where Sites RGB-05C, RGC-13A, and RGC-14A are located (yellow dots). Note that all three sites are not coinciding with high-backscatter patches on the seafloor (white polygons). Maps extracted from Miller et al. 2015.

5. STATUS OF SITE SURVEY INFORMATION

All sites proposed in IODP 910-Full2 are located at the intersection of two seismic lines (typically a NW-SE line along the dip and another NE-SW line along the strike of the Rio Grande Cone). Seismic reflection data from sixteen lines used for site characterization were provided by the Brazilian National Petroleum Agency and have been released to be used for the 910-Full2 proposal (solid lines in Fig. 2.1). Acquisition and processing information from the header of the SEG-Y data files is included in Section 10 of this report. We also used seismic reflection line GeoB01-159 (dashed line in Fig. 2.1), which was collected in 2001 during METEOR Cruise M49/3 and was provided by Volkhard Spiess for use in 910-Full2. Detailed bathymetry grids and backscatter data obtained with multibeam echo sounders have also been cleared to use in 910-Full2. All the seismic reflection data and navigation files, bathymetry grids, and backscatter data illustrated in this report have been uploaded to the IODP SSDB.

A velocity model for the Rio Grande Cone area has also been provided by Petrobras, cleared for use in the 910-Full2 proposal, and uploaded to the IODP SSDB. The model consists of a 3D velocity cube in SEG-Y format with a sampling interval of 500 m in the horizontal direction and 60 m in the vertical direction. The 3D velocity cube was built with a tomographic method from eleven regional 2D seismic lines (survey 0022) and was interpolated between lines following regional horizons. This is the best velocity model available at present and is being used for hydrocarbon exploration in the Pelotas basin. However, this velocity model became available after the 910-Full2 proposal submission deadline (October 2018) and the time-depth conversion used in the proposal was derived from a velocity-depth relationship based on sonobuoy data (Hamilton 1985) as described in the next section.

6. TRAVEL TIME-DEPTH CONVERSION

The travel time-depth conversion we used is derived from an instantaneous velocity-depth relationship based on sonobuoy data given by Hamilton (1985) in his Table II, reproduced below:

TABLE II. Coefficients of regression equations based on sonobuoy data.
Instantaneous velocity V in kilometers per second, as a function of depth in
the sediments h in kilometers, in the form: $V = A + Bh + Ch^2$.

Sediment type; area	A	B	C
Deep-sea terrigenous silt-clays, turbidites, mudstone-shale; avg. 17 areas	1.519	1.227	- 0.473
Continental rise silt-clays; United States (Atlantic); avg. three areas	1.513	0.828	- 0.138
Continental shelf basins; Sumatra-Java; avg. five areas	1.484	0.710	- 0.085
Siliceous sediments; deep Bering Sea*	1.509	0.869	- 0.267

*See Ref. 1.

The equation for instantaneous velocity at a sediment depth h is

$$V(h) = A + Bh + Ch^2.$$

The mean velocity in the sediment interval between the seafloor and depth h is the integral of the instantaneous velocity $V(h)$ divided by h . The corresponding two-way travel time t from the seafloor to depth h is two times h divided by the mean velocity. The final two-way time-sediment depth relationship that we used to plot drilling depths on the seismic reflection sections is then

$$t(h) = 2h / (A + Bh/2 + Ch^2/3).$$

In our time-depth conversion, we used the values of A , B , and C reported for deep-sea terrigenous silt-clays, turbidites, mudstone-shale (first row of Table II above), which is based on the largest data set (17 areas) and comprises the lithologies that are expected in the Rio Grande Cone sediments.

Figure 2 of Hamilton (1985) shows that the uncertainties in instantaneous sound velocity (95% confidence limits) are about $\pm 3\%$ at 750 mbsf, which is close to the maximum drilling depths in the proposed sites. If we assume that mean velocities have the same fractional uncertainty, the uncertainty in time-depth conversion should also be $\pm 3\%$. For example, if the predicted depth to the BSR was 500 mbsf, its uncertainty should be ± 15 m. We stress that this relatively small uncertainty assumes that the Hamilton equation is representative of the local velocities; a comparison with a 3D velocity cube shows larger differences, discussed next.

3D velocity cube. Just before the deadline for the IODP SSDB submission, we also received from Petrobras a 3D seismic velocity cube in SEG-Y format for the Rio Grande Cone region. As these velocity data were not available to us before the earlier proposal deadline, we were unable to use them for time-depth conversion. All the seismic line illustrations in the 910-Full2 proposal and in this report use the Hamilton (1985) equation described above to show drilling depths over time sections.

We have now extracted vertical velocity profiles at the grid nodes in the 3D cube that are closest to the proposed site locations to compare them to the velocities in the Hamilton equation. The grid spacing in the 3D velocity cube is 500 m, so the nearest grid node to any site is no more than ~350 m from any site location. Figures comparing the velocity-depth profiles in the 3D cube to those in the Hamilton equation are included in this report.

Velocity profiles given by the Hamilton equation generally agree with those in the 3D model in the deep water sites (e.g., Site RGC-08C, 2664 m water depth), whereas the velocities in the Hamilton equation are generally ~10% higher than those in the 3D model in the sites at the shallower mid-slope locations (e.g., Site RGC-01C, 1159 m water depth). If the velocities used for time-depth conversion were decreased by 10%, the depth below seafloor of a given seismic reflector (e.g., the BSR), which is velocity times travel time, would also decrease by 10%. Conversely, the travel time to a given depth below the seafloor (e.g., to the maximum drilling depth), which is depth divided by velocity, would increase by 10%.

Depth to the BSR and estimated geothermal gradient. The following table reports estimated depths to the BSR and geothermal gradients implied by the BSR depth in each of the proposed sites (primary sites are shown in bold):

Site	Water depth	T at seafloor (°C)	Two-way time to BSR (s)	BSR depth (mbsf)	T gradient (°C/km)	Max. depth (mbsf)	T at max. depth (°C)
RGC-01C	1159	4.5	0.34	287	36.8	500	22.9
RGC-09B	1219	4.3	0.40	343	33.2	500	20.9
RGC-02C	1368	4.0	0.43	371	34.0	500	21.0
RGC-03C	1505	3.7	0.38	324	41.1	500	24.3
RGC-04C	914	5.3	0.27	223	34.2	500	22.4
RGC-11A	1484	3.8	0.39	333	39.6	500	23.6
RGC-10B	1299	4.1	0.39	333	35.8	500	22.0
RGC-06C	1257	4.2	0.37	314	36.6	500	22.5
RGC-15A	1219	4.3	0.38	324	34.8	500	21.7
RGC-07C	2972	2.3	0.62	559	35.6	800	30.7
RGC-08C	2664	2.4	0.60	539	35.2	800	30.6
RGC-12A	2993	2.2	0.63	569	35.1	800	30.3
RGC-16A	2938	2.3	0.63	569	34.8	800	30.1
RGC-05C	607	7.2	0.12	95	—	200	—
RGC-13A	608	7.2	0.11	87	—	200	—
RGC-14A	607	7.2	0.11	87	—	200	—

To compute these estimates, we first picked the two-way travel time between the seafloor and the BSR from the seismic reflection data. These two-way times were converted to BSR depths below the seafloor using the Hamilton equation described above. Assuming hydrostatic pore pressure, we then computed the hydrate phase boundary temperature at the depth of the BSR. The phase boundary temperature is a fit to the data in Sloan (1998) for the pure methane hydrate-pure water system, subtracting 1.1°C to account for the effect of seawater salinity (Dickens and Quinby Hunt, 1994). The temperature at the seafloor was

obtained from the depth-temperature relationship established by Hamza et al. (2018) from ocean temperature measurements for the Brazilian continental margin (their Equation 1 and Figure 3).

The temperatures at the seafloor and at the BSR define the geothermal gradients listed in the table above. Estimates of geothermal gradients where the BSR is shallow (<100 mbsf) are not reported because they are very sensitive to uncertain inputs (e.g., T at the seafloor) and are not reliable. The geothermal gradients we computed are in the range 33-41 °C/km and are consistent with the values mapped by Hamza et al. (2018) using bottom-hole temperatures in oil wells in the Rio Grande Cone region, Pelotas basin (see their Figure 9).

The overall agreement between the geothermal gradients we estimate from the BSR depth and those obtained independently by Hamza et al. (2018) suggests that the Hamilton equation that we used for time-depth conversion is a good approximation. As noted above, the 3D velocity cube data are generally lower by ~10% compared to those in the Hamilton equation in the mid-slope sites (e.g., primary Sites RGC-01C, RGC-03C, RGC-10B). These lower velocities would imply a BSR depth below the seafloor that is ~10% shallower and hence a slightly higher temperature gradient.

7. DRILLING STRATEGY

The sequence in Table 7.1 below follows a drilling strategy that starts from the “stratigraphic” locations that are expected to be easier to drill (primary sites RGC-01C and RGC-03C), moves to a deeper penetration site in the relatively undisturbed contourite (RGC-07C), and ends at the mid- and upper-slope sites that are near pockmark fields and may be more challenging (RGC-10B and RGC-05C). This strategy will let us build on the drilling experience gained during the expedition. If the near-pockmark sites were to prove problematic, we can move to one of the seven alternate sites in mid-slope stratigraphic settings. These alternate sites are located at different water depths and distances from the axis of the Rio Grande Cone (Fig. 2.1) and will give us additional information on the spatial variability of sedimentation and organic carbon deposition, will provide additional paleoceanographic sampling, and will allow us to address our scientific objectives on characterizing methanogenesis.

		Nautical miles	Days
Transit (Rio de Janeiro-project area)		700	2.8
Site RGC-01C	Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 2 PCS cores Hole B: Same as Hole A Hole C: Same as Hole A, log		3.4 3.1 3.9
Transit		43	0.2
Site RGC-03C	Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 2 PCS cores Hole B: Same as Hole A, log		3.6 4.1
Transit		55	0.2
Site RGC-07C	Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 2 PCS cores Hole B: Same as Hole A Hole C: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 800 mbsf, 2 PCS cores, log		4.7 4.4 8.7
Transit		65	0.3
Site RGC-10B	Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 2 PCS cores Hole B: Same as Hole A, log		3.6 4.1
Transit		50	0.20
Site RGC-05C	Hole A: APC to 200 mbsf, 2 PCS cores Hole B: Same as Hole A Hole C: Same as Hole A, log		1.1 1.0 1.7
Transit (Project area-Buenos Aires)		500	2.0
Total days			52.9

Table 7.1. Time estimates obtained from the IODP JRSO coring and transit time estimator (http://iodp.tamu.edu/participants/coring_estimator.html).

8. REFERENCES CITED

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9. BATHYMETRY, SEISMIC REFLECTION DATA, SEISMIC VELOCITY PROFILES, BACKSCATTER IMAGES AT EACH PROPOSED SITE

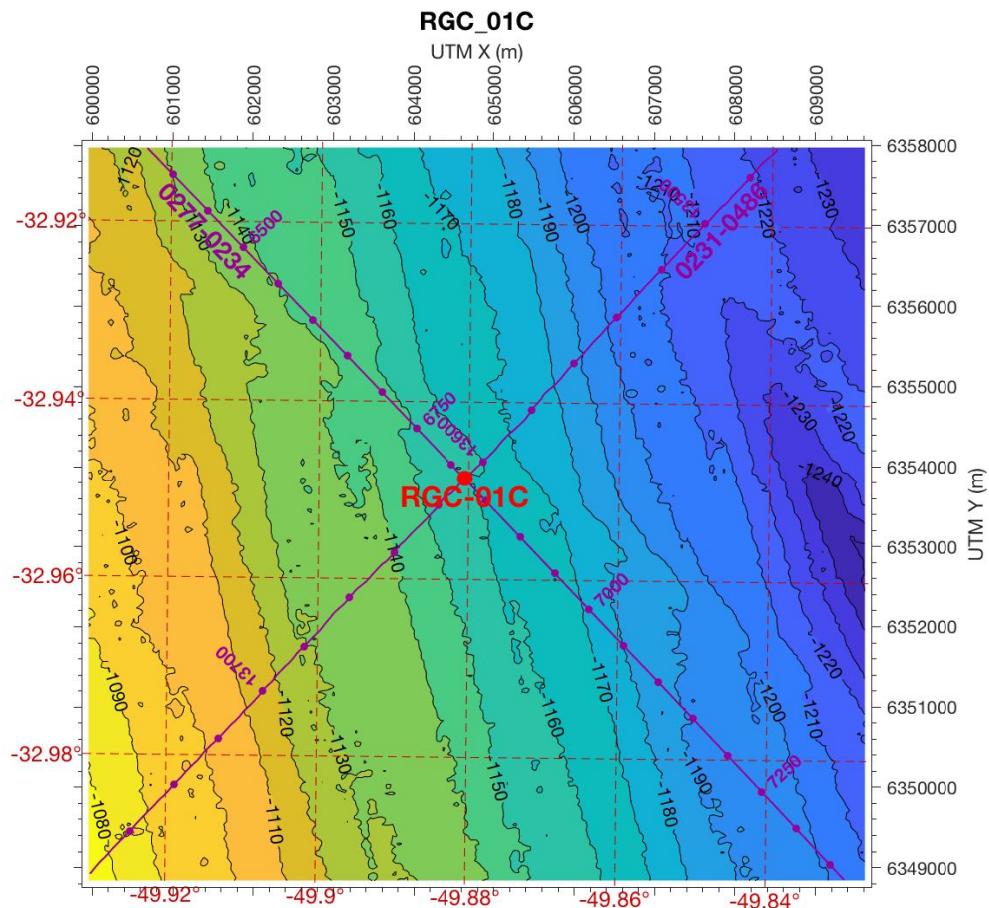
In this section we show for each site the following data:

- Bathymetry map with location of seismic lines based on the bathymetry grids that were submitted to the IODP SSDB;
- The site figure that was included in the 910-Full2 proposal (if it displays high-resolution bathymetry data);
- The two seismic reflection lines that intersect at the site location and that were submitted to the IODP SSDB;
- A comparison between the velocities in the 3D cube at the site and those predicted by the Hamilton equation;
- Backscatter image maps (if available).

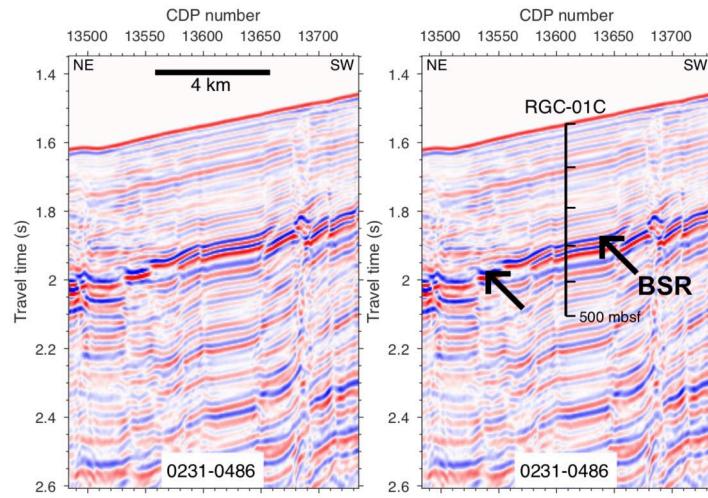
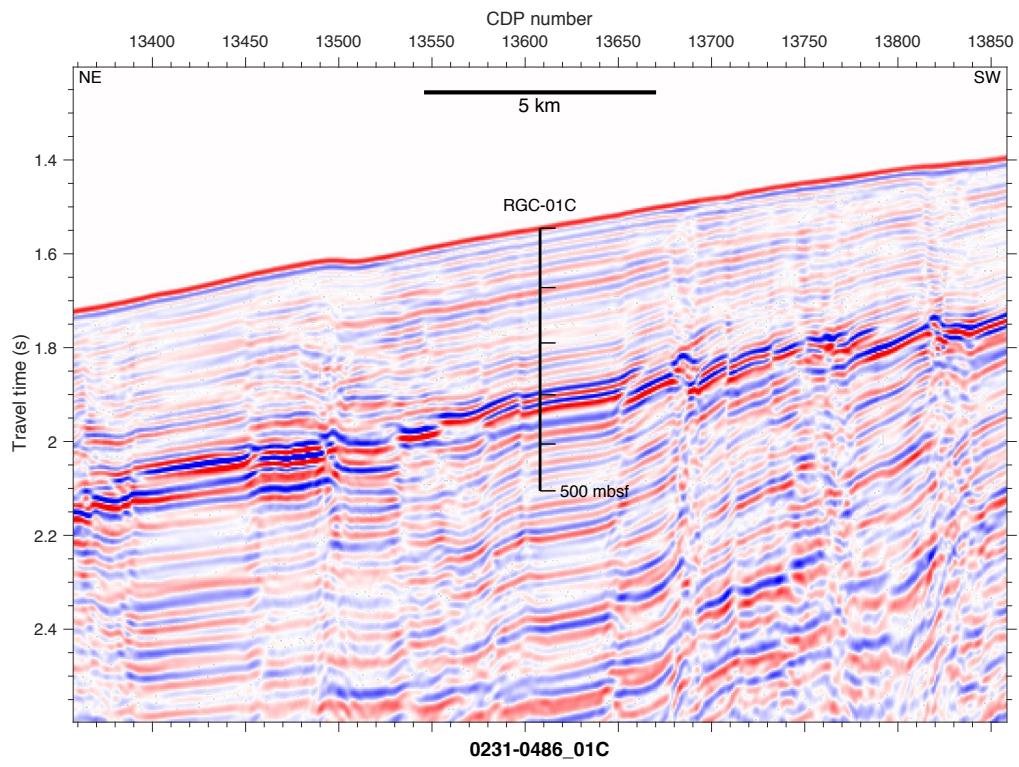
The gridded bathymetry maps presented in this section have the following grid intervals (m):

Site	dx (W-E)	dy (N-S)
RGC-01C	35	35
RGC-02C	100	100
RGC-03 + RGC-11A	100	100
RGC-04C	29	37
RGC-05C	35	35
RGC-06C	35	35
RGC-06C + RGC-10C	10	10
RGC-07C	100	100
RGC-08C	100	100
RGC-9B	20	20
RGC-10B	35	35
RGC-12A	100	100
RGC-13A	35	35
RGC-14A	35	35
RGC-15A	20	20
RGC-16A	100	100

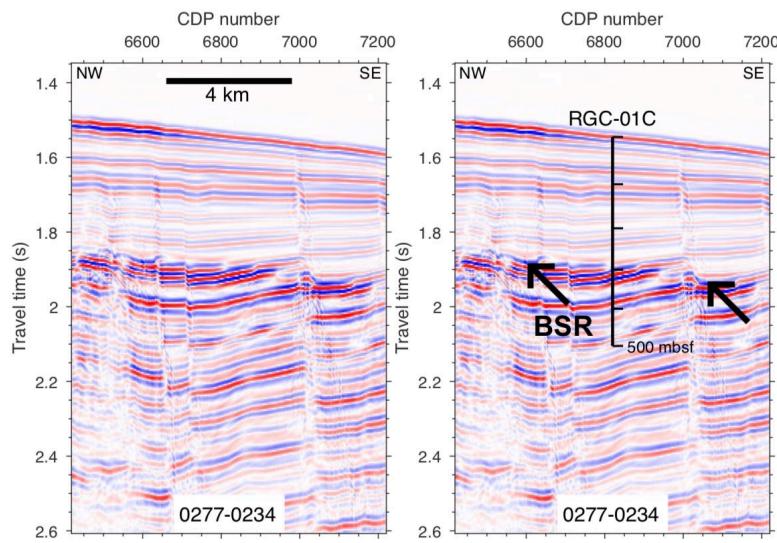
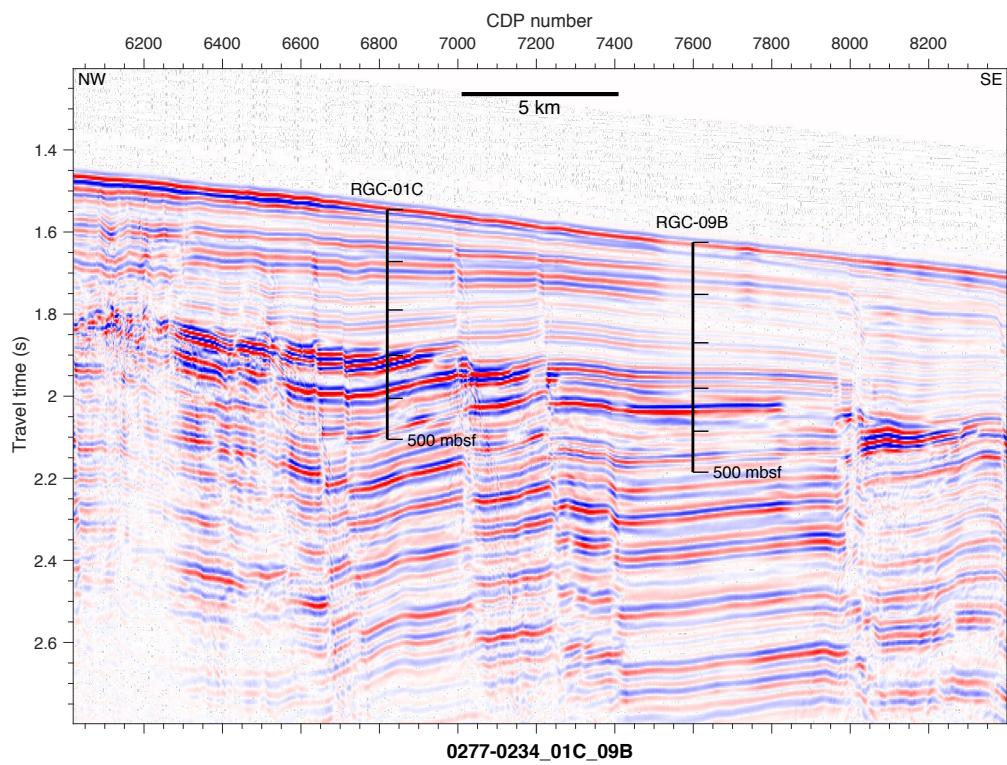
9.1 Site RGC-01C



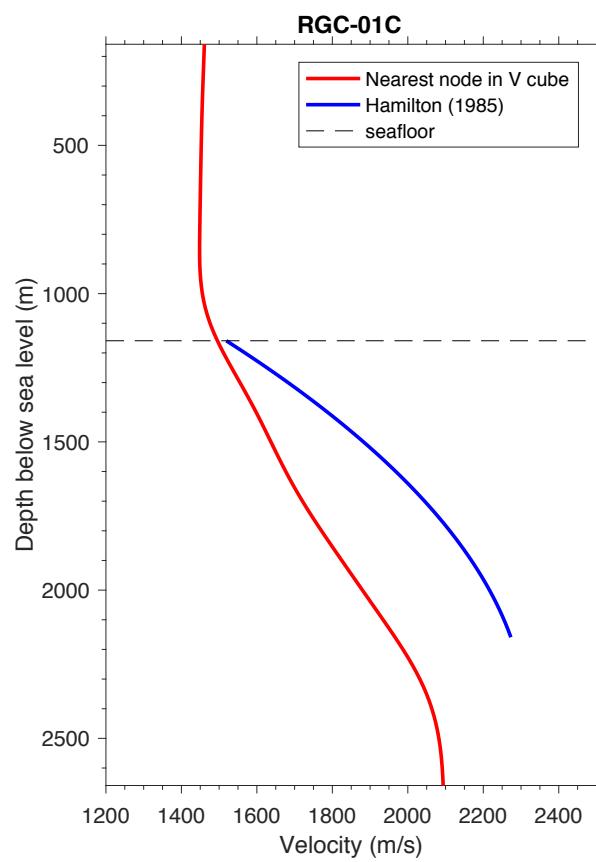
Gridded bathymetry and seismic line locations at Site RGC-01C.



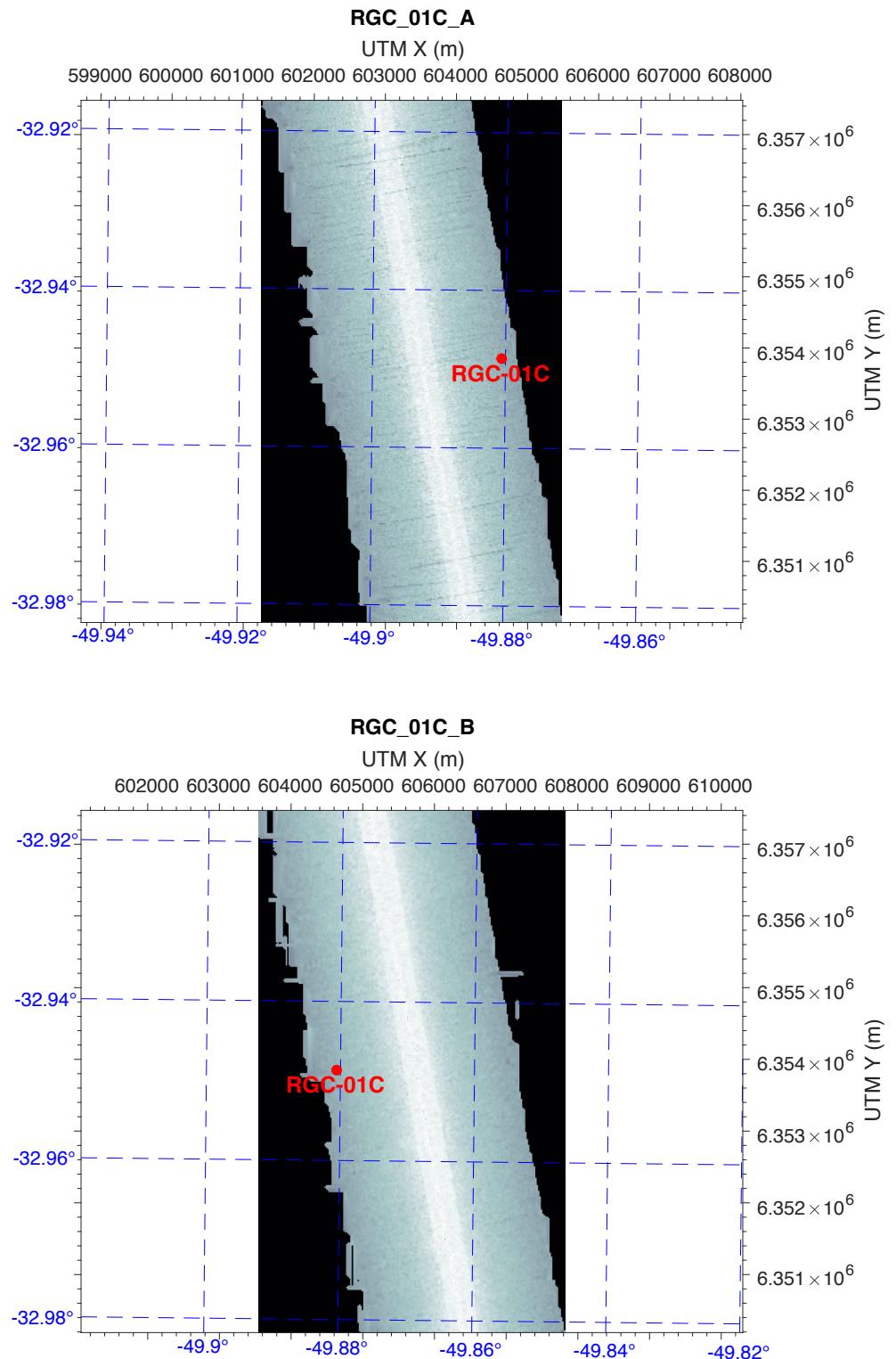
Seismic reflection line 0231-0486 at Site RGC-01C



Seismic reflection line 0277-0234 at Site RGC-01C

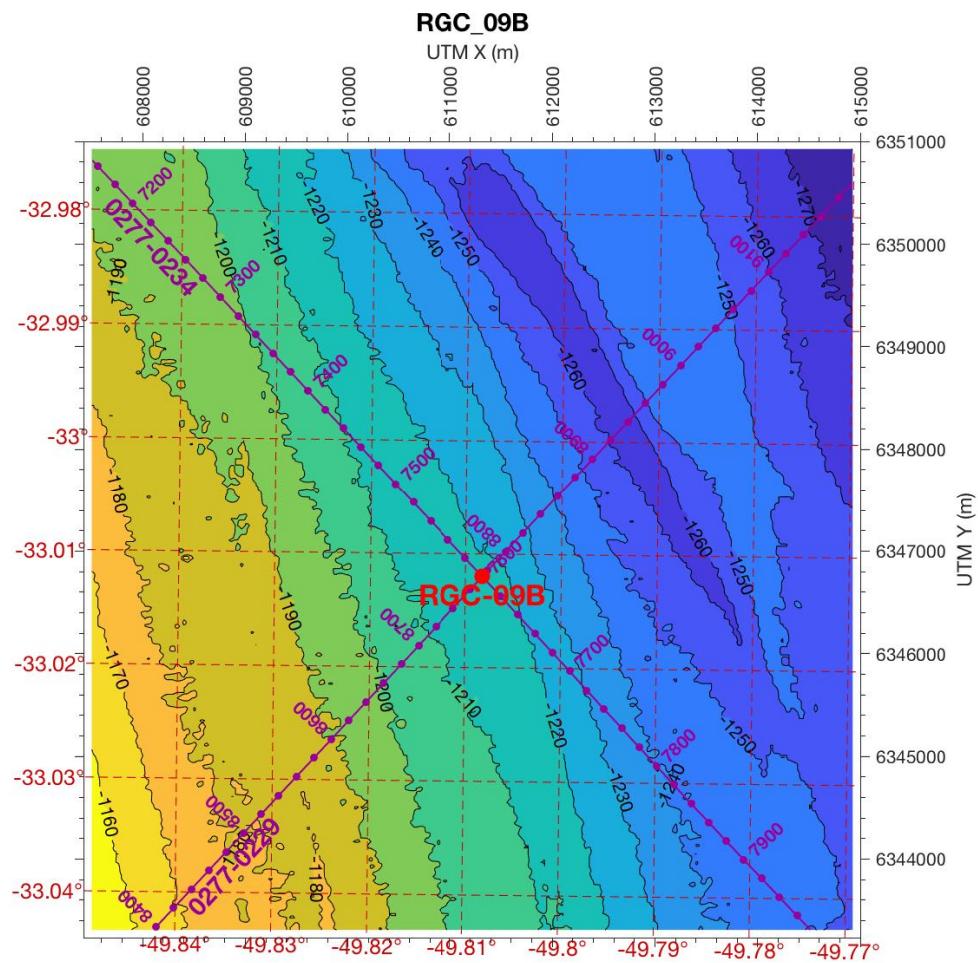


Seismic velocities for travel time-depth conversion at Site RGC-01C

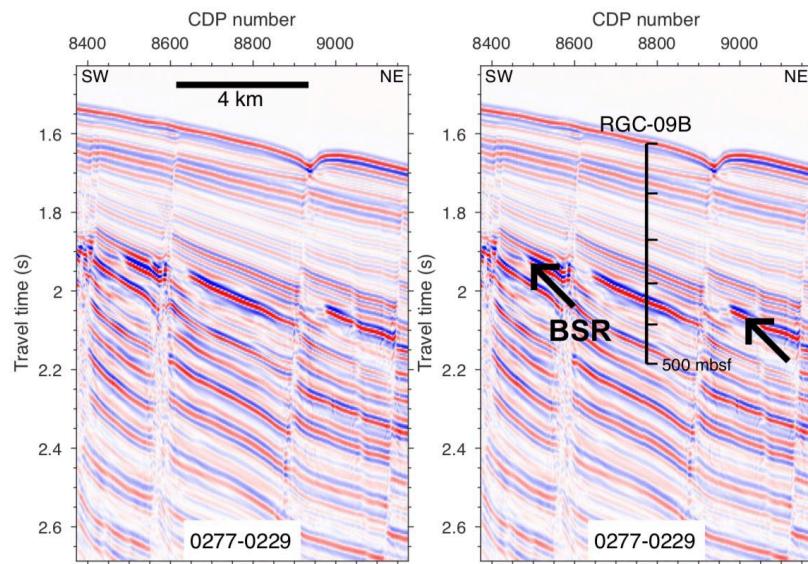
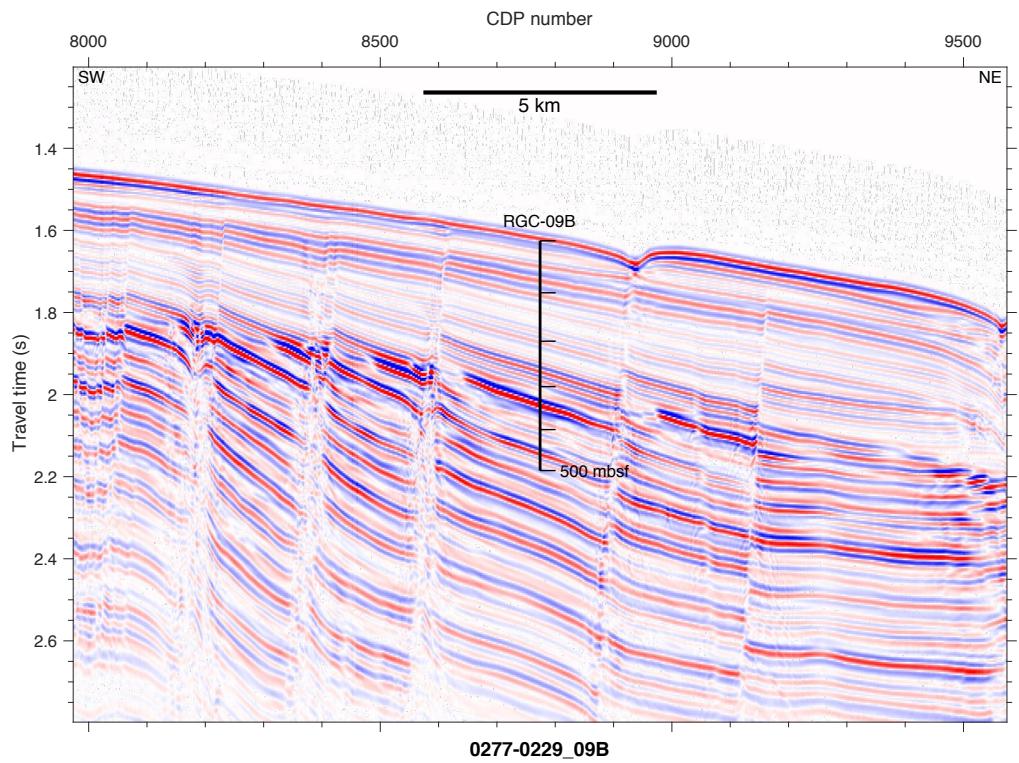


Backscatter images at Site RGC-01C

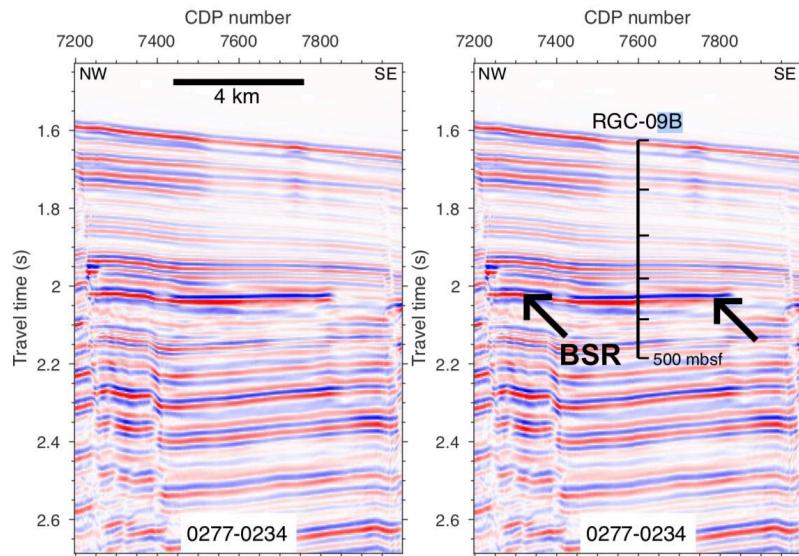
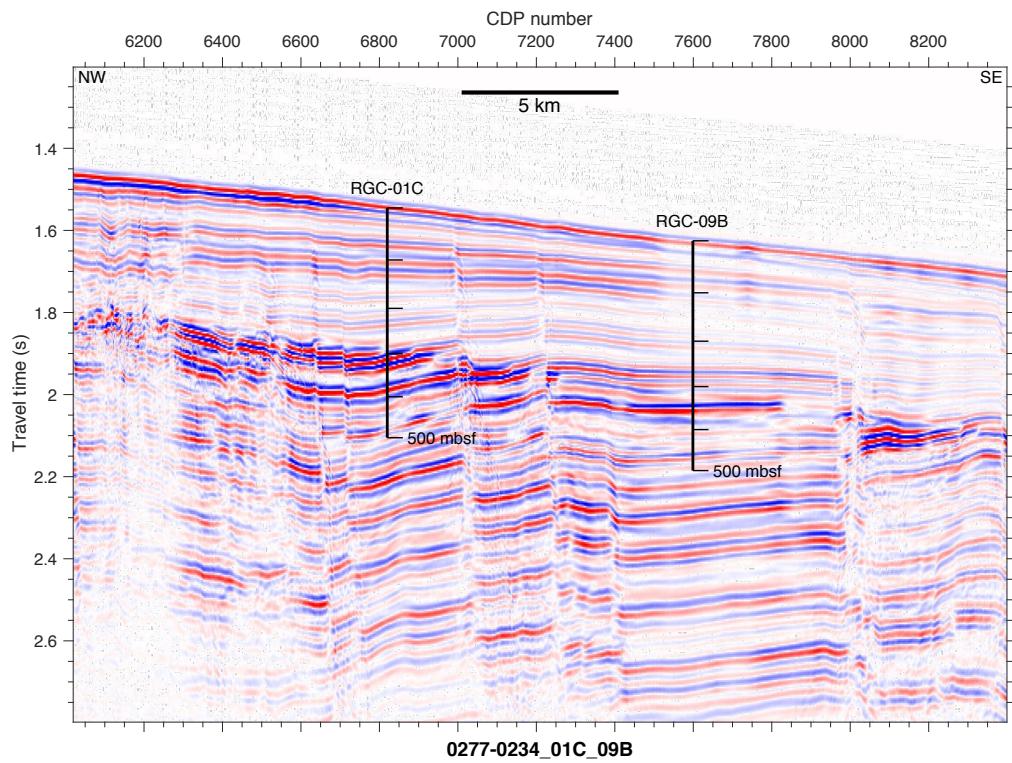
9.2 Site RGC-09B



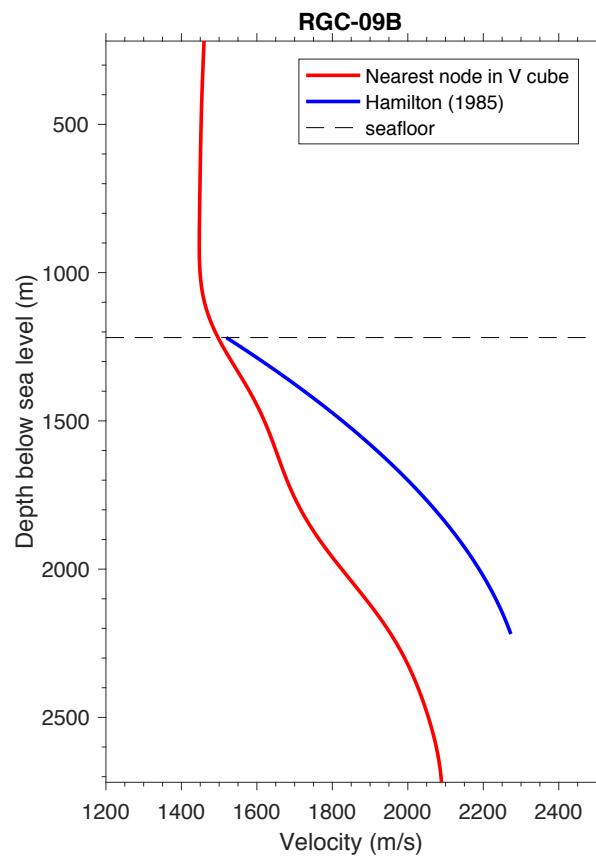
Gridded bathymetry and seismic line locations at Site RGC-09B.



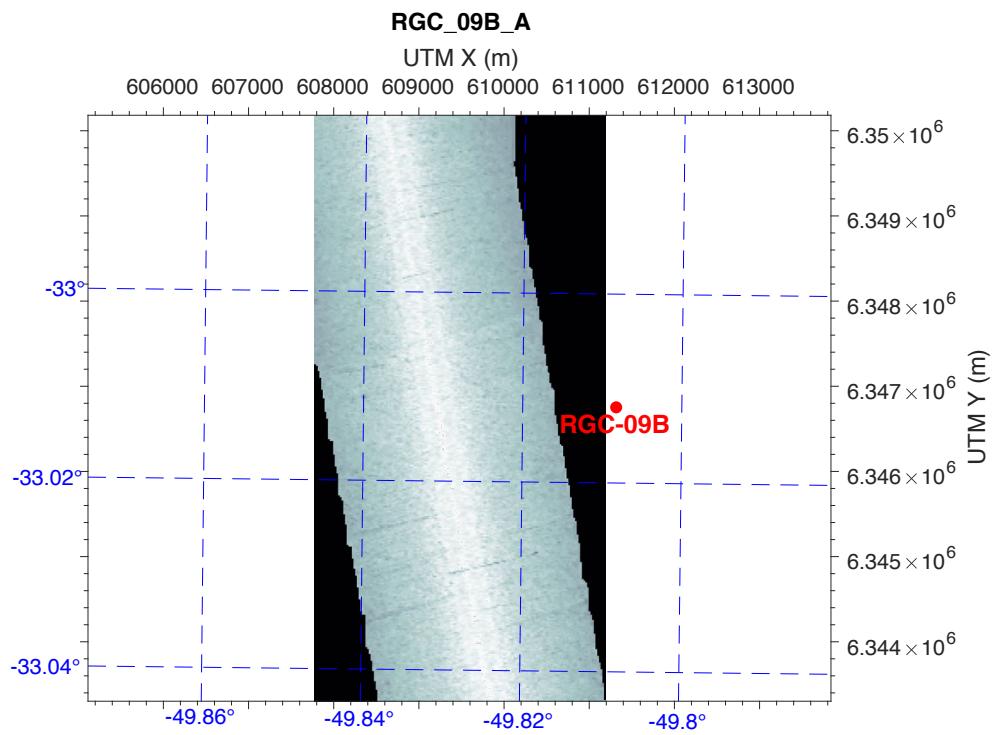
Seismic reflection for Site RGC-09B.



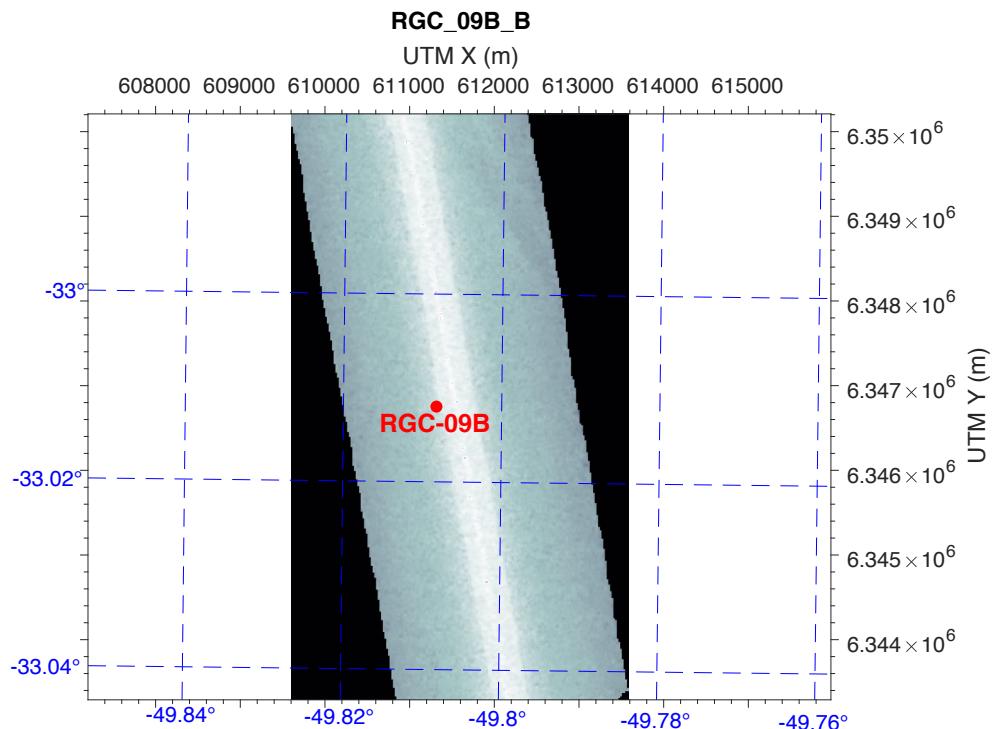
Seismic reflection line at Site RGC-09B.



Seismic velocities for travel time-depth conversion at Site RGC-09B.

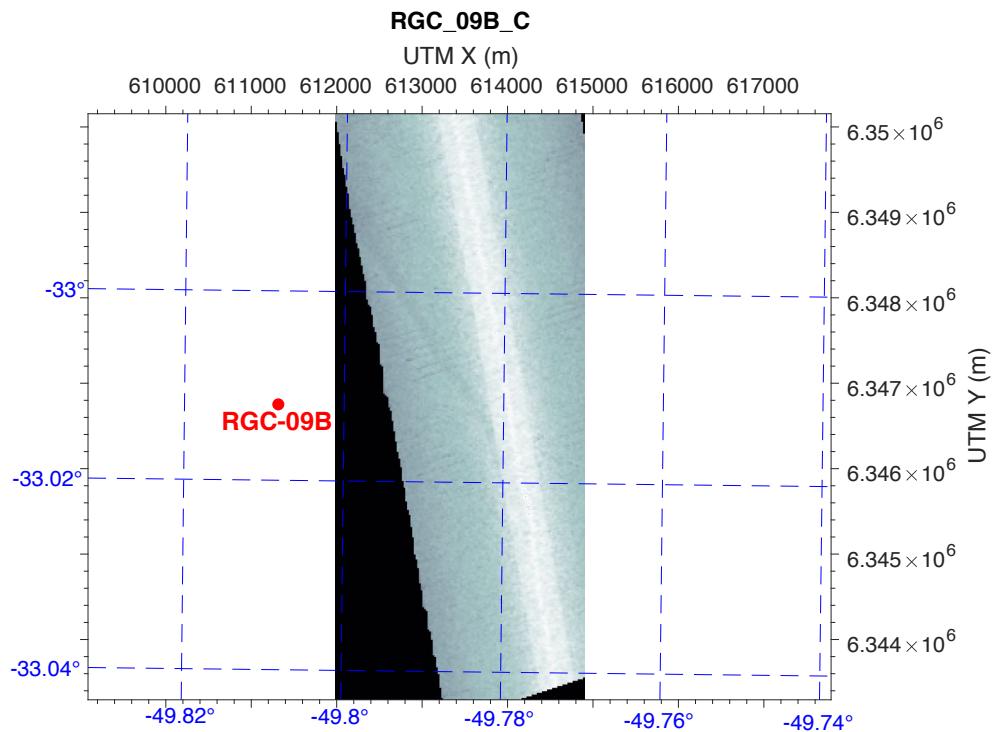


Site RGC-09B-Line 2



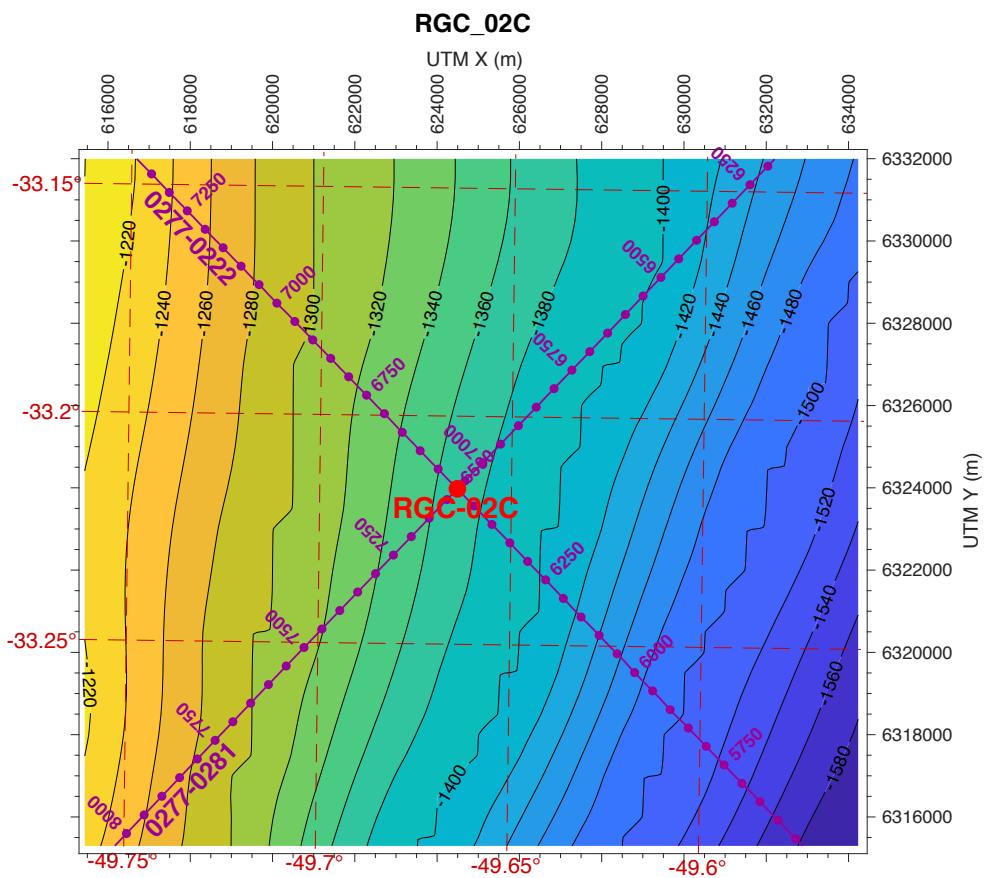
Backscatter images at Site RGC-09B.

Site RGC-09B-Line 3

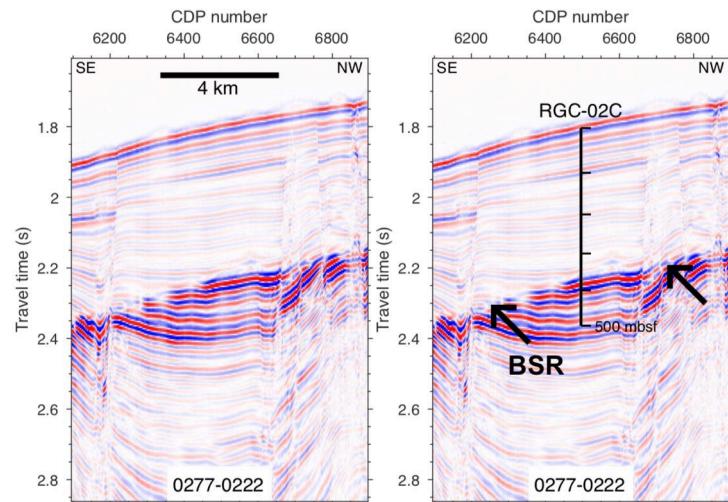
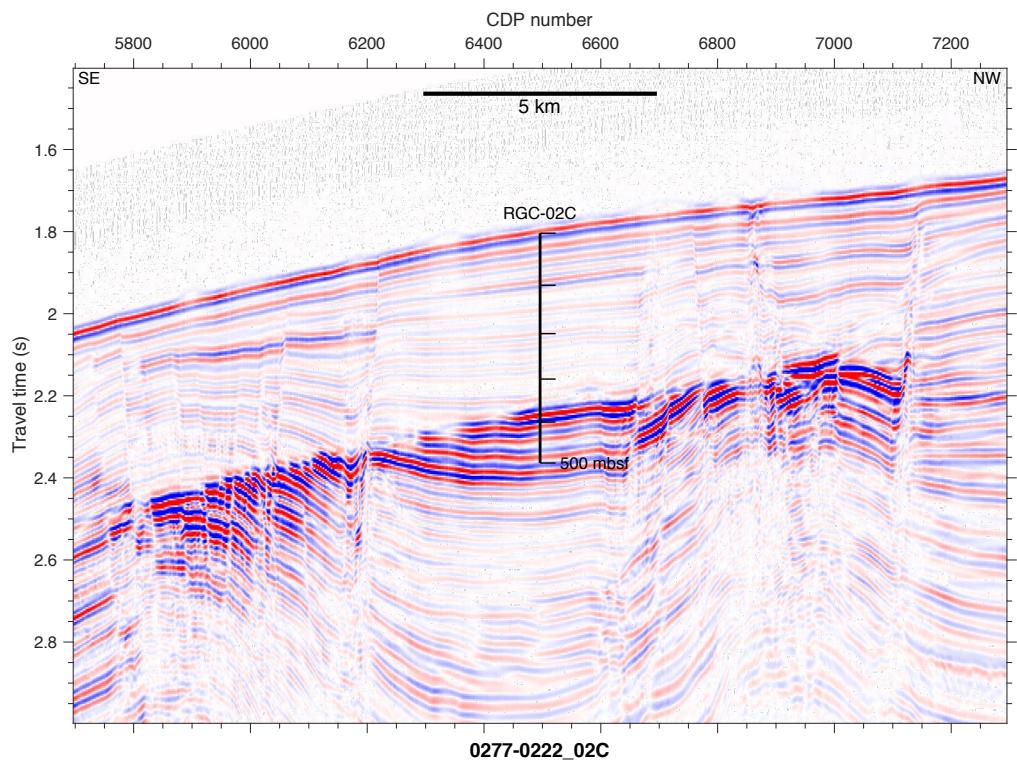


Backscatter images at Site RGC-09B.

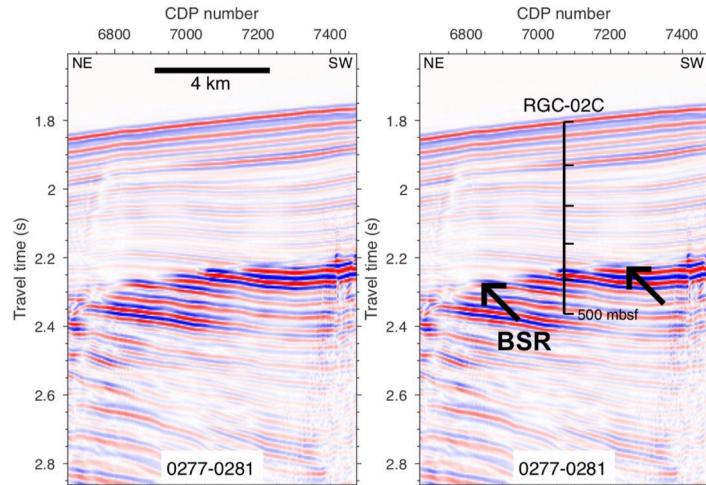
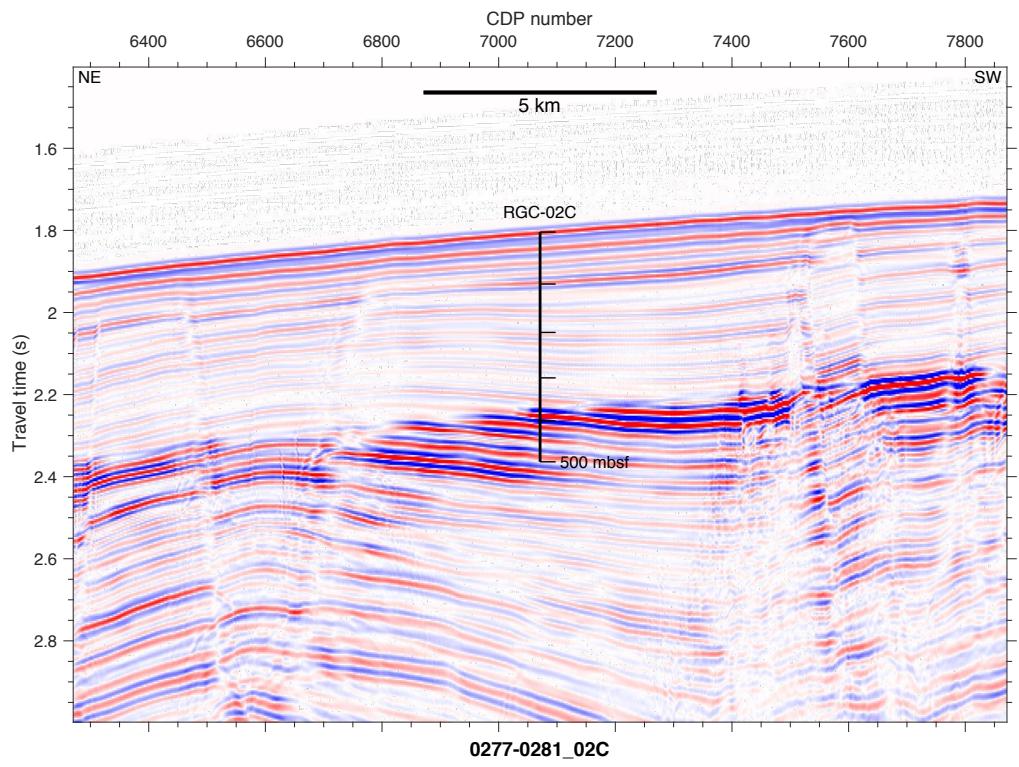
9.3 Site RGC-02C



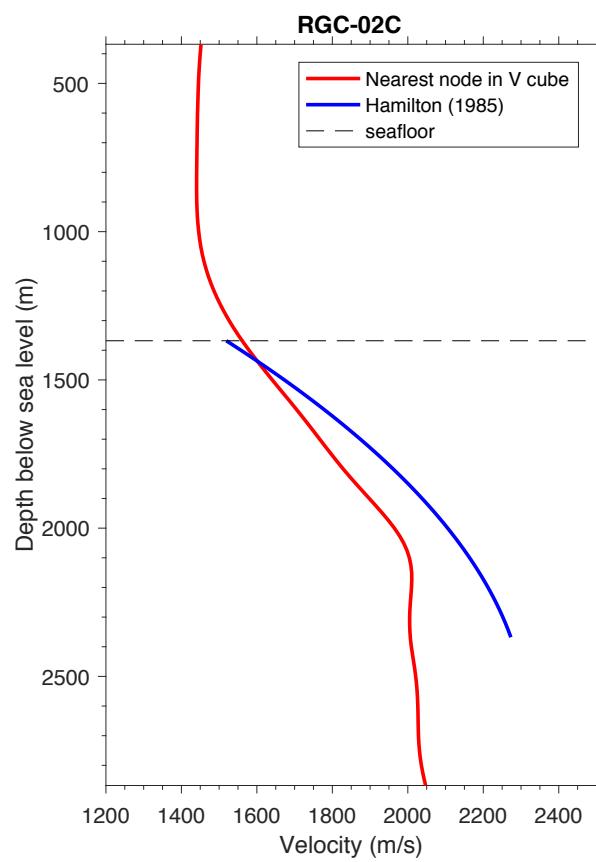
Gridded bathymetry and seismic line locations at Site RGC-02C.



Seismic reflection for Site RGC-02C.

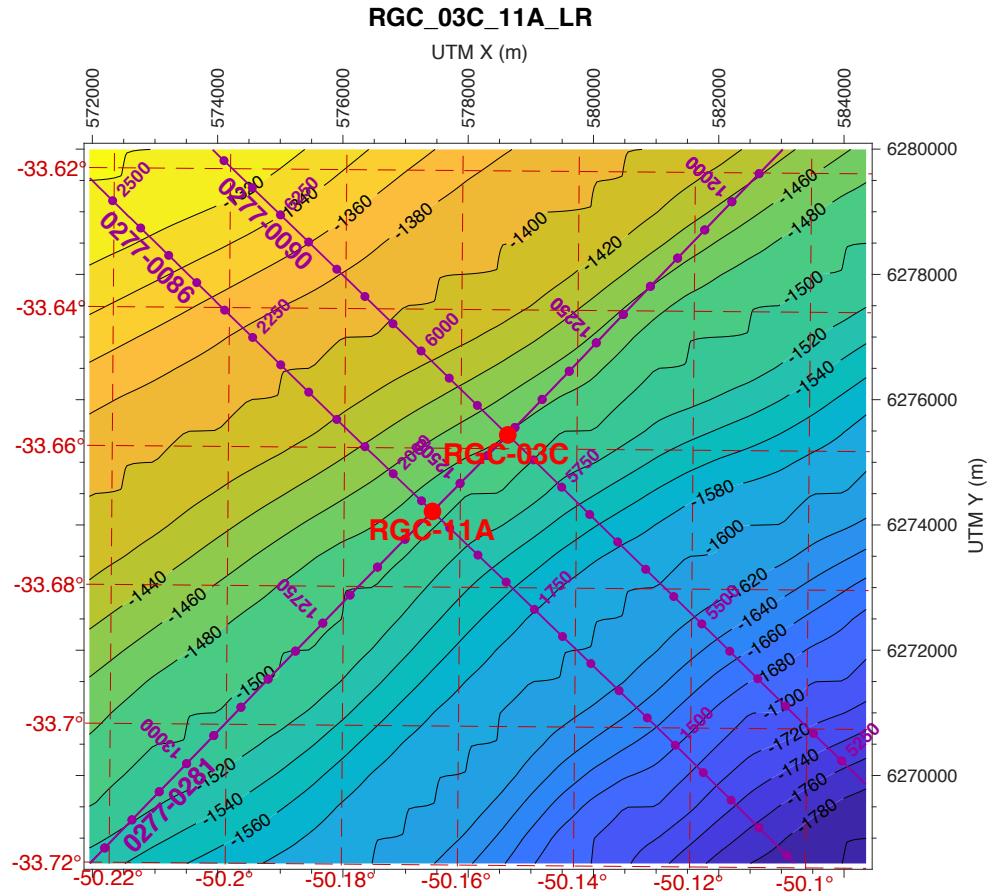


Seismic reflection line at Site RGC-02C.



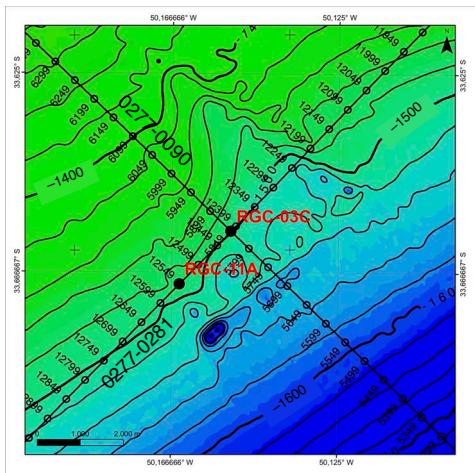
Seismic velocities for travel time-depth conversion at Site RGC-02C.

9.4 Site RGC-03C



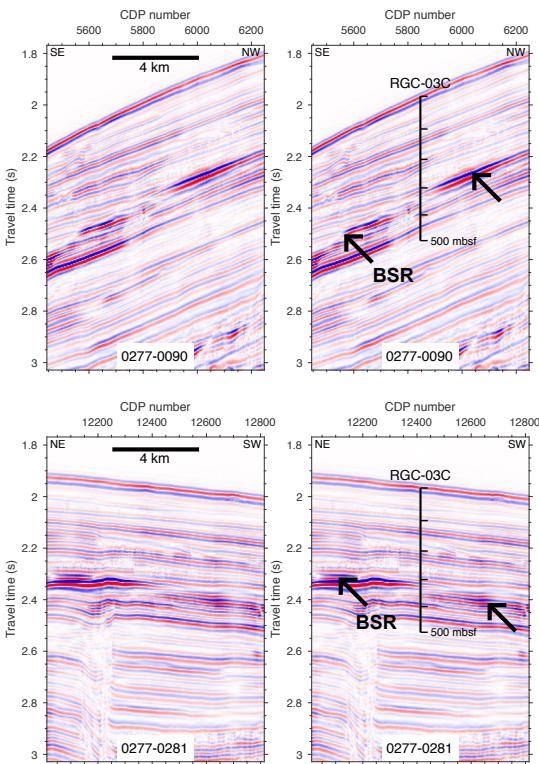
Gridded bathymetry and seismic line locations at Site RGC-03C.

IODP proposal 910-Full2
Site RGC-03C

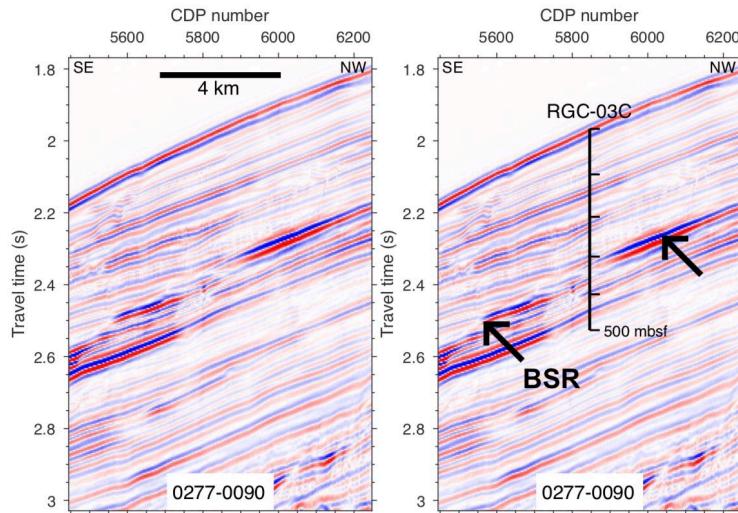
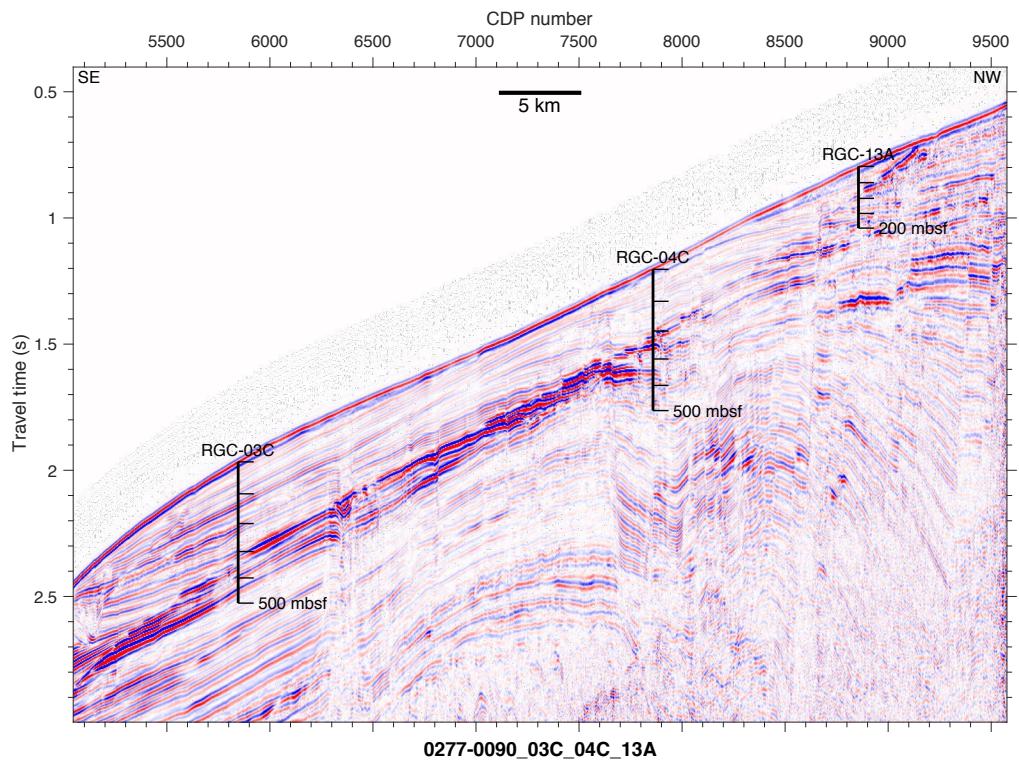


Site RGC-03C
CDP 5846 on line 0277-0090
CDP 12413 on line 0277-0281
Lat. -33.65803 / Long. -50.15192
UTM 22S 578631.7 E / 6275437.6 N
Water depth 1505 m
Penetration 500 m

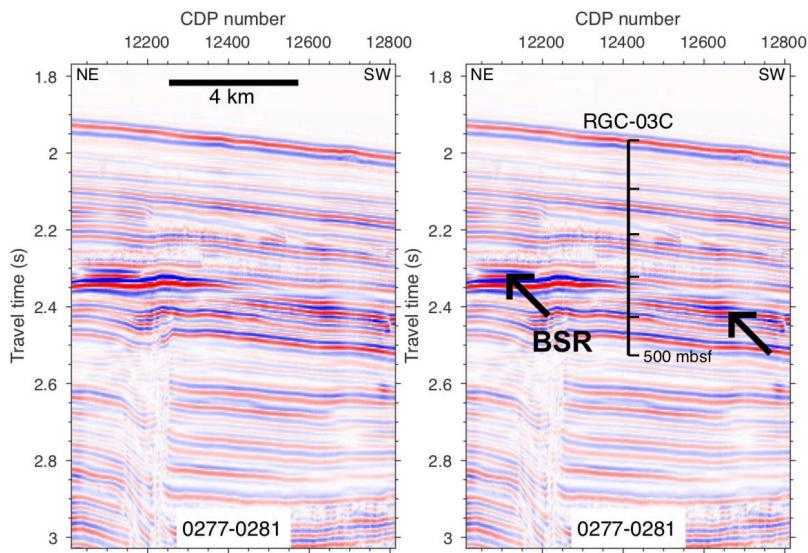
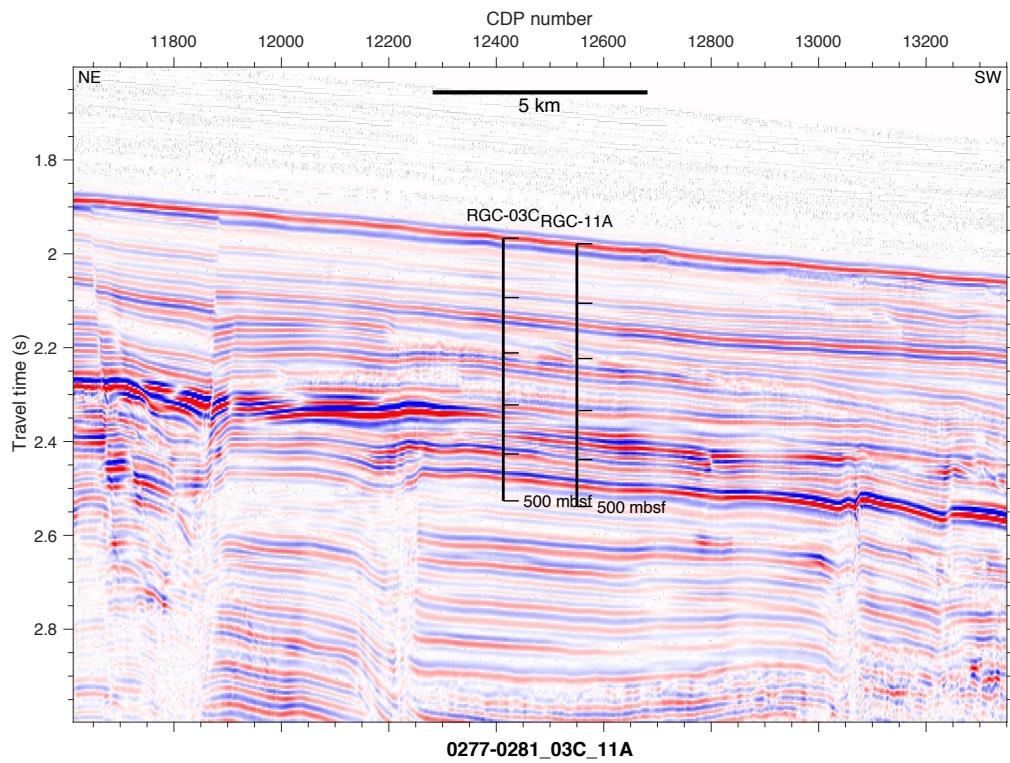
Data files will be submitted to the SSDB
by the November 2018 deadline



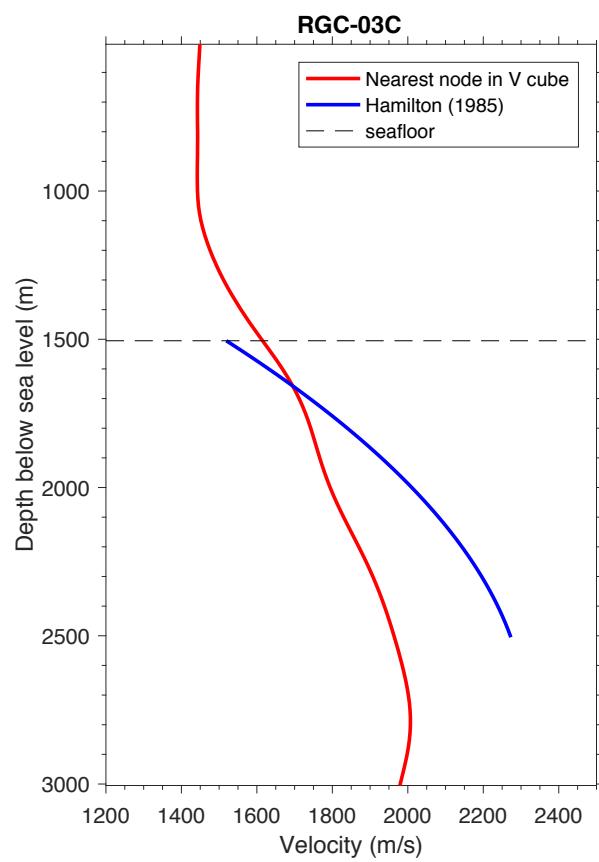
High-resolution bathymetry and seismic lines at Site RGC-03C.



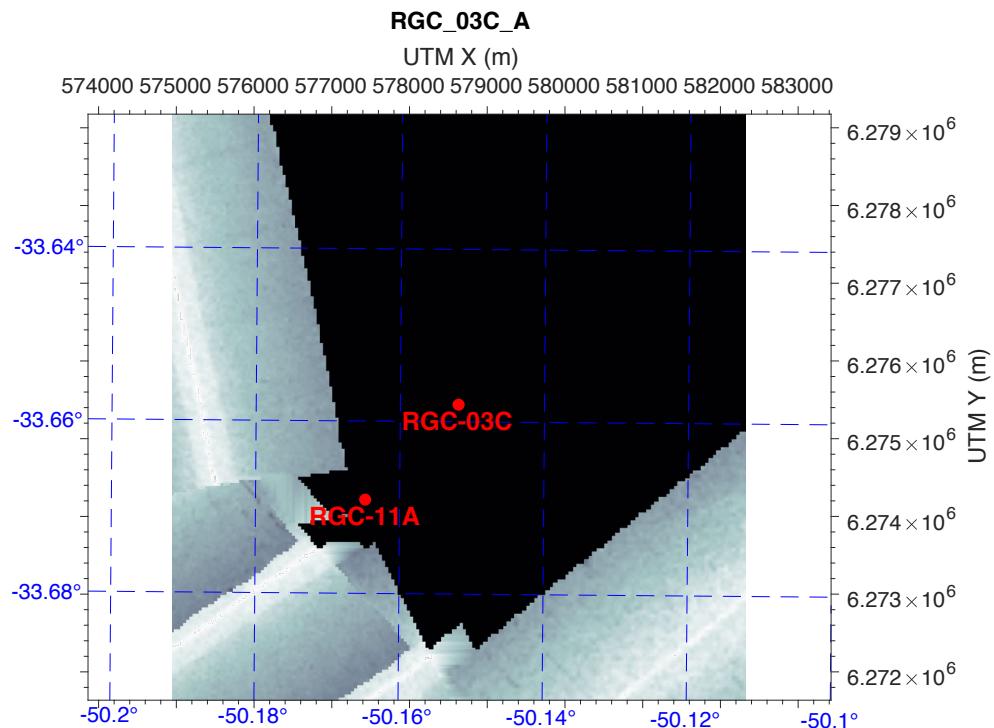
Seismic reflection for Site RGC-03C.



Seismic reflection line at Site RGC-03C.

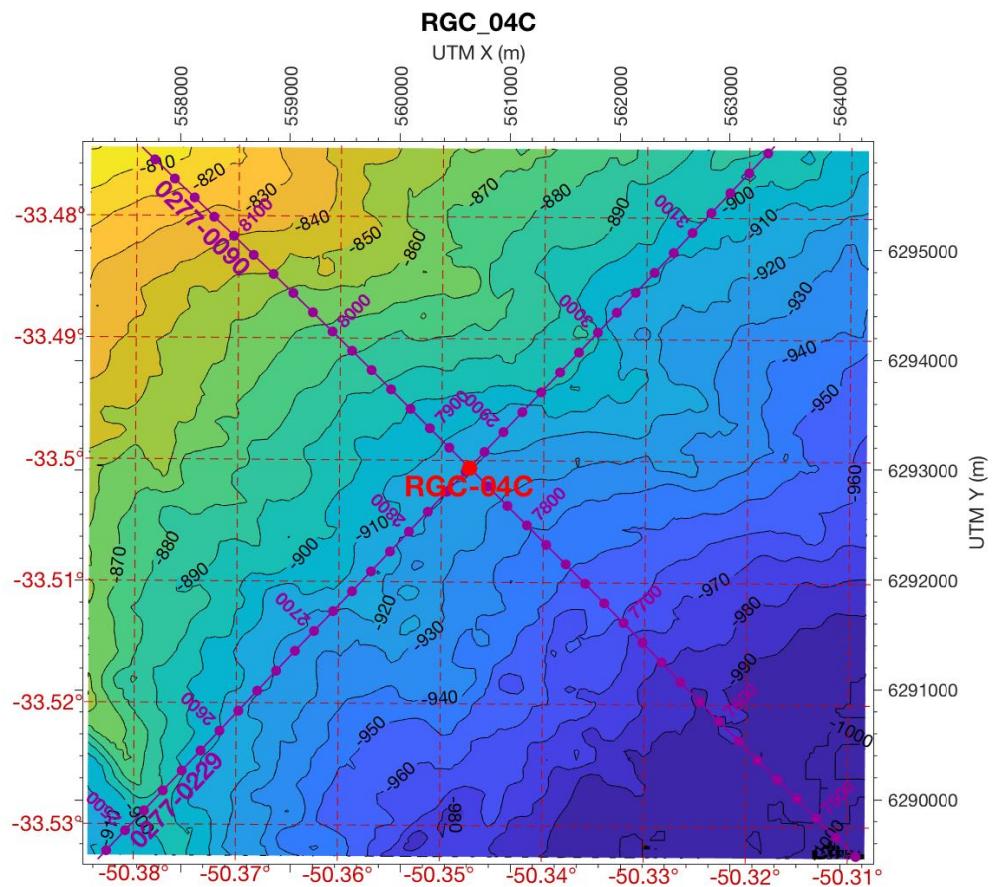


Seismic velocities for travel time-depth conversion at Site RGC-03C.

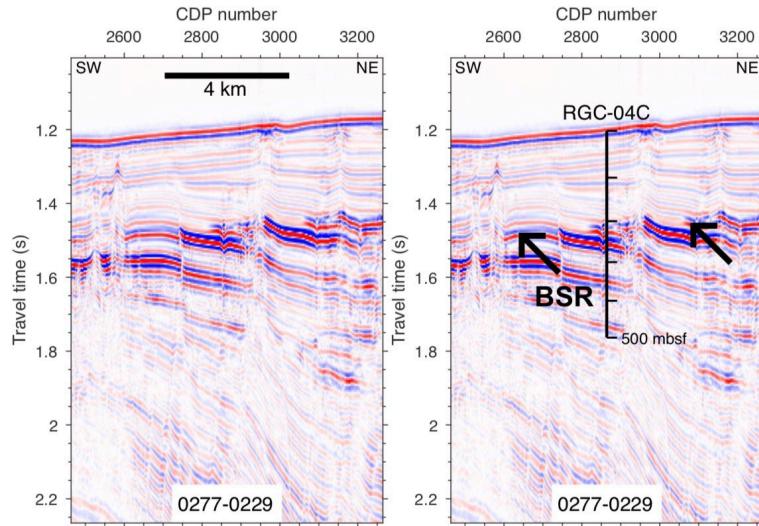
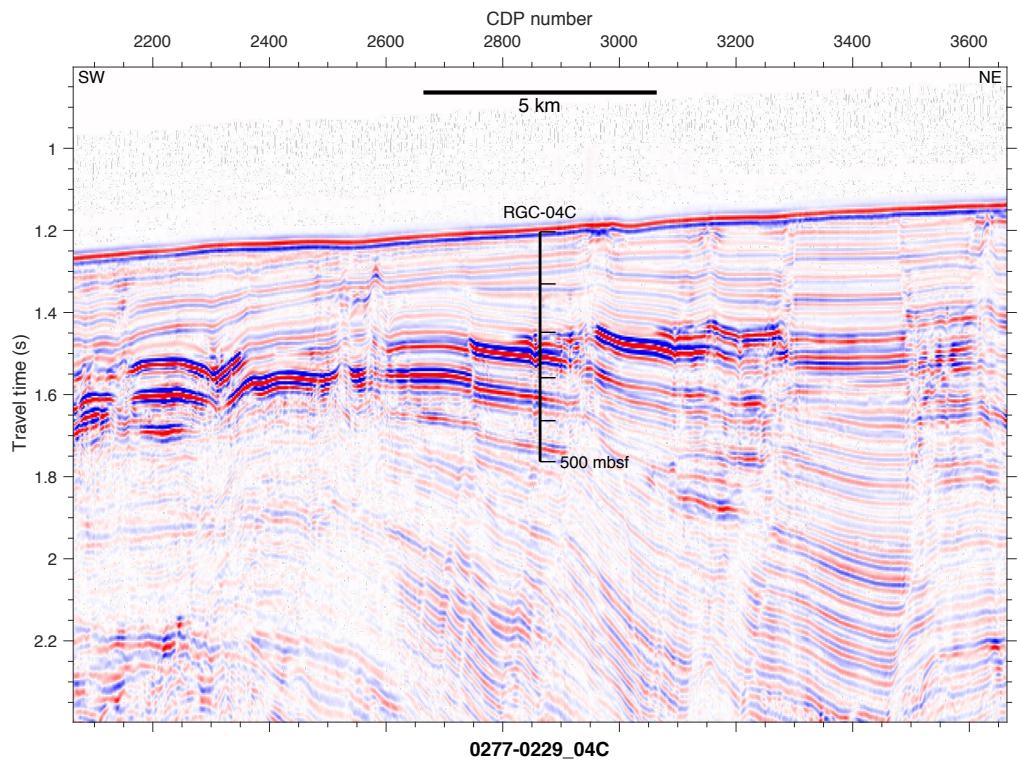


Backscatter image at Site RGC-03C.

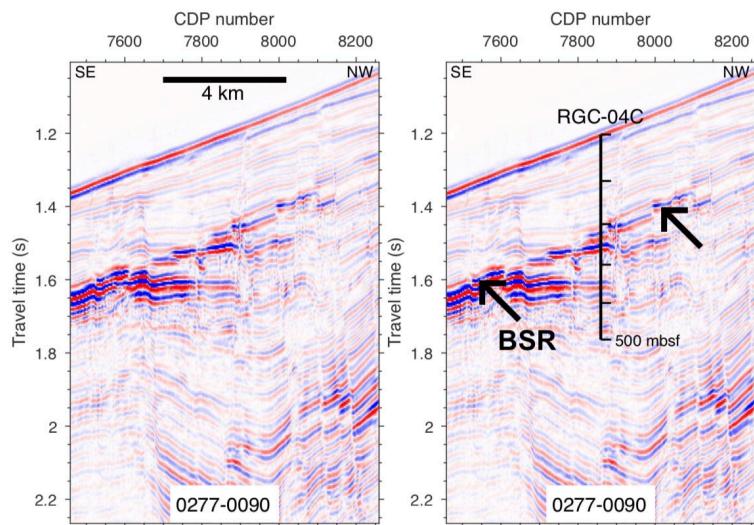
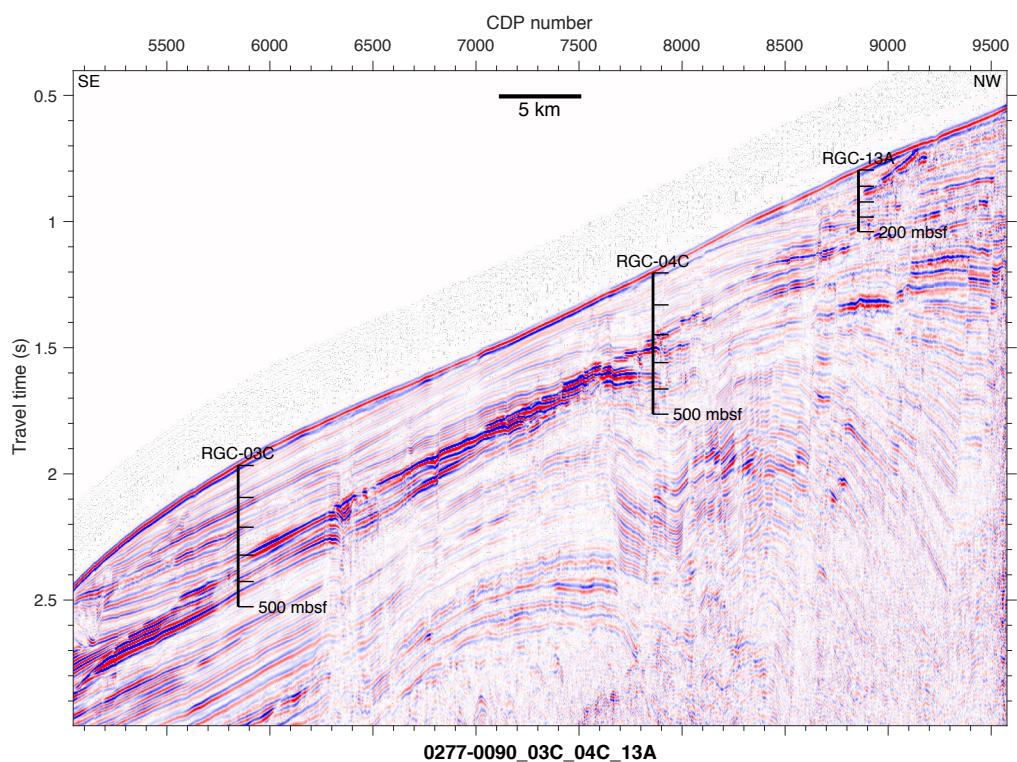
9.5 Site RGC-04C



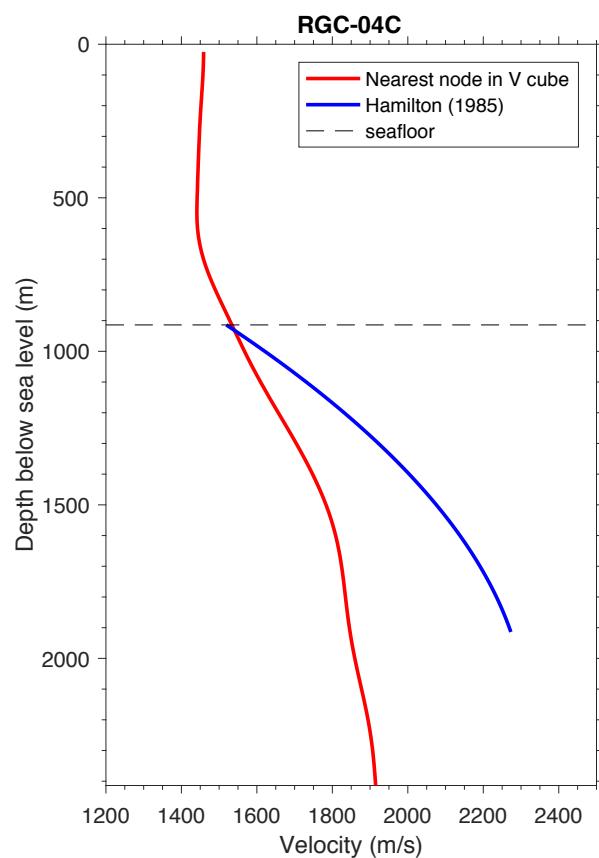
Gridded bathymetry and seismic line locations at Site RGC-04C.



Seismic reflection for Site RGC-04C.

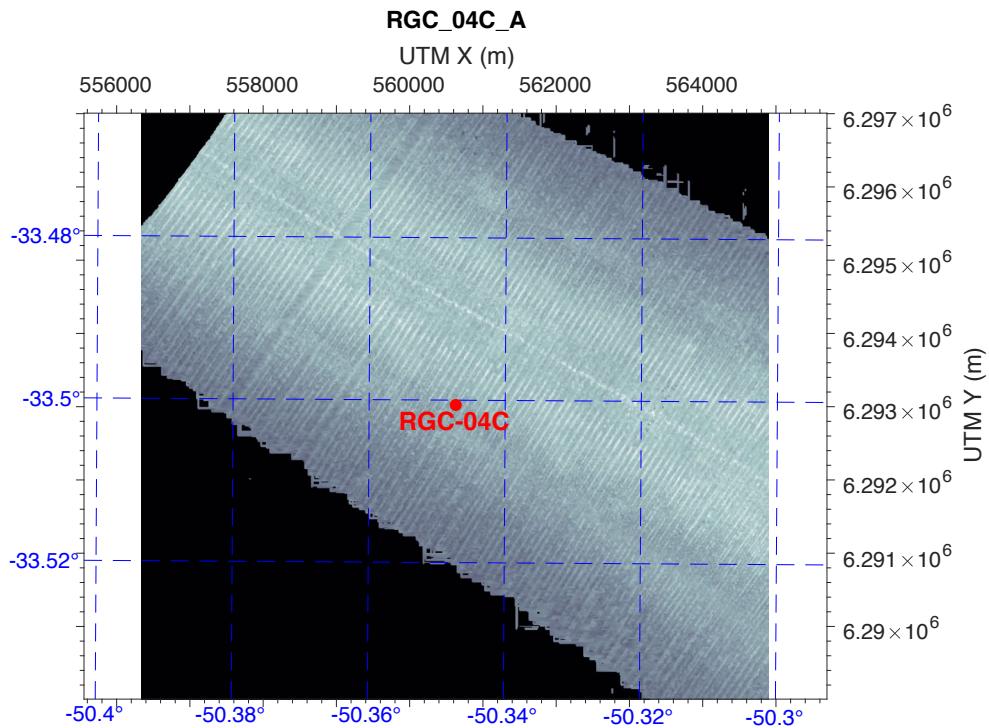


Seismic reflection line at Site RGC-04C.

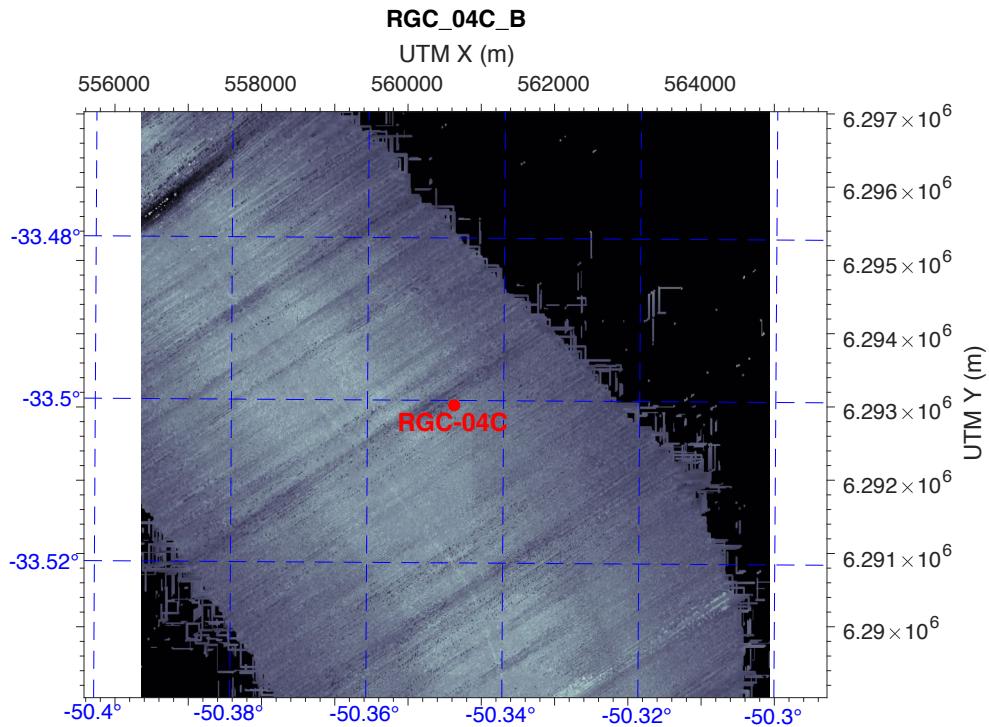


Seismic velocities for travel time-depth conversion at Site RGC-04C.

Site RGC-04C-Line 1

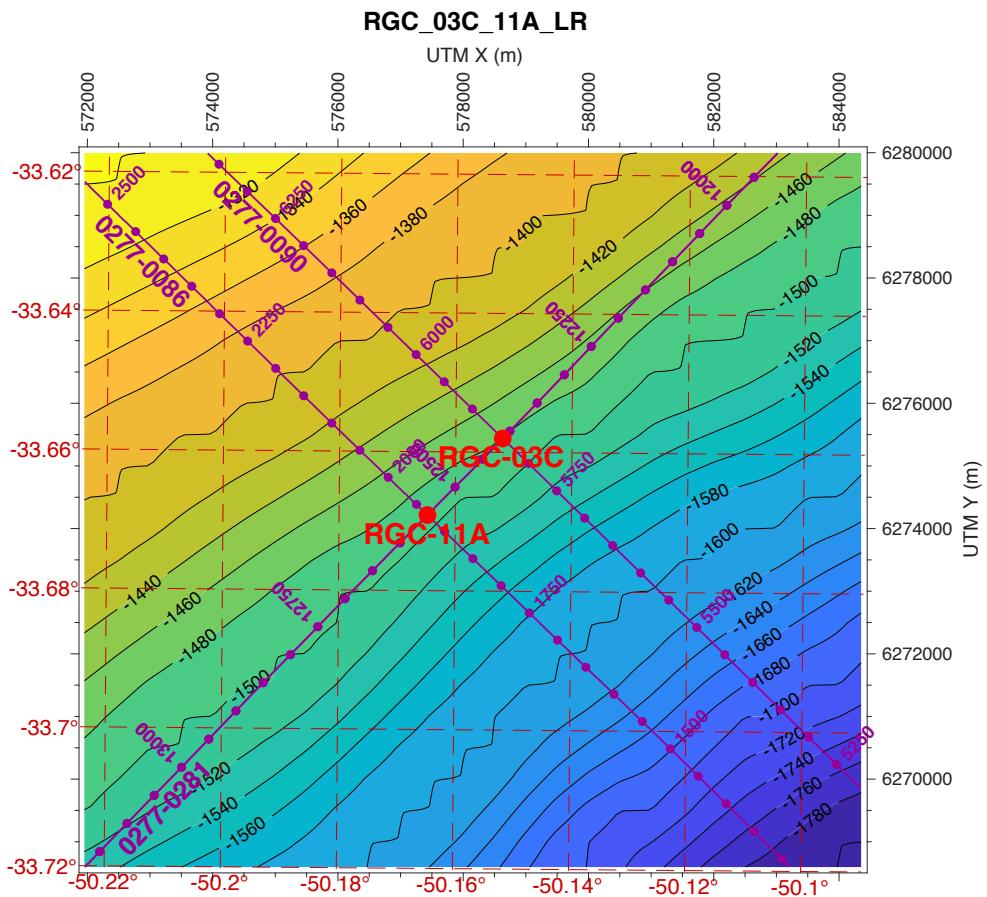


Site RGC-04C-Line 2



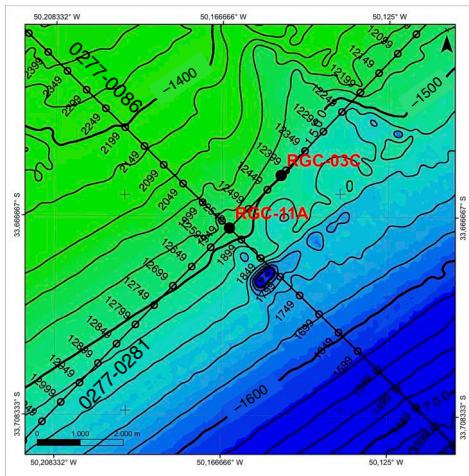
Backscatter image at Site RGC-04C.

9.6 Site RGC-11A



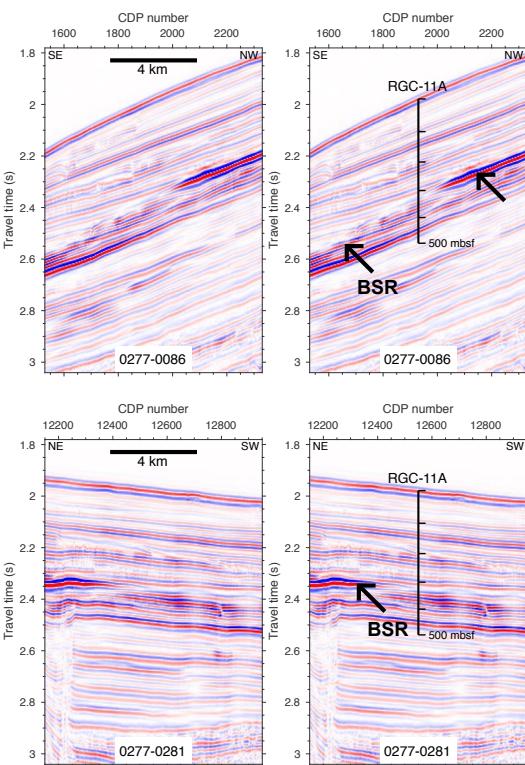
Gridded bathymetry and seismic line locations at Site RGC-11A.

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Site RGC-11A

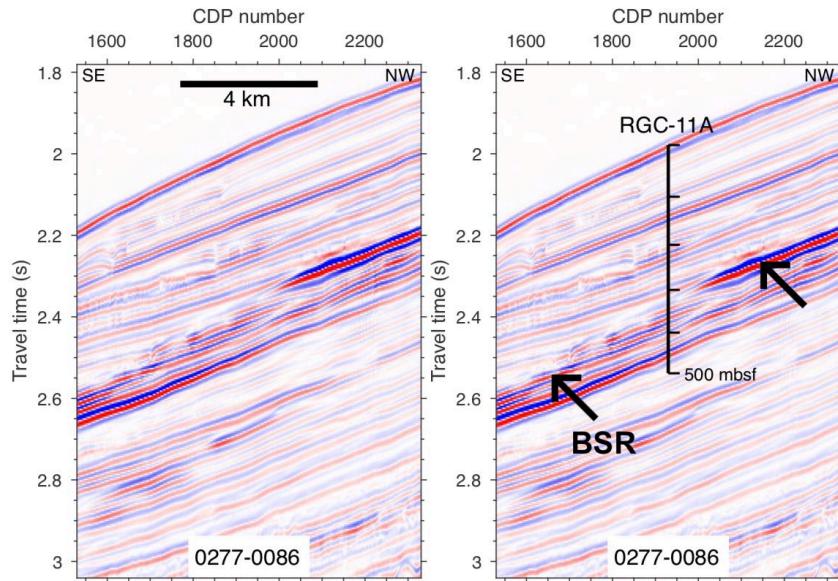
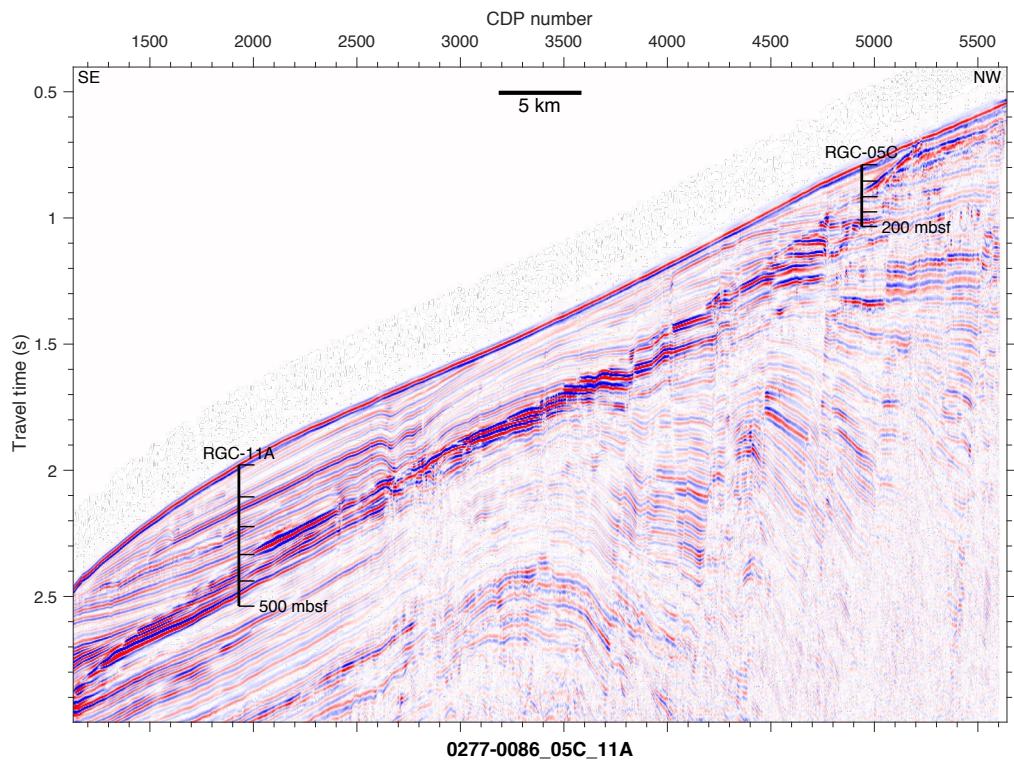


Site RGC-11A
CDP 1930 on line 0277-0086
CDP 12550 on line 0277-0281
Lat. -33.66913 / Long. -50.16478
UTM 22S 577429.7 E / 6274215.9 N
Water depth 1484 m
Penetration 500 m

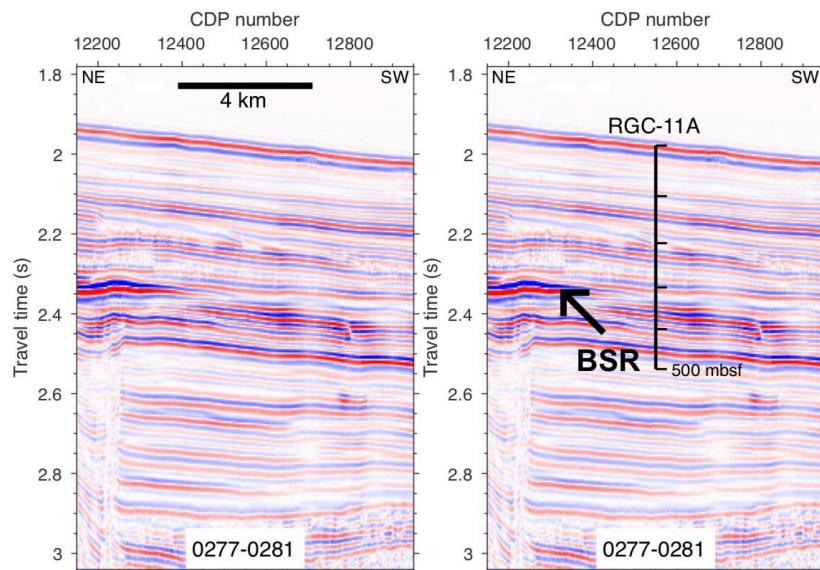
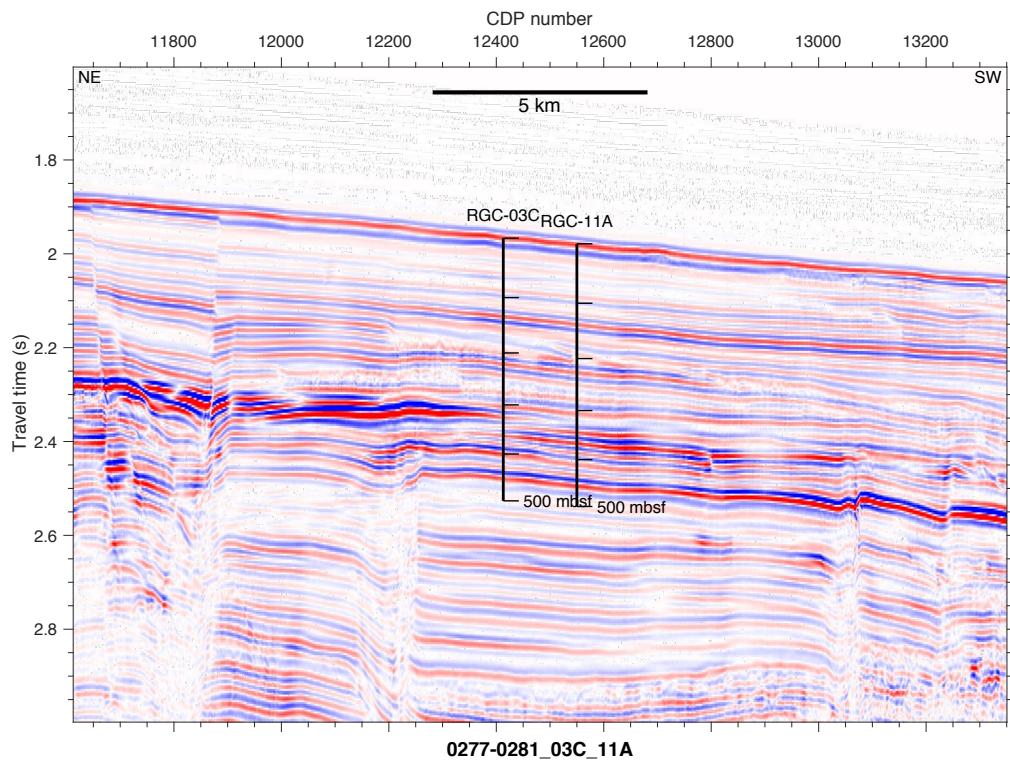
Data files will be submitted to the SSDB
by the November 2018 deadline



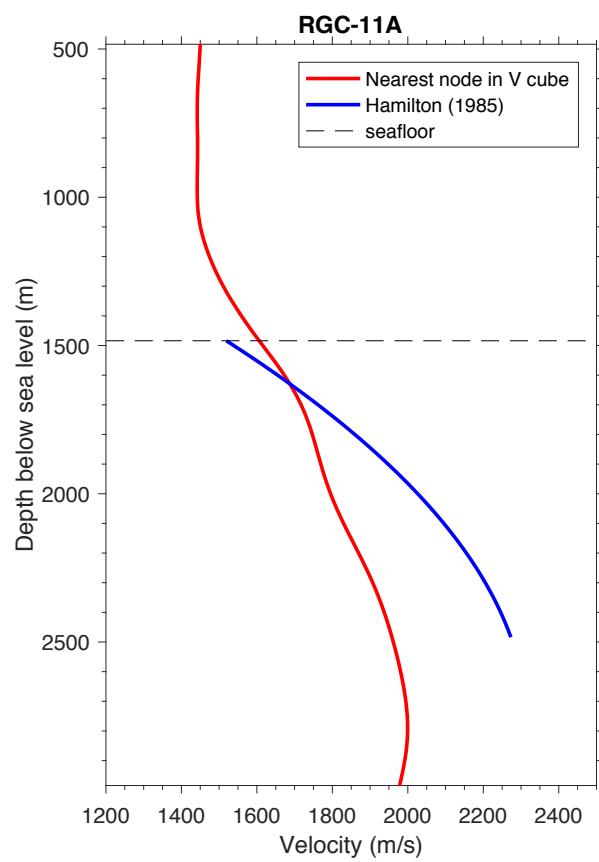
High-resolution bathymetry and seismic lines at Site RGC-11A.



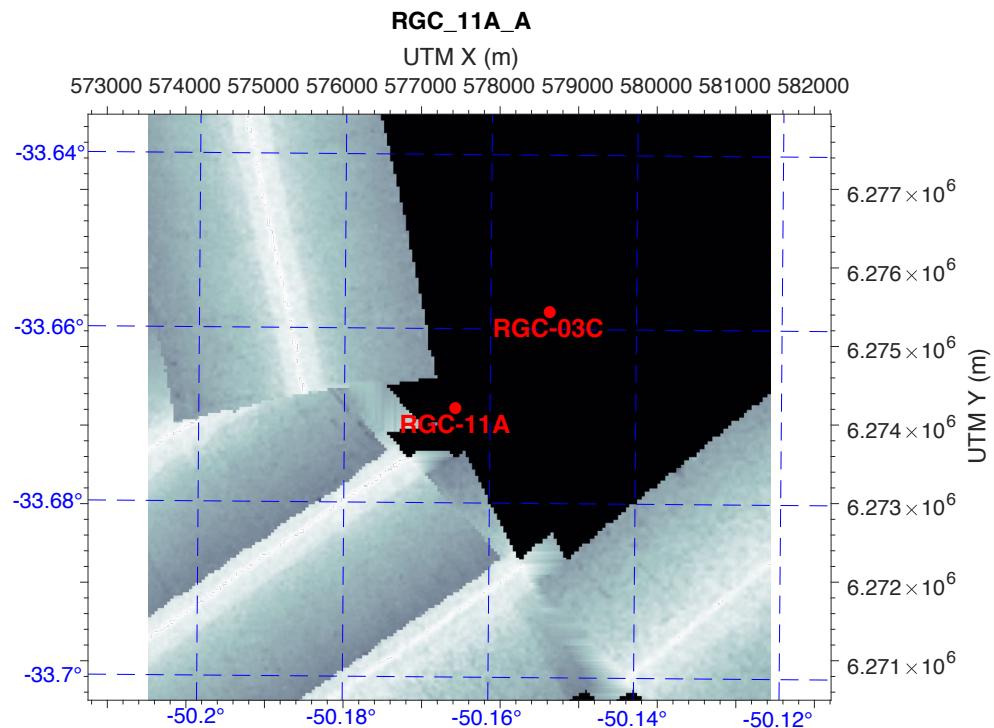
Seismic reflection for Site RGC-11A.



Seismic reflection line at Site RGC-11A.

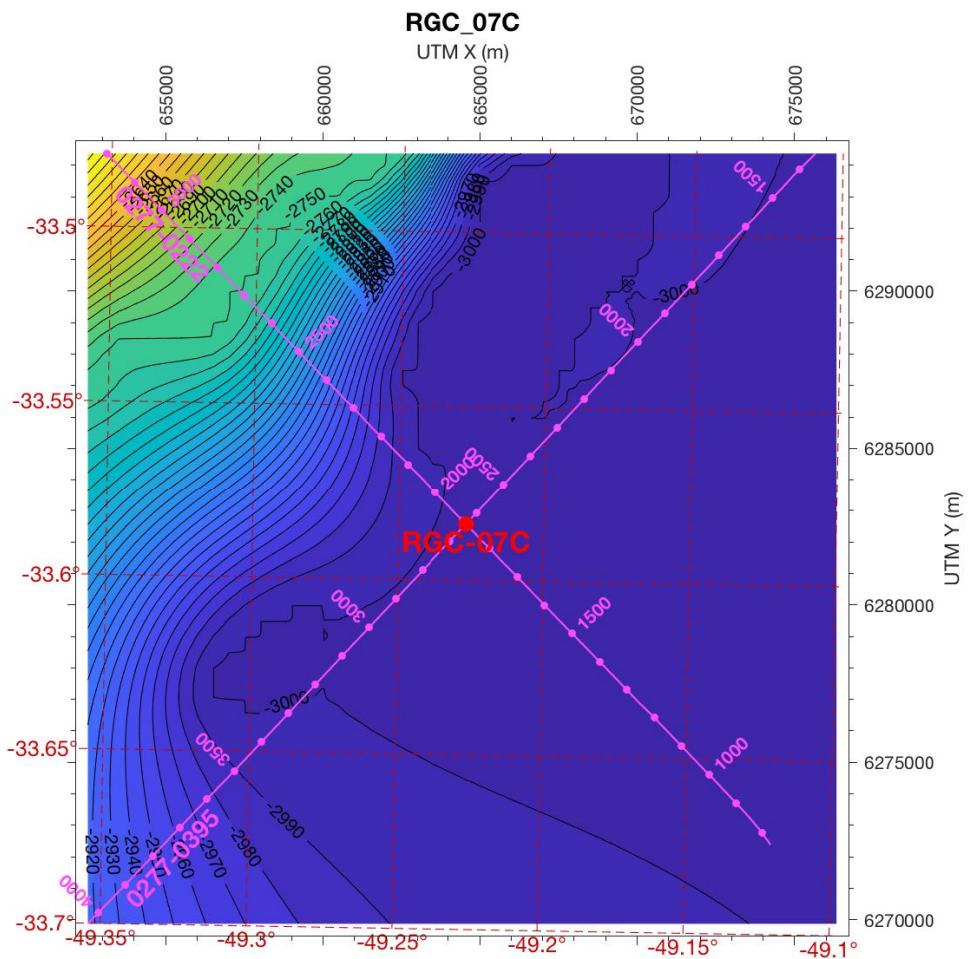


Seismic velocities for travel time-depth conversion at Site RGC-11A.

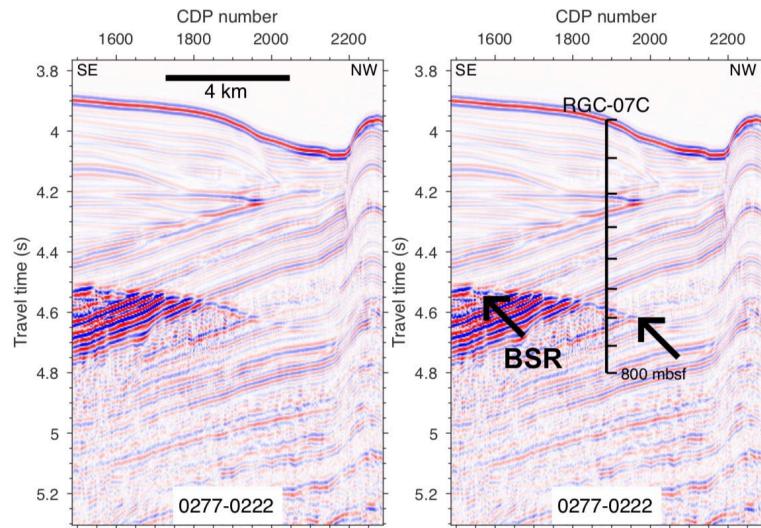
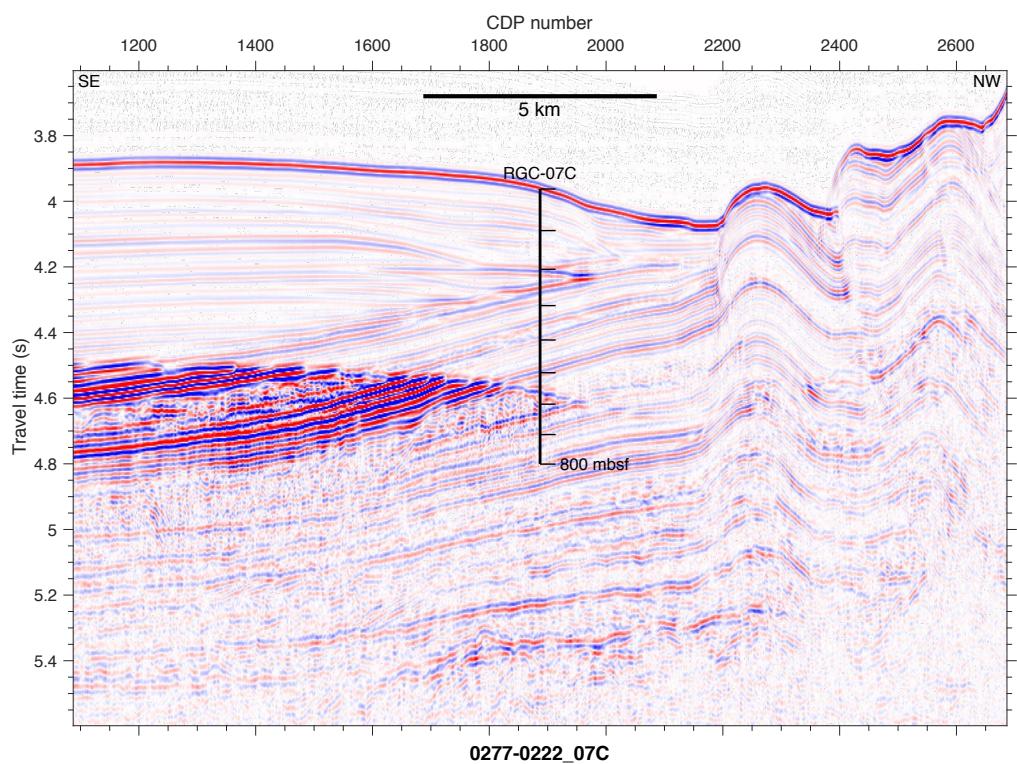


Backscatter image at Site RGC-11A.

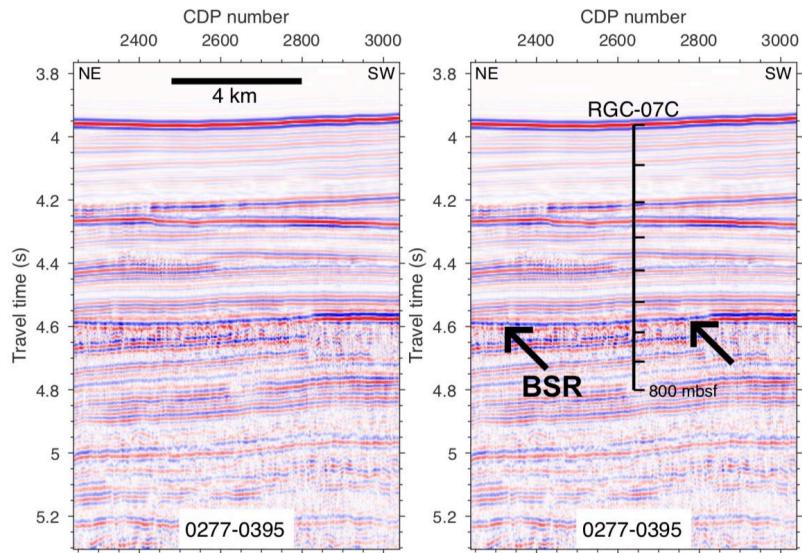
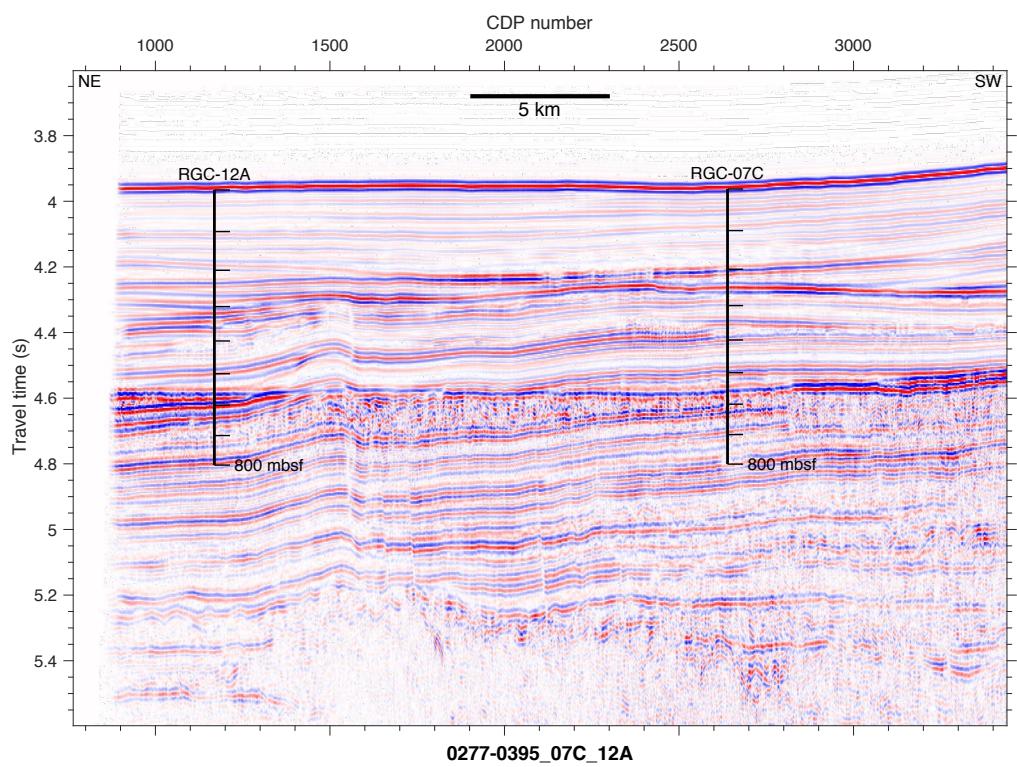
9.7 Site RGC-07C



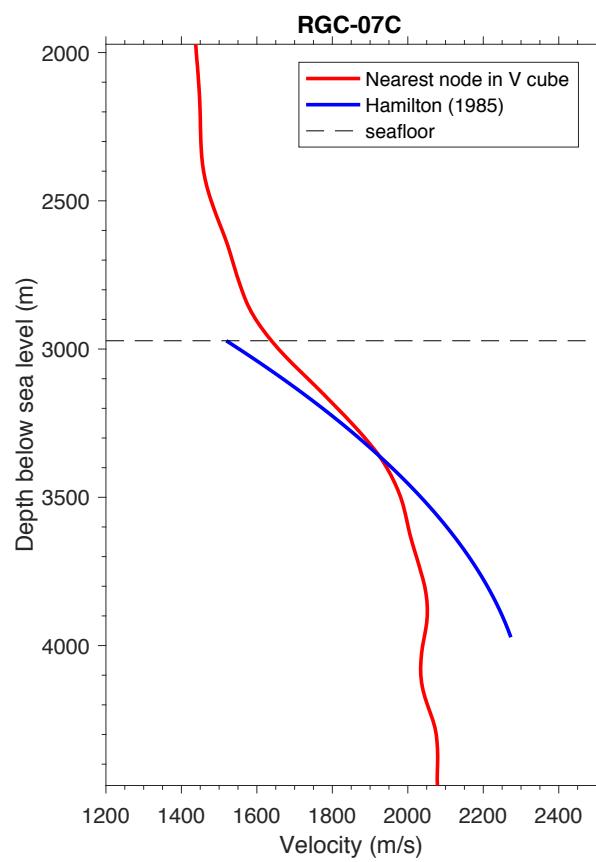
Gridded bathymetry and seismic line locations at Site RGC-07C.



Seismic reflection for Site RGC-07C.

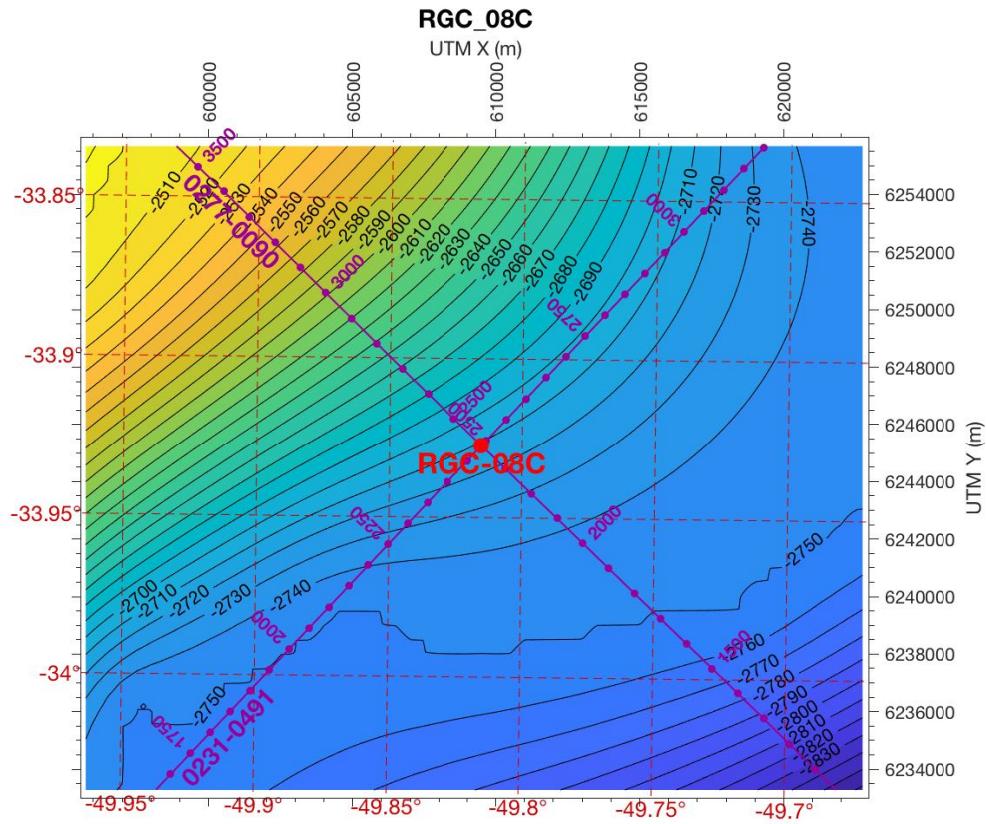


Seismic reflection line at Site RGC-07C.

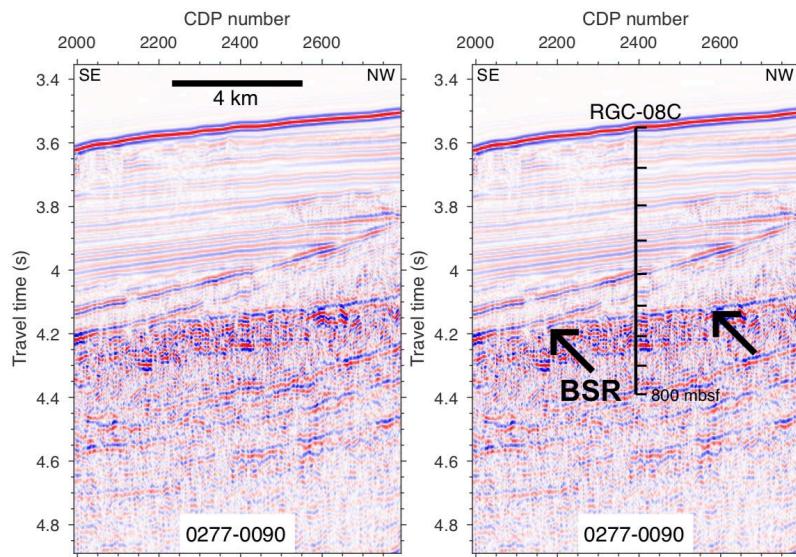
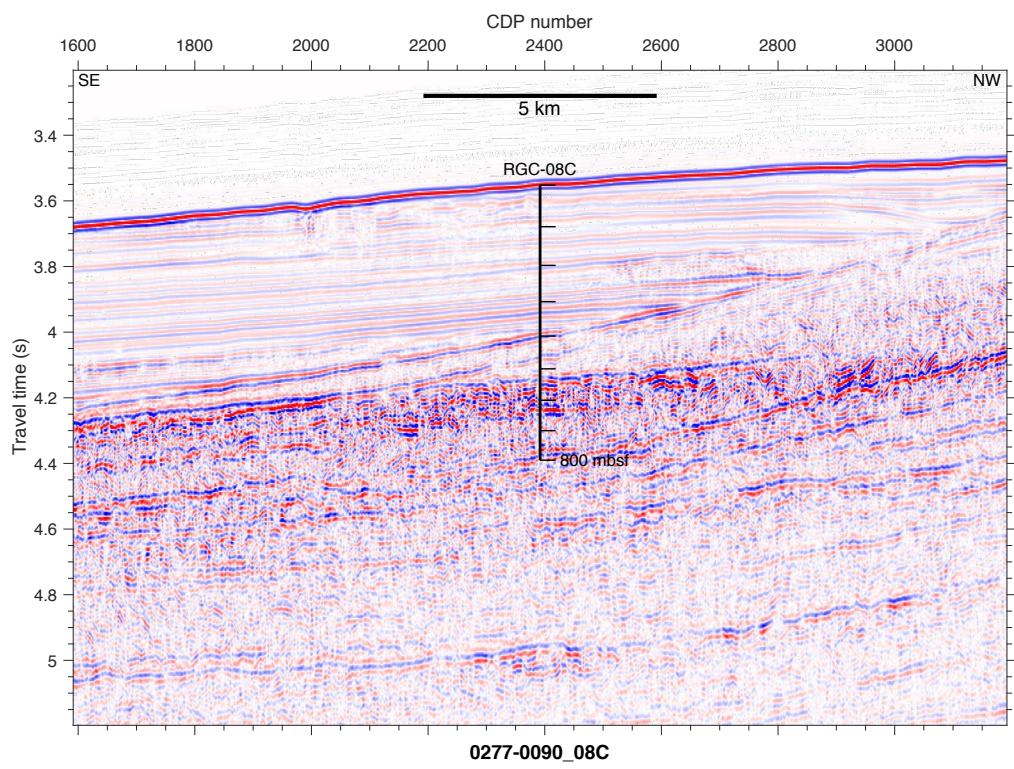


Seismic velocities for travel time-depth conversion at Site RGC-07C.

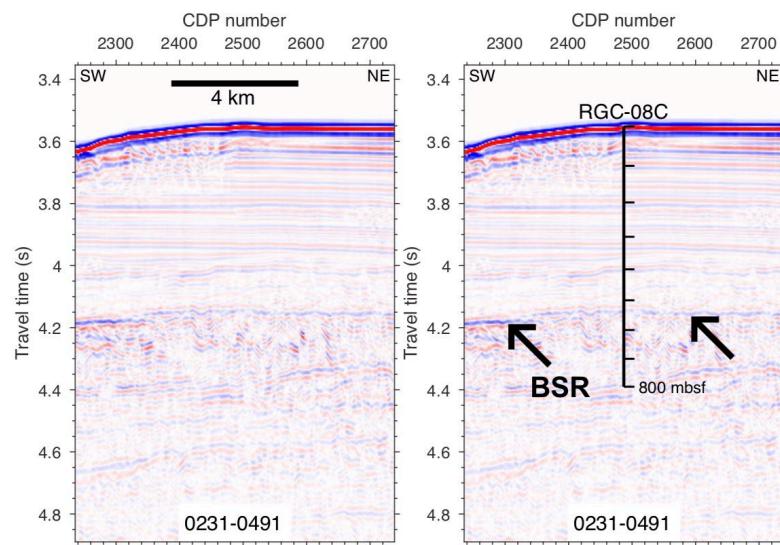
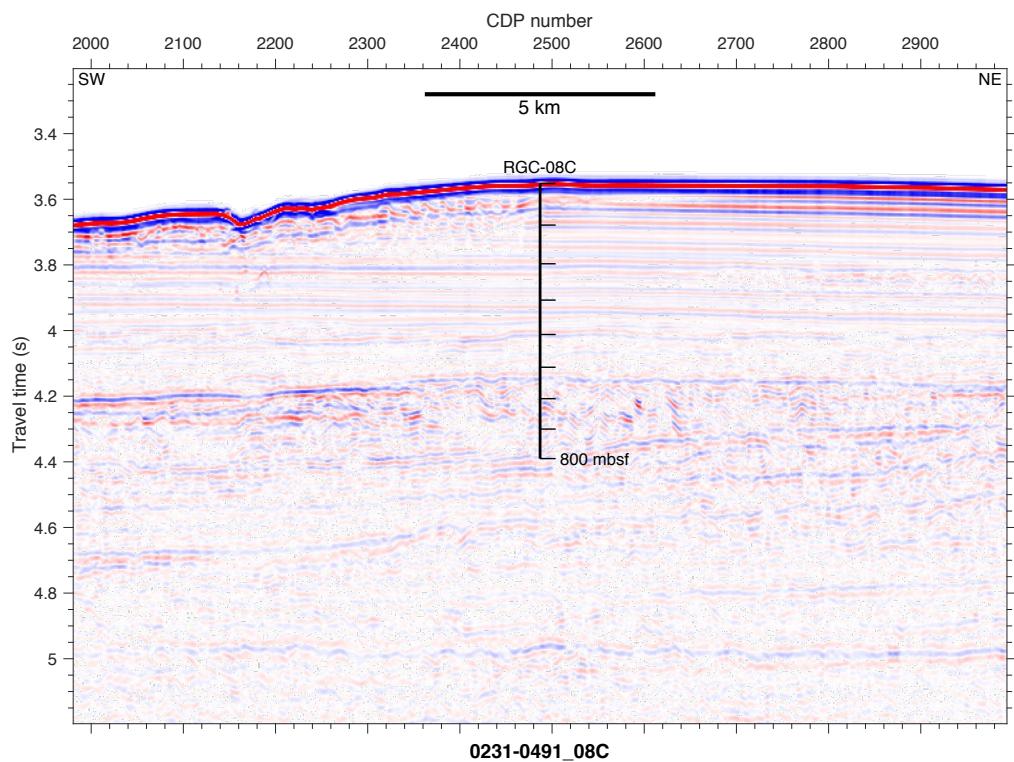
9.8 Site RGC-08C



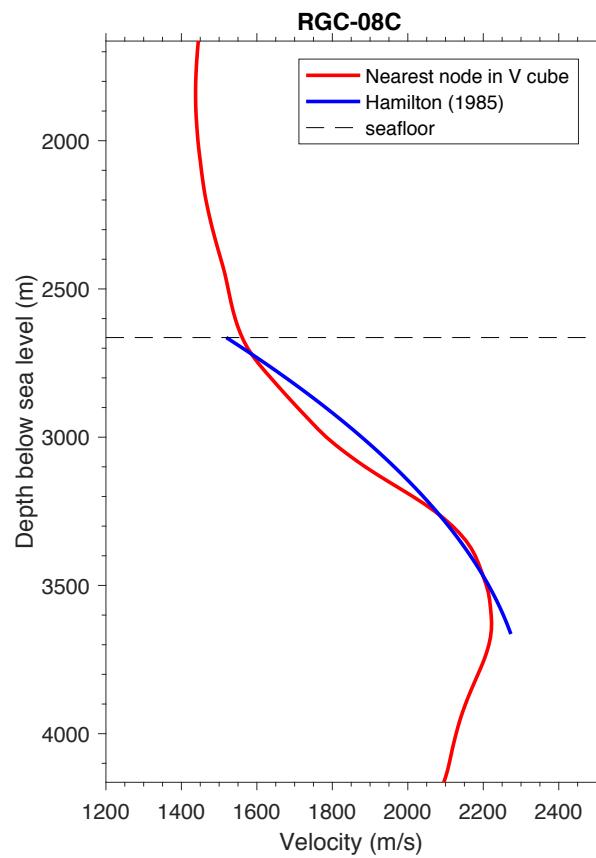
Gridded bathymetry and seismic line locations at Site RGC-08C.



Seismic reflection for Site RGC-08C.

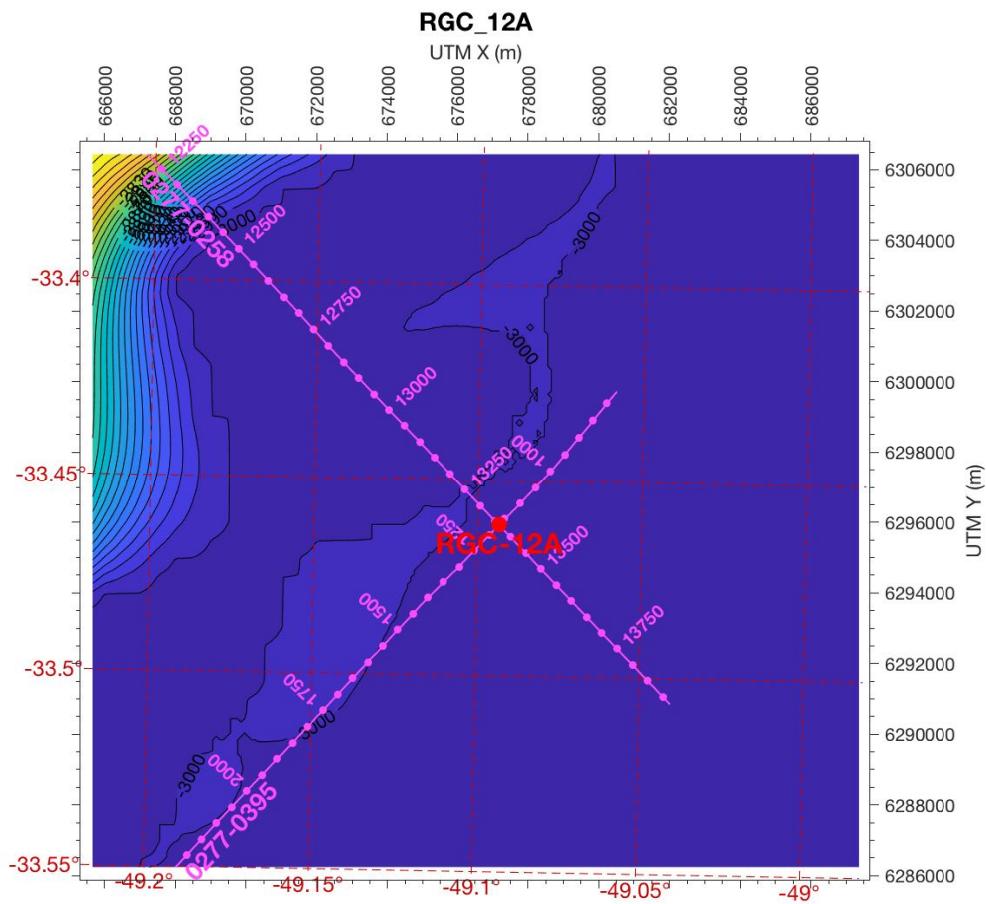


Seismic reflection line at Site RGC-08C.

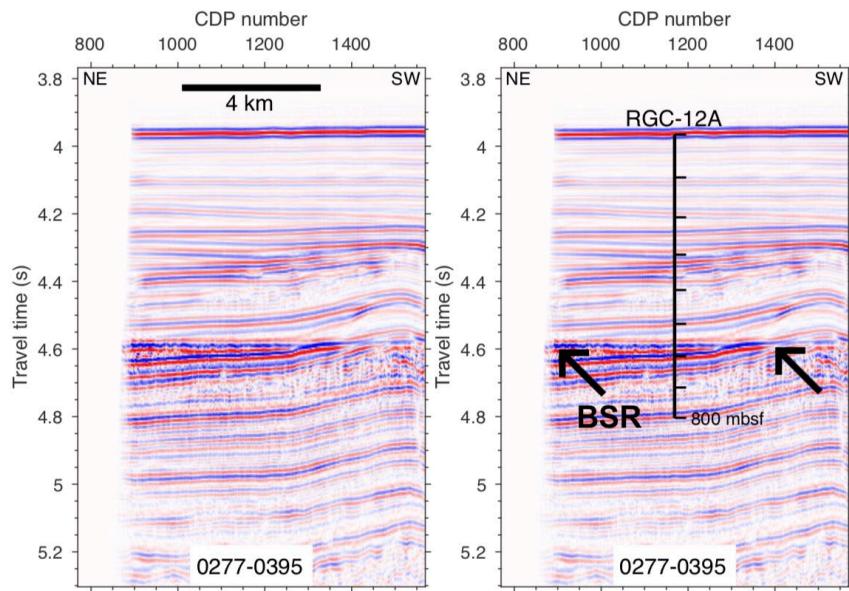
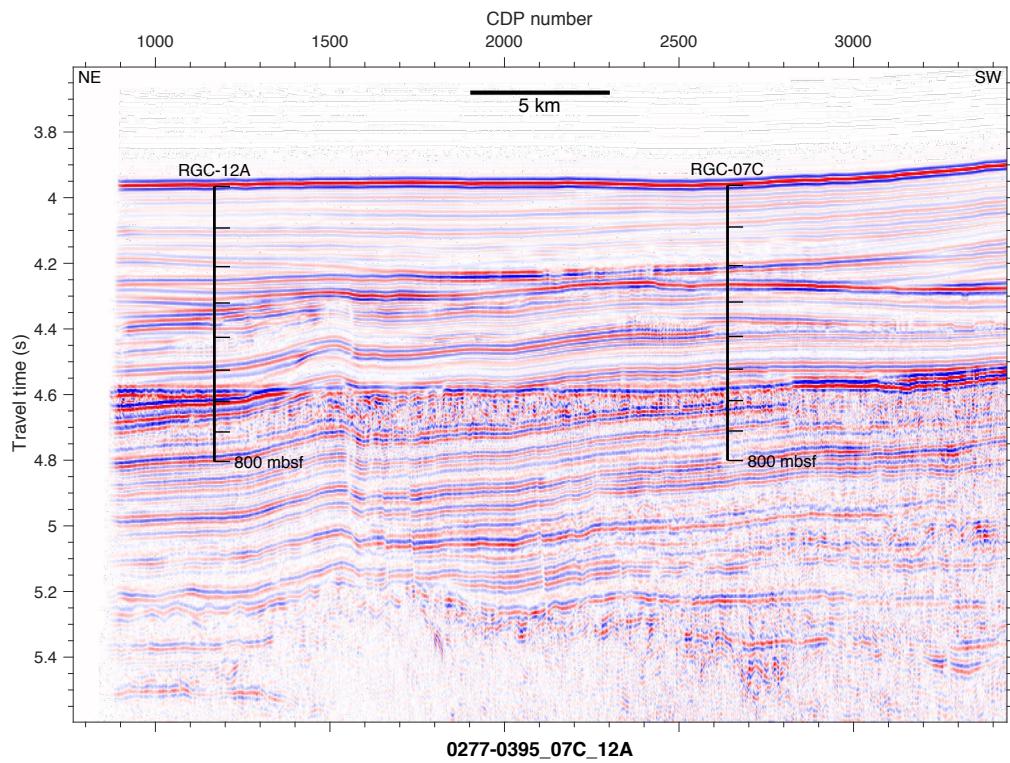


Seismic velocities for travel time-depth conversion at Site RGC-08C.

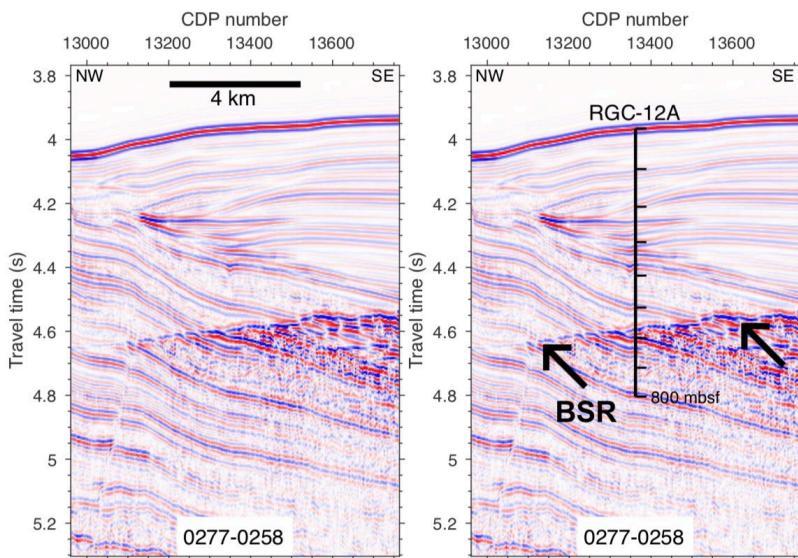
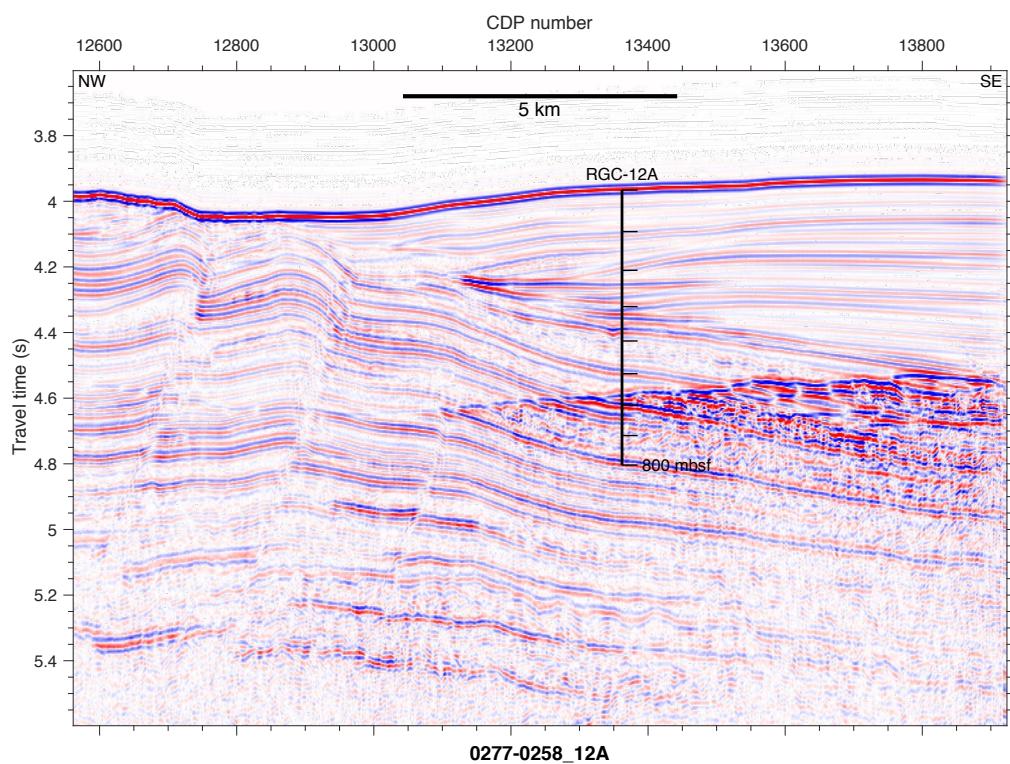
9.9 Site RGC-12A



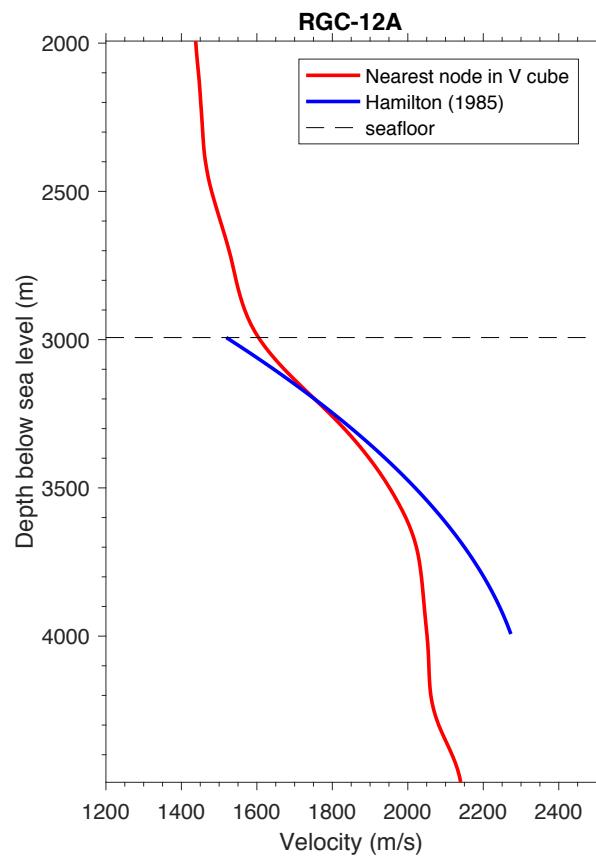
Gridded bathymetry and seismic line locations at Site RGC-12A.



Seismic reflection for Site RGC-12A.

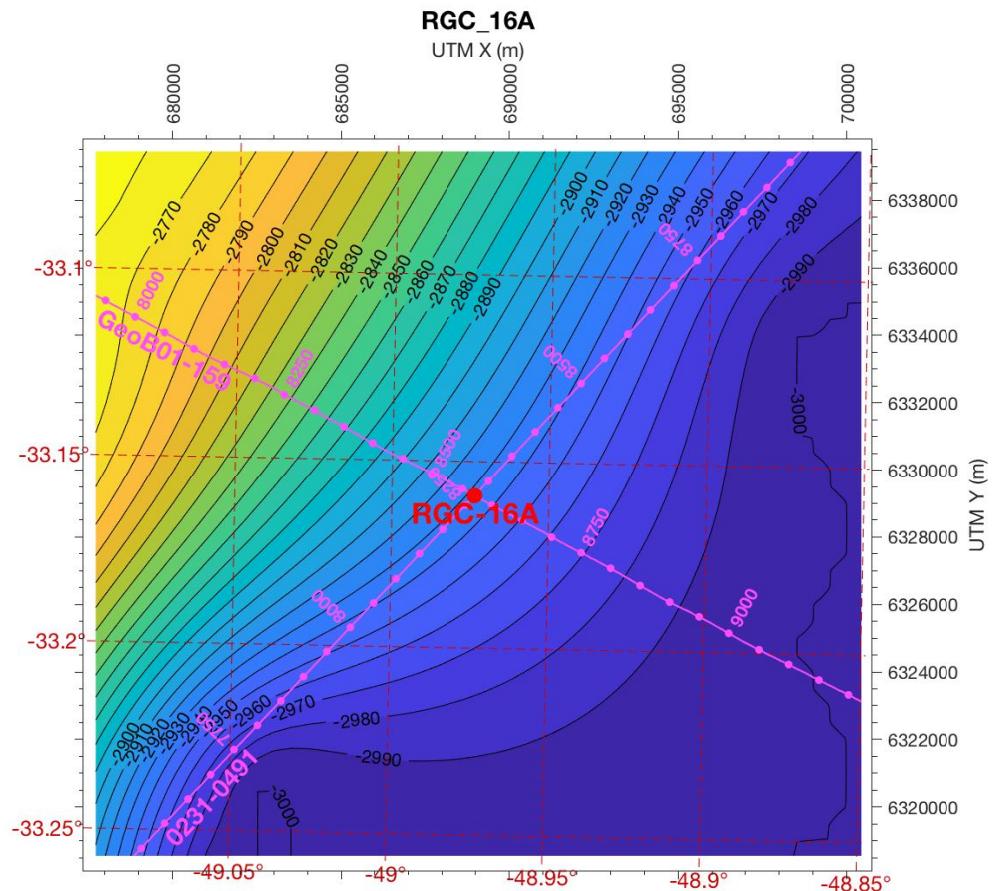


Seismic reflection line at Site RGC-12A.

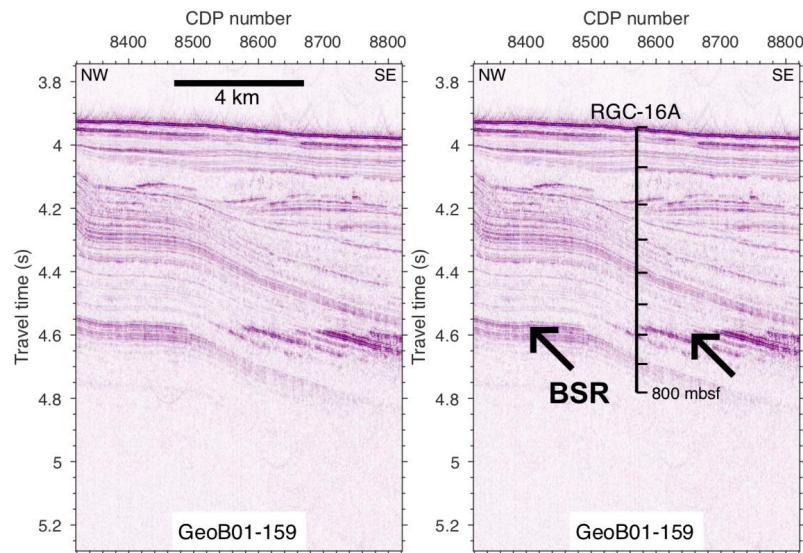
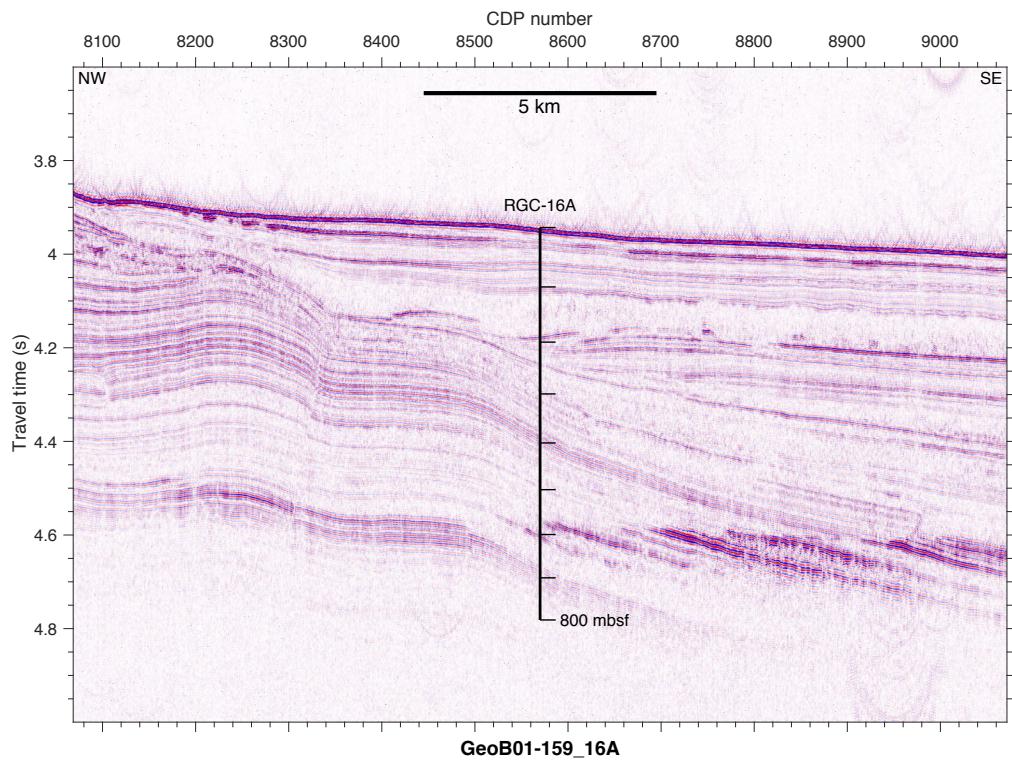


Seismic velocities for travel time-depth conversion at Site RGC-12A.

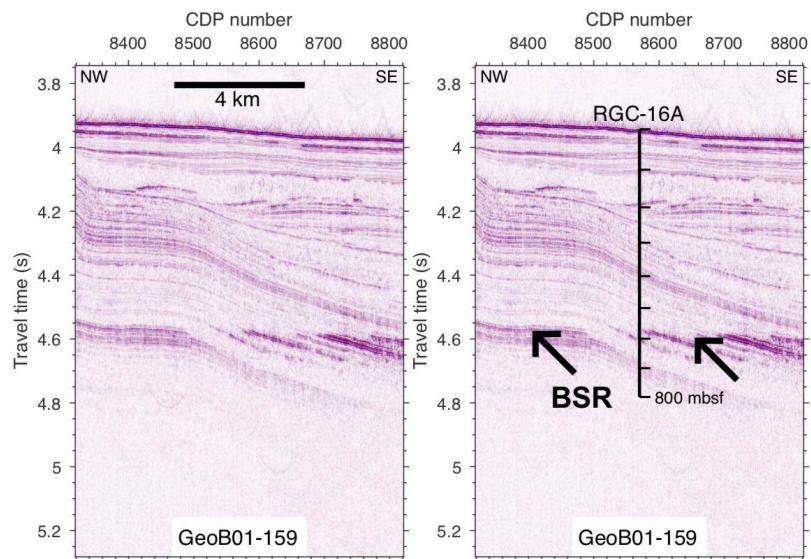
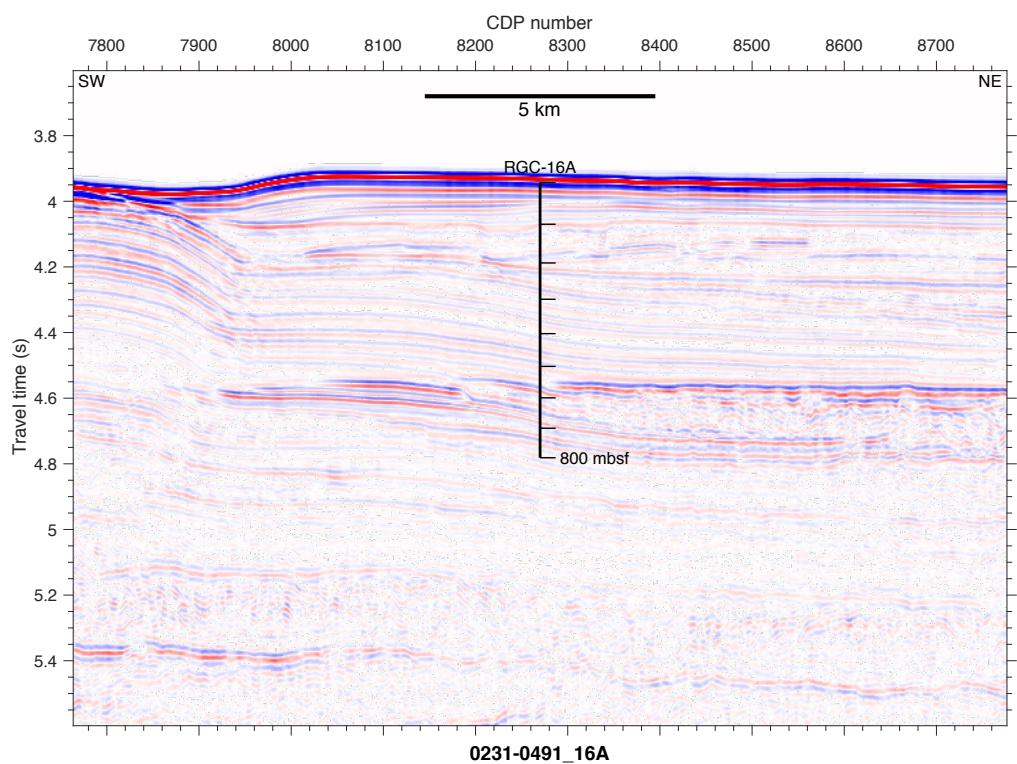
9.10 Site RGC-16A



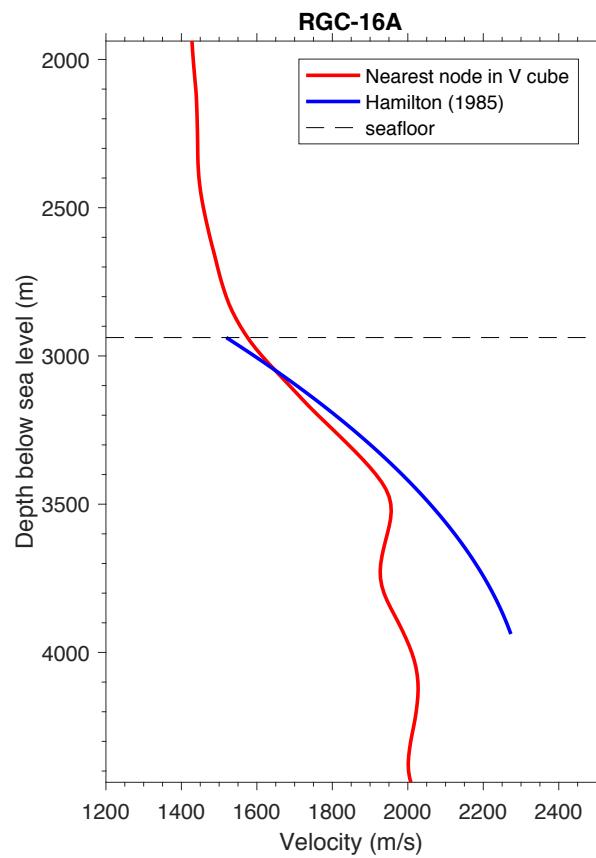
Gridded bathymetry and seismic line locations at Site RGC-16A.



Seismic reflection for Site RGC-16A.

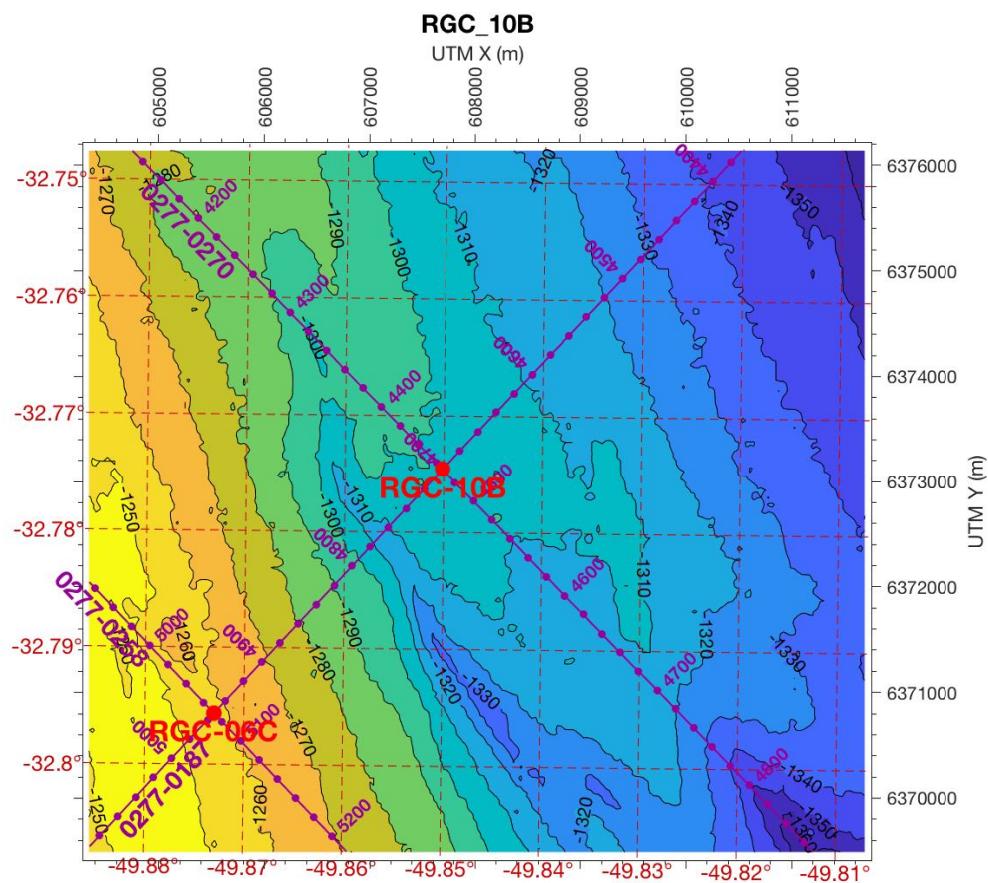


Seismic reflection line at Site RGC-16A.



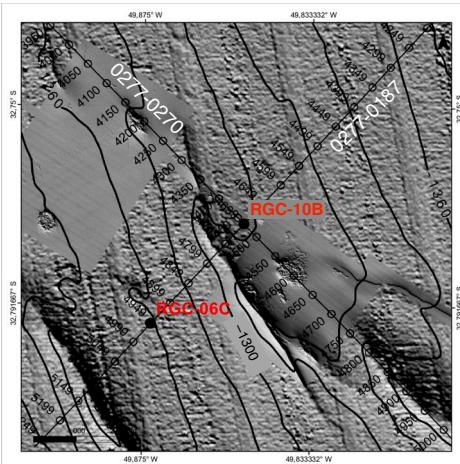
Seismic velocities for travel time-depth conversion at Site RGC-16A.

9.11 Site RGC-10B



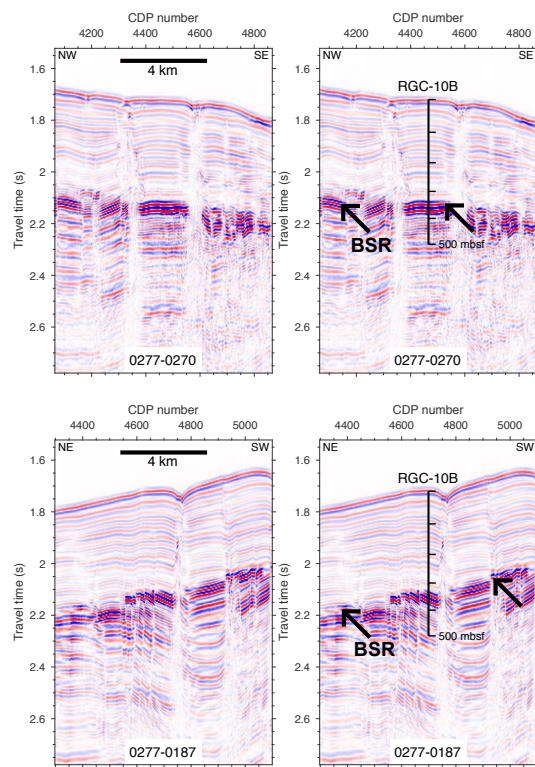
Gridded bathymetry and seismic line locations at Site RGC-10B.

IODP proposal 910-Full2
Site RGC-10B

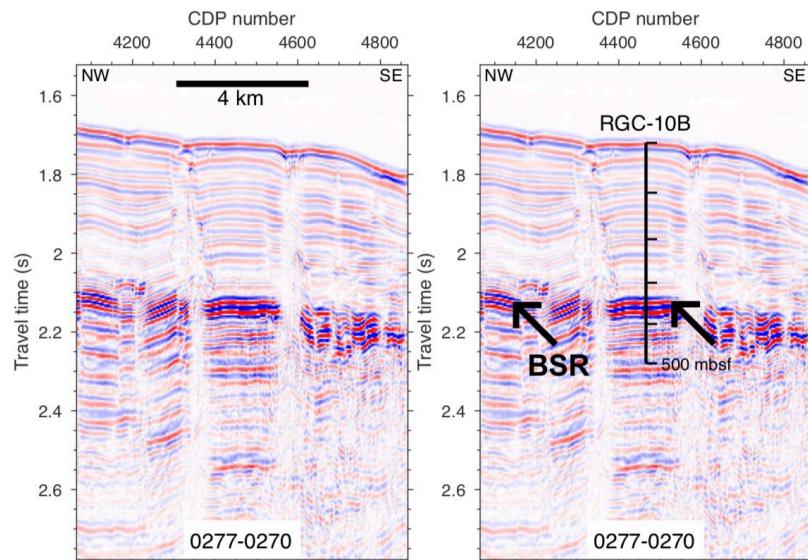
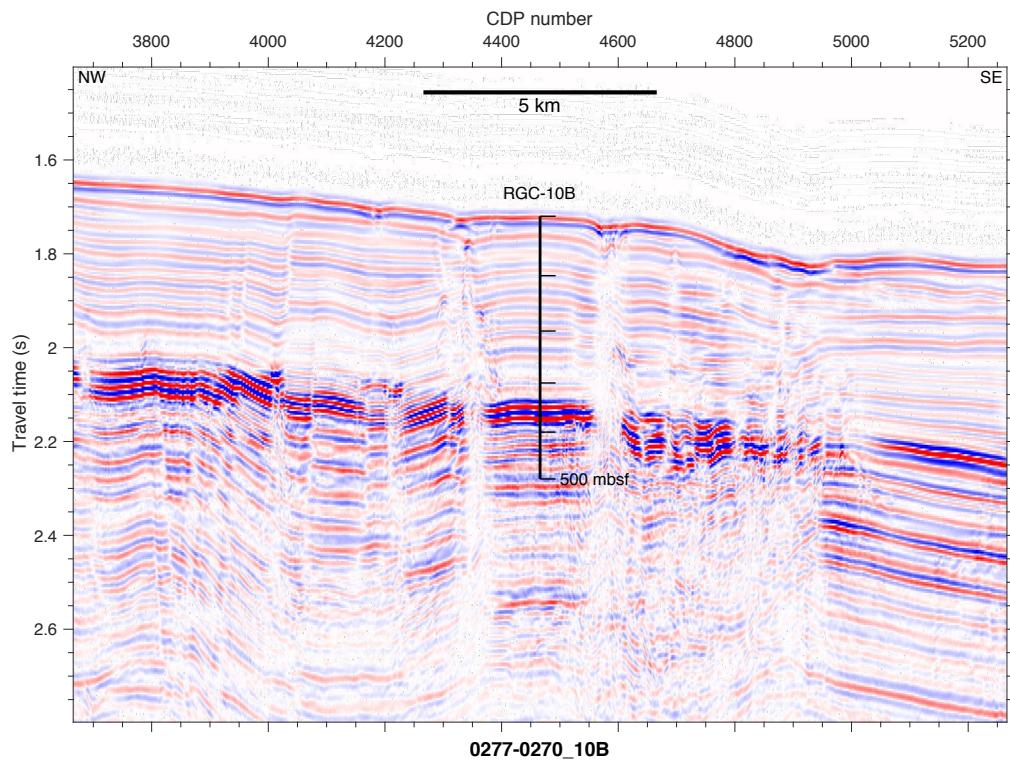


Site RGC-10B
CDP 4466 on line 0277-0270
CDP 4699 on line 0277-0187
Lat. -32.77458 / Long. -49.85012
UTM 22S 607692.0 E / 6373117.7 N
Water depth 1299 m
Penetration 500 m

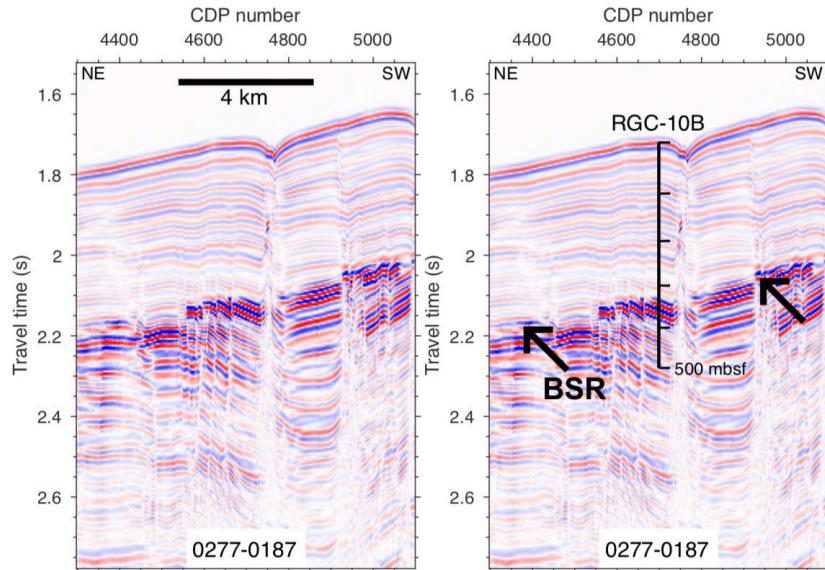
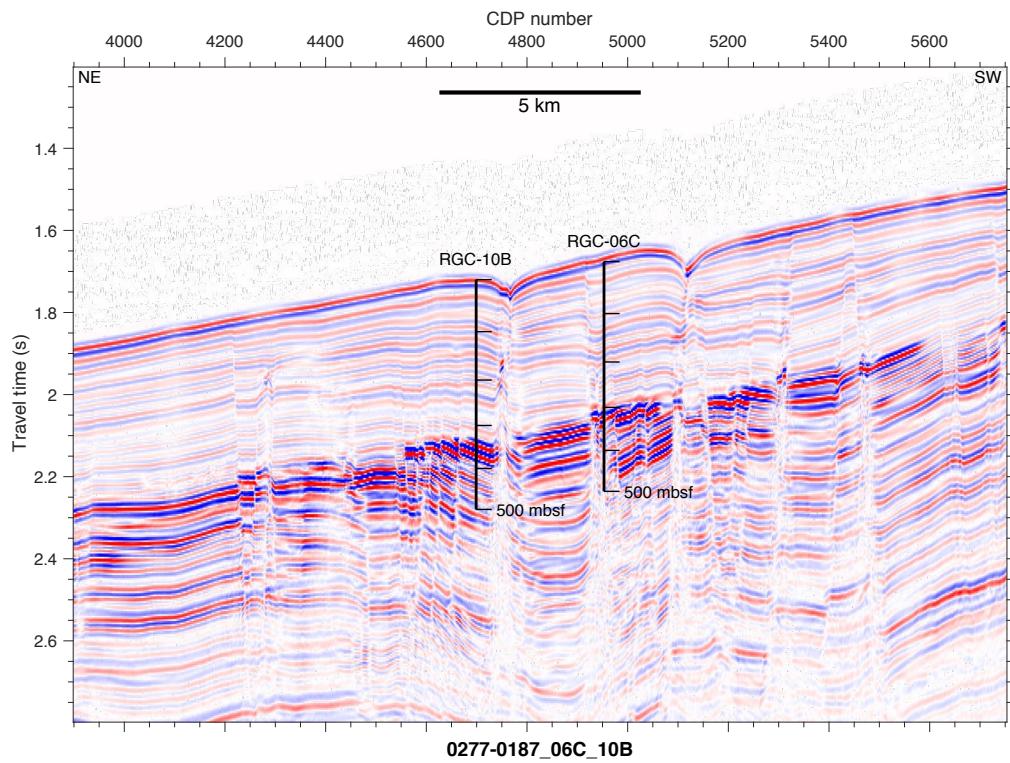
Data files will be submitted to the SSDB
by the November 2018 deadline



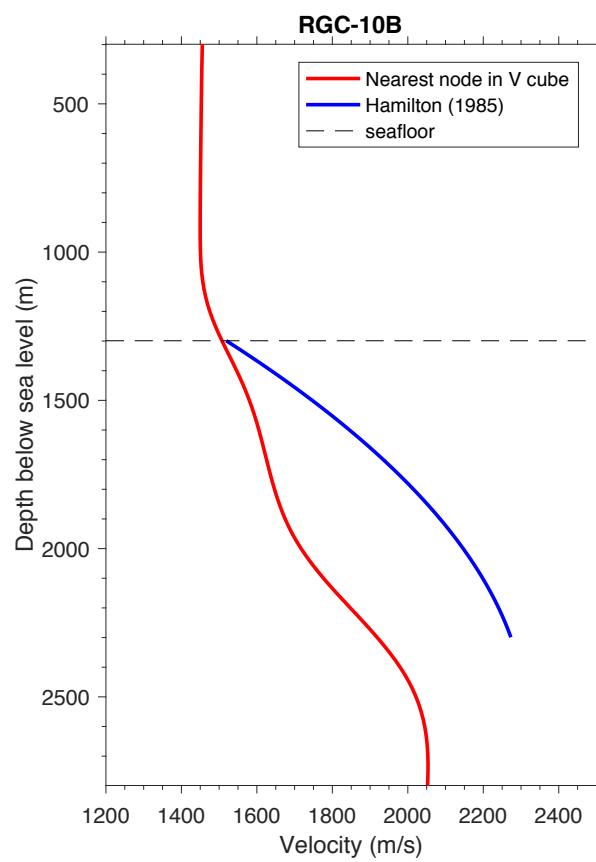
High-resolution bathymetry and seismic lines at Site RGC-10B.



Seismic reflection for Site RGC-10B.

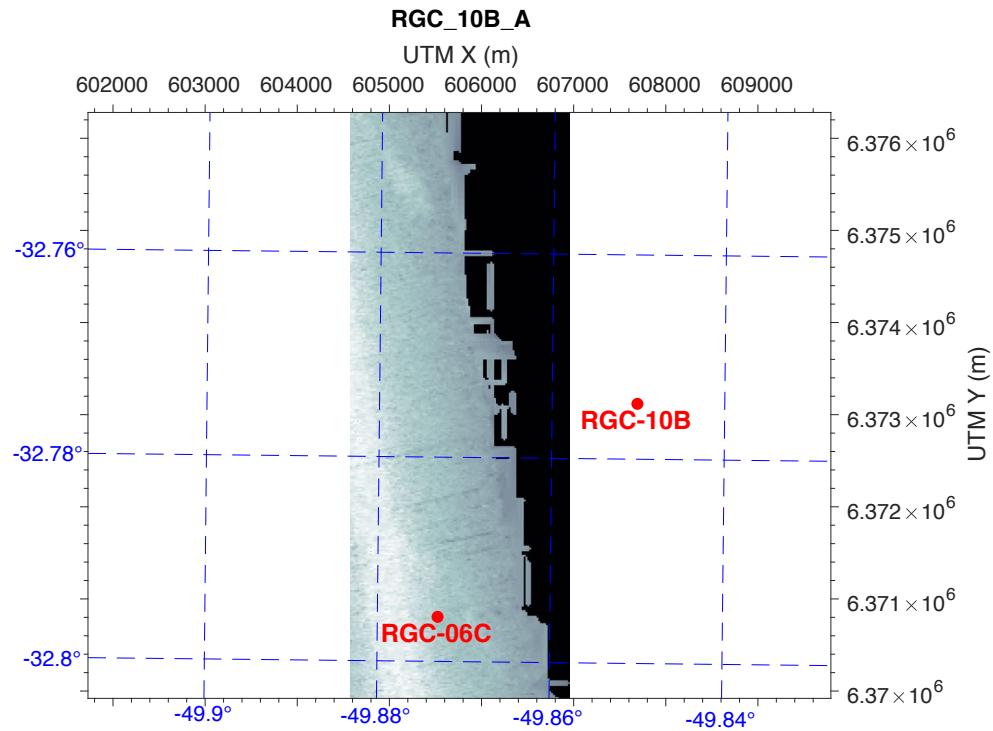


Seismic reflection line at Site RGC-10B.

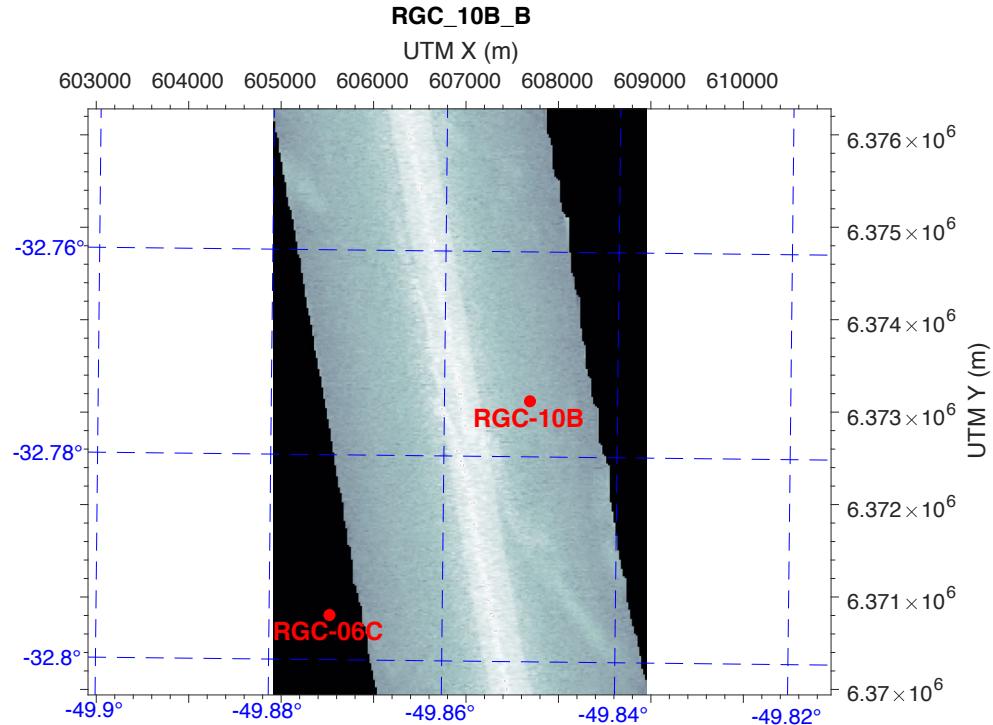


Seismic velocities for travel time-depth conversion at Site RGC-10B.

Site RGC-10B-Line 1

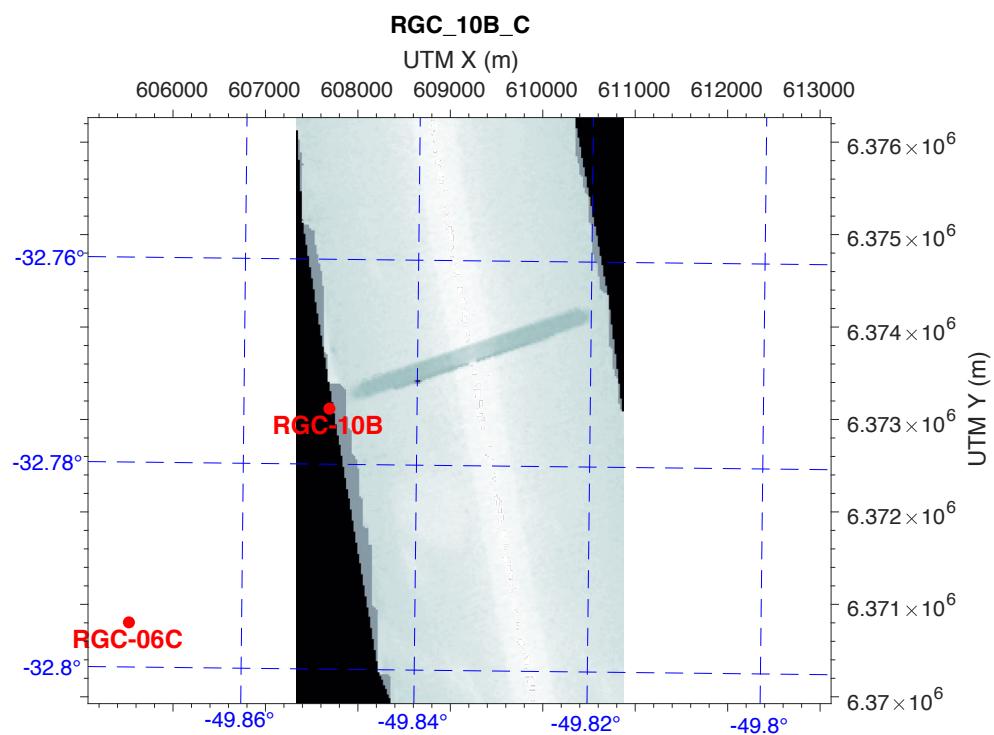


Site RGC-10B-Line 2



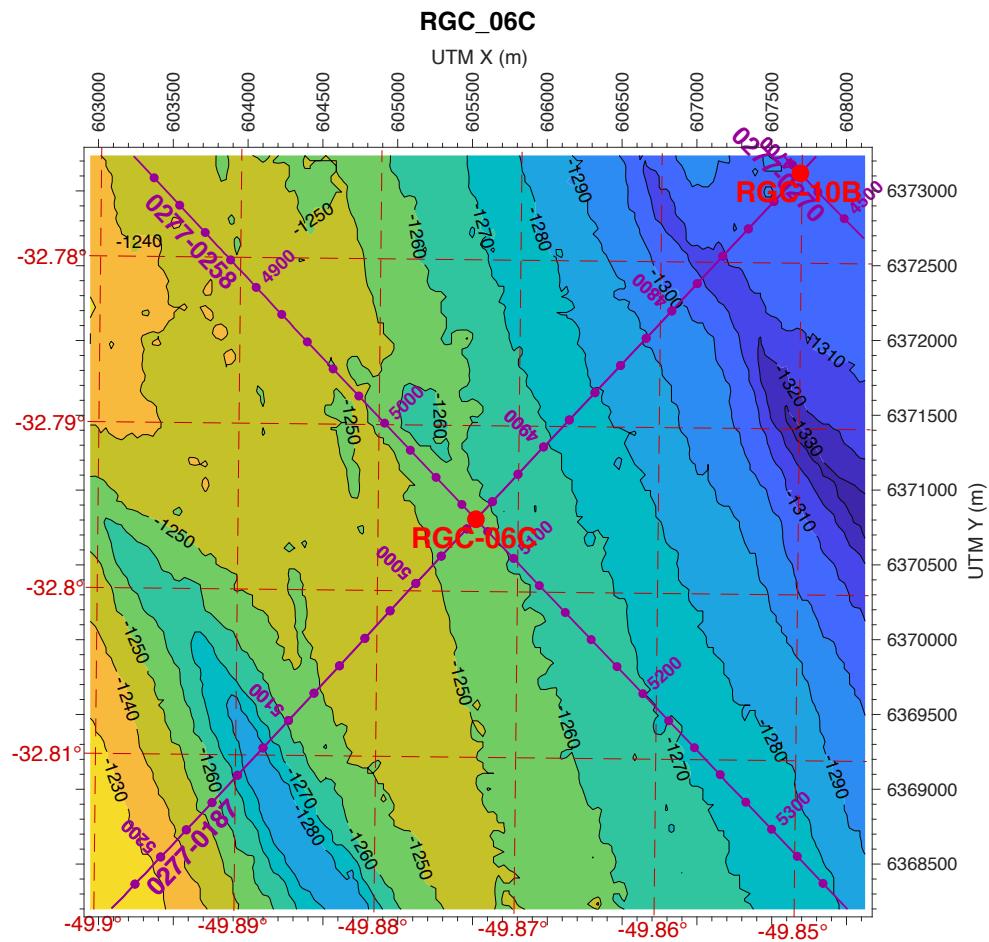
Backscatter image at Site RGC-10B.

Site RGC-10B-Line 3



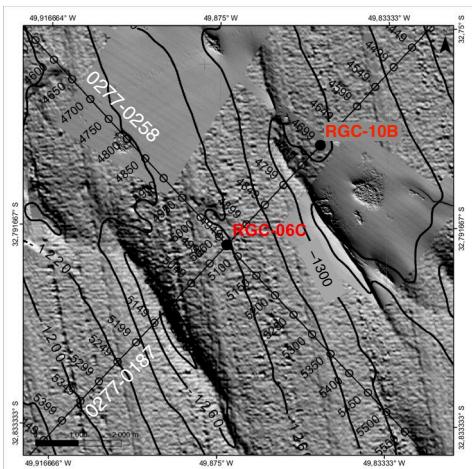
Backscatter image at Site RGC-10B.

9.8 Site RGC-06C



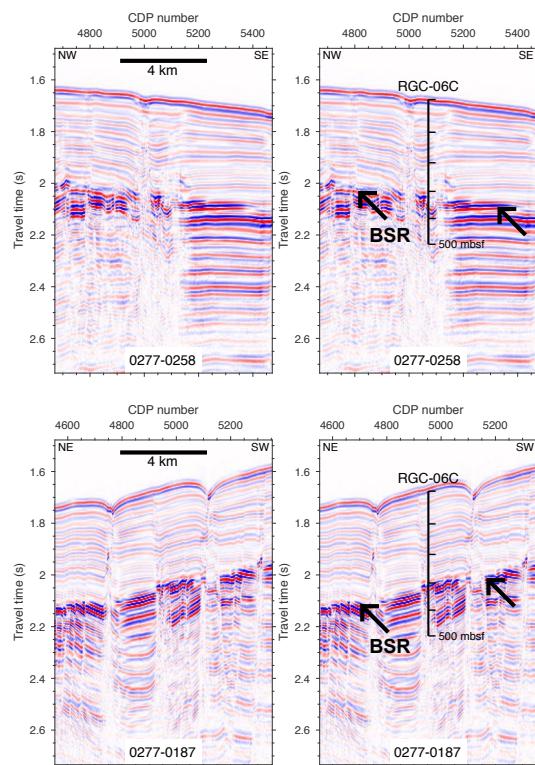
Gridded bathymetry and seismic line locations at Site RGC-06C.

IODP proposal 910-Full2
Site RGC-06C

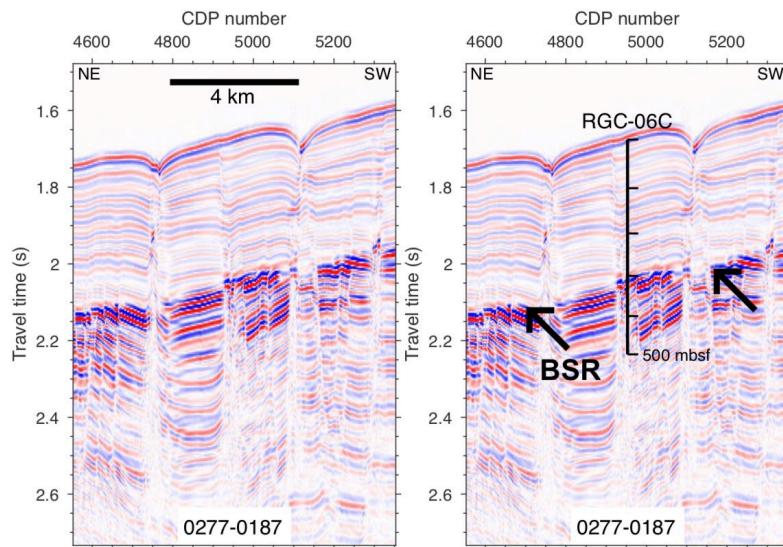
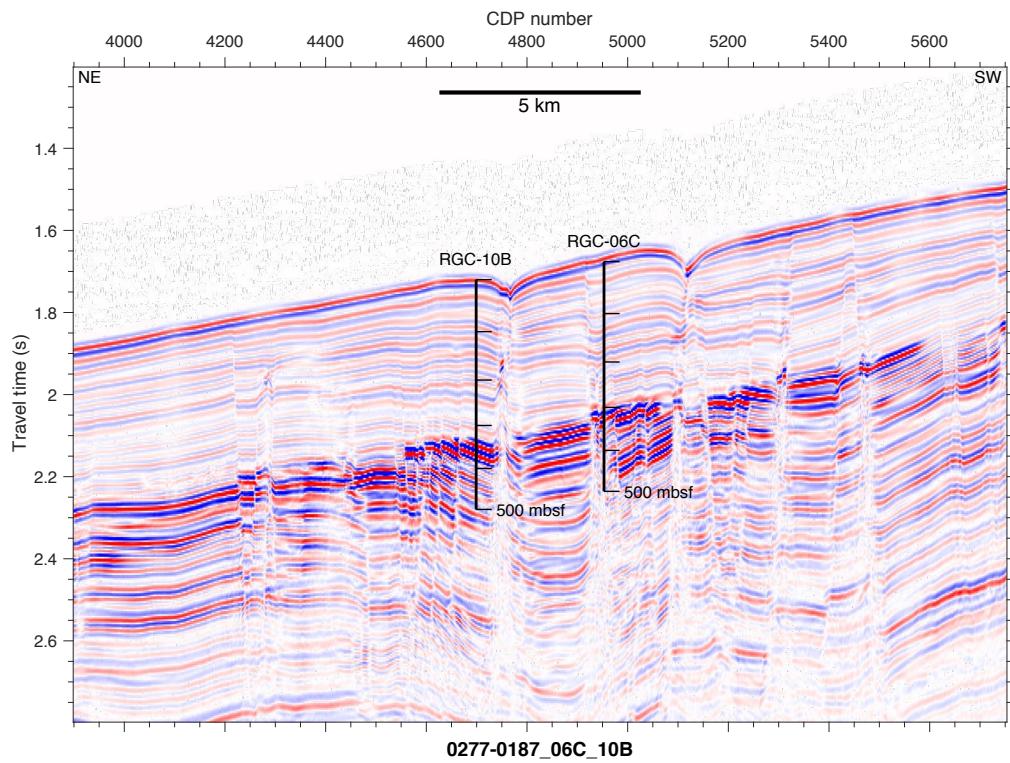


Site RGC-06C
CDP 5071 on line 0277-0258
CDP 4953 on line 0277-0187
Lat. -32.79565 / Long. -49.87302
UTM 22S 605523.0 E / 6370804.8 N
Water depth 1257 m
Penetration 500 m

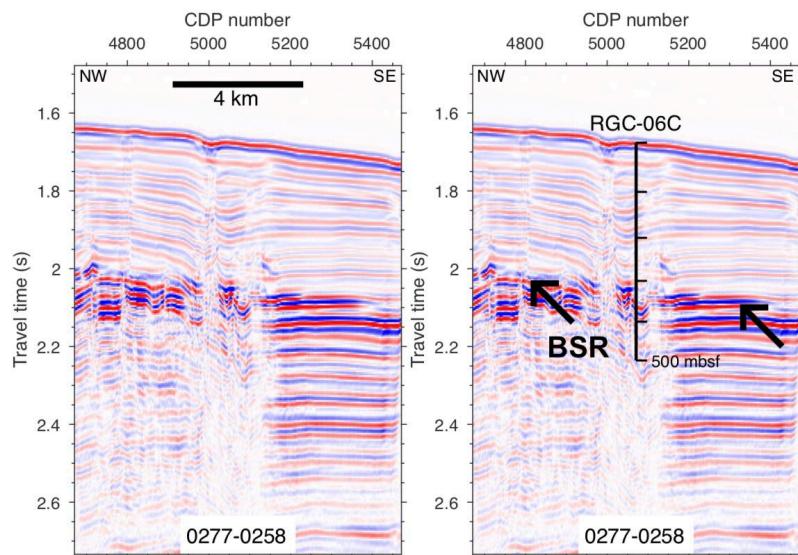
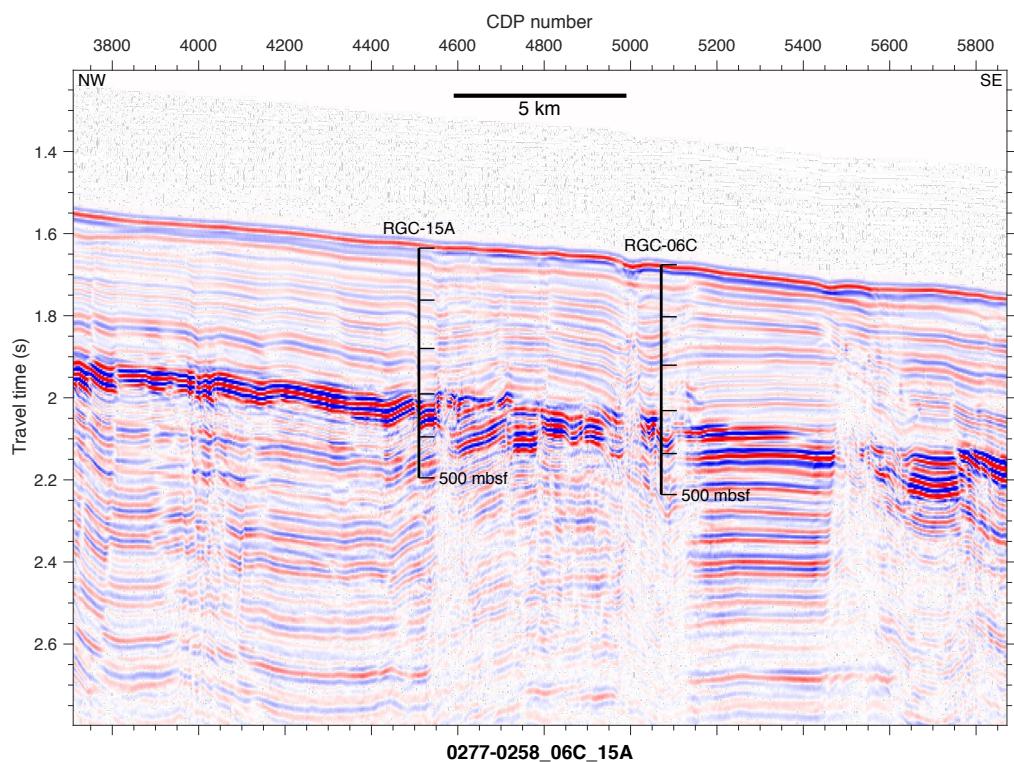
Data files will be submitted to the SSDB
by the November 2018 deadline



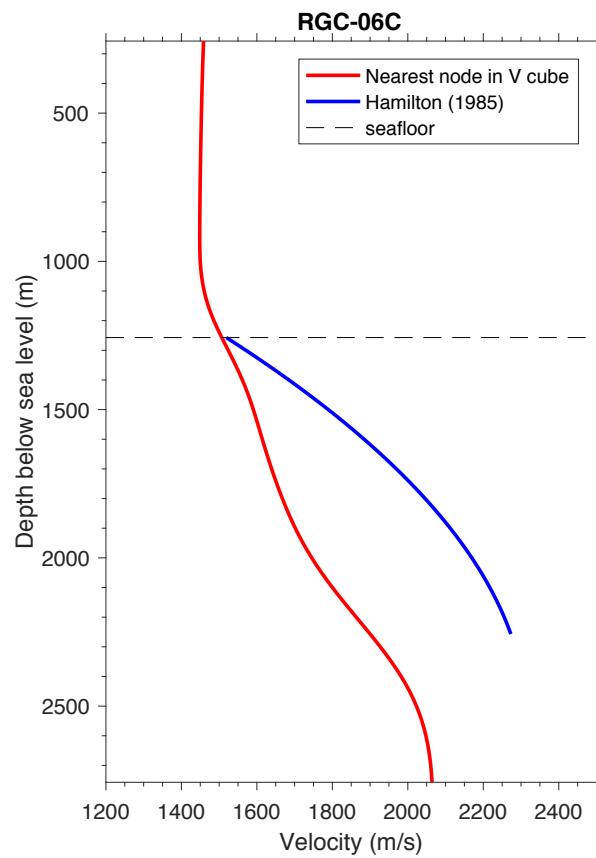
High-resolution bathymetry and seismic lines at Site RGC-06C.



Seismic reflection for Site RGC-06C.

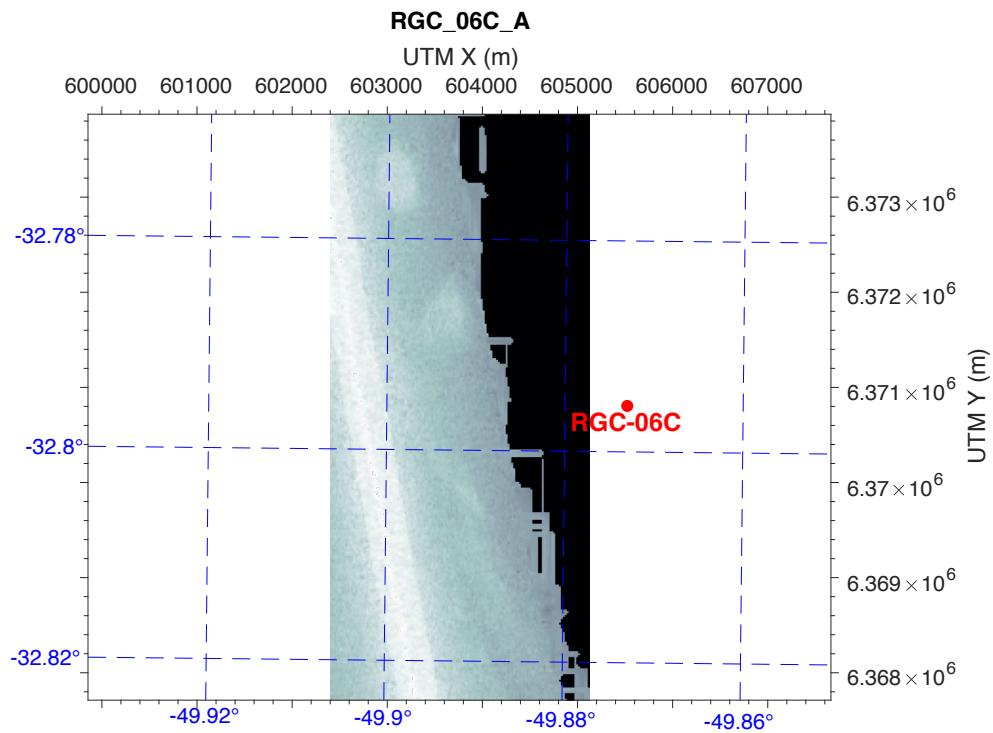


Seismic reflection line at Site RGC-06C.

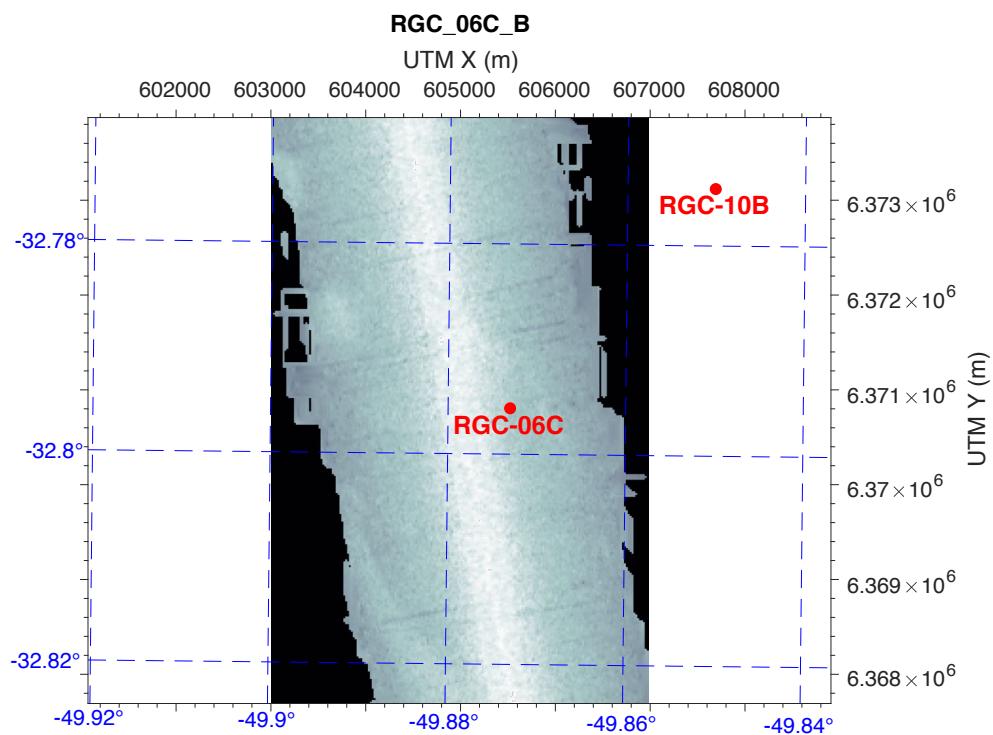


Seismic velocities for travel time-depth conversion at Site RGC-06C.

Site RGC-06C-Line 1

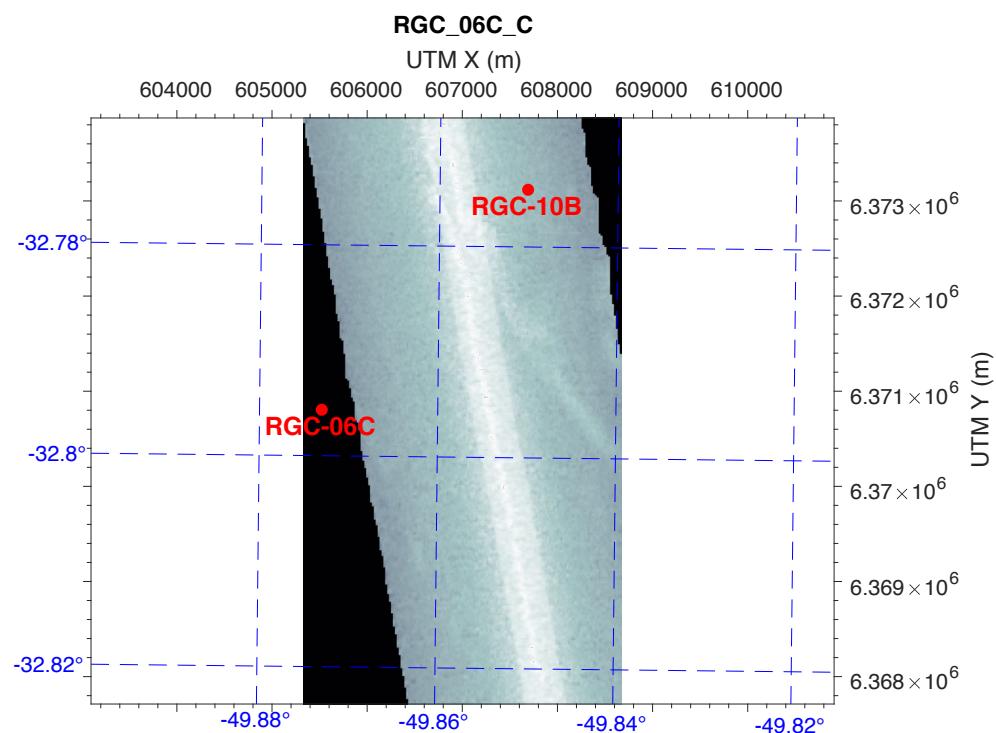


Site RGC-06C-Line 2



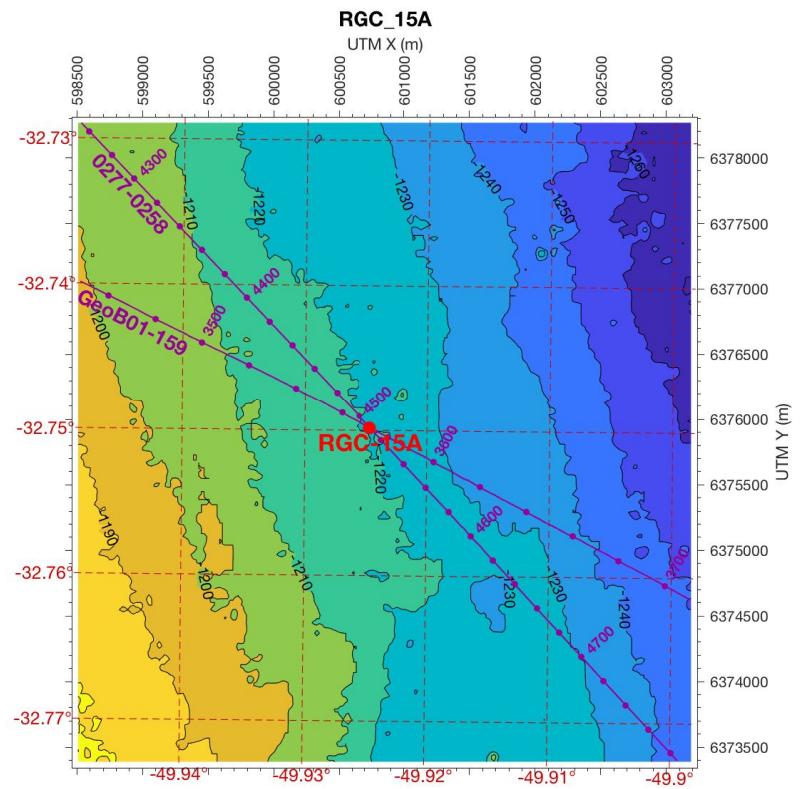
Backscatter image at Site RGC-06C.

Site RGC-06C-Line 3



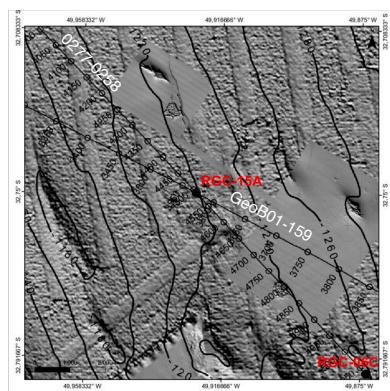
Backscatter image at Site RGC-06C.

9.13 Site RGC-15A



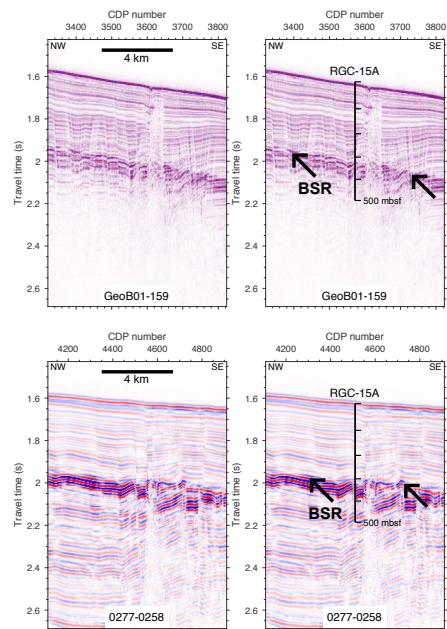
Gridded bathymetry and seismic line locations at Site RGC-15A.

IODP proposal 910-Full2
Site RGC-15A

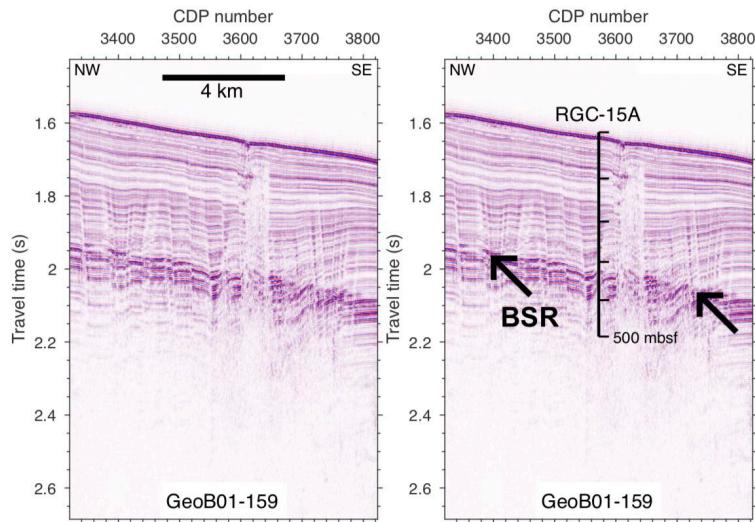
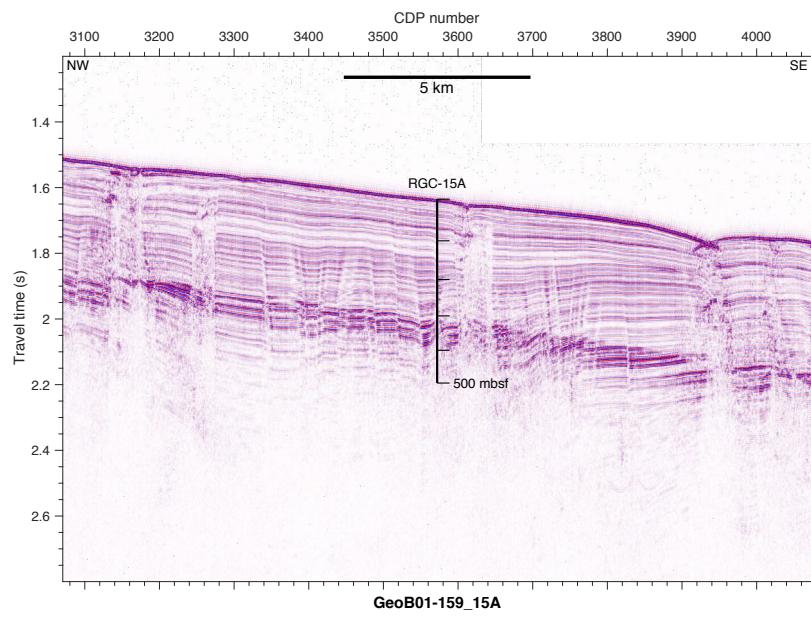


Site RGC-15A
CDP 3572 on line GeoB01-159
CDP 4510 on line 0277-0258
Lat. -32.74982 / Long. -49.92467
UTM 22S 600738.3 E / 6375936.5 N
Water depth 1219 m
Penetration 500 m

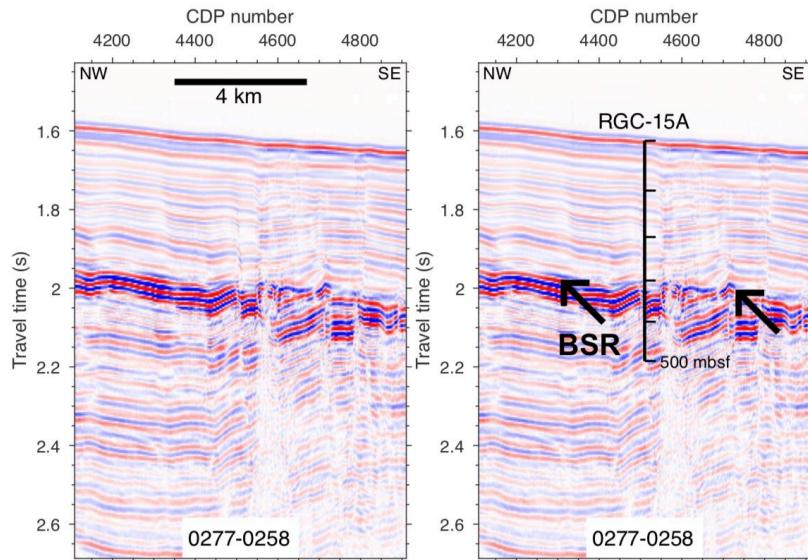
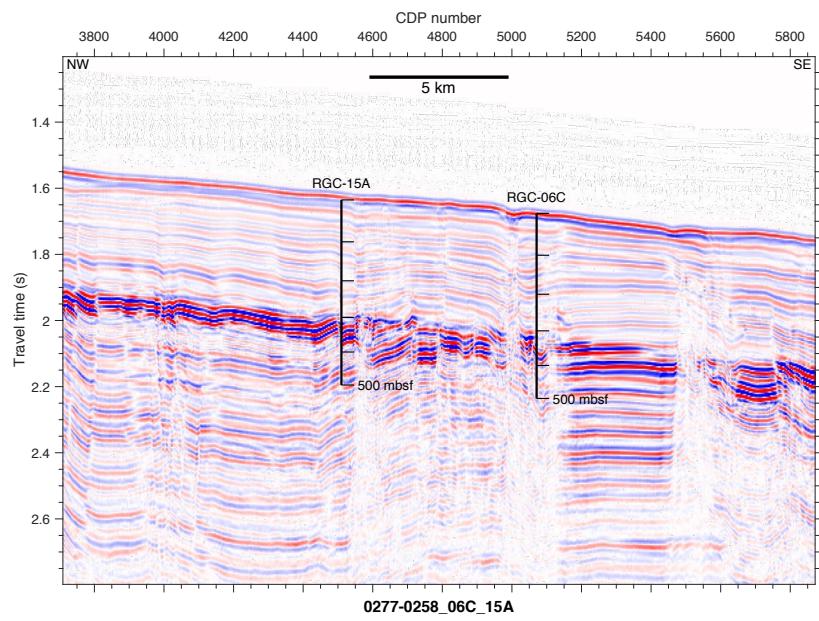
Data files will be submitted to the SSDB
by the November 2018 deadline



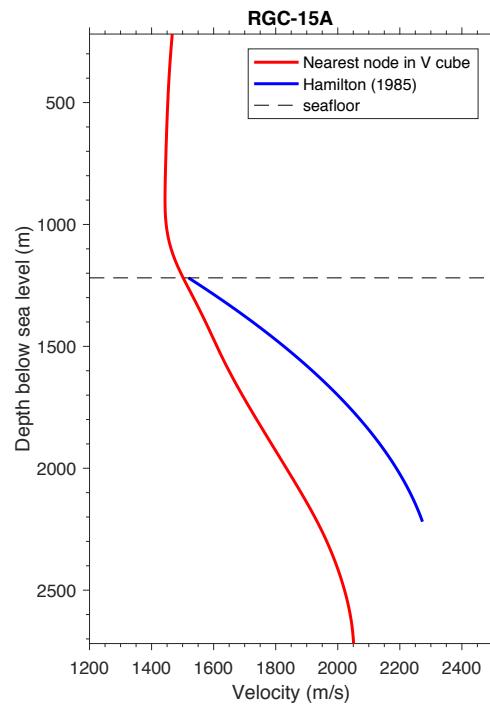
High-resolution bathymetry and seismic lines at Site RGC-15A.



Seismic reflection for Site RGC-15A.

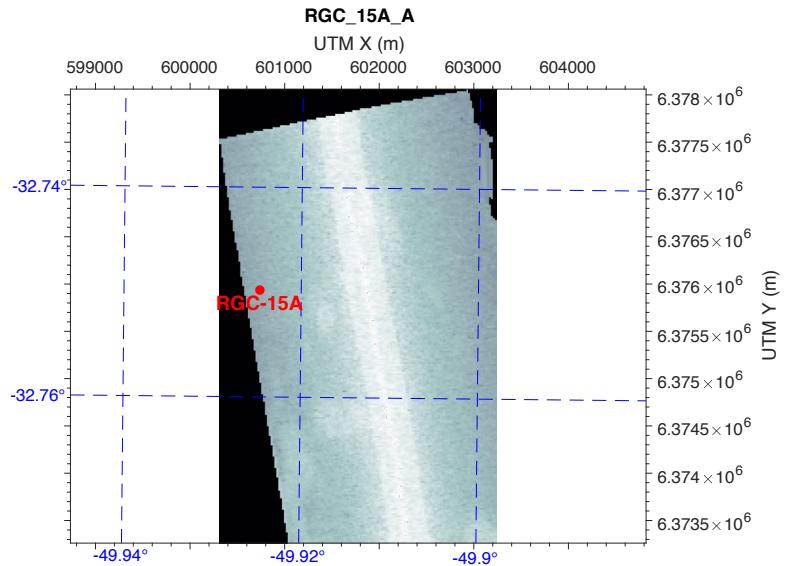


Seismic reflection line at Site RGC-15A.

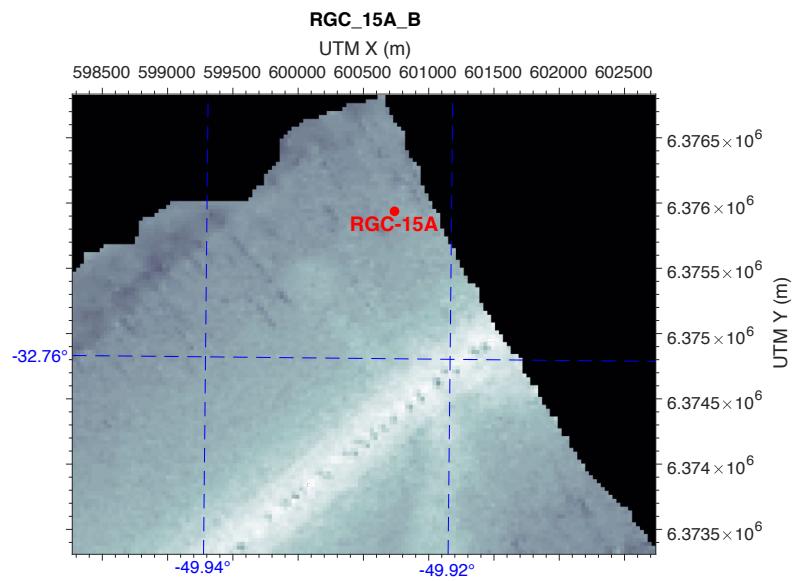


Seismic velocities for travel time-depth conversion at Site RGC-15A.

Site RGC-15A-Line 1

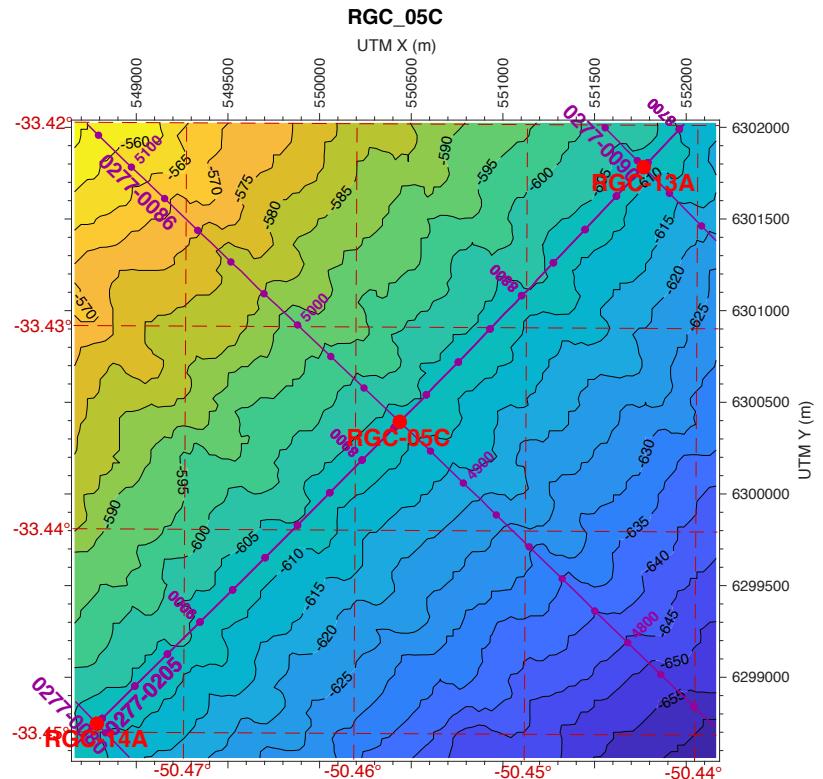


Site RGC-15A-Line 2



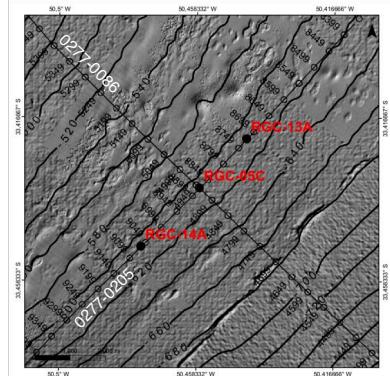
Backscatter image at Site RGC-15A.

9.14 Site RGC-05C



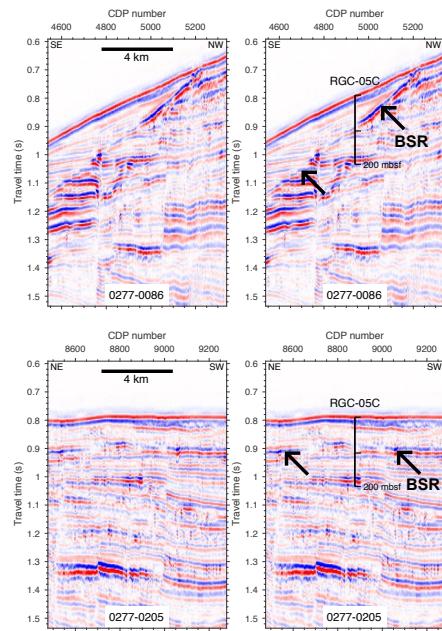
Gridded bathymetry and seismic line locations at Site RGC-05C.

IODP proposal 910-Full2
Site RGC-05C

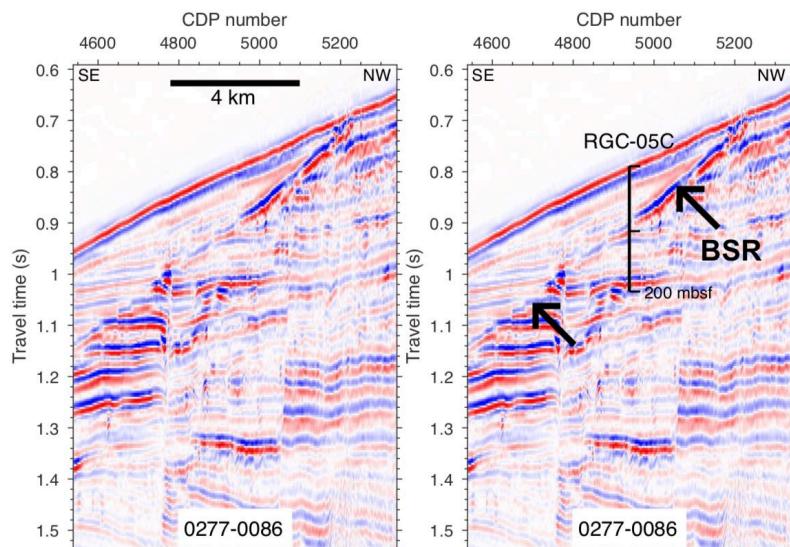
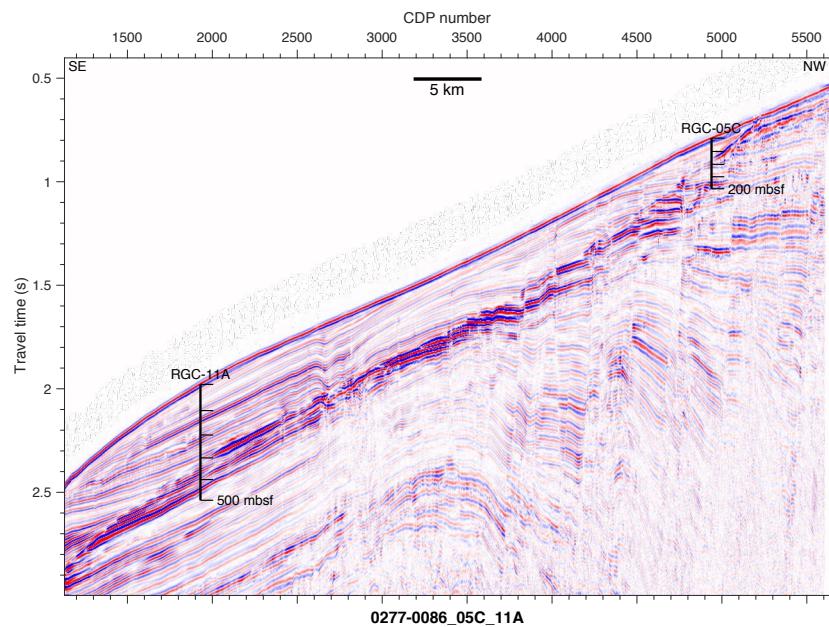


Site RGC-05C
CDP 4939 on line 0277-0086
CDP 8877 on line 0277-0205
Lat. -33.43466 / Long. -50.45741
UTM 22S 550437.3 E / 6300393.4 N
Water depth 607 m
Penetration 200 m

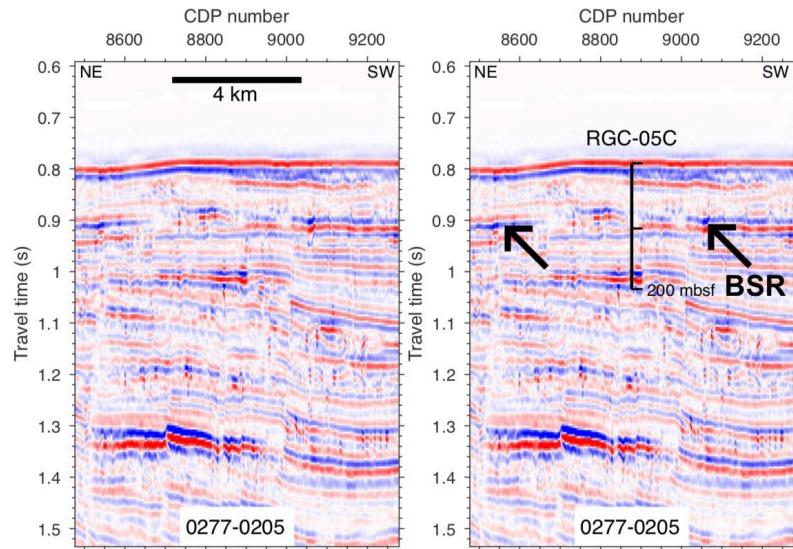
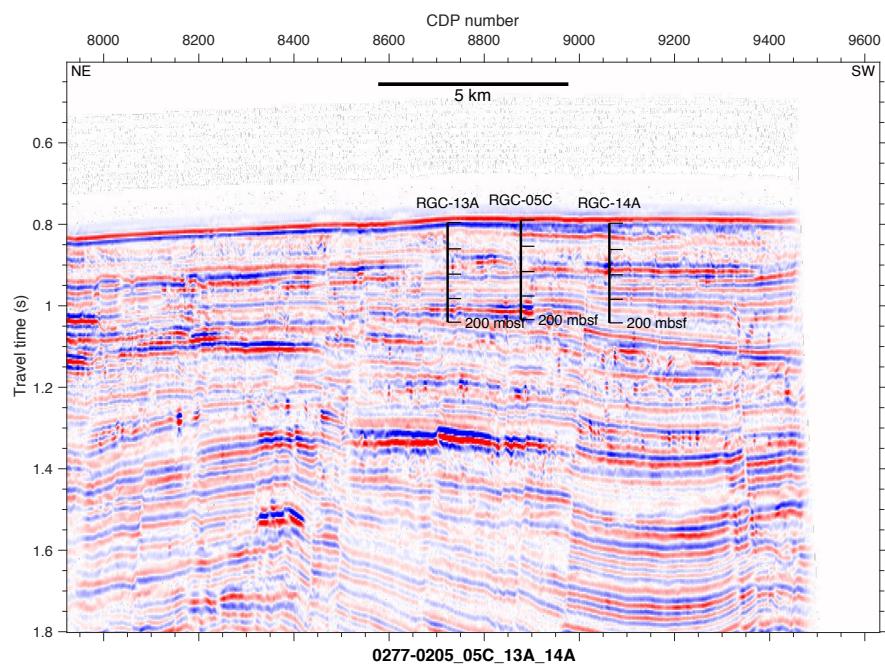
Data files will be submitted to the SSDB
by the November 2018 deadline



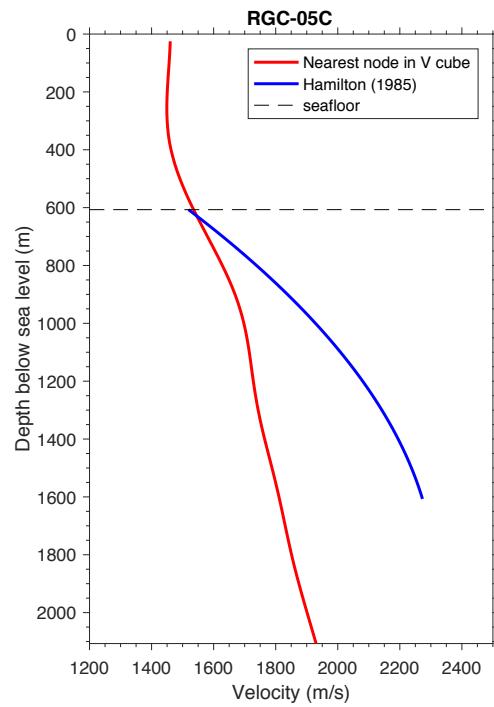
High-resolution bathymetry and seismic lines at Site RGC-05C.



Seismic reflection for Site RGC-05C.

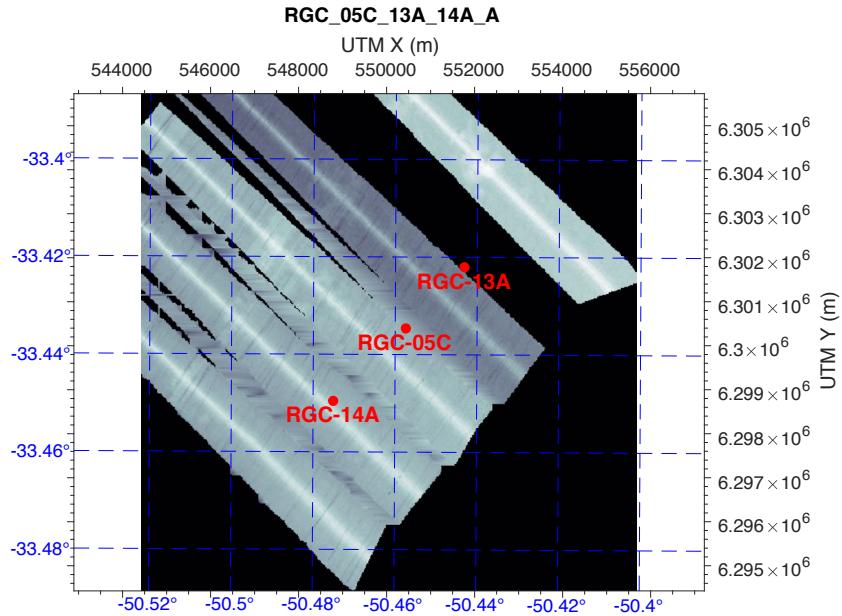


Seismic reflection line at Site RGC-05C.

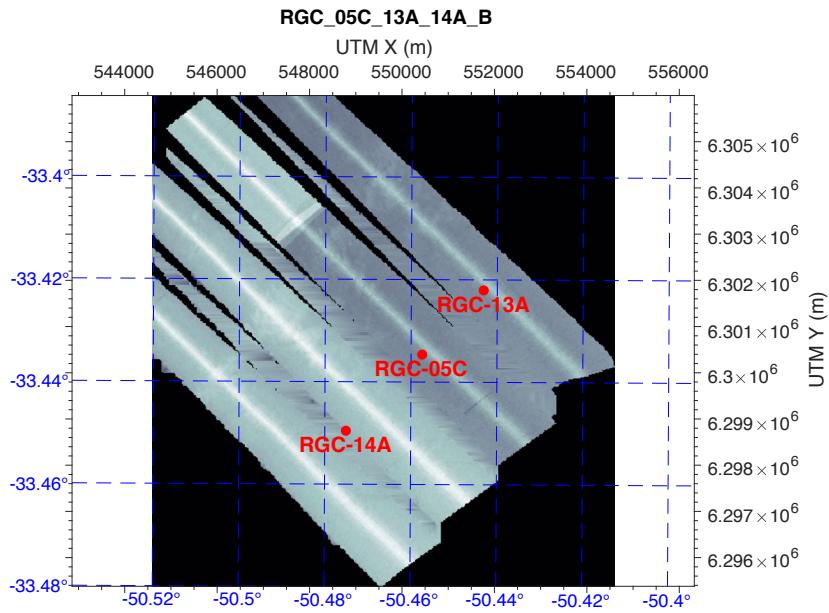


Seismic velocities for travel time-depth conversion at Site RGC-05C.

Sites RGC-05C, RGC-13A, RGC-14A-Line set 1

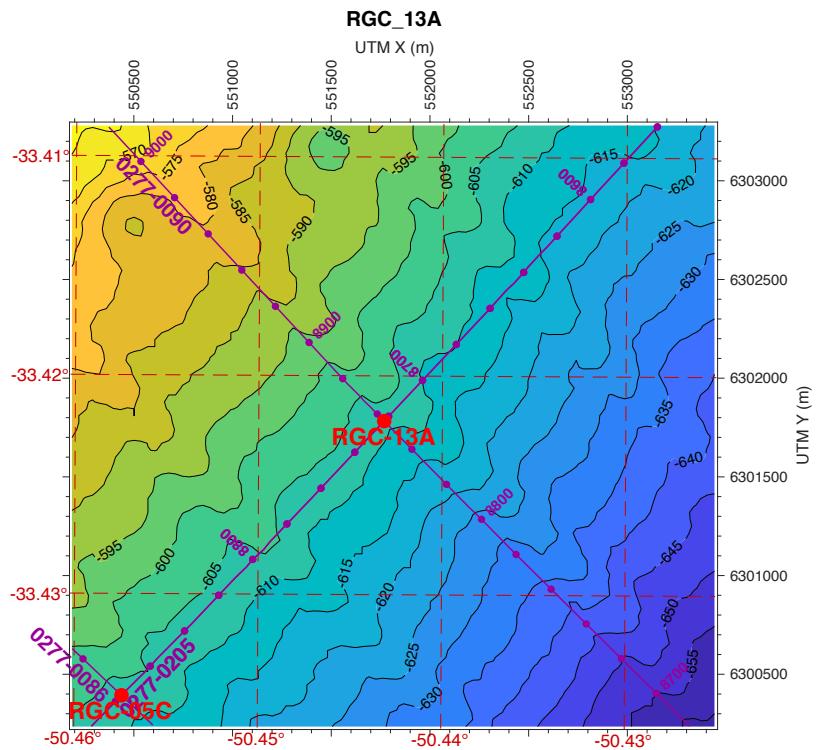


Sites RGC-05C, RGC-13A, RGC-14A-Line set 2



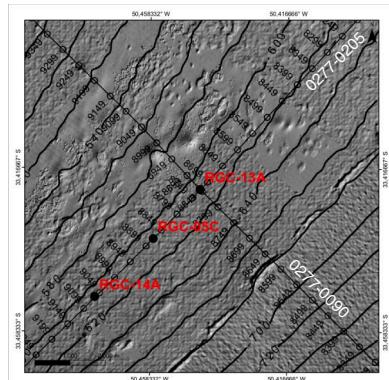
Backscatter image at Site RGC-05C.

9.15 Site RGC-13A



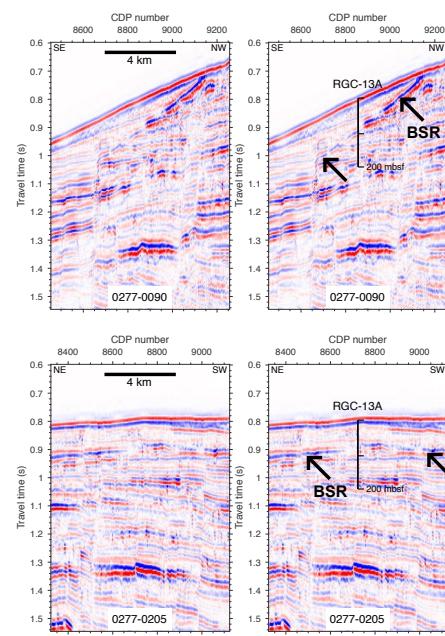
Gridded bathymetry and seismic line locations at Site RGC-13A.

IODP proposal 910-Full2
Site RGC-13A

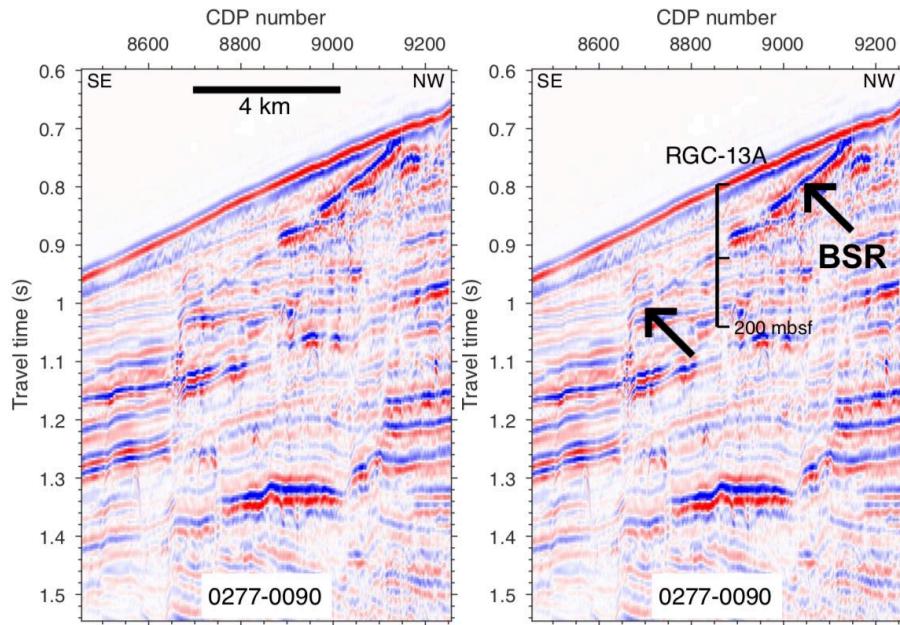
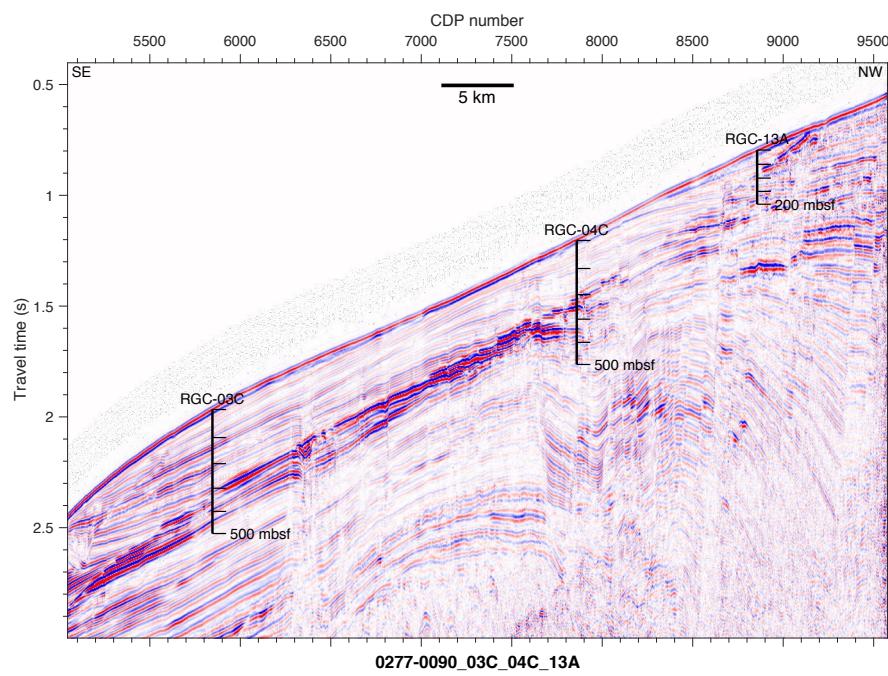


Site RGC-13A
CDP 8856 on line 0277-0090
CDP 8723 on line 0277-0205
Lat. -33.42207 / Long. -50.44317
UTM 22S 551768.1 E / 6301782.7 N
Water depth 608 m
Penetration 200 m

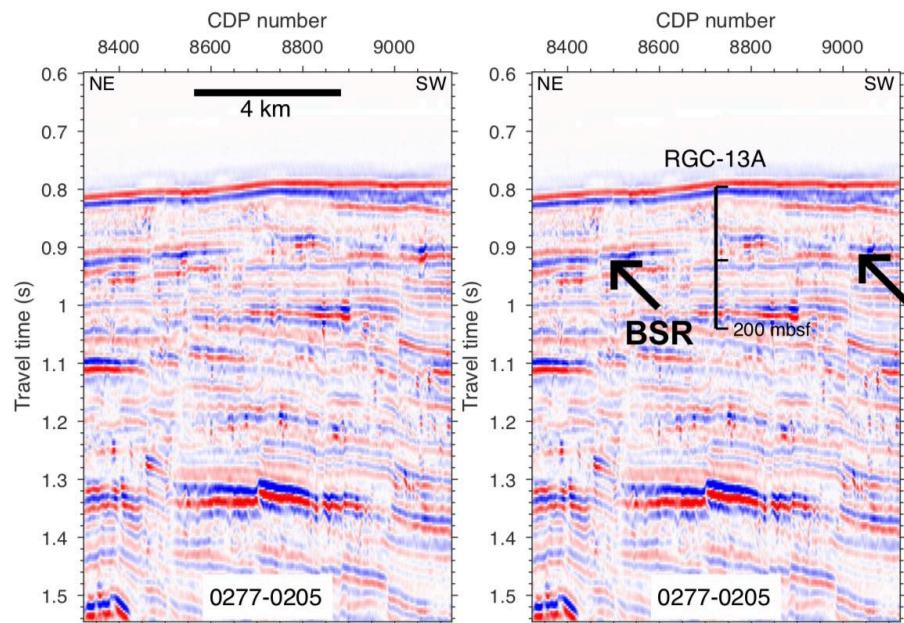
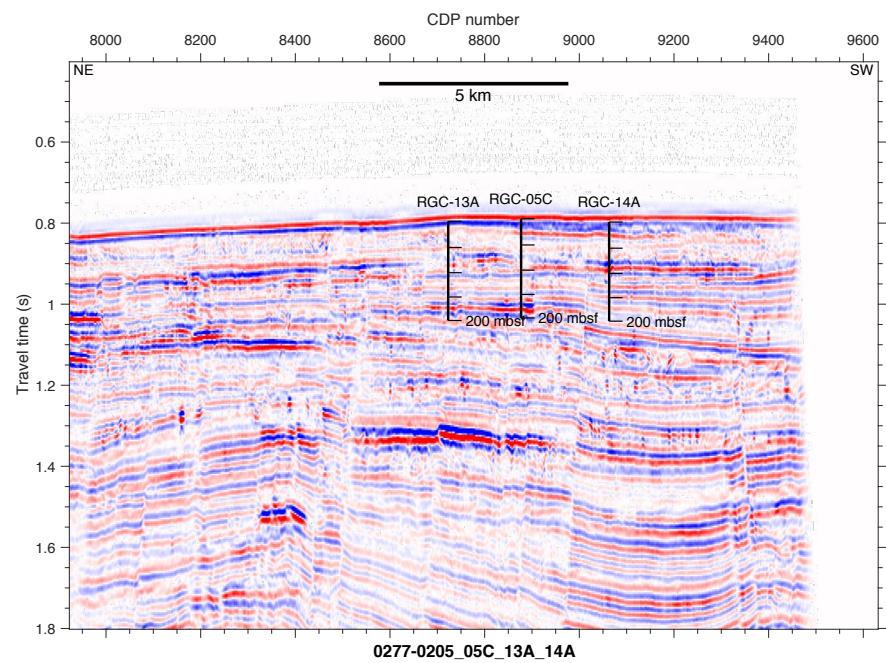
Data files will be submitted to the SSDB
by the November 2018 deadline



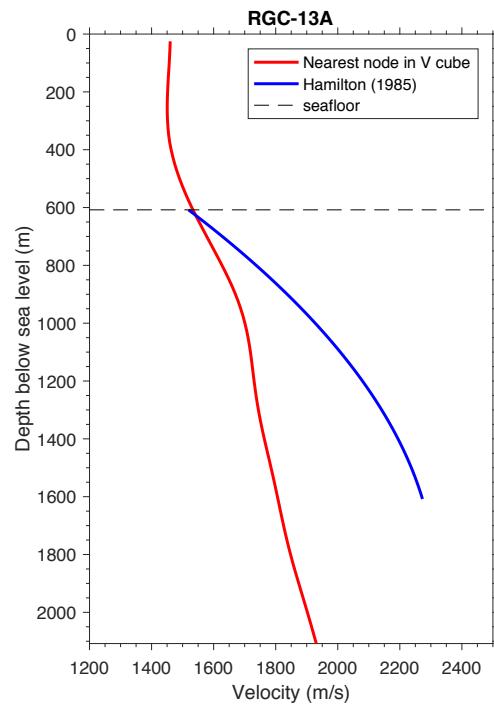
High-resolution bathymetry and seismic lines at Site RGC-13A.



Seismic reflection for Site RGC-13A.

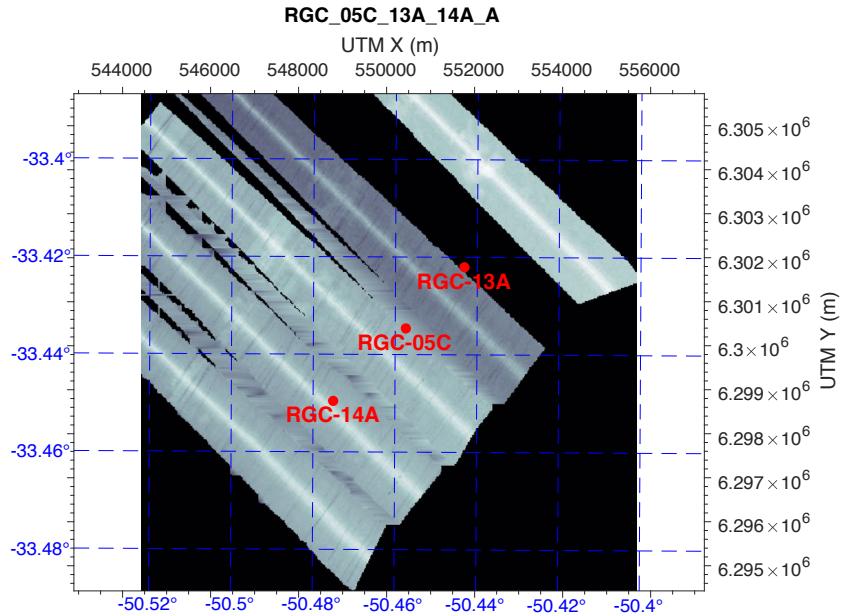


Seismic reflection line at Site RGC-13A.

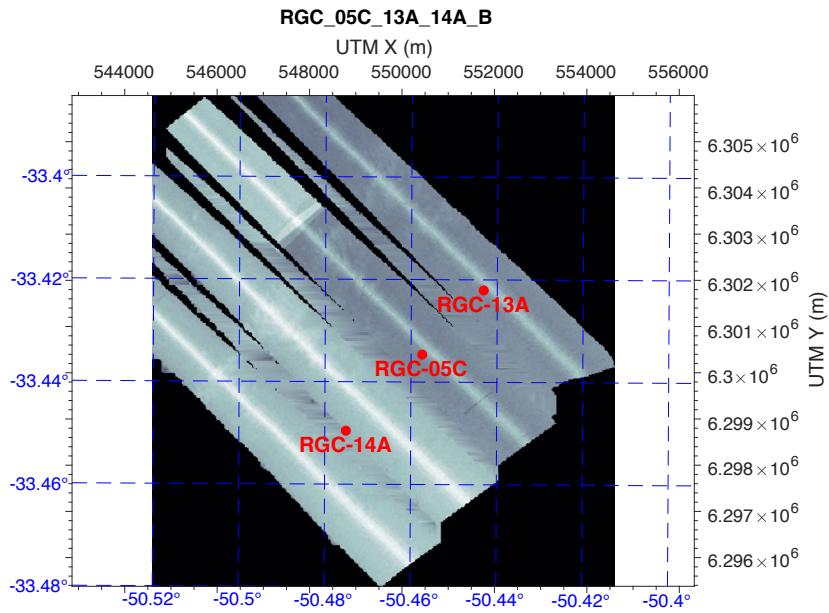


Seismic velocities for travel time-depth conversion at Site RGC-13A.

Sites RGC-05C, RGC-13A, RGC-14A-Line set 1

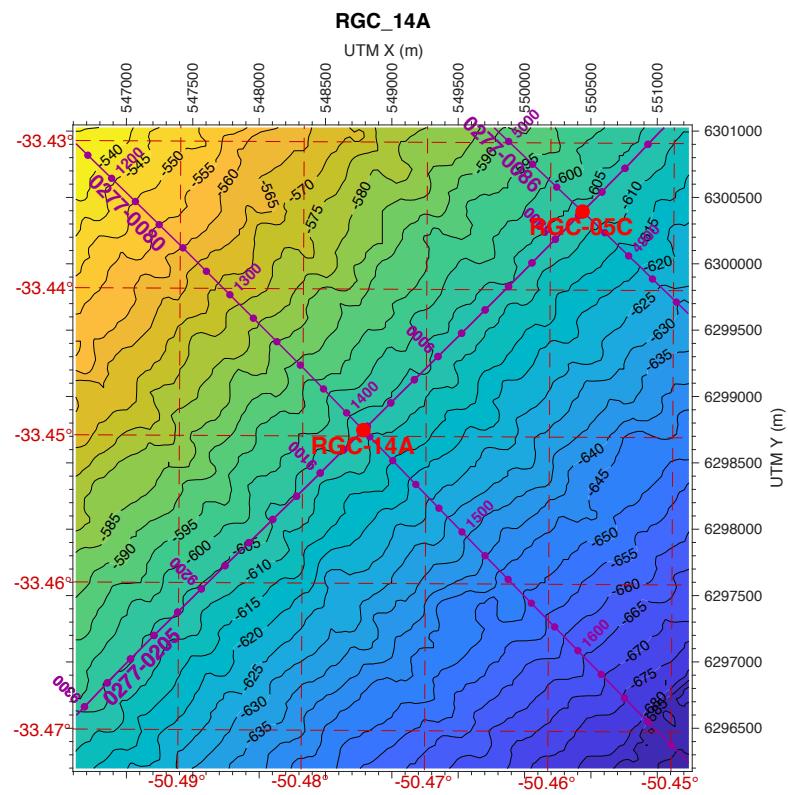


Sites RGC-05C, RGC-13A, RGC-14A-Line set 2



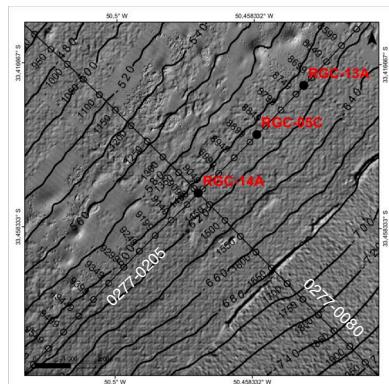
Backscatter image at Site RGC-13A.

9.16 Site RGC-14A



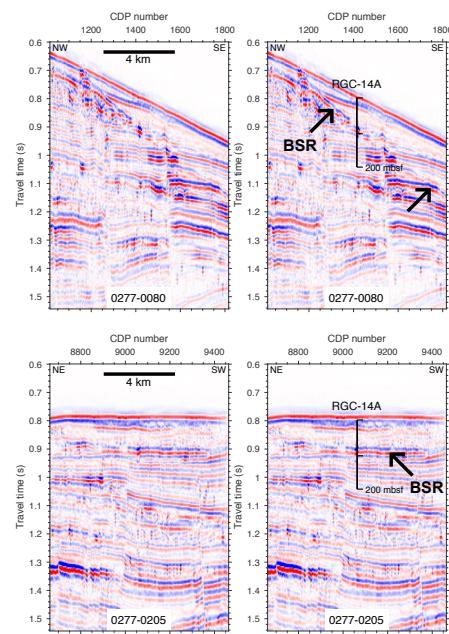
Gridded bathymetry and seismic line locations at Site RGC-14A.

IODP proposal 910-Full2
Site RGC-14A

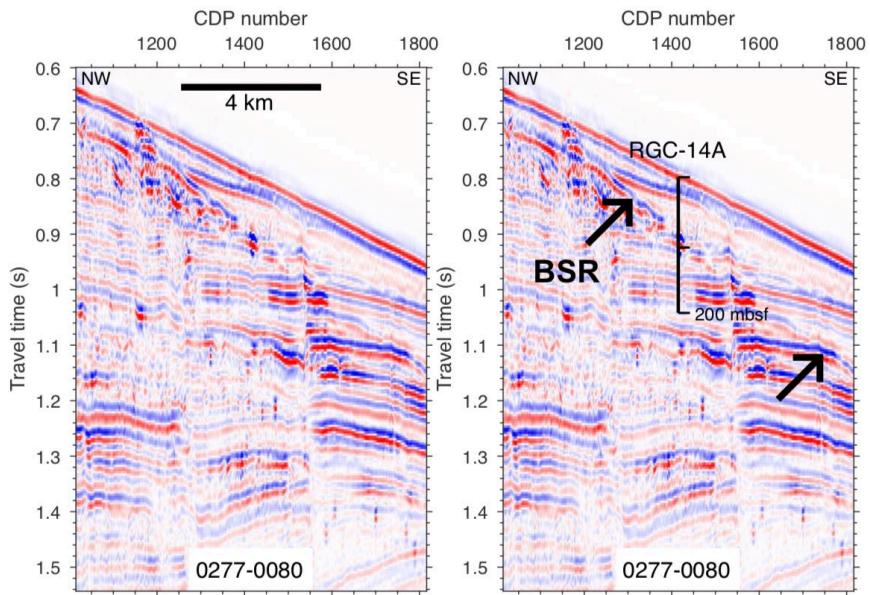
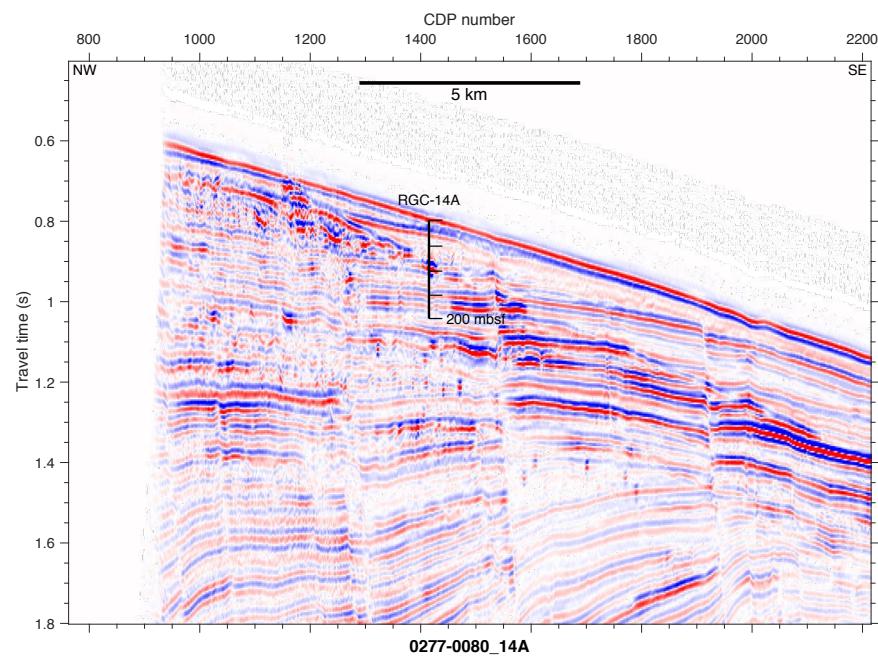


Site RGC-14A
CDP 1415 on line 0277-0080
CDP 9063 on line 0277-0205
Lat. -33.44959 / Long. -50.47509
UTM 22S 548785.2 E / 6298746.3 N
Water depth 607 m
Penetration 200 m

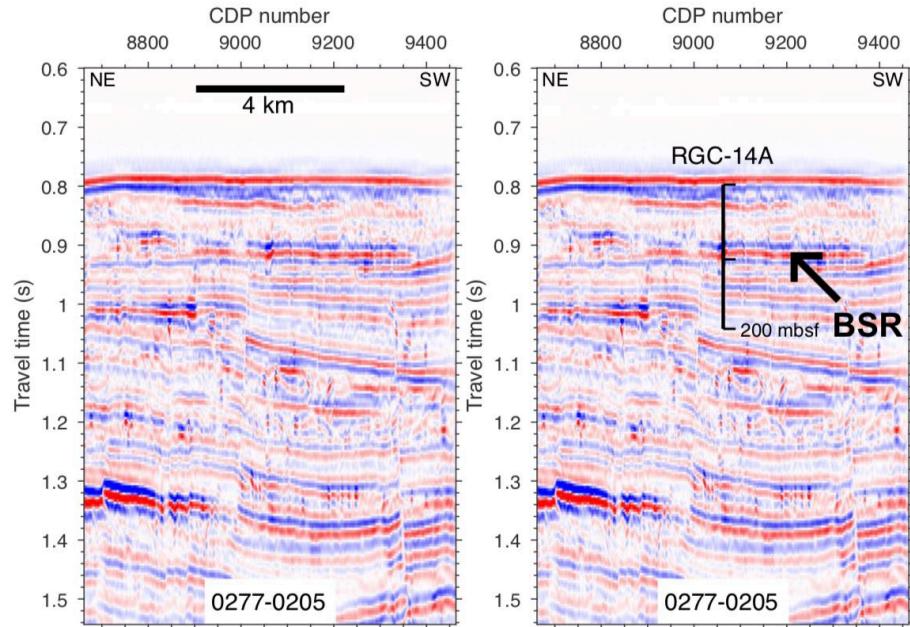
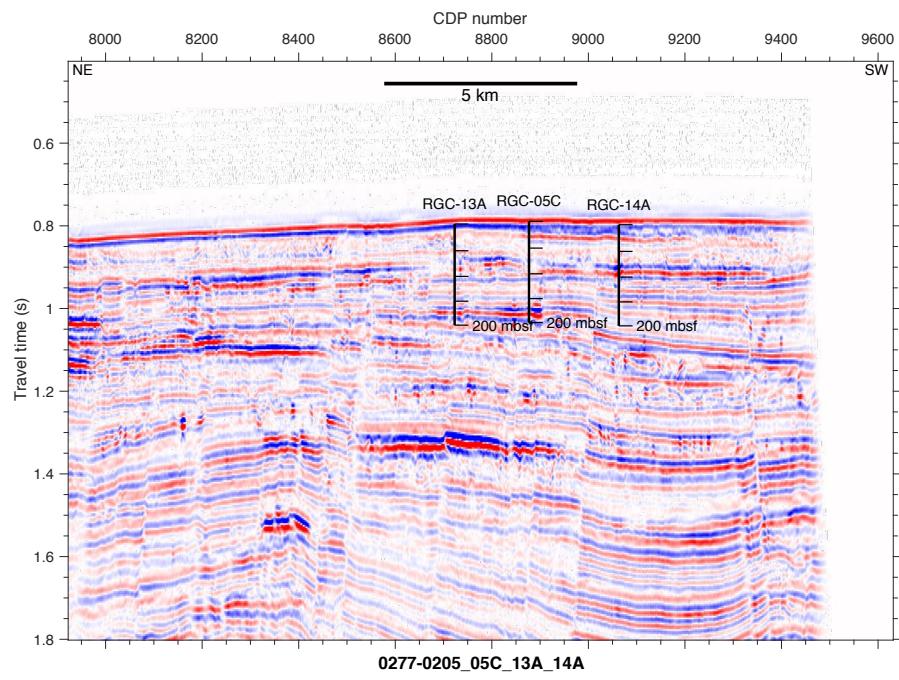
Data files will be submitted to the SSDB
by the November 2018 deadline



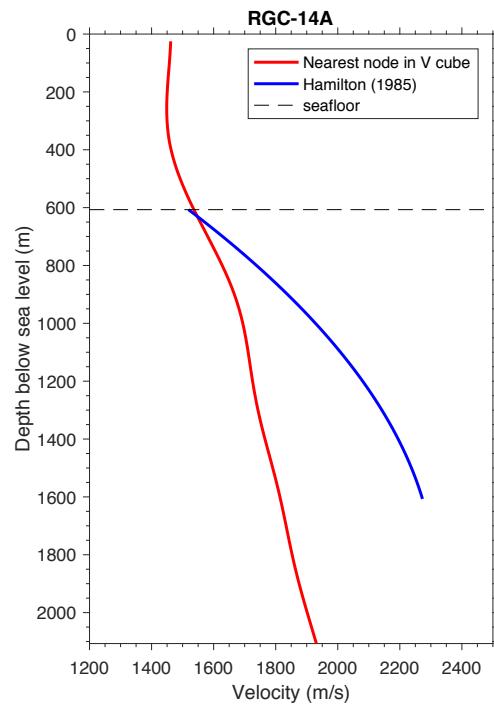
High-resolution bathymetry and seismic lines at Site RGC-14A.



Seismic reflection for Site RGC-14A.

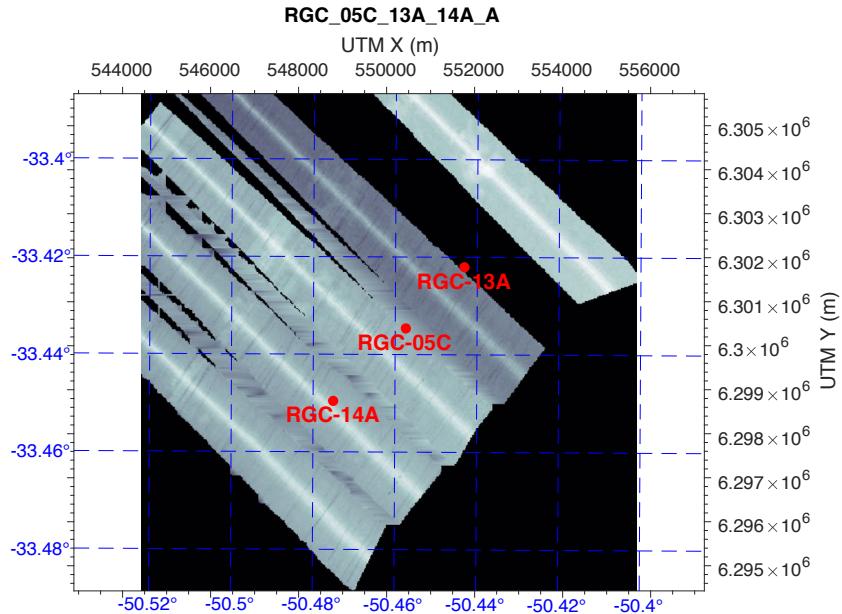


Seismic reflection line at Site RGC-14A.

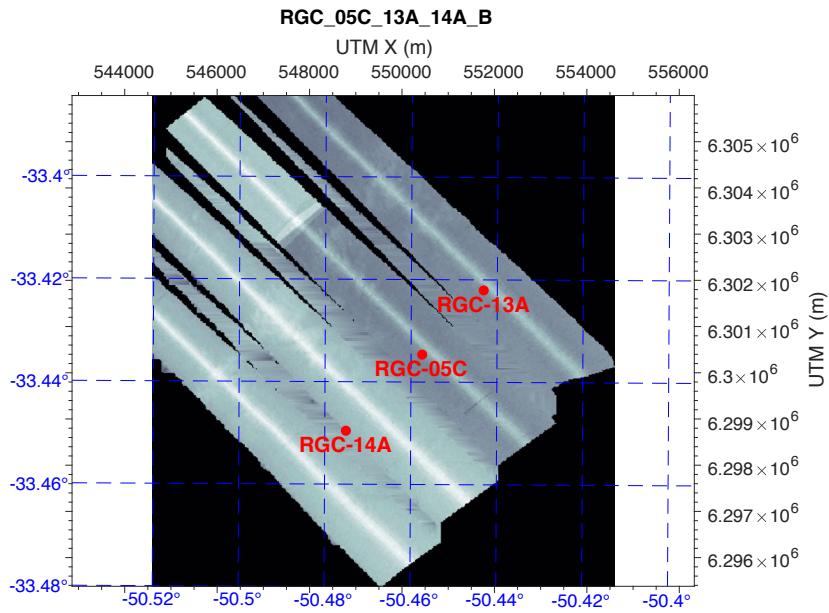


Seismic velocities for travel time-depth conversion at Site RGC-14A.

Sites RGC-05C, RGC-13A, RGC-14A-Line set 1



Sites RGC-05C, RGC-13A, RGC-14A-Line set 2



Backscatter image at Site RGC-14A.

10. SEISMIC ACQUISITION AND PROCESSING INFORMATION

Line 0231-0491

C01 CLIENT: GEOTRACE COMPANY XXXXXX CREW NO
XXX

C02 LINE: 0231-0491 AREA:PELOTAS BASIN, OFFSHORE BRASIL

C03 REEL NO. 73 DAY-START OF REEL XXX YEAR XXX OBSERVER
XXX

C04 INSTRUMENT MFG XXXX MODEL XXXX SERIAL NO XXXX

C05 DATA TRACES/RECORD 1 AUXILIARY TRACES/RECORD 0 CDP
FOLD 50

C06 SAMPLE INTERVAL 4MS SAMPLES/TRACE 2561 BITS/IN XXX
BYTES/SAMPLE 4

C07 RECORDING FORMAT SEGY FORMAT THIS REEL ANP1B
MEASUREMENT SYSTEM M

C08 SAMPLE CODE FLOATING POINT

C09 GAIN TYPE XXXX

C10 FILTERS XXXX

C11 SOURCE TYPE AIRGUN POINT INTERVAL 40M

C12 PATTERN XXXXX LENGTH XXXX WIDTH XXXX

C13 GEOPHONES PER GROUP XXX SPACING XXXX

C14 1 STREAMERS PER 100 TRACES LENGTH 4000M WIDTH 0

C15 SPREAD OFFSET 342M MAX DISTANCE 4342M GROUP INTERVAL
40M

C16

C17

C18 TRACES SORTED BY CDP

C19 AMPLITUDE RECOVERY XXX

C20 MAP PROJECTION UTM UTM ZONE 22 S COORDINATE
UNITS METERS

C21 PROCESSING: GEOTRACE HOUSTON C2296 MARCH 2011

C22 PROCESSING: <<<<---- FINAL PROCESSED MIGRATED STACK (AGC)
---->>>>

C23 1.SEGY REFORMAT 2.AAF & RESAMPLE TO 4MS 3.SPHERICAL
DIVERGENCE GAIN

C24 4.DESPIKE 5.TFD SWELL NOISE ATTENUATION 6.2D SRME

C25 7.2 KM VELOCITY ANALYSIS 8.TARGET MIGRATION 9.1 KM
MIGRATION VEL. ANALYSIS

C26 10.RADON 11.FDNA 12.RAY-TRACED MIGRATION

C27 13.RADON (WITH 65 DEG STRETCH MUTE) 14.FDNA 15.DIP FILTER

C28 16.OFFSET PLANE SNIP 17.OTM/ITM 18.NORMALISED STACK

C29 19.TVF 20.EXPONENTIAL GAIN 21.1000MS AGC

C30 22.GUN & CABLE STATIC CORRECTION 23.ASSIGN NAVIGATION

C31 24. OUTPUT TO SEG-Y

C32 BYTE POSITION

C33 SEQNO 1 -4 SP 17-20 CDP 21-24

C34 TRACE CODE 29-30 CDP-X 181-184 CDP-Y 185-188

C35 SAMPLES 115-116 SAMPLE INT 117-118

C36 SP/CDP RELATION 1:2

C37 SHOT 101-4648 CDP 309-9501

C38 CENTRAL MERIDIAN 51 W

C39 DATUM SAD-69 DATUM CODE 1 PROJECTION CODE 1

C40 END EBCDIC

Line 0277-0395

C01 CLIENT: EXXONMOBIL COMPANY WESTERN GEOPHYSICAL
CREW NO P-162
C 2 LINE J99B395 AREA PELOTAS BP1 BRAZIL 2D
C 3 REEL NO W05250 DAY-START OF REEL YEAR OBSERVER
C04 STACK FULL FOLD - FILTER + db/sec GAIN
C05 ON BOARD Convert SEG-D to In House Omega Format
C06 NAVIGATION MERGE TO SEISMIC MAX CMP FOLD = 98
C07 RESAMPLE to 4ms 36db/oct zero phase anti-alias filter at 75% nyquist
C08 4Hz 12db/oct zero phase low-cut filter
C09 TRACE SUMMATION 2:1 - even gathers traces 1&2, odd gathers sum traces
2&3
C10 DESIGNATURE with ExxonMobil provided Wavelet to zero phase
C11 OUTPUT SEG-Y format Record Length 11000ms, Sample Rate 4ms
32Bit
C12 Polarity SEG standard
C13 Navigation information - Survey Recorded in Datum WGS-84
C14 Projection Name = UTM Zone 22 South
C15 Latitude of Origin = 00 00 00.000 deg. N
C16 Longitude of Origin = 51 00 00.000deg. W
C17 False Easting 500,000m E
C18 False Northing 10 000 000m N
C19 Scale Factor at CM: 0.9996
C20 Grid Units meters
C21 IN HOUSE GEOSPREADING - 1 function hung from the waterbottom (t*v2)
C22 PRT (data nmo d using watervel - hand picked mute of prt transforms)
C23 VELOCITY ANALYSES - every 2Km ZAP
C24 SHOT AMP. CORRECTION (using two RAAC functions)
C25 INTRA GATHER INTERPOLATE (run in shot domain)
C26 COMMON OFFSET DMO (zero azimuth) 96 offsets
C27 COMMON OFFSET STOLT (pre-stack) 96 offsets
C28 VELOCITY ANALYSIS EVERY 500m
C29 PRT (nmo corrected with primary vels, hand picked mute of prt transforms)
C30 STACK to 96 fold (1/n normalisation)
C31 8- 55Hz filter , 12db/sec for 1st 2 secs then constant
C32 DATE: OCT/10, 2000 RIO DE JANEIRO
C33 HEADER LOCATIONS
C34 Bytes 73-76 Xcord Cell Center Bytes 77-80 Ycord Cell Center
C35 Bytes 17-20 Shotpoint Number Bytes 21-24 Cmp Number
C36 ACQUISITION PARAMETERS
C37 SHOTPOINT INT. = 31.25m RCVR INT. = 12.5m BIN SIZE = 12.5m
C38 CABLE LENGTH = 6000m NEAR OFFSET = 137m CABLE DEPTH =
8m
C39 NUM. CHANNELS = 480 GUN VOLUME = 4500 cubic inches
C40 End Of Comments

Line 0277-0281

C01 CLIENT: EXXONMOBIL COMPANY WESTERN GEOPHYSICAL
CREW NO P-162
C 2 LINE J99B281 AREA PELOTAS BP1 BRAZIL 2D
C 3 REEL NO W05250 DAY-START OF REEL YEAR OBSERVER
C04 STACK FULL FOLD - FILTER + db/sec GAIN
C05 ON BOARD Convert SEG-D to In House Omega Format
C06 NAVIGATION MERGE TO SEISMIC MAX CMP FOLD = 98
C07 RESAMPLE to 4ms 36db/oct zero phase anti-alias filter at 75% nyquist
C08 4Hz 12db/oct zero phase low-cut filter
C09 TRACE SUMMATION 2:1 - even gathers traces 1&2, odd gathers sum traces
2&3
C10 DESIGNATURE with ExxonMobil provided Wavelet to zero phase
C11 OUTPUT SEG-Y format Record Length 11000ms, Sample Rate 4ms
32Bit
C12 Polarity SEG standard
C13 Navigation information - Survey Recorded in Datum WGS-84
C14 Projection Name = UTM Zone 22 South
C15 Latitude of Origin = 00 00 00.000 deg. N
C16 Longitude of Origin = 51 00 00.000deg. W
C17 False Easting 500,000m E
C18 False Northing 10 000 000m N
C19 Scale Factor at CM: 0.9996
C20 Grid Units meters
C21 IN HOUSE GEOSPREADING - 1 function hung from the waterbottom (t*v2)
C22 PRT (data nmo d using watervel - hand picked mute of prt transforms)
C23 VELOCITY ANALYSES - every 2Km ZAP
C24 SHOT AMP. CORRECTION (using two RAAC functions)
C25 INTRA GATHER INTERPOLATE (run in shot domain)
C26 COMMON OFFSET DMO (zero azimuth) 96 offsets
C27 COMMON OFFSET STOLT (pre-stack) 96 offsets
C28 VELOCITY ANALYSIS EVERY 500m
C29 PRT (nmo corrected with primary vels, hand picked mute of prt transforms)
C30 STACK to 96 fold (1/n normalisation)
C31 8- 55Hz filter , 12db/sec for 1st 2 secs then constant
C32 DATE: OCT/10, 2000 RIO DE JANEIRO
C33 HEADER LOCATIONS
C34 Bytes 73-76 Xcord Cell Center Bytes 77-80 Ycord Cell Center
C35 Bytes 17-20 Shotpoint Number Bytes 21-24 Cmp Number
C36 ACQUISITION PARAMETERS
C37 SHOTPOINT INT. = 31.25m RCVR INT. = 12.5m BIN SIZE = 12.5m
C38 CABLE LENGTH = 6000m NEAR OFFSET = 137m CABLE DEPTH =
8m
C39 NUM. CHANNELS = 480 GUN VOLUME = 4500 cubic inches
C40 End Of Comments

Line 0277-0269

C01 CLIENT: EXXONMOBIL COMPANY WESTERN GEOPHYSICAL
CREW NO P-162
C 2 LINE J99B269 AREA PELOTAS BP1 BRAZIL 2D
C 3 REEL NO W05250 DAY-START OF REEL YEAR OBSERVER
C04 STACK FULL FOLD - FILTER + db/sec GAIN
C05 ON BOARD Convert SEG-D to In House Omega Format
C06 NAVIGATION MERGE TO SEISMIC MAX CMP FOLD = 98
C07 RESAMPLE to 4ms 36db/oct zero phase anti-alias filter at 75% nyquist
C08 4Hz 12db/oct zero phase low-cut filter
C09 TRACE SUMMATION 2:1 - even gathers traces 1&2, odd gathers sum traces
2&3
C10 DESIGNATURE with ExxonMobil provided Wavelet to zero phase
C11 OUTPUT SEG-Y format Record Length 11000ms, Sample Rate 4ms
32Bit
C12 Polarity SEG standard
C13 Navigation information - Survey Recorded in Datum WGS-84
C14 Projection Name = UTM Zone 22 South
C15 Latitude of Origin = 00 00 00.000 deg. N
C16 Longitude of Origin = 51 00 00.000deg. W
C17 False Easting 500,000m E
C18 False Northing 10 000 000m N
C19 Scale Factor at CM: 0.9996
C20 Grid Units meters
C21 IN HOUSE GEOSPREADING - 1 function hung from the waterbottom (t*v2)
C22 PRT (data nmo d using watervel - hand picked mute of prt transforms)
C23 VELOCITY ANALYSES - every 2Km ZAP
C24 SHOT AMP. CORRECTION (using two RAAC functions)
C25 INTRA GATHER INTERPOLATE (run in shot domain)
C26 COMMON OFFSET DMO (zero azimuth) 96 offsets
C27 COMMON OFFSET STOLT (pre-stack) 96 offsets
C28 VELOCITY ANALYSIS EVERY 500m
C29 PRT (nmo corrected with primary vels, hand picked mute of prt transforms)
C30 STACK to 96 fold (1/n normalisation)
C31 8- 55Hz filter , 12db/sec for 1st 2 secs then constant
C32 DATE: OCT/10, 2000 RIO DE JANEIRO
C33 HEADER LOCATIONS
C34 Bytes 73-76 Xcord Cell Center Bytes 77-80 Ycord Cell Center
C35 Bytes 17-20 Shotpoint Number Bytes 21-24 Cmp Number
C36 ACQUISITION PARAMETERS
C37 SHOTPOINT INT. = 31.25m RCVR INT. = 12.5m BIN SIZE = 12.5m
C38 CABLE LENGTH = 6000m NEAR OFFSET = 137m CABLE DEPTH =
8m
C39 NUM. CHANNELS = 480 GUN VOLUME = 4500 cubic inches
C40 End Of Comments

Line 0277-0258

C01 CLIENT: EXXONMOBIL COMPANY WESTERN GEOPHYSICAL
CREW NO P-162
C 2 LINE J99B258 AREA PELOTAS BP1 BRAZIL 2D
C 3 REEL NO W05250 DAY-START OF REEL YEAR OBSERVER
C04 STACK FULL FOLD - FILTER + db/sec GAIN
C05 ON BOARD Convert SEG-D to In House Omega Format
C06 NAVIGATION MERGE TO SEISMIC MAX CMP FOLD = 98
C07 RESAMPLE to 4ms 36db/oct zero phase anti-alias filter at 75% nyquist
C08 4Hz 12db/oct zero phase low-cut filter
C09 TRACE SUMMATION 2:1 - even gathers traces 1&2, odd gathers sum traces
2&3
C10 DESIGNATURE with ExxonMobil provided Wavelet to zero phase
C11 OUTPUT SEG-Y format Record Length 11000ms, Sample Rate 4ms
32Bit
C12 Polarity SEG standard
C13 Navigation information - Survey Recorded in Datum WGS-84
C14 Projection Name = UTM Zone 22 South
C15 Latitude of Origin = 00 00 00.000 deg. N
C16 Longitude of Origin = 51 00 00.000deg. W
C17 False Easting 500,000m E
C18 False Northing 10 000 000m N
C19 Scale Factor at CM: 0.9996
C20 Grid Units meters
C21 IN HOUSE GEOSPREADING - 1 function hung from the waterbottom (t*v2)
C22 PRT (data nmo d using watervel - hand picked mute of prt transforms)
C23 VELOCITY ANALYSES - every 2Km ZAP
C24 SHOT AMP. CORRECTION (using two RAAC functions)
C25 INTRA GATHER INTERPOLATE (run in shot domain)
C26 COMMON OFFSET DMO (zero azimuth) 96 offsets
C27 COMMON OFFSET STOLT (pre-stack) 96 offsets
C28 VELOCITY ANALYSIS EVERY 500m
C29 PRT (nmo corrected with primary vels, hand picked mute of prt transforms)
C30 STACK to 96 fold (1/n normalisation)
C31 8- 55Hz filter , 12db/sec for 1st 2 secs then constant
C32 DATE: OCT/10, 2000 RIO DE JANEIRO
C33 HEADER LOCATIONS
C34 Bytes 73-76 Xcord Cell Center Bytes 77-80 Ycord Cell Center
C35 Bytes 17-20 Shotpoint Number Bytes 21-24 Cmp Number
C36 ACQUISITION PARAMETERS
C37 SHOTPOINT INT. = 31.25m RCVR INT. = 12.5m BIN SIZE = 12.5m
C38 CABLE LENGTH = 6000m NEAR OFFSET = 137m CABLE DEPTH =
8m
C39 NUM. CHANNELS = 480 GUN VOLUME = 4500 cubic inches
C40 End Of Comments

Line 0277-0234

C01 CLIENT: EXXONMOBIL COMPANY WESTERN GEOPHYSICAL
CREW NO P-162
C 2 LINE J99B234 AREA PELOTAS BP1 BRAZIL 2D
C 3 REEL NO W05250 DAY-START OF REEL YEAR OBSERVER
C04 STACK FULL FOLD - FILTER + db/sec GAIN
C05 ON BOARD Convert SEG-D to In House Omega Format
C06 NAVIGATION MERGE TO SEISMIC MAX CMP FOLD = 98
C07 RESAMPLE to 4ms 36db/oct zero phase anti-alias filter at 75% nyquist
C08 4Hz 12db/oct zero phase low-cut filter
C09 TRACE SUMMATION 2:1 - even gathers traces 1&2, odd gathers sum traces
2&3
C10 DESIGNATURE with ExxonMobil provided Wavelet to zero phase
C11 OUTPUT SEG-Y format Record Length 11000ms, Sample Rate 4ms
32Bit
C12 Polarity SEG standard
C13 Navigation information - Survey Recorded in Datum WGS-84
C14 Projection Name = UTM Zone 22 South
C15 Latitude of Origin = 00 00 00.000 deg. N
C16 Longitude of Origin = 51 00 00.000deg. W
C17 False Easting 500,000m E
C18 False Northing 10 000 000m N
C19 Scale Factor at CM: 0.9996
C20 Grid Units meters
C21 IN HOUSE GEOSPREADING - 1 function hung from the waterbottom (t*v2)
C22 PRT (data nmo d using watervel - hand picked mute of prt transforms)
C23 VELOCITY ANALYSES - every 2Km ZAP
C24 SHOT AMP. CORRECTION (using two RAAC functions)
C25 INTRA GATHER INTERPOLATE (run in shot domain)
C26 COMMON OFFSET DMO (zero azimuth) 96 offsets
C27 COMMON OFFSET STOLT (pre-stack) 96 offsets
C28 VELOCITY ANALYSIS EVERY 500m
C29 PRT (nmo corrected with primary vels, hand picked mute of prt transforms)
C30 STACK to 96 fold (1/n normalisation)
C31 8- 55Hz filter , 12db/sec for 1st 2 secs then constant
C32 DATE: OCT/10, 2000 RIO DE JANEIRO
C33 HEADER LOCATIONS
C34 Bytes 73-76 Xcord Cell Center Bytes 77-80 Ycord Cell Center
C35 Bytes 17-20 Shotpoint Number Bytes 21-24 Cmp Number
C36 ACQUISITION PARAMETERS
C37 SHOTPOINT INT. = 31.25m RCVR INT. = 12.5m BIN SIZE = 12.5m
C38 CABLE LENGTH = 6000m NEAR OFFSET = 137m CABLE DEPTH =
8m
C39 NUM. CHANNELS = 480 GUN VOLUME = 4500 cubic inches
C40 End Of Comments

Line 0277-0229

C01 CLIENT: EXXONMOBIL COMPANY WESTERN GEOPHYSICAL
CREW NO P-162
C 2 LINE J99B229 AREA PELOTAS BP1 BRAZIL 2D
C 3 REEL NO W05250 DAY-START OF REEL YEAR OBSERVER
C04 STACK FULL FOLD - FILTER + db/sec GAIN
C05 ON BOARD Convert SEG-D to In House Omega Format
C06 NAVIGATION MERGE TO SEISMIC MAX CMP FOLD = 98
C07 RESAMPLE to 4ms 36db/oct zero phase anti-alias filter at 75% nyquist
C08 4Hz 12db/oct zero phase low-cut filter
C09 TRACE SUMMATION 2:1 - even gathers traces 1&2, odd gathers sum traces
2&3
C10 DESIGNATURE with ExxonMobil provided Wavelet to zero phase
C11 OUTPUT SEG-Y format Record Length 11000ms, Sample Rate 4ms
32Bit
C12 Polarity SEG standard
C13 Navigation information - Survey Recorded in Datum WGS-84
C14 Projection Name = UTM Zone 22 South
C15 Latitude of Origin = 00 00 00.000 deg. N
C16 Longitude of Origin = 51 00 00.000deg. W
C17 False Easting 500,000m E
C18 False Northing 10 000 000m N
C19 Scale Factor at CM: 0.9996
C20 Grid Units meters
C21 IN HOUSE GEOSPREADING - 1 function hung from the waterbottom (t*v2)
C22 PRT (data nmo d using watervel - hand picked mute of prt transforms)
C23 VELOCITY ANALYSES - every 2Km ZAP
C24 SHOT AMP. CORRECTION (using two RAAC functions)
C25 INTRA GATHER INTERPOLATE (run in shot domain)
C26 COMMON OFFSET DMO (zero azimuth) 96 offsets
C27 COMMON OFFSET STOLT (pre-stack) 96 offsets
C28 VELOCITY ANALYSIS EVERY 500m
C29 PRT (nmo corrected with primary vels, hand picked mute of prt transforms)
C30 STACK to 96 fold (1/n normalisation)
C31 8- 55Hz filter , 12db/sec for 1st 2 secs then constant
C32 DATE: OCT/10, 2000 RIO DE JANEIRO
C33 HEADER LOCATIONS
C34 Bytes 73-76 Xcord Cell Center Bytes 77-80 Ycord Cell Center
C35 Bytes 17-20 Shotpoint Number Bytes 21-24 Cmp Number
C36 ACQUISITION PARAMETERS
C37 SHOTPOINT INT. = 31.25m RCVR INT. = 12.5m BIN SIZE = 12.5m
C38 CABLE LENGTH = 6000m NEAR OFFSET = 137m CABLE DEPTH =
8m
C39 NUM. CHANNELS = 480 GUN VOLUME = 4500 cubic inches
C40 End Of Comments

Line 0277-0187

C01 CLIENT: EXXONMOBIL COMPANY WESTERN GEOPHYSICAL
CREW NO P-162
C 2 LINE J99B187 AREA PELOTAS BP1 BRAZIL 2D
C 3 REEL NO W05250 DAY-START OF REEL YEAR OBSERVER
C04 STACK FULL FOLD - FILTER + db/sec GAIN
C05 ON BOARD Convert SEG-D to In House Omega Format
C06 NAVIGATION MERGE TO SEISMIC MAX CMP FOLD = 98
C07 RESAMPLE to 4ms 36db/oct zero phase anti-alias filter at 75% nyquist
C08 4Hz 12db/oct zero phase low-cut filter
C09 TRACE SUMMATION 2:1 - even gathers traces 1&2, odd gathers sum traces
2&3
C10 DESIGNATURE with ExxonMobil provided Wavelet to zero phase
C11 OUTPUT SEG-Y format Record Length 11000ms, Sample Rate 4ms
32Bit
C12 Polarity SEG standard
C13 Navigation information - Survey Recorded in Datum WGS-84
C14 Projection Name = UTM Zone 22 South
C15 Latitude of Origin = 00 00 00.000 deg. N
C16 Longitude of Origin = 51 00 00.000deg. W
C17 False Easting 500,000m E
C18 False Northing 10 000 000m N
C19 Scale Factor at CM: 0.9996
C20 Grid Units meters
C21 IN HOUSE GEOSPREADING - 1 function hung from the waterbottom (t*v2)
C22 PRT (data nmo d using watervel - hand picked mute of prt transforms)
C23 VELOCITY ANALYSES - every 2Km ZAP
C24 SHOT AMP. CORRECTION (using two RAAC functions)
C25 INTRA GATHER INTERPOLATE (run in shot domain)
C26 COMMON OFFSET DMO (zero azimuth) 96 offsets
C27 COMMON OFFSET STOLT (pre-stack) 96 offsets
C28 VELOCITY ANALYSIS EVERY 500m
C29 PRT (nmo corrected with primary vels, hand picked mute of prt transforms)
C30 STACK to 96 fold (1/n normalisation)
C31 8- 55Hz filter , 12db/sec for 1st 2 secs then constant
C32 DATE: OCT/10, 2000 RIO DE JANEIRO
C33 HEADER LOCATIONS
C34 Bytes 73-76 Xcord Cell Center Bytes 77-80 Ycord Cell Center
C35 Bytes 17-20 Shotpoint Number Bytes 21-24 Cmp Number
C36 ACQUISITION PARAMETERS
C37 SHOTPOINT INT. = 31.25m RCVR INT. = 12.5m BIN SIZE = 12.5m
C38 CABLE LENGTH = 6000m NEAR OFFSET = 137m CABLE DEPTH =
8m
C39 NUM. CHANNELS = 480 GUN VOLUME = 4500 cubic inches
C40 End Of Comments

Line 0277-0090

C01 CLIENT: EXXONMOBIL COMPANY WESTERN GEOPHYSICAL
CREW NO P-162
C 2 LINE J99B090 AREA PELOTAS BP1 BRAZIL 2D
C 3 REEL NO W05250 DAY-START OF REEL YEAR OBSERVER
C04 STACK FULL FOLD - FILTER + db/sec GAIN
C05 ON BOARD Convert SEG-D to In House Omega Format
C06 NAVIGATION MERGE TO SEISMIC MAX CMP FOLD = 98
C07 RESAMPLE to 4ms 36db/oct zero phase anti-alias filter at 75% nyquist
C08 4Hz 12db/oct zero phase low-cut filter
C09 TRACE SUMMATION 2:1 - even gathers traces 1&2, odd gathers sum traces
2&3
C10 DESIGNATURE with ExxonMobil provided Wavelet to zero phase
C11 OUTPUT SEG-Y format Record Length 11000ms, Sample Rate 4ms
32Bit
C12 Polarity SEG standard
C13 Navigation information - Survey Recorded in Datum WGS-84
C14 Projection Name = UTM Zone 22 South
C15 Latitude of Origin = 00 00 00.000 deg. N
C16 Longitude of Origin = 51 00 00.000deg. W
C17 False Easting 500,000m E
C18 False Northing 10 000 000m N
C19 Scale Factor at CM: 0.9996
C20 Grid Units meters
C21 IN HOUSE GEOSPREADING - 1 function hung from the waterbottom (t*v2)
C22 PRT (data nmo d using watervel - hand picked mute of prt transforms)
C23 VELOCITY ANALYSES - every 2Km ZAP
C24 SHOT AMP. CORRECTION (using two RAAC functions)
C25 INTRA GATHER INTERPOLATE (run in shot domain)
C26 COMMON OFFSET DMO (zero azimuth) 96 offsets
C27 COMMON OFFSET STOLT (pre-stack) 96 offsets
C28 VELOCITY ANALYSIS EVERY 500m
C29 PRT (nmo corrected with primary vels, hand picked mute of prt transforms)
C30 STACK to 96 fold (1/n normalisation)
C31 8- 55Hz filter , 12db/sec for 1st 2 secs then constant
C32 DATE: OCT/10, 2000 RIO DE JANEIRO
C33 HEADER LOCATIONS
C34 Bytes 73-76 Xcord Cell Center Bytes 77-80 Ycord Cell Center
C35 Bytes 17-20 Shotpoint Number Bytes 21-24 Cmp Number
C36 ACQUISITION PARAMETERS
C37 SHOTPOINT INT. = 31.25m RCVR INT. = 12.5m BIN SIZE = 12.5m
C38 CABLE LENGTH = 6000m NEAR OFFSET = 137m CABLE DEPTH =
8m
C39 NUM. CHANNELS = 480 GUN VOLUME = 4500 cubic inches
C40 End Of Comments

Line 0277-0080

C01 CLIENT: EXXONMOBIL COMPANY WESTERN GEOPHYSICAL
CREW NO P-162
C 2 LINE J99B080D AREA PELOTAS BP1 BRAZIL 2D
C 3 REEL NO W05250 DAY-START OF REEL YEAR OBSERVER
C04 STACK FULL FOLD - FILTER + db/sec GAIN
C05 ON BOARD Convert SEG-D to In House Omega Format
C06 NAVIGATION MERGE TO SEISMIC MAX CMP FOLD = 98
C07 RESAMPLE to 4ms 36db/oct zero phase anti-alias filter at 75% nyquist
C08 4Hz 12db/oct zero phase low-cut filter
C09 TRACE SUMMATION 2:1 - even gathers traces 1&2, odd gathers sum traces
2&3
C10 DESIGNATURE with ExxonMobil provided Wavelet to zero phase
C11 OUTPUT SEG-Y format Record Length 11000ms, Sample Rate 4ms
32Bit
C12 Polarity SEG standard
C13 Navigation information - Survey Recorded in Datum WGS-84
C14 Projection Name = UTM Zone 22 South
C15 Latitude of Origin = 00 00 00.000 deg. N
C16 Longitude of Origin = 51 00 00.000deg. W
C17 False Easting 500,000m E
C18 False Northing 10 000 000m N
C19 Scale Factor at CM: 0.9996
C20 Grid Units meters
C21 IN HOUSE GEOSPREADING - 1 function hung from the waterbottom (t*v2)
C22 PRT (data nmo d using watervel - hand picked mute of prt transforms)
C23 VELOCITY ANALYSES - every 2Km ZAP
C24 SHOT AMP. CORRECTION (using two RAAC functions)
C25 INTRA GATHER INTERPOLATE (run in shot domain)
C26 COMMON OFFSET DMO (zero azimuth) 96 offsets
C27 COMMON OFFSET STOLT (pre-stack) 96 offsets
C28 VELOCITY ANALYSIS EVERY 500m
C29 PRT (nmo corrected with primary vels, hand picked mute of prt transforms)
C30 STACK to 96 fold (1/n normalisation)
C31 8- 55Hz filter , 12db/sec for 1st 2 secs then constant
C32 DATE: OCT/10, 2000 RIO DE JANEIRO
C33 HEADER LOCATIONS
C34 Bytes 73-76 Xcord Cell Center Bytes 77-80 Ycord Cell Center
C35 Bytes 17-20 Shotpoint Number Bytes 21-24 Cmp Number
C36 ACQUISITION PARAMETERS
C37 SHOTPOINT INT. = 31.25m RCVR INT. = 12.5m BIN SIZE = 12.5m
C38 CABLE LENGTH = 6000m NEAR OFFSET = 137m CABLE DEPTH =
8m
C39 NUM. CHANNELS = 480 GUN VOLUME = 4500 cubic inches
C40 End Of Comments

Line 0277-0270

C01 CLIENT: EXXONMOBIL COMPANY WESTERN GEOPHYSICAL
CREW NO P-162
C 2 LINE J00B270 AREA PELOTAS BP1 BRAZIL 2D
C 3 REEL NO W05250 DAY-START OF REEL YEAR OBSERVER
C04 STACK FULL FOLD - FILTER + db/sec GAIN
C05 ON BOARD Convert SEG-D to In House Omega Format
C06 NAVIGATION MERGE TO SEISMIC MAX CMP FOLD = 98
C07 RESAMPLE to 4ms 36db/oct zero phase anti-alias filter at 75% nyquist
C08 4Hz 12db/oct zero phase low-cut filter
C09 TRACE SUMMATION 2:1 - even gathers traces 1&2, odd gathers sum traces
2&3
C10 DESIGNATURE with ExxonMobil provided Wavelet to zero phase
C11 OUTPUT SEG-Y format Record Length 11000ms, Sample Rate 4ms
32Bit
C12 Polarity SEG standard
C13 Navigation information - Survey Recorded in Datum WGS-84
C14 Projection Name = UTM Zone 22 South
C15 Latitude of Origin = 00 00 00.000 deg. N
C16 Longitude of Origin = 51 00 00.000deg. W
C17 False Easting 500,000m E
C18 False Northing 10 000 000m N
C19 Scale Factor at CM: 0.9996
C20 Grid Units meters
C21 IN HOUSE GEOSPREADING - 1 function hung from the waterbottom (t*v2)
C22 PRT (data nmo d using watervel - hand picked mute of prt transforms)
C23 VELOCITY ANALYSES - every 2Km ZAP
C24 SHOT AMP. CORRECTION (using two RAAC functions)
C25 INTRA GATHER INTERPOLATE (run in shot domain)
C26 COMMON OFFSET DMO (zero azimuth) 96 offsets
C27 COMMON OFFSET STOLT (pre-stack) 96 offsets
C28 VELOCITY ANALYSIS EVERY 500m
C29 PRT (nmo corrected with primary vels, hand picked mute of prt transforms)
C30 STACK to 96 fold (1/n normalisation)
C31 8- 55Hz filter , 12db/sec for 1st 2 secs then constant
C32 DATE: OCT/10, 2000 RIO DE JANEIRO
C33 HEADER LOCATIONS
C34 Bytes 73-76 Xcord Cell Center Bytes 77-80 Ycord Cell Center
C35 Bytes 17-20 Shotpoint Number Bytes 21-24 Cmp Number
C36 ACQUISITION PARAMETERS
C37 SHOTPOINT INT. = 31.25m RCVR INT. = 12.5m BIN SIZE = 12.5m
C38 CABLE LENGTH = 6000m NEAR OFFSET = 137m CABLE DEPTH =
8m
C39 NUM. CHANNELS = 480 GUN VOLUME = 4500 cubic inches
C40 End Of Comments

Line 0277-0222

C01 CLIENT: EXXONMOBIL COMPANY WESTERN GEOPHYSICAL
CREW NO P-162
C 2 LINE J00B222 AREA PELOTAS BP1 BRAZIL 2D
C 3 REEL NO W05251 DAY-START OF REEL YEAR OBSERVER
C04 STACK FULL FOLD - FILTER + db/sec GAIN
C05 ON BOARD Convert SEG-D to In House Omega Format
C06 NAVIGATION MERGE TO SEISMIC MAX CMP FOLD = 60
C07 RESAMPLE to 4ms 36db/oct zero phase anti-alias filter at 75% nyquist
C08 4Hz 12db/oct zero phase low-cut filter
C09 TRACE SUMMATION 2:1 - even gathers traces 1&2, odd gathers sum traces
2&3
C10 DESIGNATURE with ExxonMobil provided Wavelet to zero phase
C11 OUTPUT SEG-Y format Record Length 17000ms, Sample Rate 4ms
32Bit
C12 Polarity SEG standard
C13 Navigation information - Survey Recorded in Datum WGS-84
C14 Projection Name = UTM Zone 22 South
C15 Latitude of Origin = 00 00 00.000 deg. N
C16 Longitude of Origin = 51 00 00.000deg. W
C17 False Easting 500,000m E
C18 False Northing 10 000 000m N
C19 Scale Factor at CM: 0.9996
C20 Grid Units meters
C21 IN HOUSE GEOSPREADING - 1 function hung from the waterbottom (t*v2)
C22 PRT (data nmo d using watervel - hand picked mute of prt transforms)
C23 VELOCITY ANALYSES - every 2Km ZAP
C24 SHOT AMP. CORRECTION (using two RAAC functions)
C25 INTRA GATHER INTERPOLATE (run in shot domain)
C26 COMMON OFFSET DMO (zero azimuth) 60 offsets
C27 COMMON OFFSET STOLT (pre-stack) 60 offsets
C28 VELOCITY ANALYSIS EVERY 500m
C29 PRT (nmo corrected with primary vels, hand picked mute of prt transforms)
C30 STACK to 96 fold (1/n normalisation)
C31 8- 55Hz filter , 12db/sec for 1st 2 secs then constant
C32 DATE: OCT/10, 2000 RIO DE JANEIRO
C33 HEADER LOCATIONS
C34 Bytes 73-76 Xcord Cell Center Bytes 77-80 Ycord Cell Center
C35 Bytes 17-20 Shotpoint Number Bytes 21-24 Cmp Number
C36 ACQUISITION PARAMETERS
C37 SHOTPOINT INT. = 50m RCVR INT. = 12.5m BIN SIZE = 12.5m
C38 CABLE LENGTH = 6000m NEAR OFFSET = 137m CABLE DEPTH =
10m
C39 NUM. CHANNELS = 480 GUN VOLUME = 4500 cubic inches
C40 End Of Comments

Line 0277-0205

C01 CLIENT: EXXONMOBIL COMPANY WESTERN GEOPHYSICAL
CREW NO P-162
C 2 LINE J00B205 AREA PELOTAS BP1 BRAZIL 2D
C 3 REEL NO W05250 DAY-START OF REEL YEAR OBSERVER
C04 STACK FULL FOLD - FILTER + db/sec GAIN
C05 ON BOARD Convert SEG-D to In House Omega Format
C06 NAVIGATION MERGE TO SEISMIC MAX CMP FOLD = 98
C07 RESAMPLE to 4ms 36db/oct zero phase anti-alias filter at 75% nyquist
C08 4Hz 12db/oct zero phase low-cut filter
C09 TRACE SUMMATION 2:1 - even gathers traces 1&2, odd gathers sum traces
2&3
C10 DESIGNATURE with ExxonMobil provided Wavelet to zero phase
C11 OUTPUT SEG-Y format Record Length 11000ms, Sample Rate 4ms
32Bit
C12 Polarity SEG standard
C13 Navigation information - Survey Recorded in Datum WGS-84
C14 Projection Name = UTM Zone 22 South
C15 Latitude of Origin = 00 00 00.000 deg. N
C16 Longitude of Origin = 51 00 00.000deg. W
C17 False Easting 500,000m E
C18 False Northing 10 000 000m N
C19 Scale Factor at CM: 0.9996
C20 Grid Units meters
C21 IN HOUSE GEOSPREADING - 1 function hung from the waterbottom (t*v2)
C22 PRT (data nmo d using watervel - hand picked mute of prt transforms)
C23 VELOCITY ANALYSES - every 2Km ZAP
C24 SHOT AMP. CORRECTION (using two RAAC functions)
C25 INTRA GATHER INTERPOLATE (run in shot domain)
C26 COMMON OFFSET DMO (zero azimuth) 96 offsets
C27 COMMON OFFSET STOLT (pre-stack) 96 offsets
C28 VELOCITY ANALYSIS EVERY 500m
C29 PRT (nmo corrected with primary vels, hand picked mute of prt transforms)
C30 STACK to 96 fold (1/n normalisation)
C31 8- 55Hz filter , 12db/sec for 1st 2 secs then constant
C32 DATE: OCT/10, 2000 RIO DE JANEIRO
C33 HEADER LOCATIONS
C34 Bytes 73-76 Xcord Cell Center Bytes 77-80 Ycord Cell Center
C35 Bytes 17-20 Shotpoint Number Bytes 21-24 Cmp Number
C36 ACQUISITION PARAMETERS
C37 SHOTPOINT INT. = 31.25m RCVR INT. = 12.5m BIN SIZE = 12.5m
C38 CABLE LENGTH = 6000m NEAR OFFSET = 137m CABLE DEPTH =
8m
C39 NUM. CHANNELS = 480 GUN VOLUME = 4500 cubic inches
C40 End Of Comments

Line 0277-0086

C01 CLIENT: EXXONMOBIL COMPANY WESTERN GEOPHYSICAL
CREW NO P-162
C 2 LINE J00B086 AREA PELOTAS BP1 BRAZIL 2D
C 3 REEL NO W05250 DAY-START OF REEL YEAR OBSERVER
C04 STACK FULL FOLD - FILTER + db/sec GAIN
C05 ON BOARD Convert SEG-D to In House Omega Format
C06 NAVIGATION MERGE TO SEISMIC MAX CMP FOLD = 98
C07 RESAMPLE to 4ms 36db/oct zero phase anti-alias filter at 75% nyquist
C08 4Hz 12db/oct zero phase low-cut filter
C09 TRACE SUMMATION 2:1 - even gathers traces 1&2, odd gathers sum traces
2&3
C10 DESIGNATURE with ExxonMobil provided Wavelet to zero phase
C11 OUTPUT SEG-Y format Record Length 11000ms, Sample Rate 4ms
32Bit
C12 Polarity SEG standard
C13 Navigation information - Survey Recorded in Datum WGS-84
C14 Projection Name = UTM Zone 22 South
C15 Latitude of Origin = 00 00 00.000 deg. N
C16 Longitude of Origin = 51 00 00.000deg. W
C17 False Easting 500,000m E
C18 False Northing 10 000 000m N
C19 Scale Factor at CM: 0.9996
C20 Grid Units meters
C21 IN HOUSE GEOSPREADING - 1 function hung from the waterbottom (t*v2)
C22 PRT (data nmo d using watervel - hand picked mute of prt transforms)
C23 VELOCITY ANALYSES - every 2Km ZAP
C24 SHOT AMP. CORRECTION (using two RAAC functions)
C25 INTRA GATHER INTERPOLATE (run in shot domain)
C26 COMMON OFFSET DMO (zero azimuth) 96 offsets
C27 COMMON OFFSET STOLT (pre-stack) 96 offsets
C28 VELOCITY ANALYSIS EVERY 500m
C29 PRT (nmo corrected with primary vels, hand picked mute of prt transforms)
C30 STACK to 96 fold (1/n normalisation)
C31 8- 55Hz filter , 12db/sec for 1st 2 secs then constant
C32 DATE: OCT/10, 2000 RIO DE JANEIRO
C33 HEADER LOCATIONS
C34 Bytes 73-76 Xcord Cell Center Bytes 77-80 Ycord Cell Center
C35 Bytes 17-20 Shotpoint Number Bytes 21-24 Cmp Number
C36 ACQUISITION PARAMETERS
C37 SHOTPOINT INT. = 31.25m RCVR INT. = 12.5m BIN SIZE = 12.5m
C38 CABLE LENGTH = 6000m NEAR OFFSET = 137m CABLE DEPTH =
8m
C39 NUM. CHANNELS = 480 GUN VOLUME = 4500 cubic inches
C40 End Of Comments

Line 0231-0486

C 1 CLIENT PETROBRAS COMPANY CREW NO
C 2 LINE 0231-0486 AREA PELOTAS
C 3 REEL NO DAY-START OF REEL YEAR OBSERVER
C 4 INSTRUMENT MFG MODEL SERIAL NO
C 5 DATA TRACES/RECORD 24 AUXILIARY TRACES/RECORD 0 CDP
FOLD 24
C 6 SAMPLE INTERVAL 4000 SAMPLES/TRACE 2500 BITS/IN
BYTES/SAMPLE 4
C 7 RECORDING FORMAT FORMAT THIS REEL BRV03
MEASUREMENT SYSTEM
C 8 SAMPLE CODE FLOATING PT
C 9 GAIN TYPE
C10 FILTERS
C11 SOURCE TYPE NUMBER/POINT POINT INTERVAL
C12 PATTERN LENGTH WIDTH
C13 SWEEP START HZ END HZ LENGTH MS CHANNEL NO
TYPE
C14 TAPER START LENGTH MS END LENGTH MS TYPE
C15 SPREAD OFFSET MAX DISTANCE GROUP INTERVAL
C16 GEOPHONES PER GROUP SPACING FREQUENCY MFG
MODEL
C17 TYPE LENGTH WIDTH
C18 TRACES SORTED BY RECORD PROJECT LINE ID
C19 AMPLITUDE RECOVERY
C20 MAP PROJECTION ZONE ID COORDINATE UNITS
C21 PROCESSING: E&P-SEDE CLAU S070 - CONVERSAO PARA SEGY
FEITA EM 1998
C22 PROCESSING: PROJETO MASTER - ORGANIZACAO DO MASTER
C23 + RNA 202 FPS 05-10-96 10.08.55 D0
C24 + OUTFIX 2A2 05-10-96 10.09.03 D0
C25 I3001V05V 05-10-96 10.09.03 S0TD.M4S060.E0030395.E231.L0486.RNA
D0
C26 + INPUT 303 08-10-96 15.18.40 D0
C27 + TVFILTER 301 FPS 08-10-96 15.18.43 D0
C28 + POSTMIX 102 08-10-96 15.18.45 D0
C29 + OUTFIX 2A2 08-10-96 15.18.47 D0
C30 I3001V05V 08-10-96 15.18.47
S0TD.M4S060.E0030395.E231.L0486.RNAFLT D0
C31 P408A 03- 1-97 16.33.53
S0TD.M4S060.E0030395.E231.L0486.RNAFLTMU D0
C32 + INPUT 303 03- 1-97 17.25.43 D0
C33 + GAIN 305 FPS 03- 1-97 17.25.43 D0
C34 + OUTFIX 2A2 03- 1-97 17.25.44 D0
C35 I3001V05V 03- 1-97 17.25.44
S0TD.M4S060.E0030395.E231.L0486.RNFTMUGA D0
C36 + INPUT 303 09- 7-98 8.15.10 D0
C37 + SEGYSTKW 102 FPS 09- 7-98 8.15.11 D0
C38 + OUTPUT 3C3 09- 7-98 8.15.11 D0
C39 I3001V05V 09- 7-98 8.15.11 SYS98190.T081506.RA000.S0705486 TEMP
D0
C40 END EBCDIC

Safety Review Preparation

Seismic Data Presentation Question	Answer
(1) Is the seabed signature clearly visible and can the polarity be established?	Yes
(2) Have the seismic data been displayed with and without an interpretation?	Yes
(3) Have both a time and a depth section been presented?	No
(4) Do the final site displays result in the drill stick representing about half of the vertical section? (This is not required for regional displays.)	Yes
(5) Has the depth of proposed penetration been marked? (This should include the target depth and the total depth of penetration if a logging tool is to be used. The marking "stick" should also include an estimate of uncertainty.)	Yes
(6) Have key geologic and/or safety issues been highlighted on the seismic data?	Yes
(7) Have seismic attributes been presented in color rather than black and white?	Yes
(8) Are the vertical and horizontal scales on associated strike- and dip-sections the same?	Yes
(9) Have intersections with cross-lines been clearly labeled?	Yes
(10) Have CDP or shot points been appropriately labeled?	Yes
(11) Are both vertical and horizontal scales present (preferably on the axis)?	Yes
(12) Has a summary of acquisition and processing been provided?	Yes
(13) Is the processing appropriate for imaging the target depth?	Yes
(14) Has the information utilized to establish the time-depth conversion been provided?	Yes

Seismic Data Presentation Question	Answer
(15) On the map, has directionality been established with an arrow or a latitude/longitude grid?	Yes
(16) Has a suitable map scale been provided?	Yes
(17) Are contours appropriately labeled with units identified?	Yes
(18) Are all necessary seismic track lines identified on maps, with shot points labeled at a regular interval?	Yes
(19) Has the resolution of the grid been provided? And, has the appropriate scale bar been presented?	Yes
(20) Do all maps share a common coordinate reference system?	Yes

Comments

IODP Site Forms

General Site Information

Section A: Proposal Information

Proposal Title:	Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)
Date Form Submitted:	2019-01-28 22:01:36
Site-Specific Objectives with Priority (Must include general objectives in proposal)	Sample a "stratigraphic" methane hydrate setting in the extensional domain of the Rio Grande Cone. This site will allow for investigating microbial methanogenesis where fluid flow is likely not to be significant and address our scientific objectives on constraining the of microbial methanogenesis pathway, vertical distribution, and rate, and on characterizing reactions at the SMTZ. This site is located on the axis of the cone where sedimentation rates are expected to be the highest and will be triple-cored for a paleoceanographic reconstruction.
List Previous Drilling in Area:	

Section B: General Site Information

Site Name:	RGC-01C		Area or Location:	Rio Grande Cone
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#:			Jurisdiction:	Brazil
Latitude:	-32.94865		Distance to Land (km):	200
Longitude:	-49.88057		Water Depth (m):	1159
Coordinate System:	WGS 84			
Priority of Site:	Primary <input checked="" type="checkbox"/>	Alternate <input type="checkbox"/>		

Section C: Operational Information

Proposed Penetration (m):

Sediments	Basement	Total Sediment Thickness (m)	Total Penetration (m)
500	0	8000	500

General Lithologies:

Marine mud and mudstone with minor amounts of intercalated sand and sandstone	
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Coring Plan (Specify or check):

Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores

Hole B: Same as Hole A

Hole C: Same as Hole A, log

APC XCB RCB Re-entry PCS

Wireline Logging Plan:

Standard Measurement		Special Tools	
Wireline Logging	<input checked="" type="checkbox"/>	Magnetic Susceptibility	<input type="checkbox"/>
Porosity	<input type="checkbox"/>	Borehole Temperature	<input type="checkbox"/>
Density	<input checked="" type="checkbox"/>	Formation Image (Acoustic)	<input type="checkbox"/>
Gamma Ray	<input checked="" type="checkbox"/>	VSP (walkaway)	<input type="checkbox"/>
Resistivity	<input checked="" type="checkbox"/>	LWD	<input type="checkbox"/>
Sonic (Δt)	<input checked="" type="checkbox"/>		
Formation Image (Res)	<input checked="" type="checkbox"/>		
VSP (zero offset)	<input type="checkbox"/>		
Formation Temperature & Pressure	<input type="checkbox"/>		
Other Measurements:		Other Tools:	

Estimated Days:

Drilling / Coring	Logging	Total On-Site
8.1	0.8	8.9

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan:

Potential Harzards/Weather:

Shallow Gas	<input type="checkbox"/>	Complicated Seabed Condition	<input type="checkbox"/>	Hydrothermal Activity	<input type="checkbox"/>	Preferred weather window: Austral summer-fall (October-April). Spring has high winds and winter high waves and currents.
Hydrocarbon	<input type="checkbox"/>	Soft Seabed	<input type="checkbox"/>	Landslide and Turbidity Current	<input type="checkbox"/>	
Shallow Water Flow	<input type="checkbox"/>	Currents	<input type="checkbox"/>	Gas Hydrate	<input checked="" type="checkbox"/>	
Abnormal Pressure	<input type="checkbox"/>	Fracture Zone	<input type="checkbox"/>	Diapir and Mud Volcano	<input type="checkbox"/>	
Man-made Objects (e.g. sea-floor cables, dump sites)	<input type="checkbox"/>	Fault	<input type="checkbox"/>	High Temperature	<input type="checkbox"/>	
H2S	<input type="checkbox"/>	High Dip Angle	<input type="checkbox"/>	Ice Conditions	<input type="checkbox"/>	
CO2	<input type="checkbox"/>					
Sensitive marine habitat (e.g. reefs, vents)						
Other: 1-3 pressure cores in each hole taken with the IODP PCS						

IODP Site Forms

Site Survey Detail

910-SRR2 for Site RGC-01C Submitted 2019-01-28 22:01:36

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 0277-0234 Position 6820
1b High resolution seismic reflection (crossing)	yes	Line: 0231-0486 Position 13608
2a Deep penetration seismic reflection (primary)	yes	Same as high-resolution seismic line
2b Deep penetration seismic reflection (crossing)	yes	Same as high-resolution seismic line
3 Seismic Velocity	yes	
4 Seismic Grid		
5a Refraction (surface)		
5b Refraction (bottom)		
6 3.5 kHz	yes	
7 Swath bathymetry	yes	Multibeam bathymetry with backscatter data
8a Side looking sonar (surface)		
8b Side looking sonar (bottom)		
9 Photography or video		
10 Heat Flow		
11a Magnetics		
11b Gravity		
12 Sediment cores		
13 Rock sampling		
14a Water current data		
14b Ice Conditions		
15 OBS microseismicity		
16 Navigation	yes	
17 Other		

IODP Site Forms

Environmental Protection

910-SRR2 for Site RGC-01C Submitted 2019-01-28 22:01:36

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores. Hole B: Same as Hole A. Hole C: Same as Hole A, log as shown on Form #1.
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	None known
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	None known
4. Indications of gas hydrates at this location	BSR at about 287 m below seafloor
5. Are there reasons to expect hydrocarbon accumulations at this site?	No
6. What "special" precautions will be taken during drilling?	Weighted mud to counteract possible gas flow in the borehole
7. What abandonment procedures need to be followed?	
8. Natural or manmade hazards which may affect ship's operations	
9. Summary: What do you consider the major risks in drilling at this site?	Possible gas beneath the base of the methane hydrate stability zone

IODP Site Forms

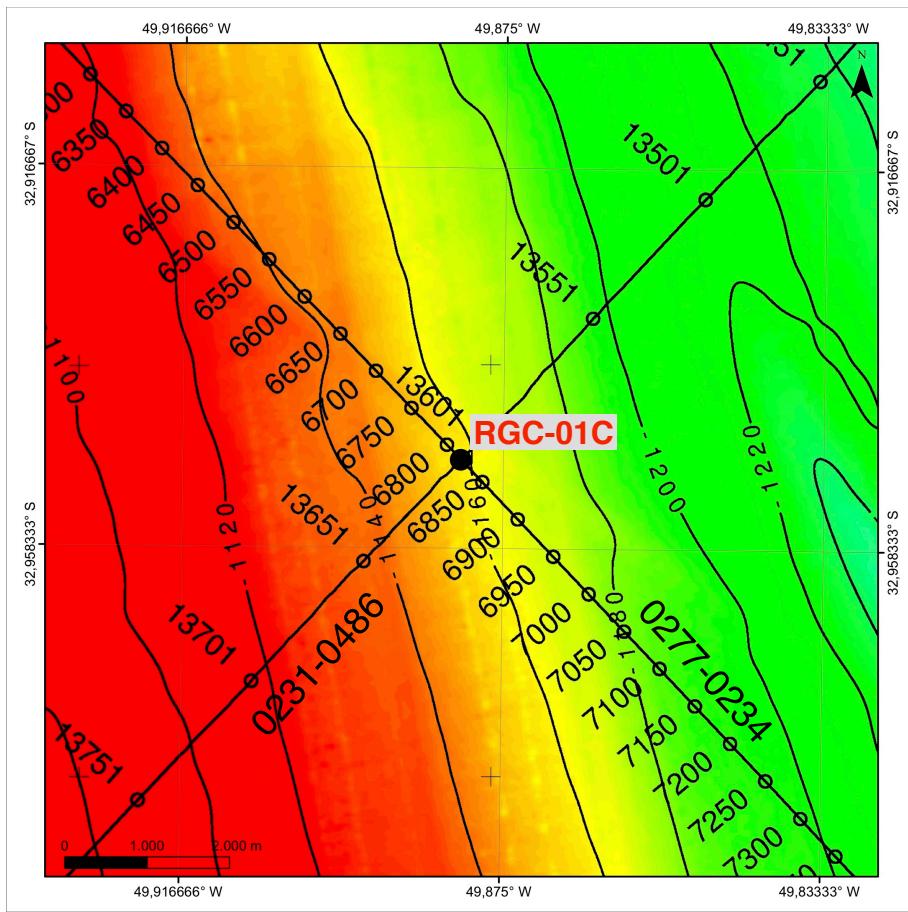
Lithologies

910-SRR2 for Site RGC-01C Submitted 2019-01-28 22:01:36

Subbottom depth (m)	Key reflectors, unconformities faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate(m/My)	Comments
0 - 500		5.5	2	Marine mud and mudstone with minor amounts of intercalated sand and sandstone		90	

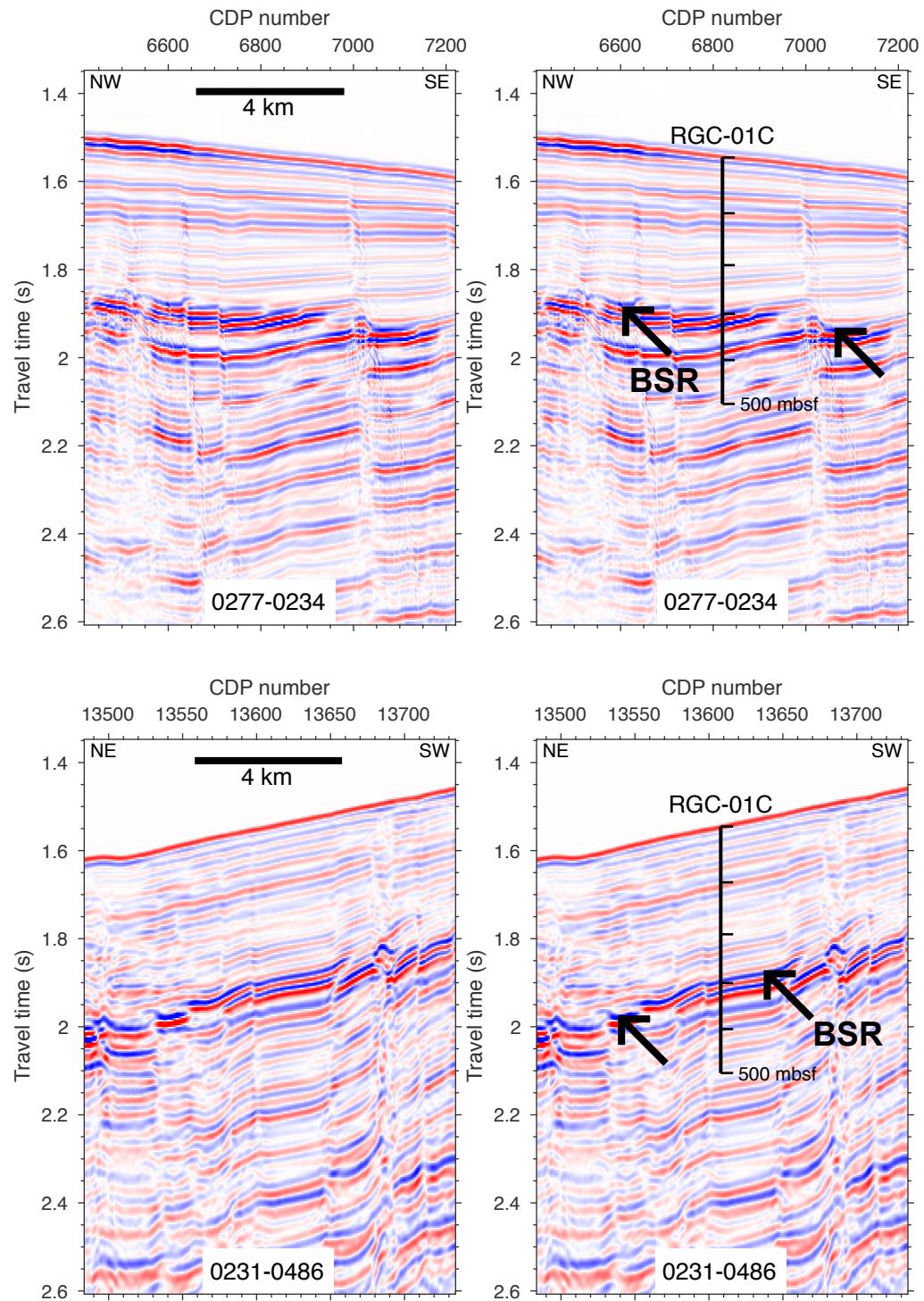
IODP proposal 910-Full2

Site RGC-01C



Site RGC-01C
 CDP 6820 on line 0277-0234
 CDP 13608 on line 0231-0486
 Lat. -32.94865 / Long. -49.88057
 UTM 22S 604635.6 E / 6353849.9 N
 Water depth 1159 m
 Penetration 500 m

Data files will be submitted to the SSDB
 by the November 2018 deadline



IODP Site Forms

General Site Information

Section A: Proposal Information

Proposal Title:	Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)
Date Form Submitted:	2019-01-28 22:01:36
Site-Specific Objectives with Priority (Must include general objectives in proposal)	Alternate site with same site-specific objectives as RGC-01C.
List Previous Drilling in Area:	

Section B: General Site Information

Site Name:	RGC-09B		Area or Location:	Rio Grande Cone
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#:			Jurisdiction:	Brazil
Latitude:	-33.012		Distance to Land (km):	210
Longitude:	-49.80825		Water Depth (m):	1219
Coordinate System:	WGS 84			
Priority of Site:	Primary <input type="checkbox"/>	Alternate <input checked="" type="checkbox"/>		

Section C: Operational Information

Proposed Penetration (m):

Sediments	Basement	Total Sediment Thickness (m)	Total Penetration (m)
500	0	8000	500

General Lithologies:

Marine mud and mudstone with minor amounts of intercalated sand and sandstone	
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Coring Plan (Specify or check):

Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores

Hole B: Same as Hole A

Hole C: Same as Hole A, log

APC XCB RCB Re-entry PCS

Wireline Logging Plan:

Standard Measurement		Special Tools	
Wireline Logging	<input checked="" type="checkbox"/>	Magnetic Susceptibility	<input type="checkbox"/>
Porosity	<input type="checkbox"/>	Borehole Temperature	<input type="checkbox"/>
Density	<input checked="" type="checkbox"/>	Formation Image (Acoustic)	<input type="checkbox"/>
Gamma Ray	<input checked="" type="checkbox"/>	VSP (walkaway)	<input type="checkbox"/>
Resistivity	<input checked="" type="checkbox"/>	LWD	<input type="checkbox"/>
Sonic (Δt)	<input checked="" type="checkbox"/>		
Formation Image (Res)	<input checked="" type="checkbox"/>		
VSP (zero offset)	<input type="checkbox"/>		
Formation Temperature & Pressure	<input type="checkbox"/>		
Other Measurements:		Other Tools:	

Estimated Days:

Drilling / Coring	Logging	Total On-Site
8.1	0.8	8.9

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan:

Potential Harzards/Weather:

Shallow Gas	<input type="checkbox"/>	Complicated Seabed Condition	<input type="checkbox"/>	Hydrothermal Activity	<input type="checkbox"/>	Preferred weather window: Austral summer-fall (October-April). Spring has high winds and winter high waves and currents.						
Hydrocarbon	<input type="checkbox"/>	Soft Seabed	<input type="checkbox"/>	Landslide and Turbidity Current	<input type="checkbox"/>							
Shallow Water Flow	<input type="checkbox"/>	Currents	<input type="checkbox"/>	Gas Hydrate	<input checked="" type="checkbox"/>							
Abnormal Pressure	<input type="checkbox"/>	Fracture Zone	<input type="checkbox"/>	Diapir and Mud Volcano	<input type="checkbox"/>							
Man-made Objects (e.g. sea-floor cables, dump sites)	<input type="checkbox"/>	Fault	<input type="checkbox"/>	High Temperature	<input type="checkbox"/>							
H2S	<input type="checkbox"/>	High Dip Angle	<input type="checkbox"/>	Ice Conditions	<input type="checkbox"/>							
CO2	<input type="checkbox"/>											
Sensitive marine habitat (e.g. reefs, vents)												
Other: 1-3 pressure cores in each hole taken with the IODP PCS												

IODP Site Forms

Site Survey Detail

910-SRR2 for Site RGC-09B Submitted 2019-01-28 22:01:36

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 0277-0234 Position 7599
1b High resolution seismic reflection (crossing)	yes	Line: 0277-0229 Position 8774
2a Deep penetration seismic reflection (primary)	yes	Same as high-resolution seismic line
2b Deep penetration seismic reflection (crossing)	yes	Same as high-resolution seismic line
3 Seismic Velocity	yes	
4 Seismic Grid		
5a Refraction (surface)		
5b Refraction (bottom)		
6 3.5 kHz	yes	
7 Swath bathymetry	yes	Multibeam bathymetry with backscatter data
8a Side looking sonar (surface)		
8b Side looking sonar (bottom)		
9 Photography or video		
10 Heat Flow		
11a Magnetics		
11b Gravity		
12 Sediment cores		
13 Rock sampling		
14a Water current data		
14b Ice Conditions		
15 OBS microseismicity		
16 Navigation	yes	
17 Other		

IODP Site Forms

Environmental Protection

910-SRR2 for Site RGC-09B Submitted 2019-01-28 22:01:36

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores. Hole B: Same as Hole A. Hole C: Same as Hole A, log as shown on form #1
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	None known
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	None known
4. Indications of gas hydrates at this location	BSR at about 343 m below seafloor
5. Are there reasons to expect hydrocarbon accumulations at this site?	No
6. What "special" precautions will be taken during drilling?	Weighted mud to counteract possible gas flow in the borehole
7. What abandonment procedures need to be followed?	
8. Natural or manmade hazards which may affect ship's operations	
9. Summary: What do you consider the major risks in drilling at this site?	Possible gas beneath the base of the methane hydrate stability zone

IODP Site Forms

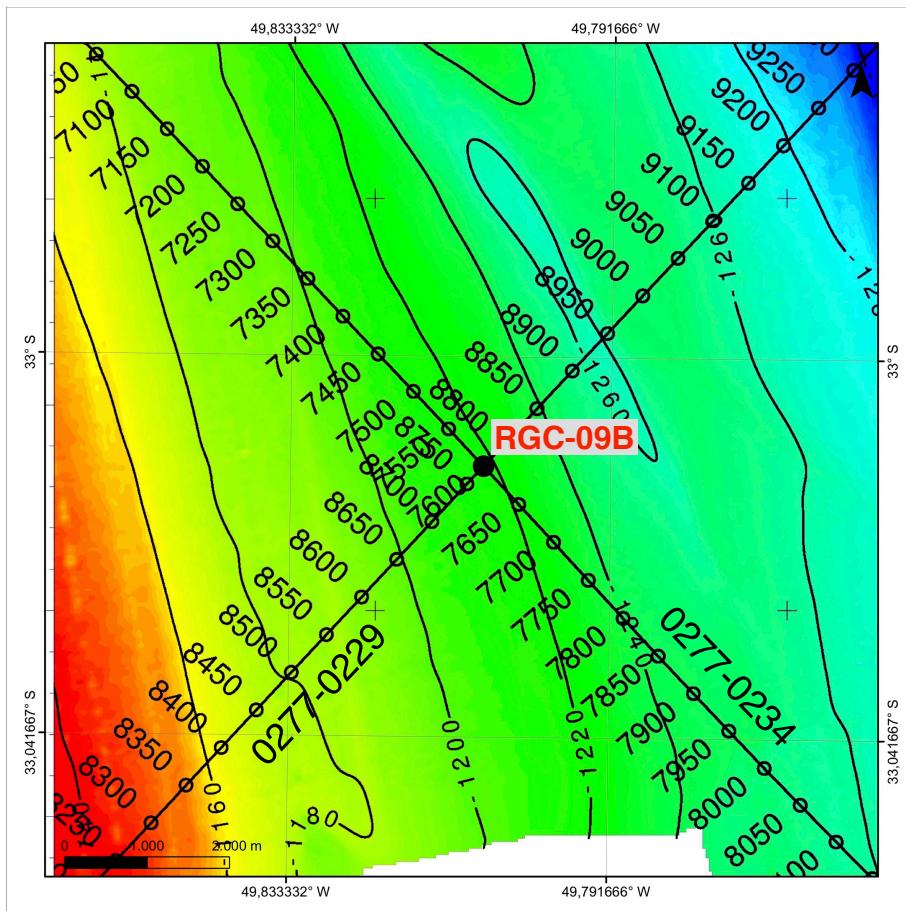
Lithologies

910-SRR2 for Site RGC-09B Submitted 2019-01-28 22:01:36

Subbottom depth (m)	Key reflectors, unconformities faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate(m/My)	Comments
0 - 500		5.5	2	Marine mud and mudstone with minor amounts of intercalated sand and sandstone		90	

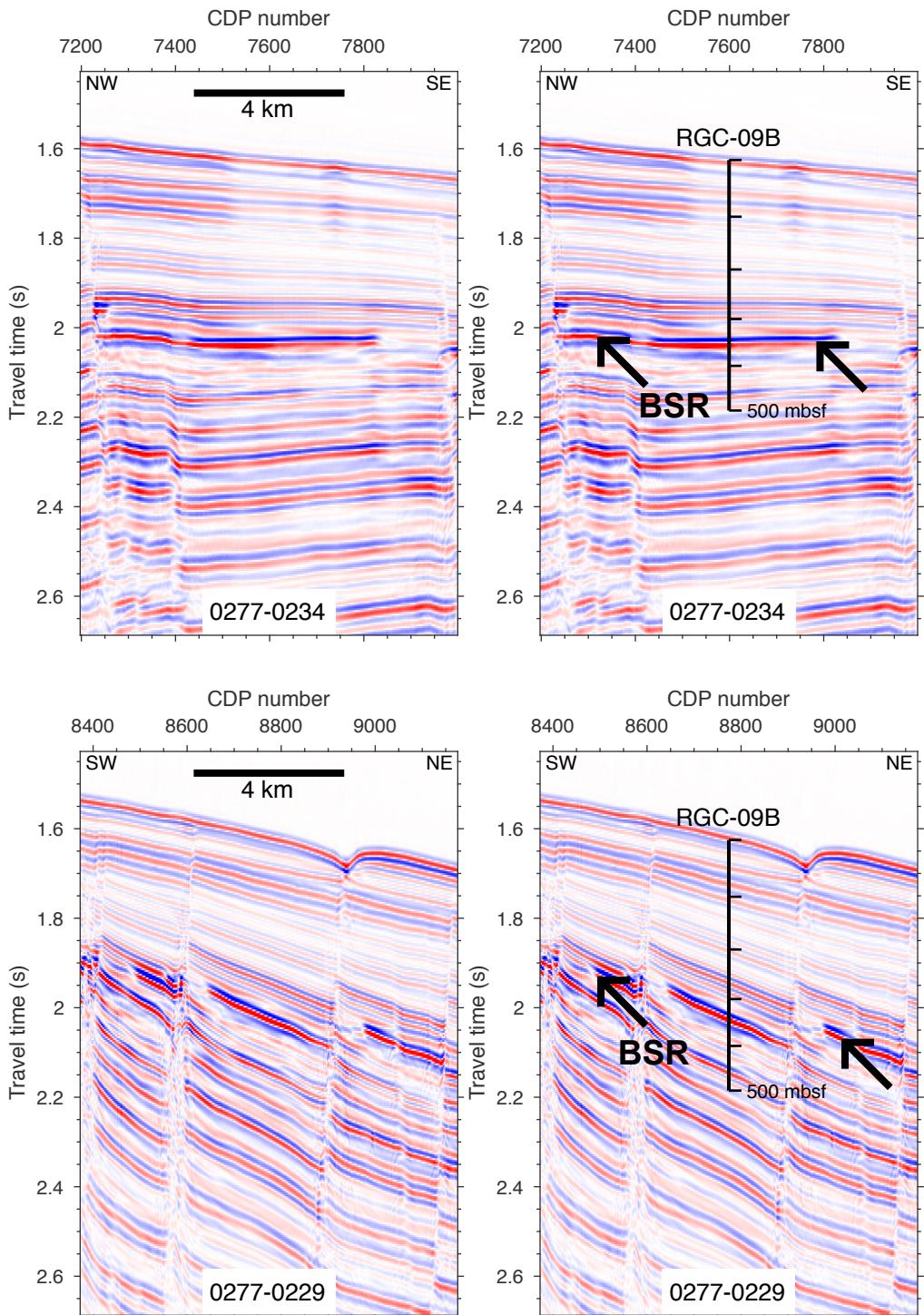
IODP proposal 910-Full2

Site RGC-09B



Site RGC-09B
 CDP 7599 on line 0277-0234
 CDP 8774 on line 0277-0229
 Lat. -33.01200 / Long. -49.80825
 UTM 22S 611316.5 E / 6346752.5 N
 Water depth 1219 m
 Penetration 500 m

Data files will be submitted to the SSDB
 by the November 2018 deadline



IODP Site Forms

General Site Information

Section A: Proposal Information

Proposal Title:	Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)
Date Form Submitted:	2019-01-28 22:01:36
Site-Specific Objectives with Priority (Must include general objectives in proposal)	Alternate site with same site-specific objectives as RGC-01C.
List Previous Drilling in Area:	

Section B: General Site Information

Site Name:	RGC-02C		Area or Location:	Rio Grande Cone
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#:			Jurisdiction:	Brazil
Latitude:	-33.21597		Distance to Land (km):	230
Longitude:	-49.66411		Water Depth (m):	1368
Coordinate System:	WGS 84			
Priority of Site:	Primary <input type="checkbox"/>	Alternate <input checked="" type="checkbox"/>		

Section C: Operational Information

Proposed Penetration (m):

Sediments	Basement	Total Sediment Thickness (m)	Total Penetration (m)
500	0	8000	500

General Lithologies:

Marine mud and mudstone with minor amounts of intercalated sand and sandstone	
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Coring Plan (Specify or check):

Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores

Hole B: Same as Hole A

Hole C: Same as Hole A, log

APC XCB RCB Re-entry PCS

Wireline Logging Plan:

Standard Measurement		Special Tools	
Wireline Logging	<input checked="" type="checkbox"/>	Magnetic Susceptibility	<input type="checkbox"/>
Porosity	<input type="checkbox"/>	Borehole Temperature	<input type="checkbox"/>
Density	<input checked="" type="checkbox"/>	Formation Image (Acoustic)	<input type="checkbox"/>
Gamma Ray	<input checked="" type="checkbox"/>	VSP (walkaway)	<input type="checkbox"/>
Resistivity	<input checked="" type="checkbox"/>	LWD	<input type="checkbox"/>
Sonic (Δt)	<input checked="" type="checkbox"/>		
Formation Image (Res)	<input checked="" type="checkbox"/>		
VSP (zero offset)	<input type="checkbox"/>		
Formation Temperature & Pressure	<input type="checkbox"/>		
Other Measurements:		Other Tools:	

Estimated Days:

Drilling / Coring	Logging	Total On-Site
8.1	0.8	8.9

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan:

Potential Harzards/Weather:

Shallow Gas	<input type="checkbox"/>	Complicated Seabed Condition	<input type="checkbox"/>	Hydrothermal Activity	<input type="checkbox"/>	Preferred weather window: Austral summer-fall (October-April). Spring has high winds and winter high waves and currents.						
Hydrocarbon	<input type="checkbox"/>	Soft Seabed	<input type="checkbox"/>	Landslide and Turbidity Current	<input type="checkbox"/>							
Shallow Water Flow	<input type="checkbox"/>	Currents	<input type="checkbox"/>	Gas Hydrate	<input checked="" type="checkbox"/>							
Abnormal Pressure	<input type="checkbox"/>	Fracture Zone	<input type="checkbox"/>	Diapir and Mud Volcano	<input type="checkbox"/>							
Man-made Objects (e.g. sea-floor cables, dump sites)	<input type="checkbox"/>	Fault	<input type="checkbox"/>	High Temperature	<input type="checkbox"/>							
H2S	<input type="checkbox"/>	High Dip Angle	<input type="checkbox"/>	Ice Conditions	<input type="checkbox"/>							
CO2	<input type="checkbox"/>											
Sensitive marine habitat (e.g. reefs, vents)												
Other: 1-3 pressure cores in each hole taken with the IODP PCS												

IODP Site Forms

Site Survey Detail

910-SRR2 for Site RGC-02C Submitted 2019-01-28 22:01:36

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 0277-0222 Position 6496
1b High resolution seismic reflection (crossing)	yes	Line: 0277-0281 Position 7071
2a Deep penetration seismic reflection (primary)	yes	Same as high-resolution seismic line
2b Deep penetration seismic reflection (crossing)	yes	Same as high-resolution seismic line
3 Seismic Velocity	yes	
4 Seismic Grid		
5a Refraction (surface)		
5b Refraction (bottom)		
6 3.5 kHz		
7 Swath bathymetry		
8a Side looking sonar (surface)		
8b Side looking sonar (bottom)		
9 Photography or video		
10 Heat Flow		
11a Magnetics		
11b Gravity		
12 Sediment cores		
13 Rock sampling		
14a Water current data		
14b Ice Conditions		
15 OBS microseismicity		
16 Navigation	yes	
17 Other		

IODP Site Forms

Environmental Protection

910-SRR2 for Site RGC-02C Submitted 2019-01-28 22:01:36

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores. Hole B: Same as Hole A. Hole C: Same as Hole A, log as shown on form #1
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	None known
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	None known
4. Indications of gas hydrates at this location	BSR at about 371 m below seafloor
5. Are there reasons to expect hydrocarbon accumulations at this site?	No
6. What "special" precautions will be taken during drilling?	Weighted mud to counteract possible gas flow in the borehole
7. What abandonment procedures need to be followed?	
8. Natural or manmade hazards which may affect ship's operations	
9. Summary: What do you consider the major risks in drilling at this site?	Possible gas beneath the base of the methane hydrate stability zone

IODP Site Forms

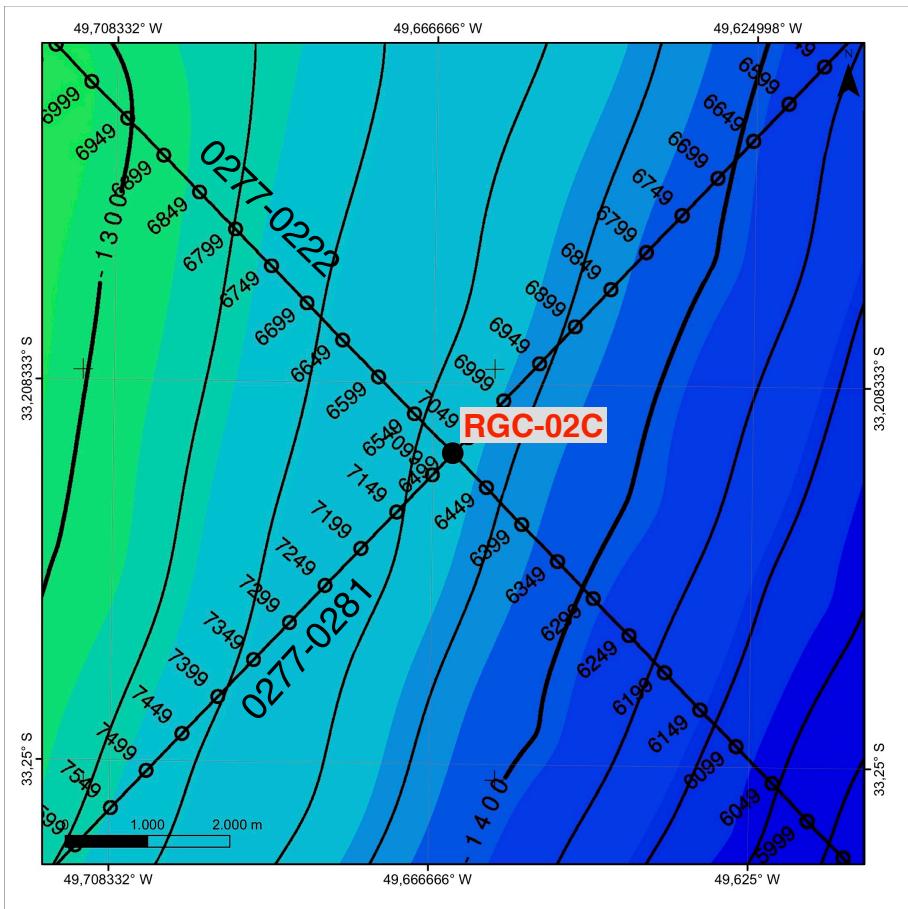
Lithologies

910-SRR2 for Site RGC-02C Submitted 2019-01-28 22:01:36

Subbottom depth (m)	Key reflectors, unconformities faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate(m/My)	Comments
0 - 500		5.5	2	Marine mud and mudstone with minor amounts of intercalated sand and sandstone		90	

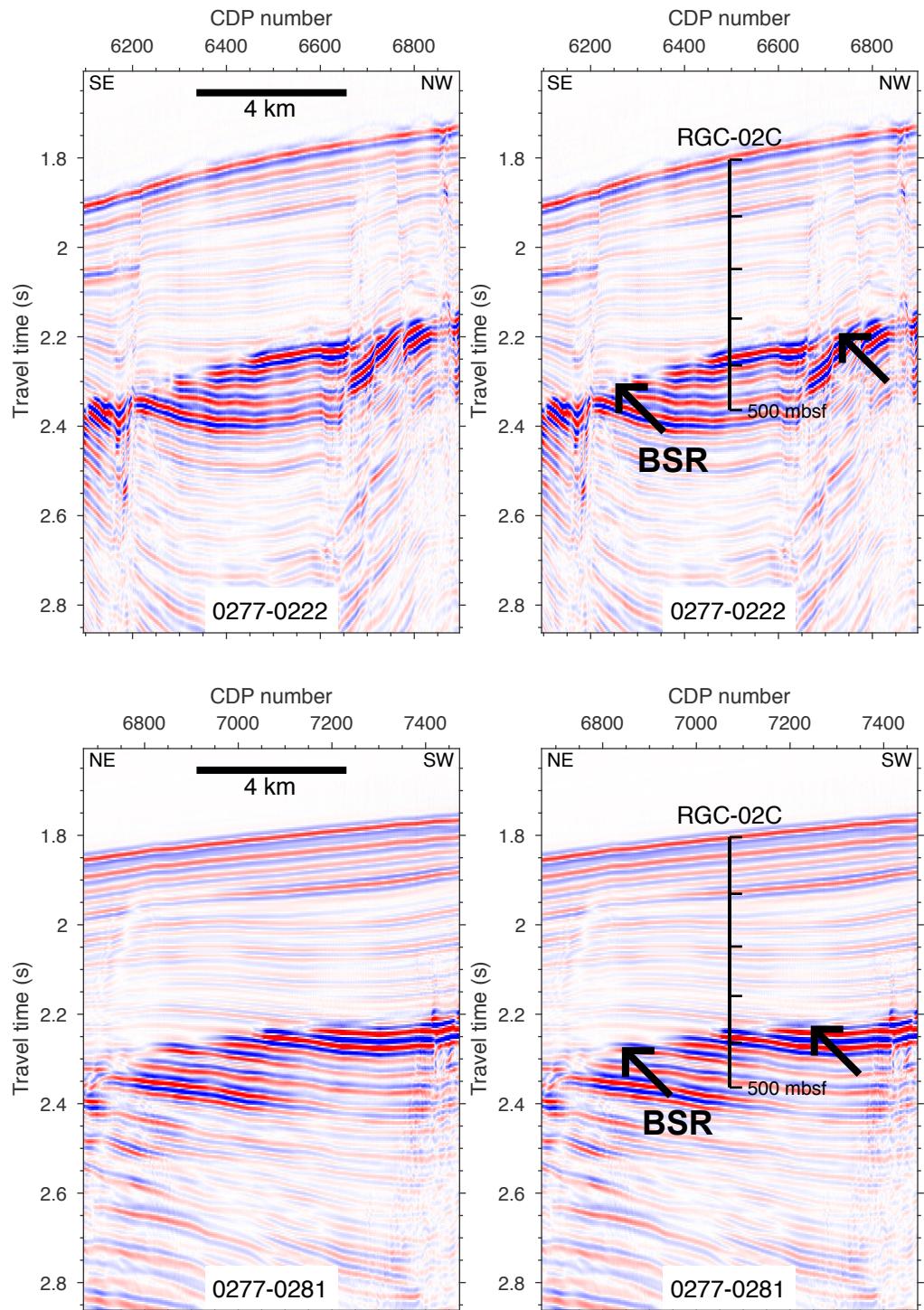
IODP proposal 910-Full2

Site RGC-02C



Site RGC-02C
 CDP 6496 on line 0277-0222
 CDP 7071 on line 0277-0281
 Lat. -33.21597 / Long. -49.66411
 UTM 22S 624493.2 E / 6323975.4 N
 Water depth 1368 m
 Penetration 500 m

Data files will be submitted to the SSDB
 by the November 2018 deadline



IODP Site Forms

General Site Information

Section A: Proposal Information

Proposal Title:	Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)
Date Form Submitted:	2019-01-28 22:01:36
Site-Specific Objectives with Priority (Must include general objectives in proposal)	Sample a "stratigraphic" methane hydrate setting in the extensional domain of the Rio Grande Cone. This site will allow for investigating microbial methanogenesis where fluid flow is likely not to be significant and address our scientific objectives on constraining the of microbial methanogenesis pathway, vertical distribution, and rate, and on characterizing reactions at the SMTZ. This site is located on the southern flank of the RGC where sediments are thinner and sedimentation rates are likely lower than at the location of primary Site RGC-01C.
List Previous Drilling in Area:	

Section B: General Site Information

Site Name:	RGC-03C		Area or Location:	Rio Grande Cone
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#:			Jurisdiction:	Brazil
Latitude:	-33.65803		Distance to Land (km):	230
Longitude:	-50.15192		Water Depth (m):	1505
Coordinate System:	WGS 84			
Priority of Site:	Primary <input checked="" type="checkbox"/>	Alternate <input type="checkbox"/>		

Section C: Operational Information

Proposed Penetration (m):

Sediments	Basement	Total Sediment Thickness (m)	Total Penetration (m)
500	0	8000	500

General Lithologies:

Marine mud and mudstone with minor amounts of intercalated sand and sandstone	
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Coring Plan (Specify or check):

Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores
Hole B: Same as Hole A, log

APC XCB RCB Re-entry PCS

Wireline Logging Plan:

Standard Measurement		Special Tools	
Wireline Logging	<input checked="" type="checkbox"/>	Magnetic Susceptibility	<input type="checkbox"/>
Porosity	<input type="checkbox"/>	Borehole Temperature	<input type="checkbox"/>
Density	<input checked="" type="checkbox"/>	Formation Image (Acoustic)	<input type="checkbox"/>
Gamma Ray	<input checked="" type="checkbox"/>	VSP (walkaway)	<input type="checkbox"/>
Resistivity	<input checked="" type="checkbox"/>	LWD	<input type="checkbox"/>
Sonic (Δt)	<input checked="" type="checkbox"/>		
Formation Image (Res)	<input checked="" type="checkbox"/>		
VSP (zero offset)	<input type="checkbox"/>		
Formation Temperature & Pressure	<input type="checkbox"/>		
Other Measurements:		Other Tools:	

Estimated Days:

Drilling / Coring	Logging	Total On-Site
6.2	0.5	6.7

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan:

Potential Harzards/Weather:

Shallow Gas	<input type="checkbox"/>	Complicated Seabed Condition	<input type="checkbox"/>	Hydrothermal Activity	<input type="checkbox"/>	Preferred weather window: Austral summer-fall (October-April). Spring has high winds and winter high waves and currents.						
Hydrocarbon	<input type="checkbox"/>	Soft Seabed	<input type="checkbox"/>	Landslide and Turbidity Current	<input type="checkbox"/>							
Shallow Water Flow	<input type="checkbox"/>	Currents	<input type="checkbox"/>	Gas Hydrate	<input checked="" type="checkbox"/>							
Abnormal Pressure	<input type="checkbox"/>	Fracture Zone	<input type="checkbox"/>	Diapir and Mud Volcano	<input type="checkbox"/>							
Man-made Objects (e.g. sea-floor cables, dump sites)	<input type="checkbox"/>	Fault	<input type="checkbox"/>	High Temperature	<input type="checkbox"/>							
H2S	<input type="checkbox"/>	High Dip Angle	<input type="checkbox"/>	Ice Conditions	<input type="checkbox"/>							
CO2	<input type="checkbox"/>											
Sensitive marine habitat (e.g. reefs, vents)												
Other: 1-3 pressure cores in each hole taken with the IODP PCS												

IODP Site Forms

Site Survey Detail

910-SRR2 for Site RGC-03C Submitted 2019-01-28 22:01:36

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 0277-0090 Position 5846
1b High resolution seismic reflection (crossing)	yes	Line: 0277-0281 Position 12413
2a Deep penetration seismic reflection (primary)	yes	Same as high-resolution seismic line
2b Deep penetration seismic reflection (crossing)	yes	Same as high-resolution seismic line
3 Seismic Velocity	yes	
4 Seismic Grid		
5a Refraction (surface)		
5b Refraction (bottom)		
6 3.5 kHz	yes	
7 Swath bathymetry		
8a Side looking sonar (surface)		
8b Side looking sonar (bottom)		
9 Photography or video		
10 Heat Flow		
11a Magnetics		
11b Gravity		
12 Sediment cores		
13 Rock sampling		
14a Water current data		
14b Ice Conditions		
15 OBS microseismicity		
16 Navigation	yes	
17 Other		

IODP Site Forms

Environmental Protection

910-SRR2 for Site RGC-03C Submitted 2019-01-28 22:01:36

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores. Hole B: Same as Hole A, log as shown on form #1
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	None known
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	None known
4. Indications of gas hydrates at this location	BSR at about 324 m below seafloor
5. Are there reasons to expect hydrocarbon accumulations at this site?	No
6. What "special" precautions will be taken during drilling?	Weighted mud to counteract possible gas flow in the borehole
7. What abandonment procedures need to be followed?	
8. Natural or manmade hazards which may affect ship's operations	
9. Summary: What do you consider the major risks in drilling at this site?	Possible gas beneath the base of the methane hydrate stability zone

IODP Site Forms

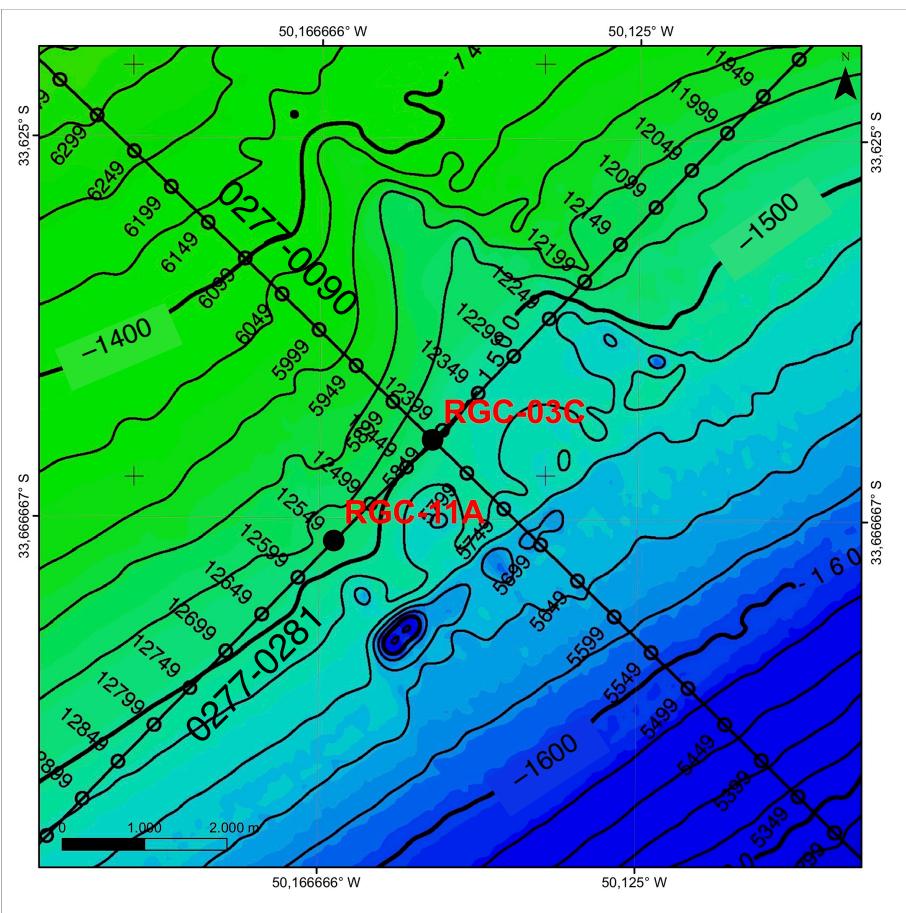
Lithologies

910-SRR2 for Site RGC-03C Submitted 2019-01-28 22:01:36

Subbottom depth (m)	Key reflectors, unconformities faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate(m/My)	Comments
0 - 500		5.5	2	Marine mud and mudstone with minor amounts of intercalated sand and sandstone		90	

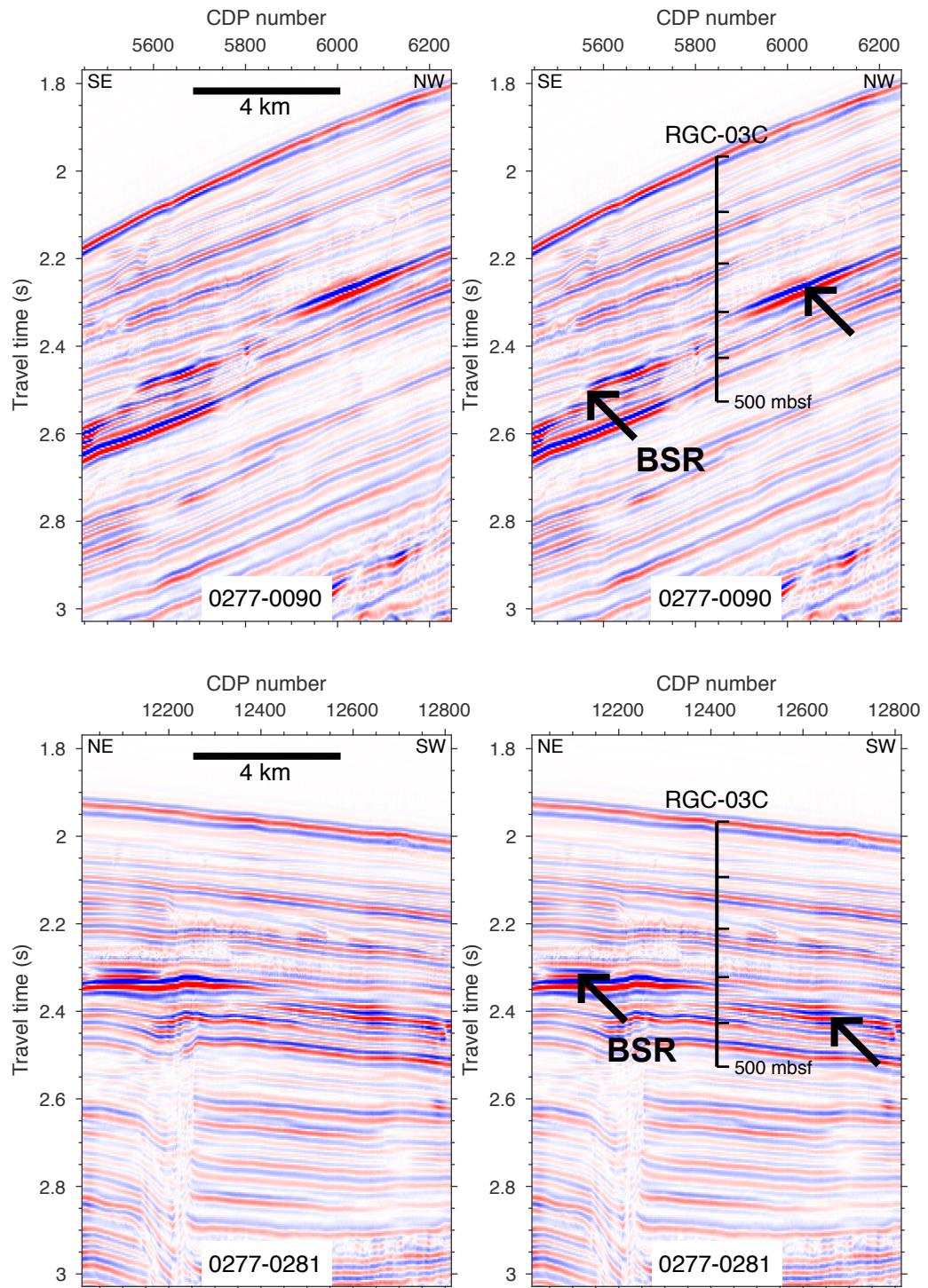
IODP proposal 910-Full2

Site RGC-03C



Site RGC-03C
 CDP 5846 on line 0277-0090
 CDP 12413 on line 0277-0281
 Lat. -33.65803 / Long. -50.15192
 UTM 22S 578631.7 E / 6275437.6 N
 Water depth 1505 m
 Penetration 500 m

Data files will be submitted to the SSDB
 by the November 2018 deadline



IODP Site Forms

General Site Information

Section A: Proposal Information

Proposal Title:	Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)
Date Form Submitted:	2019-01-28 22:01:36
Site-Specific Objectives with Priority (Must include general objectives in proposal)	Alternate site with same site-specific objectives as RGC-03C.
List Previous Drilling in Area:	

Section B: General Site Information

Site Name:	RGC-04C		Area or Location:	Rio Grande Cone
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#:			Jurisdiction:	Brazil
Latitude:	-33.5006		Distance to Land (km):	210
Longitude:	-50.34727		Water Depth (m):	914
Coordinate System:	WGS 84			
Priority of Site:	Primary <input type="checkbox"/>	Alternate <input checked="" type="checkbox"/>		

Section C: Operational Information

Proposed Penetration (m):

Sediments	Basement	Total Sediment Thickness (m)	Total Penetration (m)
500	0	8000	500

General Lithologies:

Marine mud and mudstone with minor amounts of intercalated sand and sandstone	
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Coring Plan (Specify or check):

Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores
Hole B: Same as Hole A, log

APC XCB RCB Re-entry PCS

Wireline Logging Plan:

Standard Measurement		Special Tools	
Wireline Logging	<input checked="" type="checkbox"/>	Magnetic Susceptibility	<input type="checkbox"/>
Porosity	<input type="checkbox"/>	Borehole Temperature	<input type="checkbox"/>
Density	<input checked="" type="checkbox"/>	Formation Image (Acoustic)	<input type="checkbox"/>
Gamma Ray	<input checked="" type="checkbox"/>	VSP (walkaway)	<input type="checkbox"/>
Resistivity	<input checked="" type="checkbox"/>	LWD	<input type="checkbox"/>
Sonic (Δt)	<input checked="" type="checkbox"/>		
Formation Image (Res)	<input checked="" type="checkbox"/>		
VSP (zero offset)	<input type="checkbox"/>		
Formation Temperature & Pressure	<input type="checkbox"/>		
Other Measurements:		Other Tools:	

Estimated Days:

Drilling / Coring	Logging	Total On-Site
6.2	0.5	6.7

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan:

Potential Harzards/Weather:

Shallow Gas	<input type="checkbox"/>	Complicated Seabed Condition	<input type="checkbox"/>	Hydrothermal Activity	<input type="checkbox"/>	Preferred weather window: Austral summer-fall (October-April). Spring has high winds and winter high waves and currents.						
Hydrocarbon	<input type="checkbox"/>	Soft Seabed	<input type="checkbox"/>	Landslide and Turbidity Current	<input type="checkbox"/>							
Shallow Water Flow	<input type="checkbox"/>	Currents	<input type="checkbox"/>	Gas Hydrate	<input checked="" type="checkbox"/>							
Abnormal Pressure	<input type="checkbox"/>	Fracture Zone	<input type="checkbox"/>	Diapir and Mud Volcano	<input type="checkbox"/>							
Man-made Objects (e.g. sea-floor cables, dump sites)	<input type="checkbox"/>	Fault	<input type="checkbox"/>	High Temperature	<input type="checkbox"/>							
H2S	<input type="checkbox"/>	High Dip Angle	<input type="checkbox"/>	Ice Conditions	<input type="checkbox"/>							
CO2	<input type="checkbox"/>											
Sensitive marine habitat (e.g. reefs, vents)												
Other: 1-3 pressure cores in each hole taken with the IODP PCS												

IODP Site Forms

Site Survey Detail

910-SRR2 for Site RGC-04C Submitted 2019-01-28 22:01:36

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 0277-0090 Position 7859
1b High resolution seismic reflection (crossing)	yes	Line: 0277-0229 Position 2864
2a Deep penetration seismic reflection (primary)	yes	Same as high-resolution seismic line
2b Deep penetration seismic reflection (crossing)	yes	Same as high-resolution seismic line
3 Seismic Velocity	yes	
4 Seismic Grid		
5a Refraction (surface)		
5b Refraction (bottom)		
6 3.5 kHz	yes	
7 Swath bathymetry		
8a Side looking sonar (surface)		
8b Side looking sonar (bottom)		
9 Photography or video		
10 Heat Flow		
11a Magnetics		
11b Gravity		
12 Sediment cores		
13 Rock sampling		
14a Water current data		
14b Ice Conditions		
15 OBS microseismicity		
16 Navigation	yes	
17 Other		

IODP Site Forms

Environmental Protection

910-SRR2 for Site RGC-04C Submitted 2019-01-28 22:01:36

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores. Hole B: Same as Hole A, log as shown on form #1
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	None known
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	None known
4. Indications of gas hydrates at this location	BSR at about 223 m below seafloor
5. Are there reasons to expect hydrocarbon accumulations at this site?	No
6. What "special" precautions will be taken during drilling?	Weighted mud to counteract possible gas flow in the borehole
7. What abandonment procedures need to be followed?	
8. Natural or manmade hazards which may affect ship's operations	
9. Summary: What do you consider the major risks in drilling at this site?	Possible gas beneath the base of the methane hydrate stability zone

IODP Site Forms

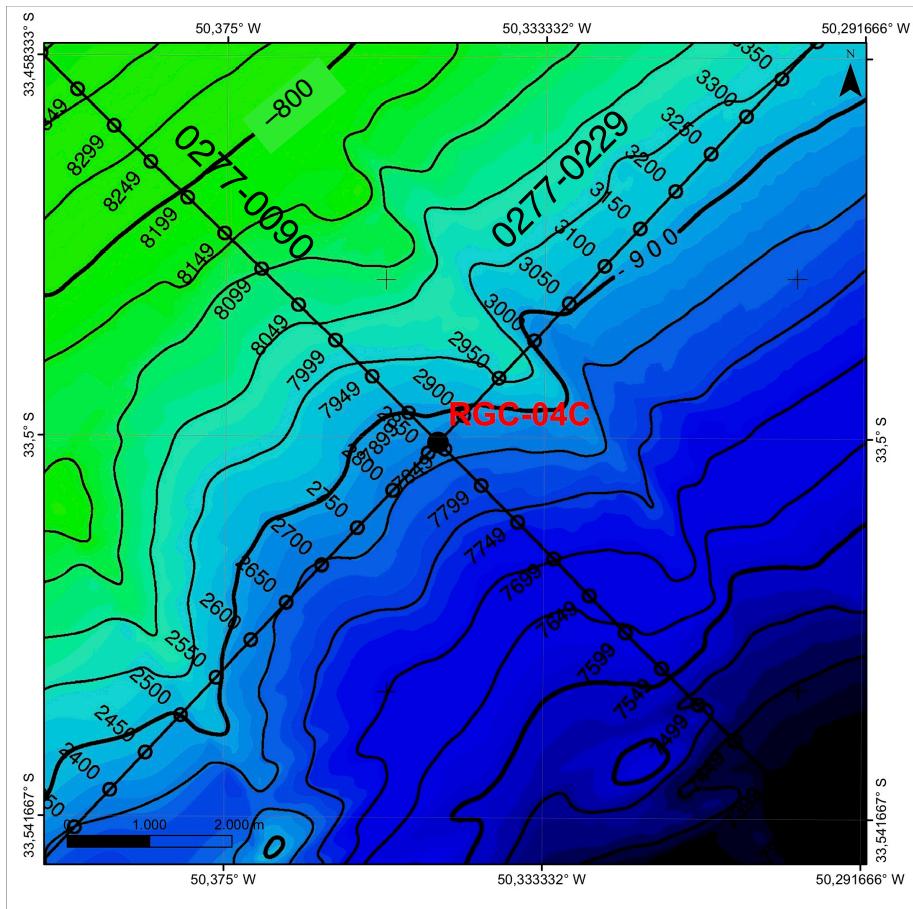
Lithologies

910-SRR2 for Site RGC-04C Submitted 2019-01-28 22:01:36

Subbottom depth (m)	Key reflectors, unconformities faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate(m/My)	Comments
0 - 500		5.5	2	Marine mud and mudstone with minor amounts of intercalated sand and sandstone		90	

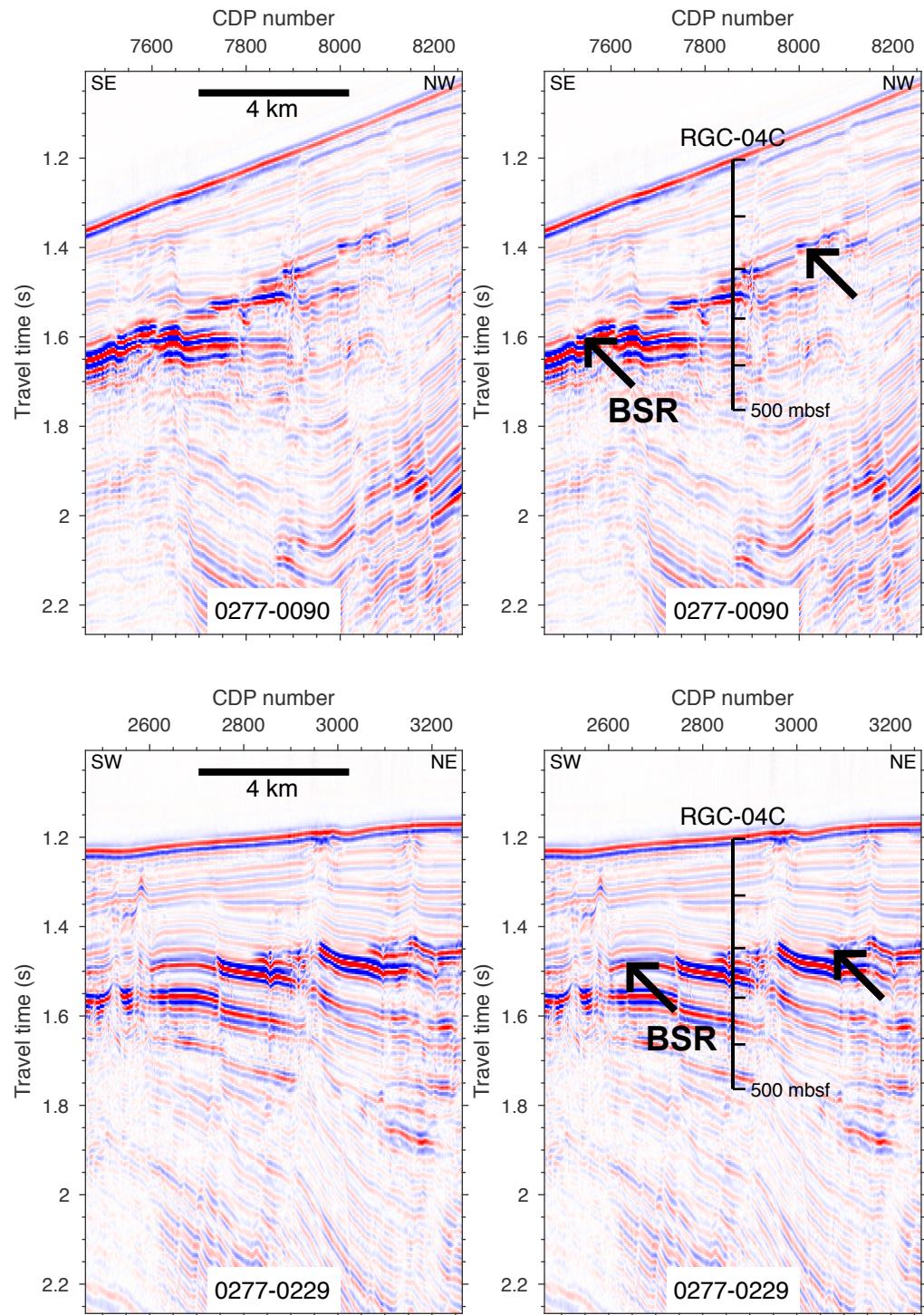
IODP proposal 910-Full2

Site RGC-04C



Site RGC-04C
 CDP 7859 on line 0277-0090
 CDP 2864 on line 0277-0229
 Lat. -33.50060 / Long. -50.34727
 UTM 22S 560629.5 E / 6293023.2 N
 Water depth 914 m
 Penetration 500 m

Data files will be submitted to the SSDB
 by the November 2018 deadline



IODP Site Forms

General Site Information

Section A: Proposal Information

Proposal Title:	Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)
Date Form Submitted:	2019-01-28 22:01:36
Site-Specific Objectives with Priority (Must include general objectives in proposal)	Alternate site with same site-specific objectives as RGC-03C.
List Previous Drilling in Area:	

Section B: General Site Information

Site Name:	RGC-11A		Area or Location:	Rio Grande Cone
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#:			Jurisdiction:	Brazil
Latitude:	-33.66913		Distance to Land (km):	210
Longitude:	-50.16478		Water Depth (m):	1484
Coordinate System:	WGS 84			
Priority of Site:	Primary <input type="checkbox"/>	Alternate <input checked="" type="checkbox"/>		

Section C: Operational Information

Proposed Penetration (m):

Sediments	Basement	Total Sediment Thickness (m)	Total Penetration (m)
500	0	8000	500

General Lithologies:

Marine mud and mudstone with minor amounts of intercalated sand and sandstone	
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Coring Plan (Specify or check):

Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores
Hole B: Same as Hole A, log

APC XCB RCB Re-entry PCS

Wireline Logging Plan:

Standard Measurement		Special Tools	
Wireline Logging	<input checked="" type="checkbox"/>	Magnetic Susceptibility	<input type="checkbox"/>
Porosity	<input type="checkbox"/>	Borehole Temperature	<input type="checkbox"/>
Density	<input checked="" type="checkbox"/>	Formation Image (Acoustic)	<input type="checkbox"/>
Gamma Ray	<input checked="" type="checkbox"/>	VSP (walkaway)	<input type="checkbox"/>
Resistivity	<input checked="" type="checkbox"/>	LWD	<input type="checkbox"/>
Sonic (Δt)	<input checked="" type="checkbox"/>		
Formation Image (Res)	<input checked="" type="checkbox"/>		
VSP (zero offset)	<input type="checkbox"/>		
Formation Temperature & Pressure	<input type="checkbox"/>		
Other Measurements:		Other Tools:	

Estimated Days:

Drilling / Coring	Logging	Total On-Site
6.2	0.5	6.7

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan:

Potential Harzards/Weather:

Shallow Gas	<input type="checkbox"/>	Complicated Seabed Condition	<input type="checkbox"/>	Hydrothermal Activity	<input type="checkbox"/>	Preferred weather window: Austral summer-fall (October-April). Spring has high winds and winter high waves and currents.						
Hydrocarbon	<input type="checkbox"/>	Soft Seabed	<input type="checkbox"/>	Landslide and Turbidity Current	<input type="checkbox"/>							
Shallow Water Flow	<input type="checkbox"/>	Currents	<input type="checkbox"/>	Gas Hydrate	<input checked="" type="checkbox"/>							
Abnormal Pressure	<input type="checkbox"/>	Fracture Zone	<input type="checkbox"/>	Diapir and Mud Volcano	<input type="checkbox"/>							
Man-made Objects (e.g. sea-floor cables, dump sites)	<input type="checkbox"/>	Fault	<input type="checkbox"/>	High Temperature	<input type="checkbox"/>							
H2S	<input type="checkbox"/>	High Dip Angle	<input type="checkbox"/>	Ice Conditions	<input type="checkbox"/>							
CO2	<input type="checkbox"/>											
Sensitive marine habitat (e.g. reefs, vents)												
Other: 1-3 pressure cores in each hole taken with the IODP PCS												

IODP Site Forms

Site Survey Detail

910-SRR2 for Site RGC-11A Submitted 2019-01-28 22:01:36

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 0277-0086 Position 1930
1b High resolution seismic reflection (crossing)	yes	Line: 0277-0281 Position 12550
2a Deep penetration seismic reflection (primary)	yes	Same as high-resolution seismic line
2b Deep penetration seismic reflection (crossing)	yes	Same as high-resolution seismic line
3 Seismic Velocity	yes	
4 Seismic Grid		
5a Refraction (surface)		
5b Refraction (bottom)		
6 3.5 kHz	yes	
7 Swath bathymetry		
8a Side looking sonar (surface)		
8b Side looking sonar (bottom)		
9 Photography or video		
10 Heat Flow		
11a Magnetics		
11b Gravity		
12 Sediment cores		
13 Rock sampling		
14a Water current data		
14b Ice Conditions		
15 OBS microseismicity		
16 Navigation	yes	
17 Other		

IODP Site Forms

Environmental Protection

910-SRR2 for Site RGC-11A Submitted 2019-01-28 22:01:36

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores. Hole B: Same as Hole A, log as shown on form #1
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	None known
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	None known
4. Indications of gas hydrates at this location	BSR at about 333 m below seafloor
5. Are there reasons to expect hydrocarbon accumulations at this site?	No
6. What "special" precautions will be taken during drilling?	Weighted mud to counteract possible gas flow in the borehole
7. What abandonment procedures need to be followed?	
8. Natural or manmade hazards which may affect ship's operations	
9. Summary: What do you consider the major risks in drilling at this site?	Possible gas beneath the base of the methane hydrate stability zone

IODP Site Forms

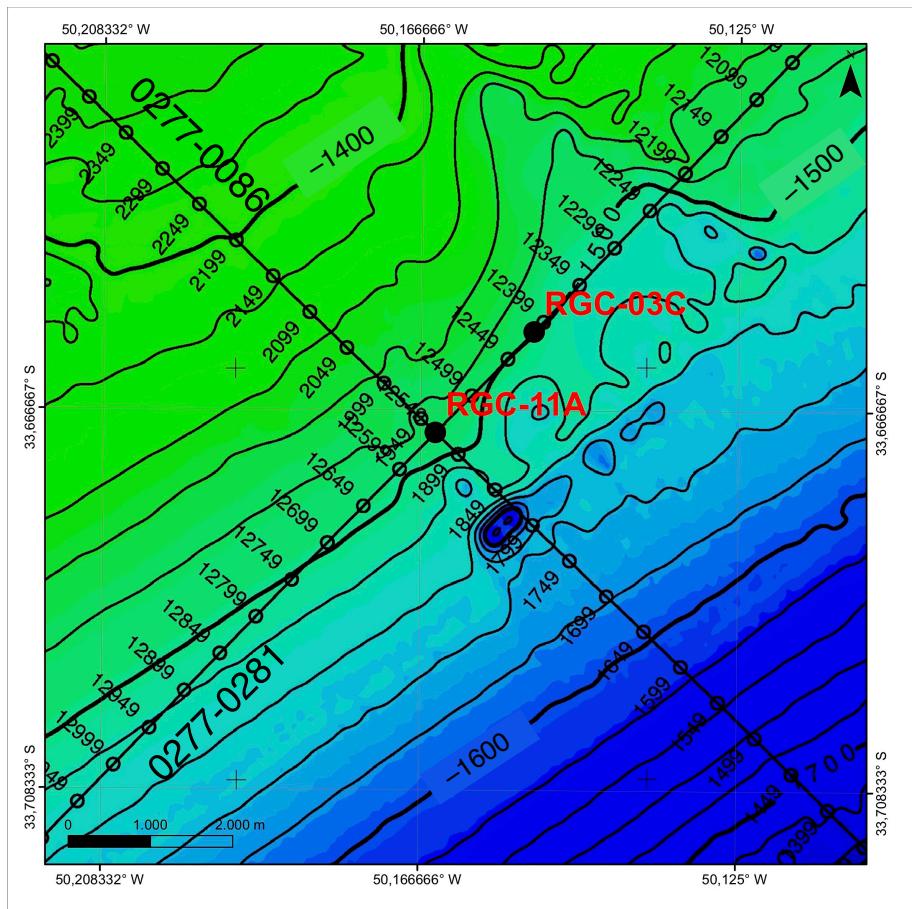
Lithologies

910-SRR2 for Site RGC-11A Submitted 2019-01-28 22:01:36

Subbottom depth (m)	Key reflectors, unconformities faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate(m/My)	Comments
0 - 500		5.5	2	Marine mud and mudstone with minor amounts of intercalated sand and sandstone		90	

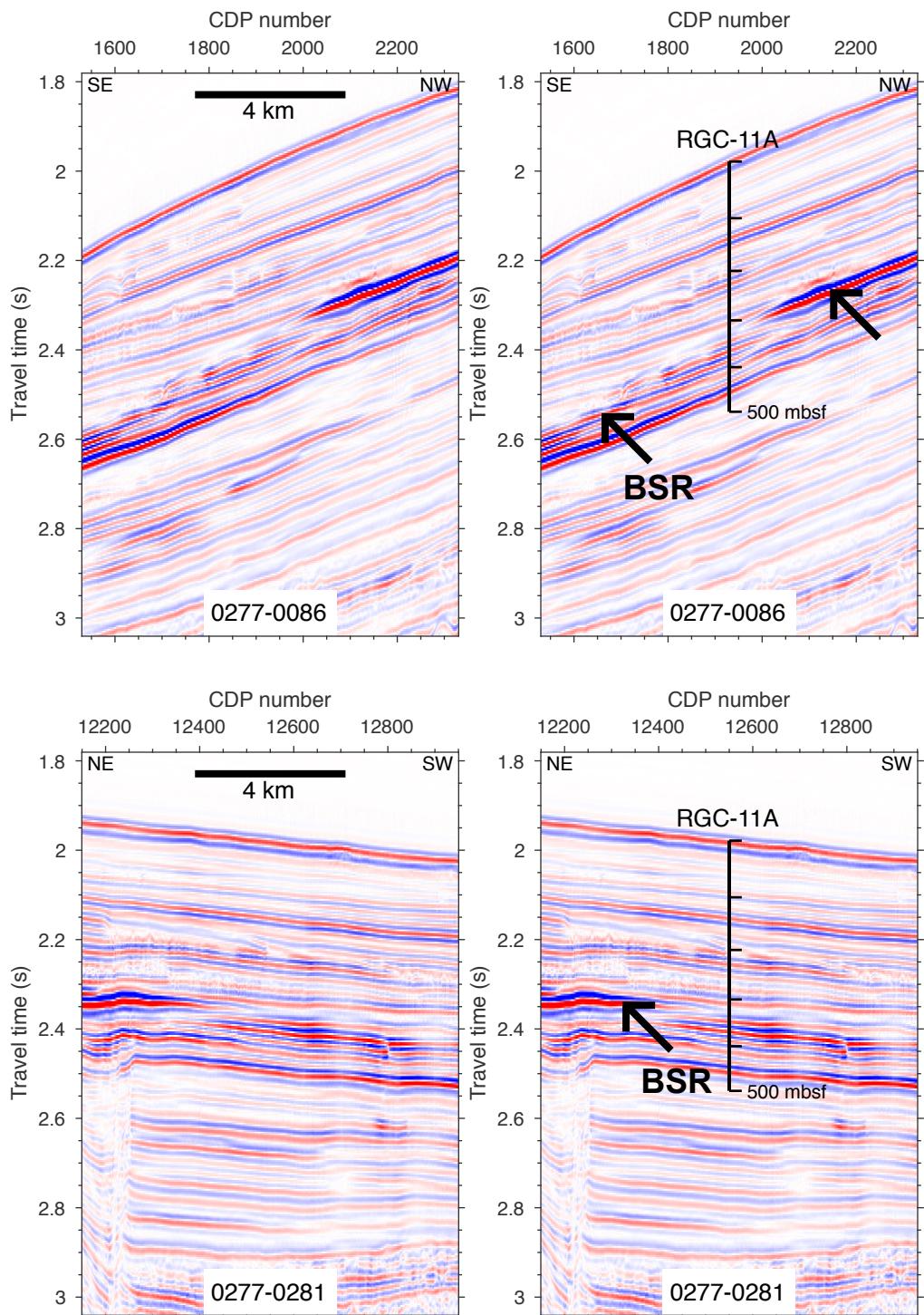
IODP proposal 910-Full2

Site RGC-11A



Site RGC-11A
 CDP 1930 on line 0277-0086
 CDP 12550 on line 0277-0281
 Lat. -33.66913 / Long. -50.16478
 UTM 22S 577429.7 E / 6274215.9 N
 Water depth 1484 m
 Penetration 500 m

Data files will be submitted to the SSDB
 by the November 2018 deadline



IODP Site Forms

General Site Information

Section A: Proposal Information

Proposal Title:	Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)
Date Form Submitted:	2019-01-28 22:01:36
Site-Specific Objectives with Priority (Must include general objectives in proposal)	Sample a "stratigraphic" methane hydrate setting in the deepwater contourite SE of the Rio Grande Cone. This site will allow for investigating microbial methanogenesis where fluid flow is likely not to be significant and address our scientific objectives on constraining the of microbial methanogenesis pathway, vertical distribution, and rate, and on characterizing reactions at the SMTZ. This site will be also triple-cored for a paleoceanographic reconstruction.
List Previous Drilling in Area:	

Section B: General Site Information

Site Name:	RGC-07C		Area or Location:	Rio Grande Cone
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#:			Jurisdiction:	Brazil
Latitude:	-33.58388		Distance to Land (km):	300
Longitude:	-49.22675		Water Depth (m):	2972
Coordinate System:	WGS 84			
Priority of Site:	Primary <input checked="" type="checkbox"/>	Alternate <input type="checkbox"/>		

Section C: Operational Information

Proposed Penetration (m):

Sediments	Basement	Total Sediment Thickness (m)	Total Penetration (m)
800	0	8000	800

General Lithologies:

Marine mud and mudstone with minor amounts of intercalated sand and sandstone	
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Coring Plan (Specify or check):

Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores
Hole B: Same as Hole A
Hole C: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 800 mbsf, 1-3 PCS cores, log

APC XCB RCB Re-entry PCS

Wireline Logging Plan:

Standard Measurement		Special Tools	
Wireline Logging	<input checked="" type="checkbox"/>	Magnetic Susceptibility	<input type="checkbox"/>
Porosity	<input type="checkbox"/>	Borehole Temperature	<input type="checkbox"/>
Density	<input checked="" type="checkbox"/>	Formation Image (Acoustic)	<input type="checkbox"/>
Gamma Ray	<input checked="" type="checkbox"/>	VSP (walkaway)	<input type="checkbox"/>
Resistivity	<input checked="" type="checkbox"/>	LWD	<input type="checkbox"/>
Sonic (Δt)	<input checked="" type="checkbox"/>		
Formation Image (Res)	<input checked="" type="checkbox"/>		
VSP (zero offset)	<input type="checkbox"/>		
Formation Temperature & Pressure	<input type="checkbox"/>		
Other Measurements:		Other Tools:	

Estimated Days:

Drilling / Coring	Logging	Total On-Site
14.7	1	15.7

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan:

Potential Harzards/Weather:

Shallow Gas	<input type="checkbox"/>	Complicated Seabed Condition	<input type="checkbox"/>	Hydrothermal Activity	<input type="checkbox"/>	Preferred weather window: Austral summer-fall (October-April). Spring has high winds and winter high waves and currents.						
Hydrocarbon	<input type="checkbox"/>	Soft Seabed	<input type="checkbox"/>	Landslide and Turbidity Current	<input type="checkbox"/>							
Shallow Water Flow	<input type="checkbox"/>	Currents	<input type="checkbox"/>	Gas Hydrate	<input checked="" type="checkbox"/>							
Abnormal Pressure	<input type="checkbox"/>	Fracture Zone	<input type="checkbox"/>	Diapir and Mud Volcano	<input type="checkbox"/>							
Man-made Objects (e.g. sea-floor cables, dump sites)	<input type="checkbox"/>	Fault	<input type="checkbox"/>	High Temperature	<input type="checkbox"/>							
H2S	<input type="checkbox"/>	High Dip Angle	<input type="checkbox"/>	Ice Conditions	<input type="checkbox"/>							
CO2	<input type="checkbox"/>											
Sensitive marine habitat (e.g. reefs, vents)												
Other: 1-3 pressure cores in each hole taken with the IODP PCS												

IODP Site Forms

Site Survey Detail

910-SRR2 for Site RGC-07C Submitted 2019-01-28 22:01:36

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 0277-0222 Position 1887
1b High resolution seismic reflection (crossing)	yes	Line: 0277-0395 Position 2639
2a Deep penetration seismic reflection (primary)	yes	Same as high-resolution seismic line
2b Deep penetration seismic reflection (crossing)	yes	Same as high-resolution seismic line
3 Seismic Velocity	yes	
4 Seismic Grid		
5a Refraction (surface)		
5b Refraction (bottom)		
6 3.5 kHz		
7 Swath bathymetry		
8a Side looking sonar (surface)		
8b Side looking sonar (bottom)		
9 Photography or video		
10 Heat Flow		
11a Magnetics		
11b Gravity		
12 Sediment cores		
13 Rock sampling		
14a Water current data		
14b Ice Conditions		
15 OBS microseismicity		
16 Navigation	yes	
17 Other		

IODP Site Forms

Environmental Protection

910-SRR2 for Site RGC-07C Submitted 2019-01-28 22:01:36

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores. Hole B: Same as Hole A. Hole C: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 800 mbsf, 1-3 PCS cores, log as shown on form #1
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	None known
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	None known
4. Indications of gas hydrates at this location	BSR at about 559 m below seafloor
5. Are there reasons to expect hydrocarbon accumulations at this site?	No
6. What "special" precautions will be taken during drilling?	Weighted mud to counteract possible gas flow in the borehole
7. What abandonment procedures need to be followed?	
8. Natural or manmade hazards which may affect ship's operations	
9. Summary: What do you consider the major risks in drilling at this site?	Possible gas beneath the base of the methane hydrate stability zone

IODP Site Forms

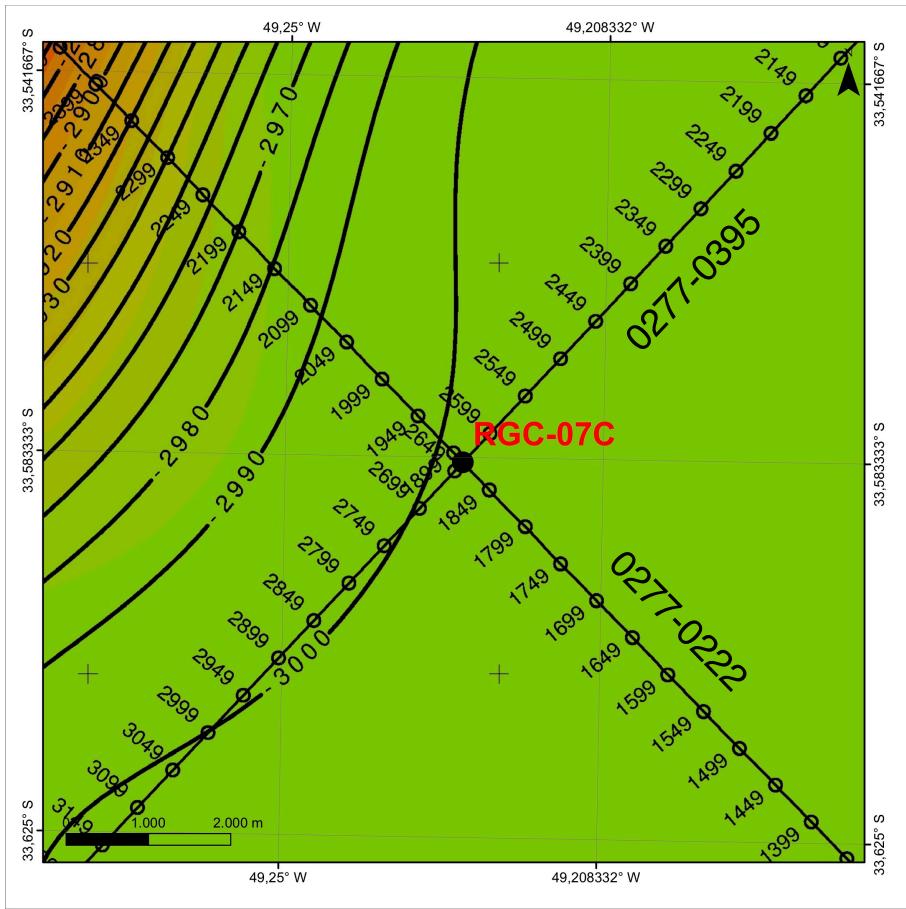
Lithologies

910-SRR2 for Site RGC-07C Submitted 2019-01-28 22:01:36

Subbottom depth (m)	Key reflectors, unconformities faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate(m/My)	Comments
0 - 800		19	2	Marine mud and mudstone with minor amounts of intercalated sand and sandstone		43	

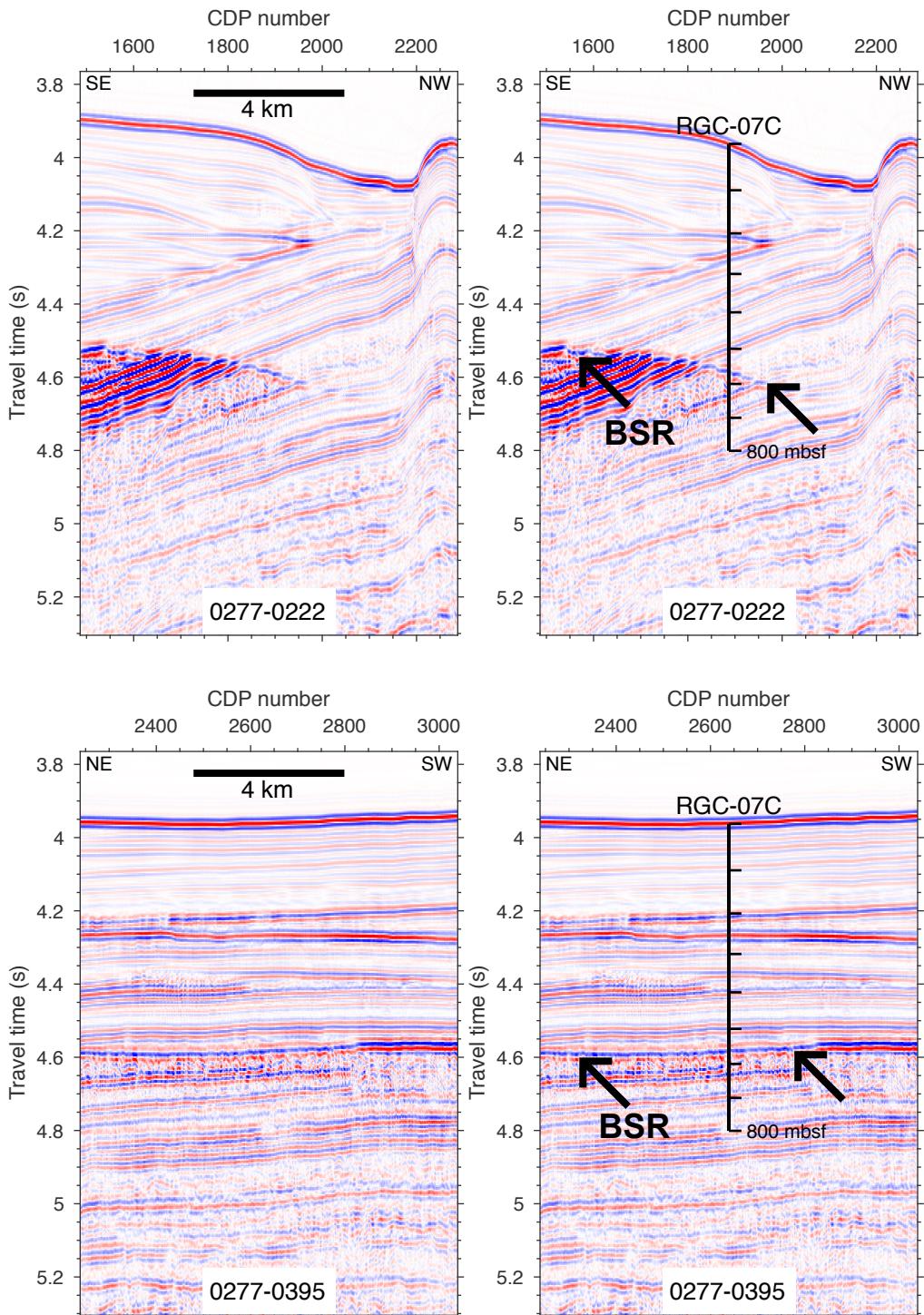
IODP proposal 910-Full2

Site RGC-07C



Site RGC-07C
 CDP 1887 on line 0277-0222
 CDP 2639 on line 0277-0395
 Lat. -33.58388 / Long. -49.22675
 UTM 22S 664560.2 E / 6282571.7 N
 Water depth 2972 m
 Penetration 800 m

Data files will be submitted to the SSDB
 by the November 2018 deadline



IODP Site Forms

General Site Information

Section A: Proposal Information

Proposal Title:	Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)
Date Form Submitted:	2019-01-28 22:01:36
Site-Specific Objectives with Priority (Must include general objectives in proposal)	Alternate site with same site-specific objectives as RGC-07C.
List Previous Drilling in Area:	

Section B: General Site Information

Site Name:	RGC-08C		Area or Location:	Rio Grande Cone
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#:			Jurisdiction:	Brazil
Latitude:	-33.92741		Distance to Land (km):	280
Longitude:	-49.81531		Water Depth (m):	2664
Coordinate System:	WGS 84			
Priority of Site:	Primary <input type="checkbox"/>	Alternate <input checked="" type="checkbox"/>		

Section C: Operational Information

Proposed Penetration (m):

Sediments	Basement	Total Sediment Thickness (m)	Total Penetration (m)
800	0	8000	800

General Lithologies:

Marine mud and mudstone with minor amounts of intercalated sand and sandstone	
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Coring Plan (Specify or check):

Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores
Hole B: Same as Hole A
Hole C: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 800 mbsf, 1-3 PCS cores, log

APC XCB RCB Re-entry PCS

Wireline Logging Plan:

Standard Measurement		Special Tools	
Wireline Logging	<input checked="" type="checkbox"/>	Magnetic Susceptibility	<input type="checkbox"/>
Porosity	<input type="checkbox"/>	Borehole Temperature	<input type="checkbox"/>
Density	<input checked="" type="checkbox"/>	Formation Image (Acoustic)	<input type="checkbox"/>
Gamma Ray	<input checked="" type="checkbox"/>	VSP (walkaway)	<input type="checkbox"/>
Resistivity	<input checked="" type="checkbox"/>	LWD	<input type="checkbox"/>
Sonic (Δt)	<input checked="" type="checkbox"/>		
Formation Image (Res)	<input checked="" type="checkbox"/>		
VSP (zero offset)	<input type="checkbox"/>		
Formation Temperature & Pressure	<input type="checkbox"/>		
Other Measurements:		Other Tools:	

Estimated Days:

Drilling / Coring	Logging	Total On-Site
14.7	1	15.7

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan:

Potential Harzards/Weather:

Shallow Gas	<input type="checkbox"/>	Complicated Seabed Condition	<input type="checkbox"/>	Hydrothermal Activity	<input type="checkbox"/>	Preferred weather window: Austral summer-fall (October-April). Spring has high winds and winter high waves and currents.						
Hydrocarbon	<input type="checkbox"/>	Soft Seabed	<input type="checkbox"/>	Landslide and Turbidity Current	<input type="checkbox"/>							
Shallow Water Flow	<input type="checkbox"/>	Currents	<input type="checkbox"/>	Gas Hydrate	<input checked="" type="checkbox"/>							
Abnormal Pressure	<input type="checkbox"/>	Fracture Zone	<input type="checkbox"/>	Diapir and Mud Volcano	<input type="checkbox"/>							
Man-made Objects (e.g. sea-floor cables, dump sites)	<input type="checkbox"/>	Fault	<input type="checkbox"/>	High Temperature	<input type="checkbox"/>							
H2S	<input type="checkbox"/>	High Dip Angle	<input type="checkbox"/>	Ice Conditions	<input type="checkbox"/>							
CO2	<input type="checkbox"/>											
Sensitive marine habitat (e.g. reefs, vents)												
Other: 1-3 pressure cores in each hole taken with the IODP PCS												

IODP Site Forms

Site Survey Detail

910-SRR2 for Site RGC-08C Submitted 2019-01-28 22:01:36

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 0277-0090 Position 2392
1b High resolution seismic reflection (crossing)	yes	Line: 0231-0491 Position 2487
2a Deep penetration seismic reflection (primary)	yes	Same as high-resolution seismic line
2b Deep penetration seismic reflection (crossing)	yes	Same as high-resolution seismic line
3 Seismic Velocity	yes	
4 Seismic Grid		
5a Refraction (surface)		
5b Refraction (bottom)		
6 3.5 kHz		
7 Swath bathymetry		
8a Side looking sonar (surface)		
8b Side looking sonar (bottom)		
9 Photography or video		
10 Heat Flow		
11a Magnetics		
11b Gravity		
12 Sediment cores		
13 Rock sampling		
14a Water current data		
14b Ice Conditions		
15 OBS microseismicity		
16 Navigation	yes	
17 Other		

IODP Site Forms

Environmental Protection

910-SRR2 for Site RGC-08C Submitted 2019-01-28 22:01:36

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores. Hole B: Same as Hole A. Hole C: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 800 mbsf, 1-3 PCS cores, log as shown on form #1
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	None known
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	None known
4. Indications of gas hydrates at this location	BSR at about 539 m below seafloor
5. Are there reasons to expect hydrocarbon accumulations at this site?	No
6. What "special" precautions will be taken during drilling?	Weighted mud to counteract possible gas flow in the borehole
7. What abandonment procedures need to be followed?	
8. Natural or manmade hazards which may affect ship's operations	
9. Summary: What do you consider the major risks in drilling at this site?	Possible gas beneath the base of the methane hydrate stability zone

IODP Site Forms

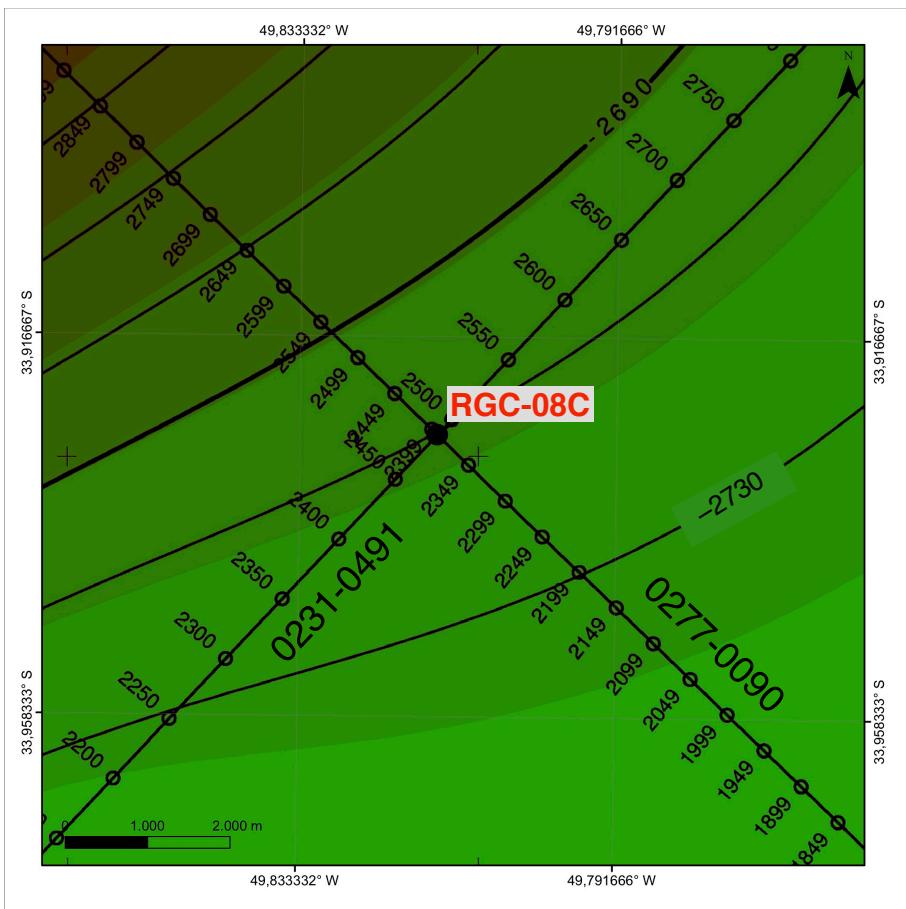
Lithologies

910-SRR2 for Site RGC-08C Submitted 2019-01-28 22:01:36

Subbottom depth (m)	Key reflectors, unconformities faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate(m/My)	Comments
0 - 800		19	2	Marine mud and mudstone with minor amounts of intercalated sand and sandstone		43	

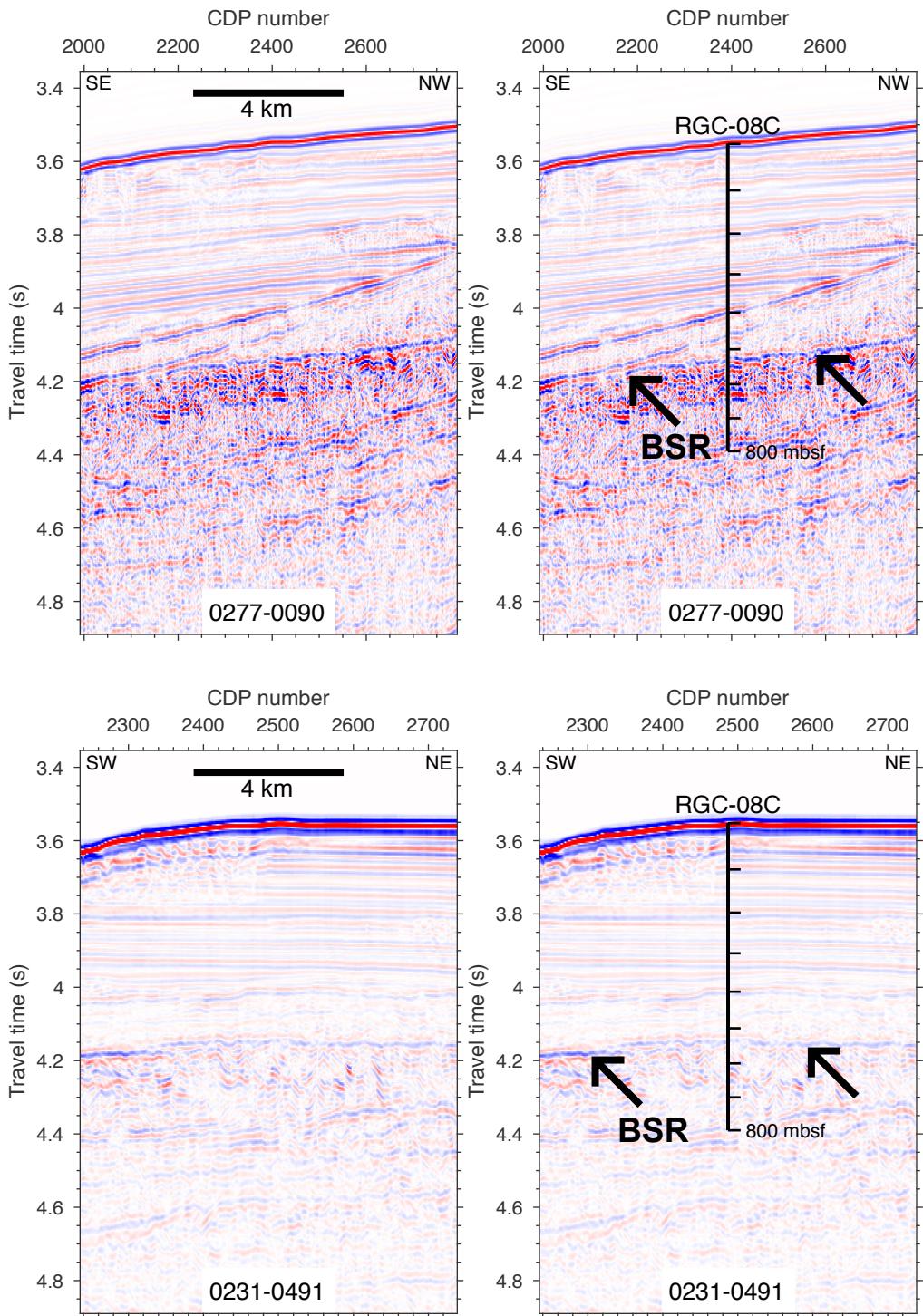
IODP proposal 910-Full2

Site RGC-08C



Site RGC-08C
 CDP 2392 on line 0277-0090
 CDP 2487 on line 0231-0491
 Lat. -33.92741 / Long. -49.81531
 UTM 22S 609499.7 E / 6245260.3 N
 Water depth 2664 m
 Penetration 800 m

Data files will be submitted to the SSDB
 by the November 2018 deadline



IODP Site Forms

General Site Information

Section A: Proposal Information

Proposal Title:	Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)
Date Form Submitted:	2019-01-28 22:01:36
Site-Specific Objectives with Priority (Must include general objectives in proposal)	Alternate site with same site-specific objectives as RGC-07C.
List Previous Drilling in Area:	

Section B: General Site Information

Site Name:	RGC-12A		Area or Location:	Rio Grande Cone
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#:			Jurisdiction:	Brazil
Latitude:	-33.46151		Distance to Land (km):	280
Longitude:	-49.09352		Water Depth (m):	2993
Coordinate System:	WGS 84			
Priority of Site:	Primary <input type="checkbox"/>	Alternate <input checked="" type="checkbox"/>		

Section C: Operational Information

Proposed Penetration (m):

Sediments	Basement	Total Sediment Thickness (m)	Total Penetration (m)
800	0	8000	800

General Lithologies:

Marine mud and mudstone with minor amounts of intercalated sand and sandstone	
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Coring Plan (Specify or check):

Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores
Hole B: Same as Hole A
Hole C: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 800 mbsf, 1-3 PCS cores, log

APC XCB RCB Re-entry PCS

Wireline Logging Plan:

Standard Measurement		Special Tools	
Wireline Logging	<input checked="" type="checkbox"/>	Magnetic Susceptibility	<input type="checkbox"/>
Porosity	<input type="checkbox"/>	Borehole Temperature	<input type="checkbox"/>
Density	<input checked="" type="checkbox"/>	Formation Image (Acoustic)	<input type="checkbox"/>
Gamma Ray	<input checked="" type="checkbox"/>	VSP (walkaway)	<input type="checkbox"/>
Resistivity	<input checked="" type="checkbox"/>	LWD	<input type="checkbox"/>
Sonic (Δt)	<input checked="" type="checkbox"/>		
Formation Image (Res)	<input checked="" type="checkbox"/>		
VSP (zero offset)	<input type="checkbox"/>		
Formation Temperature & Pressure	<input type="checkbox"/>		
Other Measurements:		Other Tools:	

Estimated Days:

Drilling / Coring	Logging	Total On-Site
14.7	1	15.7

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan:

Potential Harzards/Weather:

Shallow Gas	<input type="checkbox"/>	Complicated Seabed Condition	<input type="checkbox"/>	Hydrothermal Activity	<input type="checkbox"/>	Preferred weather window: Austral summer-fall (October-April). Spring has high winds and winter high waves and currents.						
Hydrocarbon	<input type="checkbox"/>	Soft Seabed	<input type="checkbox"/>	Landslide and Turbidity Current	<input type="checkbox"/>							
Shallow Water Flow	<input type="checkbox"/>	Currents	<input type="checkbox"/>	Gas Hydrate	<input checked="" type="checkbox"/>							
Abnormal Pressure	<input type="checkbox"/>	Fracture Zone	<input type="checkbox"/>	Diapir and Mud Volcano	<input type="checkbox"/>							
Man-made Objects (e.g. sea-floor cables, dump sites)	<input type="checkbox"/>	Fault	<input type="checkbox"/>	High Temperature	<input type="checkbox"/>							
H2S	<input type="checkbox"/>	High Dip Angle	<input type="checkbox"/>	Ice Conditions	<input type="checkbox"/>							
CO2	<input type="checkbox"/>											
Sensitive marine habitat (e.g. reefs, vents)												
Other: 1-3 pressure cores in each hole taken with the IODP PCS												

IODP Site Forms

Site Survey Detail

910-SRR2 for Site RGC-12A Submitted 2019-01-28 22:01:36

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 0277-0258 Position 13362
1b High resolution seismic reflection (crossing)	yes	Line: 0277-0395 Position 1169
2a Deep penetration seismic reflection (primary)	yes	Same as high-resolution seismic line
2b Deep penetration seismic reflection (crossing)	yes	Same as high-resolution seismic line
3 Seismic Velocity	yes	
4 Seismic Grid		
5a Refraction (surface)		
5b Refraction (bottom)		
6 3.5 kHz		
7 Swath bathymetry		
8a Side looking sonar (surface)		
8b Side looking sonar (bottom)		
9 Photography or video		
10 Heat Flow		
11a Magnetics		
11b Gravity		
12 Sediment cores		
13 Rock sampling		
14a Water current data		
14b Ice Conditions		
15 OBS microseismicity		
16 Navigation	yes	
17 Other		

IODP Site Forms

Environmental Protection

910-SRR2 for Site RGC-12A Submitted 2019-01-28 22:01:36

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores. Hole B: Same as Hole A. Hole C: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 800 mbsf, 1-3 PCS cores, log as shown on form #1
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	None known
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	None known
4. Indications of gas hydrates at this location	BSR at about 569 m below seafloor
5. Are there reasons to expect hydrocarbon accumulations at this site?	No
6. What "special" precautions will be taken during drilling?	Weighted mud to counteract possible gas flow in the borehole
7. What abandonment procedures need to be followed?	
8. Natural or manmade hazards which may affect ship's operations	
9. Summary: What do you consider the major risks in drilling at this site?	Possible gas beneath the base of the methane hydrate stability zone

IODP Site Forms

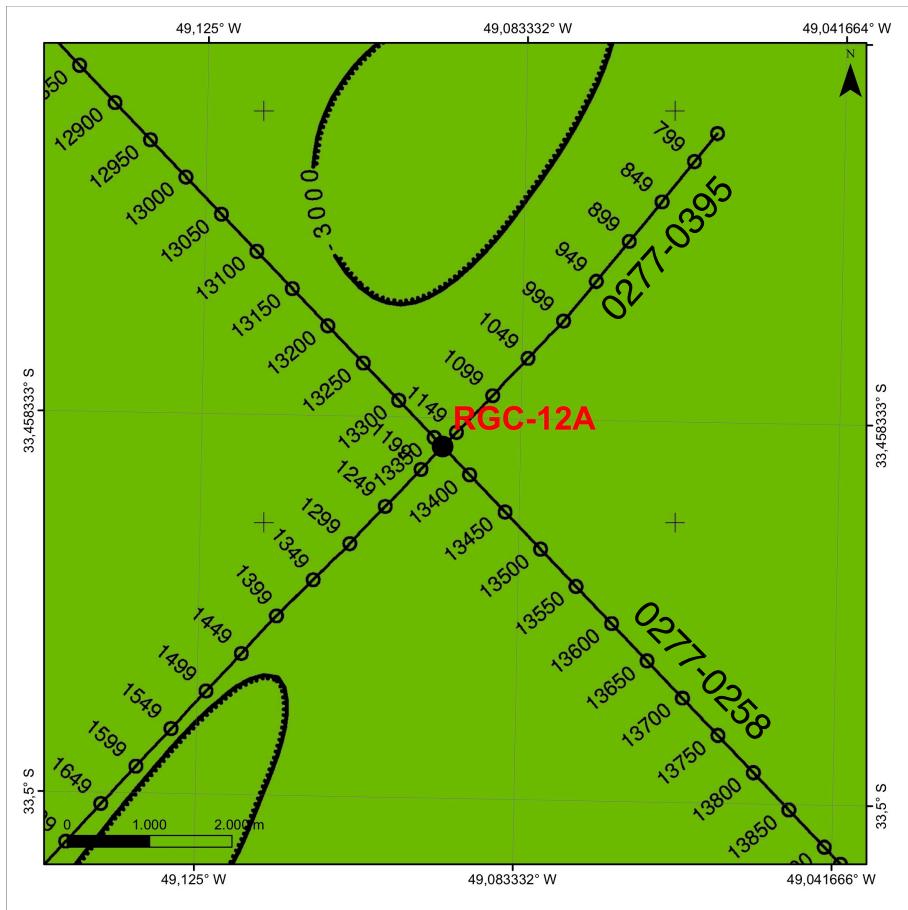
Lithologies

910-SRR2 for Site RGC-12A Submitted 2019-01-28 22:01:36

Subbottom depth (m)	Key reflectors, unconformities faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate(m/My)	Comments
0 - 800		19	2	Marine mud and mudstone with minor amounts of intercalated sand and sandstone		43	

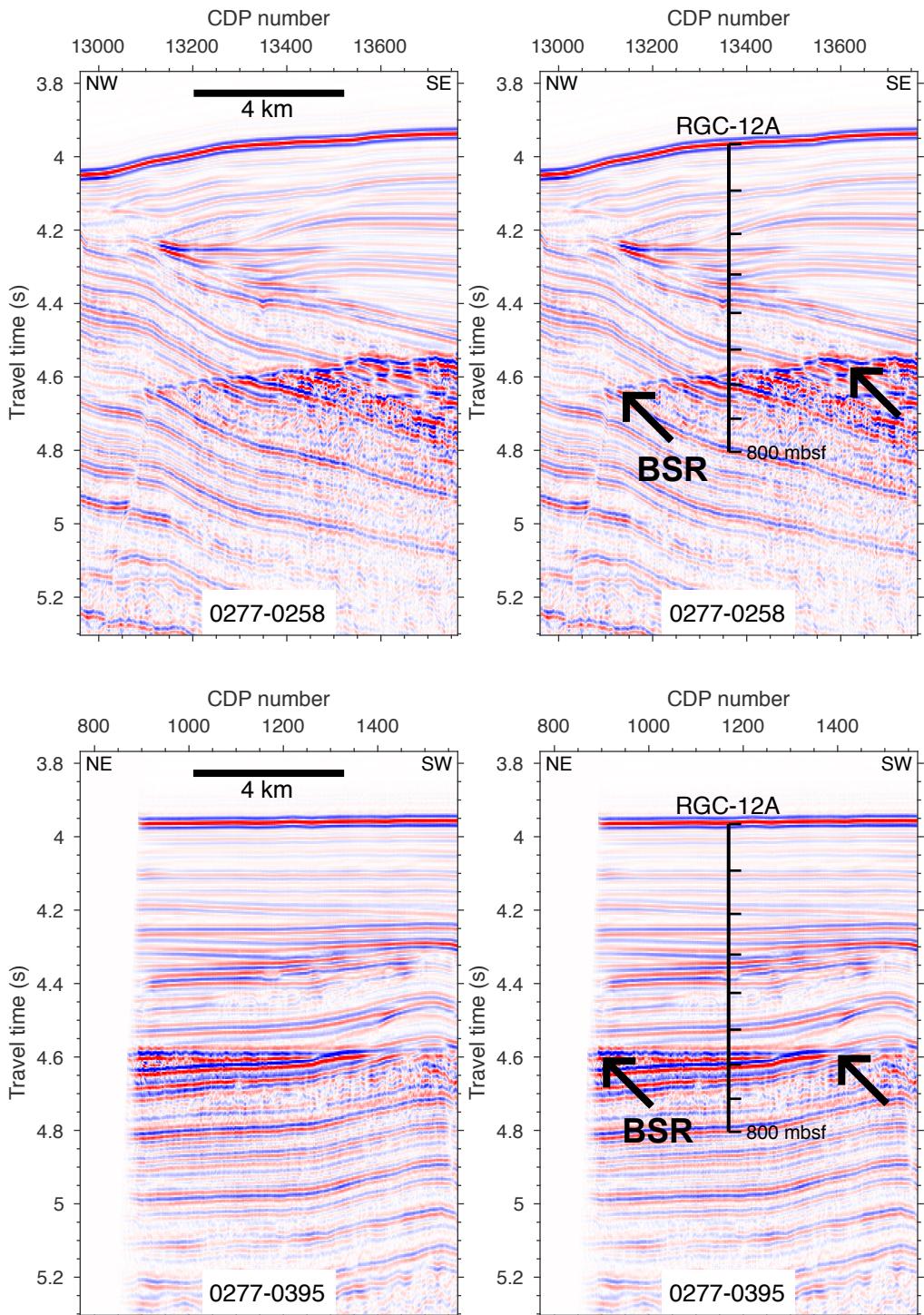
IODP proposal 910-Full2

Site RGC-12A



Site RGC-12A
 CDP 13362 on line 0277-0258
 CDP 1169 on line 0277-0395
 Lat. -33.46151 / Long. -49.09352
 UTM 22S 677175.3 E / 6295923.0 N
 Water depth 2993 m
 Penetration 800 m

Data files will be submitted to the SSDB
 by the November 2018 deadline



IODP Site Forms

General Site Information

Section A: Proposal Information

Proposal Title:	Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)
Date Form Submitted:	2019-01-28 22:01:36
Site-Specific Objectives with Priority (Must include general objectives in proposal)	Alternate site with same site-specific objectives as RGC-07C.
List Previous Drilling in Area:	

Section B: General Site Information

Site Name:	RGC-16A		Area or Location:	Rio Grande Cone
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#:			Jurisdiction:	Brazil
Latitude:	-33.15918		Distance to Land (km):	280
Longitude:	-48.9736		Water Depth (m):	2938
Coordinate System:	WGS 84			
Priority of Site:	Primary <input type="checkbox"/>	Alternate <input checked="" type="checkbox"/>		

Section C: Operational Information

Proposed Penetration (m):

Sediments	Basement	Total Sediment Thickness (m)	Total Penetration (m)
800	0	8000	800

General Lithologies:

Marine mud and mudstone with minor amounts of intercalated sand and sandstone	
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Coring Plan (Specify or check):

Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores
Hole B: Same as Hole A
Hole C: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 800 mbsf, 1-3 PCS cores, log

APC XCB RCB Re-entry PCS

Wireline Logging Plan:

Standard Measurement		Special Tools	
Wireline Logging	<input checked="" type="checkbox"/>	Magnetic Susceptibility	<input type="checkbox"/>
Porosity	<input type="checkbox"/>	Borehole Temperature	<input type="checkbox"/>
Density	<input checked="" type="checkbox"/>	Formation Image (Acoustic)	<input type="checkbox"/>
Gamma Ray	<input checked="" type="checkbox"/>	VSP (walkaway)	<input type="checkbox"/>
Resistivity	<input checked="" type="checkbox"/>	LWD	<input type="checkbox"/>
Sonic (Δt)	<input checked="" type="checkbox"/>		
Formation Image (Res)	<input checked="" type="checkbox"/>		
VSP (zero offset)	<input type="checkbox"/>		
Formation Temperature & Pressure	<input type="checkbox"/>		
Other Measurements:		Other Tools:	

Estimated Days:

Drilling / Coring	Logging	Total On-Site
14.7	1	15.7

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan:

Potential Harzards/Weather:

Shallow Gas	<input type="checkbox"/>	Complicated Seabed Condition	<input type="checkbox"/>	Hydrothermal Activity	<input type="checkbox"/>	Preferred weather window: Austral summer-fall (October-April). Spring has high winds and winter high waves and currents.						
Hydrocarbon	<input type="checkbox"/>	Soft Seabed	<input type="checkbox"/>	Landslide and Turbidity Current	<input type="checkbox"/>							
Shallow Water Flow	<input type="checkbox"/>	Currents	<input type="checkbox"/>	Gas Hydrate	<input checked="" type="checkbox"/>							
Abnormal Pressure	<input type="checkbox"/>	Fracture Zone	<input type="checkbox"/>	Diapir and Mud Volcano	<input type="checkbox"/>							
Man-made Objects (e.g. sea-floor cables, dump sites)	<input type="checkbox"/>	Fault	<input type="checkbox"/>	High Temperature	<input type="checkbox"/>							
H2S	<input type="checkbox"/>	High Dip Angle	<input type="checkbox"/>	Ice Conditions	<input type="checkbox"/>							
CO2	<input type="checkbox"/>											
Sensitive marine habitat (e.g. reefs, vents)												
Other: 1-3 pressure cores in each hole taken with the IODP PCS												

IODP Site Forms

Site Survey Detail

910-SRR2 for Site RGC-16A Submitted 2019-01-28 22:01:36

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB01-159 Position 8570
1b High resolution seismic reflection (crossing)	yes	Line: 0231-0491 Position 8270
2a Deep penetration seismic reflection (primary)	yes	Same as high-resolution seismic line
2b Deep penetration seismic reflection (crossing)	yes	Same as high-resolution seismic line
3 Seismic Velocity	yes	
4 Seismic Grid		
5a Refraction (surface)		
5b Refraction (bottom)		
6 3.5 kHz		
7 Swath bathymetry		
8a Side looking sonar (surface)		
8b Side looking sonar (bottom)		
9 Photography or video		
10 Heat Flow		
11a Magnetics		
11b Gravity		
12 Sediment cores		
13 Rock sampling		
14a Water current data		
14b Ice Conditions		
15 OBS microseismicity		
16 Navigation	yes	
17 Other		

IODP Site Forms

Environmental Protection

910-SRR2 for Site RGC-16A Submitted 2019-01-28 22:01:36

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores. Hole B: Same as Hole A. Hole C: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 800 mbsf, 1-3 PCS cores, log as shown on form #1
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	None known
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	None known
4. Indications of gas hydrates at this location	BSR at about 569 m below seafloor
5. Are there reasons to expect hydrocarbon accumulations at this site?	No
6. What "special" precautions will be taken during drilling?	Weighted mud to counteract possible gas flow in the borehole
7. What abandonment procedures need to be followed?	
8. Natural or manmade hazards which may affect ship's operations	
9. Summary: What do you consider the major risks in drilling at this site?	Possible gas beneath the base of the methane hydrate stability zone

IODP Site Forms

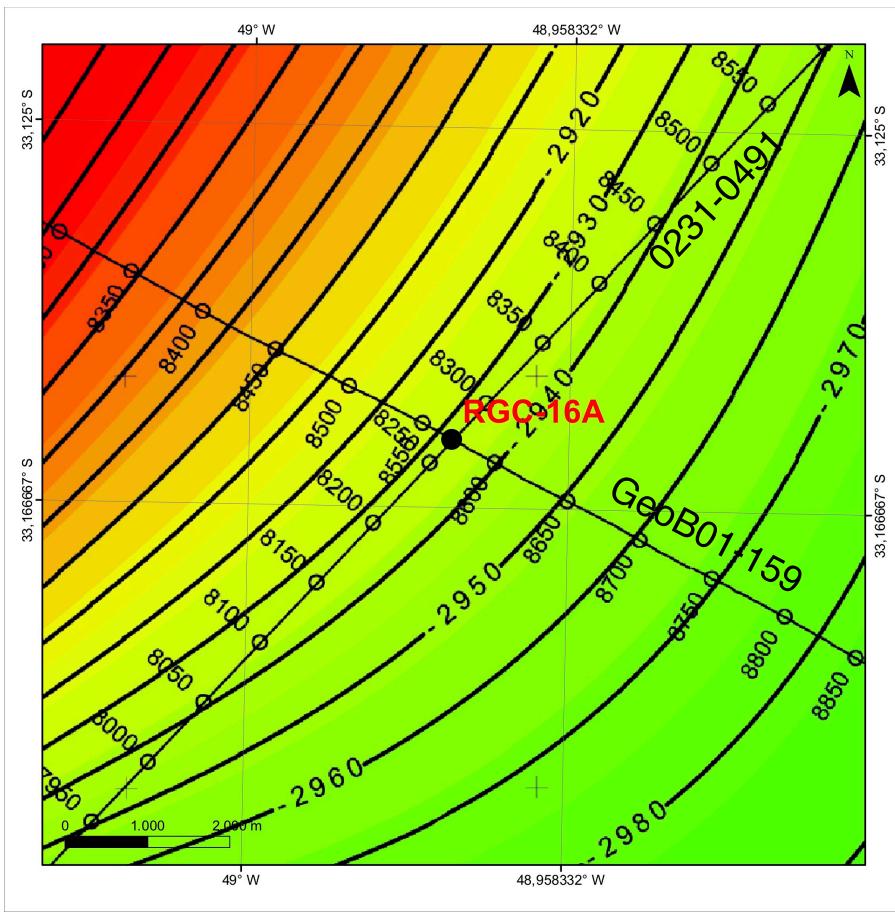
Lithologies

910-SRR2 for Site RGC-16A Submitted 2019-01-28 22:01:36

Subbottom depth (m)	Key reflectors, unconformities faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate(m/My)	Comments
0 - 800		19	2	Marine mud and mudstone with minor amounts of intercalated sand and sandstone		43	

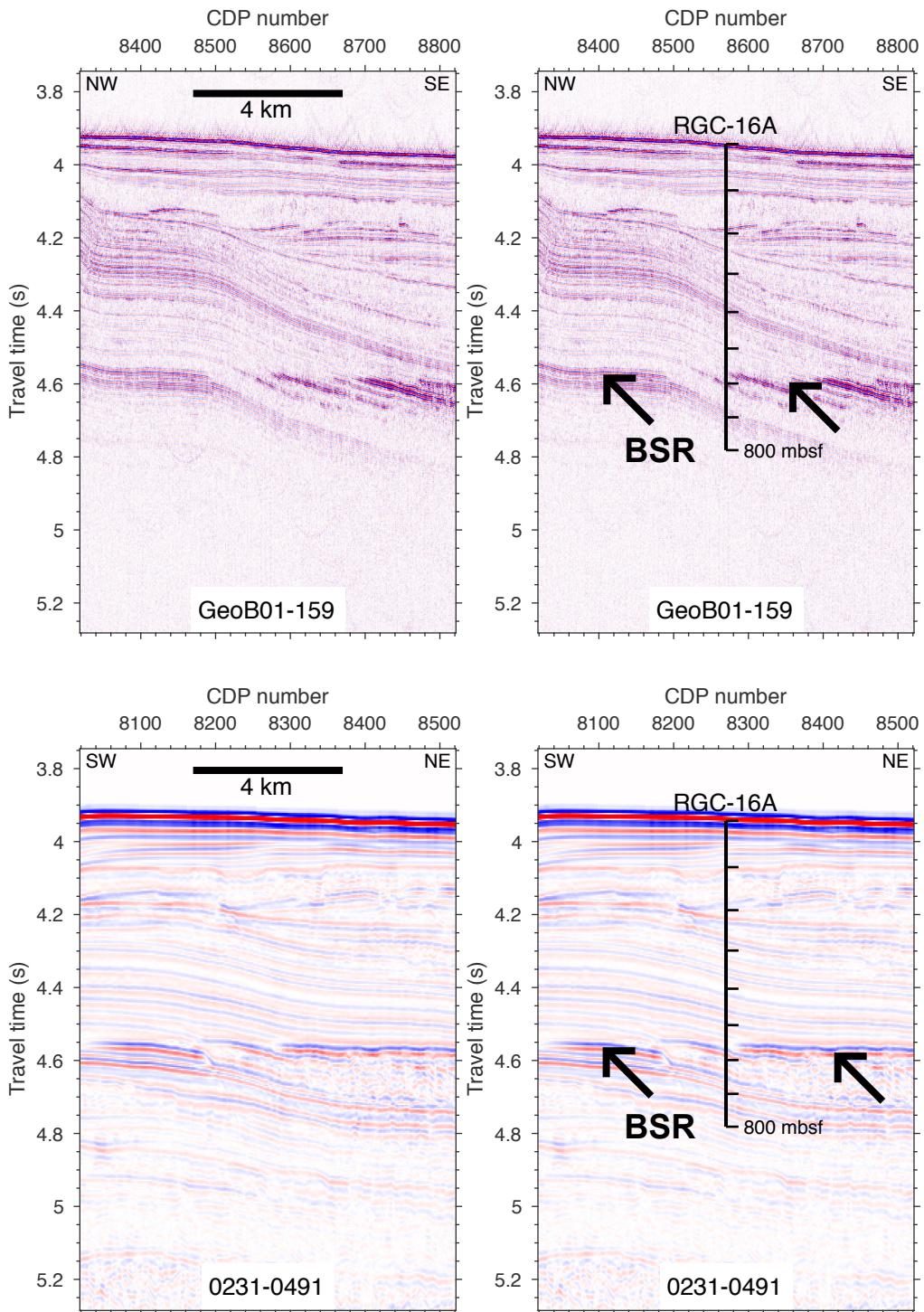
IODP proposal 910-Full2

Site RGC-16A



Site RGC-16A
 CDP 8570 on line GeoB01-159
 CDP 8270 on line 0231-0491
 Lat. -33.15918 / Long. -48.97360
 UTM 22S 688973.5 E / 6329237.6 N
 Water depth 2938 m
 Penetration 800 m

Data files will be submitted to the SSDB
 by the November 2018 deadline



IODP Site Forms

General Site Information

Section A: Proposal Information

Proposal Title:	Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)
Date Form Submitted:	2019-01-28 22:01:36
Site-Specific Objectives with Priority (Must include general objectives in proposal)	Sample a location near pockmarks on the middle slope of the Rio Grande Cone. This site will allow for determining the variation in methanogenesis in a location where fluid advection may be important for a comparison to "stratigraphic" settings.
List Previous Drilling in Area:	

Section B: General Site Information

Site Name:	RGC-10B		Area or Location:	Rio Grande Cone
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#:			Jurisdiction:	Brazil
Latitude:	-32.77458		Distance to Land (km):	190
Longitude:	-49.85012		Water Depth (m):	1299
Coordinate System:	WGS 84			
Priority of Site:	Primary <input checked="" type="checkbox"/>	Alternate <input type="checkbox"/>		

Section C: Operational Information

Proposed Penetration (m):

Sediments	Basement	Total Sediment Thickness (m)	Total Penetration (m)
500	0	8000	500

General Lithologies:

Marine mud and mudstone with minor amounts of intercalated sand and sandstone	
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Coring Plan (Specify or check):

Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores
Hole B: Same as Hole A, log

APC XCB RCB Re-entry PCS

Wireline Logging Plan:

Standard Measurement		Special Tools	
Wireline Logging	<input checked="" type="checkbox"/>	Magnetic Susceptibility	<input type="checkbox"/>
Porosity	<input type="checkbox"/>	Borehole Temperature	<input type="checkbox"/>
Density	<input checked="" type="checkbox"/>	Formation Image (Acoustic)	<input type="checkbox"/>
Gamma Ray	<input checked="" type="checkbox"/>	VSP (walkaway)	<input type="checkbox"/>
Resistivity	<input checked="" type="checkbox"/>	LWD	<input type="checkbox"/>
Sonic (Δt)	<input checked="" type="checkbox"/>		
Formation Image (Res)	<input checked="" type="checkbox"/>		
VSP (zero offset)	<input type="checkbox"/>		
Formation Temperature & Pressure	<input type="checkbox"/>		
Other Measurements:		Other Tools:	

Estimated Days:

Drilling / Coring	Logging	Total On-Site
6.2	0.5	6.7

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan:

Potential Harzards/Weather:

Shallow Gas	<input checked="" type="checkbox"/>	Complicated Seabed Condition	<input type="checkbox"/>	Hydrothermal Activity	<input type="checkbox"/>	Preferred weather window: Austral summer-fall (October-April). Spring has high winds and winter high waves and currents.						
Hydrocarbon	<input type="checkbox"/>	Soft Seabed	<input type="checkbox"/>	Landslide and Turbidity Current	<input type="checkbox"/>							
Shallow Water Flow	<input type="checkbox"/>	Currents	<input type="checkbox"/>	Gas Hydrate	<input checked="" type="checkbox"/>							
Abnormal Pressure	<input type="checkbox"/>	Fracture Zone	<input type="checkbox"/>	Diapir and Mud Volcano	<input type="checkbox"/>							
Man-made Objects (e.g. sea-floor cables, dump sites)	<input type="checkbox"/>	Fault	<input type="checkbox"/>	High Temperature	<input type="checkbox"/>							
H2S	<input type="checkbox"/>	High Dip Angle	<input type="checkbox"/>	Ice Conditions	<input type="checkbox"/>							
CO2	<input type="checkbox"/>											
Sensitive marine habitat (e.g. reefs, vents)												
Other: 1-3 pressure cores in each hole taken with the IODP PCS												

IODP Site Forms

Site Survey Detail

910-SRR2 for Site RGC-10B Submitted 2019-01-28 22:01:36

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 0277-0270 Position 4466
1b High resolution seismic reflection (crossing)	yes	Line: 0277-0187 Position 4699
2a Deep penetration seismic reflection (primary)	yes	Same as high-resolution seismic line
2b Deep penetration seismic reflection (crossing)	yes	Same as high-resolution seismic line
3 Seismic Velocity	yes	
4 Seismic Grid		
5a Refraction (surface)		
5b Refraction (bottom)		
6 3.5 kHz	yes	
7 Swath bathymetry	yes	Multibeam bathymetry with backscatter data
8a Side looking sonar (surface)		
8b Side looking sonar (bottom)	yes	AUV side-looking sonar
9 Photography or video		
10 Heat Flow		
11a Magnetics		
11b Gravity		
12 Sediment cores		
13 Rock sampling		
14a Water current data		
14b Ice Conditions		
15 OBS microseismicity		
16 Navigation	yes	
17 Other		

IODP Site Forms

Environmental Protection

910-SRR2 for Site RGC-10B Submitted 2019-01-28 22:01:36

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores. Hole B: Same as Hole A, log as shown on form #1
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	None known
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	None known
4. Indications of gas hydrates at this location	BSR at about 333 m below seafloor, nearby pockmarks have near-seafloor hydrates
5. Are there reasons to expect hydrocarbon accumulations at this site?	No
6. What "special" precautions will be taken during drilling?	Weighted mud to counteract possible gas flow in the borehole
7. What abandonment procedures need to be followed?	
8. Natural or manmade hazards which may affect ship's operations	
9. Summary: What do you consider the major risks in drilling at this site?	Possible gas beneath the base of the methane hydrate stability zone

IODP Site Forms

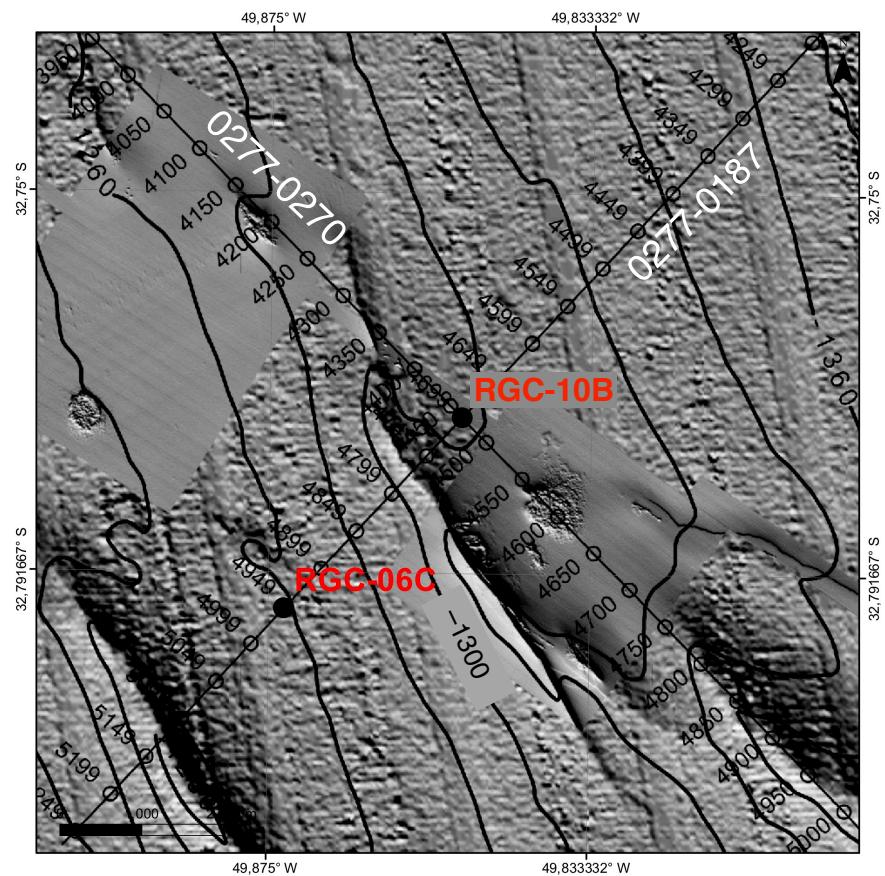
Lithologies

910-SRR2 for Site RGC-10B Submitted 2019-01-28 22:01:36

Subbottom depth (m)	Key reflectors, unconformities faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate(m/My)	Comments
0 - 500		5.5	2	Marine mud and mudstone with minor amounts of intercalated sand and sandstone		90	

IODP proposal 910-Full2

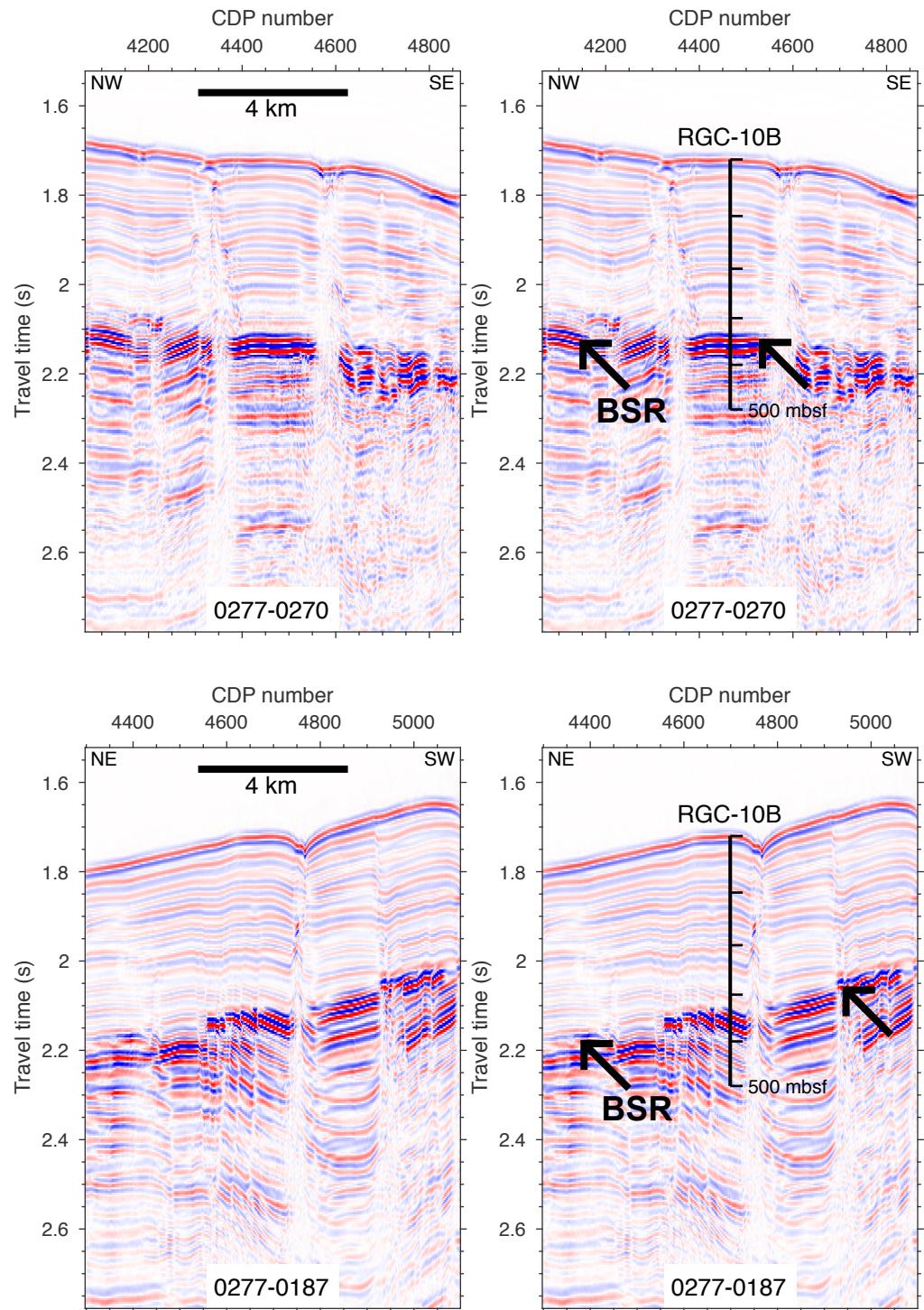
Site RGC-10B



Site RGC-10B

CDP 4466 on line 0277-0270
 CDP 4699 on line 0277-0187
 Lat. -32.77458 / Long. -49.85012
 UTM 22S 607692.0 E / 6373117.7 N
 Water depth 1299 m
 Penetration 500 m

Data files will be submitted to the SSDB
 by the November 2018 deadline



IODP Site Forms

General Site Information

Section A: Proposal Information

Proposal Title:	Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)
Date Form Submitted:	2019-01-28 22:01:36
Site-Specific Objectives with Priority (Must include general objectives in proposal)	Alternate site with same site-specific objectives as RGC-10B.
List Previous Drilling in Area:	

Section B: General Site Information

Site Name:	RGC-06C		Area or Location:	Rio Grande Cone
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#:			Jurisdiction:	Brazil
Latitude:	-32.79565		Distance to Land (km):	190
Longitude:	-49.87302		Water Depth (m):	1257
Coordinate System:	WGS 84			
Priority of Site:	Primary <input type="checkbox"/>	Alternate <input checked="" type="checkbox"/>		

Section C: Operational Information

Proposed Penetration (m):

Sediments	Basement	Total Sediment Thickness (m)	Total Penetration (m)
500	0	8000	500

General Lithologies:

Marine mud and mudstone with minor amounts of intercalated sand and sandstone	
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Coring Plan (Specify or check):

Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores
Hole B: Same as Hole A, log

APC XCB RCB Re-entry PCS

Wireline Logging Plan:

Standard Measurement		Special Tools	
Wireline Logging	<input checked="" type="checkbox"/>	Magnetic Susceptibility	<input type="checkbox"/>
Porosity	<input type="checkbox"/>	Borehole Temperature	<input type="checkbox"/>
Density	<input checked="" type="checkbox"/>	Formation Image (Acoustic)	<input type="checkbox"/>
Gamma Ray	<input checked="" type="checkbox"/>	VSP (walkaway)	<input type="checkbox"/>
Resistivity	<input checked="" type="checkbox"/>	LWD	<input type="checkbox"/>
Sonic (Δt)	<input checked="" type="checkbox"/>		
Formation Image (Res)	<input checked="" type="checkbox"/>		
VSP (zero offset)	<input type="checkbox"/>		
Formation Temperature & Pressure	<input type="checkbox"/>		
Other Measurements:		Other Tools:	

Estimated Days:

Drilling / Coring	Logging	Total On-Site
6.2	0.5	6.7

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan:

Potential Harzards/Weather:

Shallow Gas	<input checked="" type="checkbox"/>	Complicated Seabed Condition	<input type="checkbox"/>	Hydrothermal Activity	<input type="checkbox"/>	Preferred weather window: Austral summer-fall (October-April). Spring has high winds and winter high waves and currents.						
Hydrocarbon	<input type="checkbox"/>	Soft Seabed	<input type="checkbox"/>	Landslide and Turbidity Current	<input type="checkbox"/>							
Shallow Water Flow	<input type="checkbox"/>	Currents	<input type="checkbox"/>	Gas Hydrate	<input checked="" type="checkbox"/>							
Abnormal Pressure	<input type="checkbox"/>	Fracture Zone	<input type="checkbox"/>	Diapir and Mud Volcano	<input type="checkbox"/>							
Man-made Objects (e.g. sea-floor cables, dump sites)	<input type="checkbox"/>	Fault	<input type="checkbox"/>	High Temperature	<input type="checkbox"/>							
H2S	<input type="checkbox"/>	High Dip Angle	<input type="checkbox"/>	Ice Conditions	<input type="checkbox"/>							
CO2	<input type="checkbox"/>											
Sensitive marine habitat (e.g. reefs, vents)												
Other: 1-3 pressure cores in each hole taken with the IODP PCS												

IODP Site Forms

Site Survey Detail

910-SRR2 for Site RGC-06C Submitted 2019-01-28 22:01:36

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 0277-0258 Position 5071
1b High resolution seismic reflection (crossing)	yes	Line: 0277-0187 Position 4953
2a Deep penetration seismic reflection (primary)	yes	Same as high-resolution seismic line
2b Deep penetration seismic reflection (crossing)	yes	Same as high-resolution seismic line
3 Seismic Velocity	yes	
4 Seismic Grid		
5a Refraction (surface)		
5b Refraction (bottom)		
6 3.5 kHz	yes	
7 Swath bathymetry	yes	Multibeam bathymetry with backscatter data
8a Side looking sonar (surface)		
8b Side looking sonar (bottom)	yes	AUV side-looking sonar
9 Photography or video		
10 Heat Flow		
11a Magnetics		
11b Gravity		
12 Sediment cores		
13 Rock sampling		
14a Water current data		
14b Ice Conditions		
15 OBS microseismicity		
16 Navigation	yes	
17 Other		

IODP Site Forms

Environmental Protection

910-SRR2 for Site RGC-06C Submitted 2019-01-28 22:01:36

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores. Hole B: Same as Hole A, log as shown on form #1
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	None known
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	None known
4. Indications of gas hydrates at this location	BSR at about 314 m below seafloor, nearby pockmarks have near-seafloor hydrates
5. Are there reasons to expect hydrocarbon accumulations at this site?	No
6. What "special" precautions will be taken during drilling?	Weighted mud to counteract possible gas flow in the borehole
7. What abandonment procedures need to be followed?	
8. Natural or manmade hazards which may affect ship's operations	
9. Summary: What do you consider the major risks in drilling at this site?	Possible gas beneath the base of the methane hydrate stability zone

IODP Site Forms

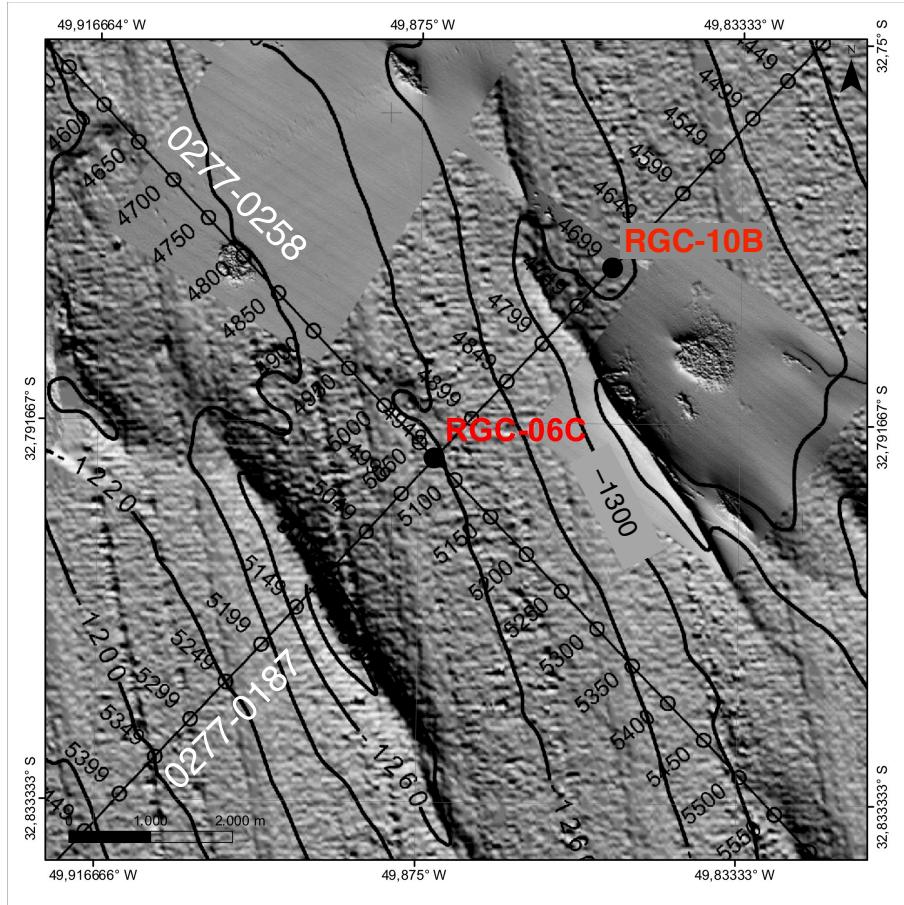
Lithologies

910-SRR2 for Site RGC-06C Submitted 2019-01-28 22:01:36

Subbottom depth (m)	Key reflectors, unconformities faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate(m/My)	Comments
0 - 500		5.5	2	Marine mud and mudstone with minor amounts of intercalated sand and sandstone		90	

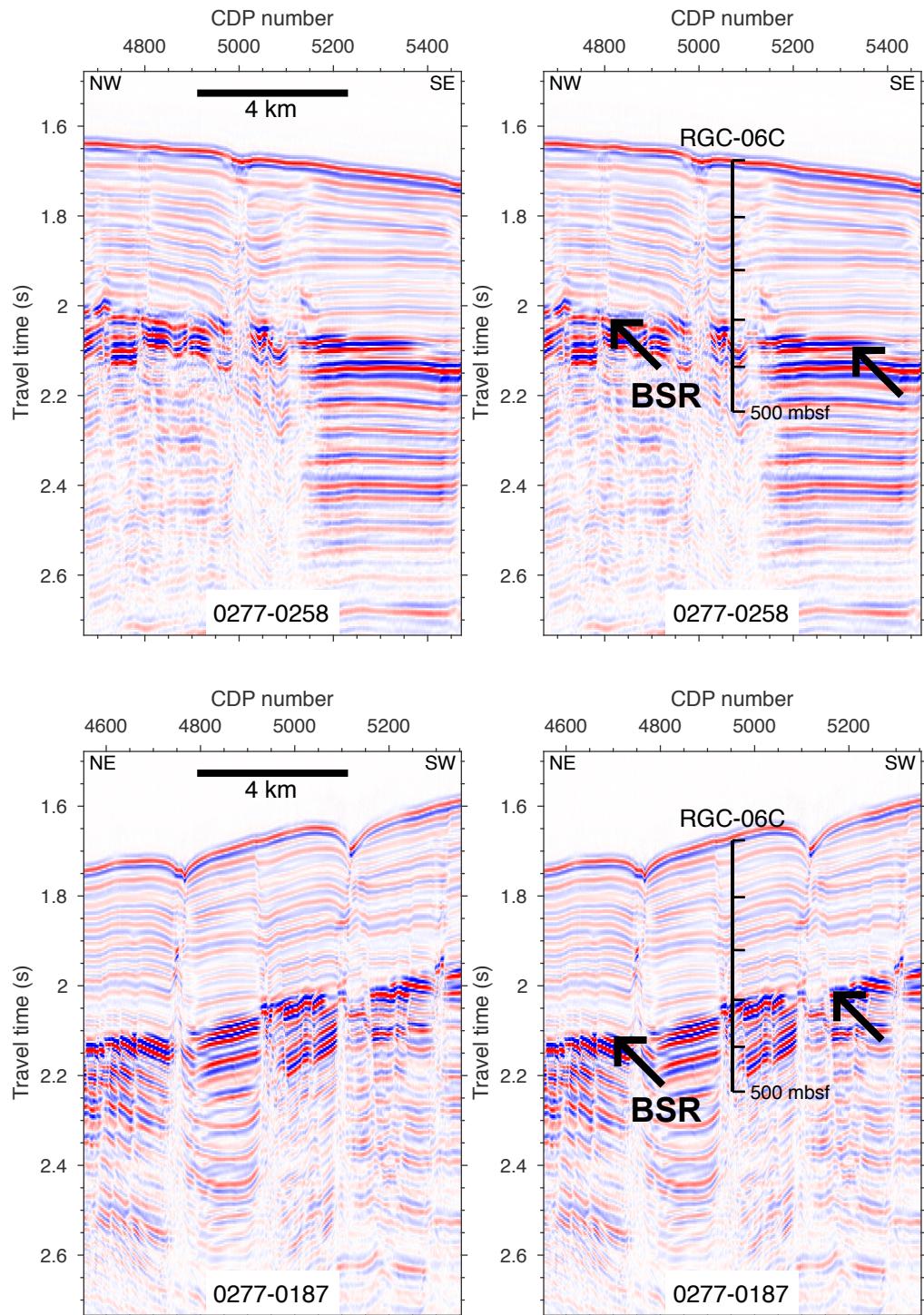
IODP proposal 910-Full2

Site RGC-06C



Site RGC-06C
 CDP 5071 on line 0277-0258
 CDP 4953 on line 0277-0187
 Lat. -32.79565 / Long. -49.87302
 UTM 22S 605523.0 E / 6370804.8 N
 Water depth 1257 m
 Penetration 500 m

Data files will be submitted to the SSDB
 by the November 2018 deadline



IODP Site Forms

General Site Information

Section A: Proposal Information

Proposal Title:	Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)
Date Form Submitted:	2019-01-28 22:01:36
Site-Specific Objectives with Priority (Must include general objectives in proposal)	Alternate site with same site-specific objectives as RGC-10B.
List Previous Drilling in Area:	

Section B: General Site Information

Site Name:	RGC-15A		Area or Location:	Rio Grande Cone
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#:			Jurisdiction:	Brazil
Latitude:	-32.74982		Distance to Land (km):	190
Longitude:	-49.92467		Water Depth (m):	1219
Coordinate System:	WGS 84			
Priority of Site:	Primary <input type="checkbox"/>	Alternate <input checked="" type="checkbox"/>		

Section C: Operational Information

Proposed Penetration (m):

Sediments	Basement	Total Sediment Thickness (m)	Total Penetration (m)
500	0	8000	500

General Lithologies:

Marine mud and mudstone with minor amounts of intercalated sand and sandstone	
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Coring Plan (Specify or check):

Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores
Hole B: Same as Hole A, log

APC XCB RCB Re-entry PCS

Wireline Logging Plan:

Standard Measurement		Special Tools	
Wireline Logging	<input checked="" type="checkbox"/>	Magnetic Susceptibility	<input type="checkbox"/>
Porosity	<input type="checkbox"/>	Borehole Temperature	<input type="checkbox"/>
Density	<input checked="" type="checkbox"/>	Formation Image (Acoustic)	<input type="checkbox"/>
Gamma Ray	<input checked="" type="checkbox"/>	VSP (walkaway)	<input type="checkbox"/>
Resistivity	<input checked="" type="checkbox"/>	LWD	<input type="checkbox"/>
Sonic (Δt)	<input checked="" type="checkbox"/>		
Formation Image (Res)	<input checked="" type="checkbox"/>		
VSP (zero offset)	<input type="checkbox"/>		
Formation Temperature & Pressure	<input type="checkbox"/>		
Other Measurements:		Other Tools:	

Estimated Days:

Drilling / Coring	Logging	Total On-Site
6.2	0.5	6.7

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan:

Potential Harzards/Weather:

Shallow Gas	<input checked="" type="checkbox"/>	Complicated Seabed Condition	<input type="checkbox"/>	Hydrothermal Activity	<input type="checkbox"/>	Preferred weather window: Austral summer-fall (October-April). Spring has high winds and winter high waves and currents.						
Hydrocarbon	<input type="checkbox"/>	Soft Seabed	<input type="checkbox"/>	Landslide and Turbidity Current	<input type="checkbox"/>							
Shallow Water Flow	<input type="checkbox"/>	Currents	<input type="checkbox"/>	Gas Hydrate	<input checked="" type="checkbox"/>							
Abnormal Pressure	<input type="checkbox"/>	Fracture Zone	<input type="checkbox"/>	Diapir and Mud Volcano	<input type="checkbox"/>							
Man-made Objects (e.g. sea-floor cables, dump sites)	<input type="checkbox"/>	Fault	<input type="checkbox"/>	High Temperature	<input type="checkbox"/>							
H2S	<input type="checkbox"/>	High Dip Angle	<input type="checkbox"/>	Ice Conditions	<input type="checkbox"/>							
CO2	<input type="checkbox"/>											
Sensitive marine habitat (e.g. reefs, vents)												
Other: 1-3 pressure cores in each hole taken with the IODP PCS												

IODP Site Forms

Site Survey Detail

910-SRR2 for Site RGC-15A Submitted 2019-01-28 22:01:36

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 0277-0258 Position 4510
1b High resolution seismic reflection (crossing)	yes	Line: GeoB01-159 Position 3572
2a Deep penetration seismic reflection (primary)	yes	Same as high-resolution seismic line
2b Deep penetration seismic reflection (crossing)	yes	Same as high-resolution seismic line
3 Seismic Velocity	yes	
4 Seismic Grid		
5a Refraction (surface)		
5b Refraction (bottom)		
6 3.5 kHz	yes	
7 Swath bathymetry	yes	Multibeam bathymetry with backscatter data
8a Side looking sonar (surface)		
8b Side looking sonar (bottom)	yes	AUV side-looking sonar
9 Photography or video		
10 Heat Flow		
11a Magnetics		
11b Gravity		
12 Sediment cores		
13 Rock sampling		
14a Water current data		
14b Ice Conditions		
15 OBS microseismicity		
16 Navigation	yes	
17 Other		

IODP Site Forms

Environmental Protection

910-SRR2 for Site RGC-15A Submitted 2019-01-28 22:01:36

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to 250 mbsf, HLAPC to 300 mbsf, XCB to 500 mbsf, 1-3 PCS cores. Hole B: Same as Hole A, log as shown on form #1
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	None known
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	None known
4. Indications of gas hydrates at this location	BSR at about 324 m below seafloor, nearby pockmarks have near-seafloor hydrates
5. Are there reasons to expect hydrocarbon accumulations at this site?	No
6. What "special" precautions will be taken during drilling?	Weighted mud to counteract possible gas flow in the borehole
7. What abandonment procedures need to be followed?	
8. Natural or manmade hazards which may affect ship's operations	
9. Summary: What do you consider the major risks in drilling at this site?	Possible gas beneath the base of the methane hydrate stability zone

IODP Site Forms

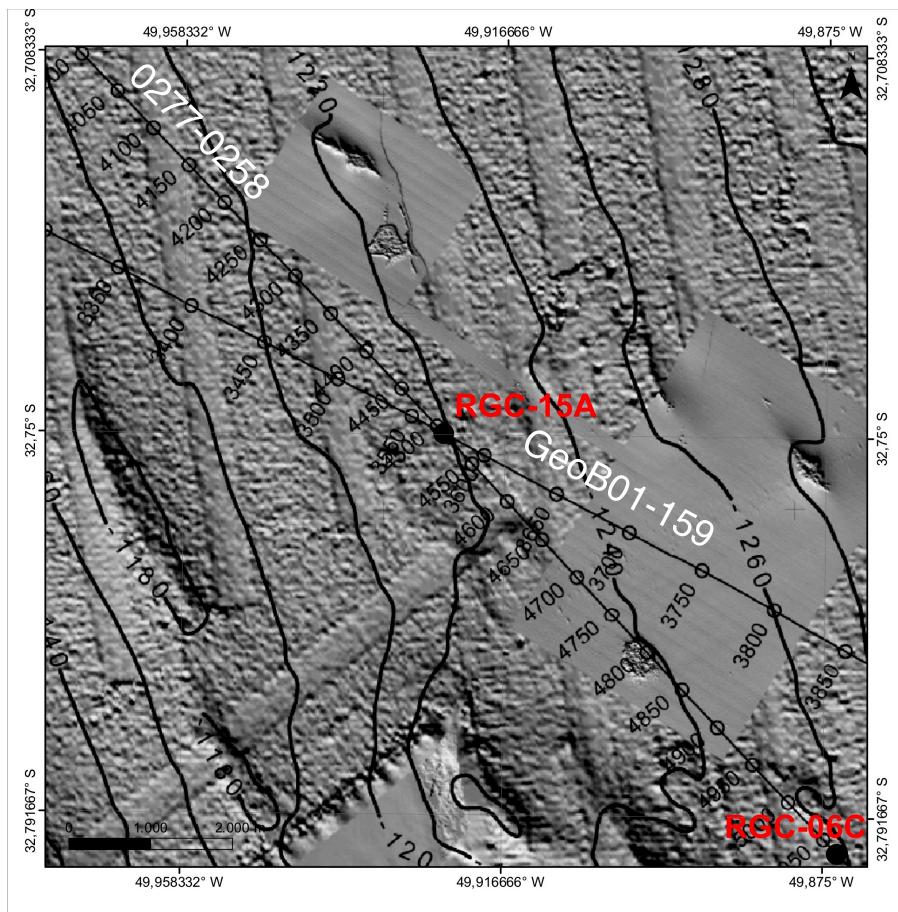
Lithologies

910-SRR2 for Site RGC-15A Submitted 2019-01-28 22:01:36

Subbottom depth (m)	Key reflectors, unconformities faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate(m/My)	Comments
0 - 500		5.5	2	Marine mud and mudstone with minor amounts of intercalated sand and sandstone		90	

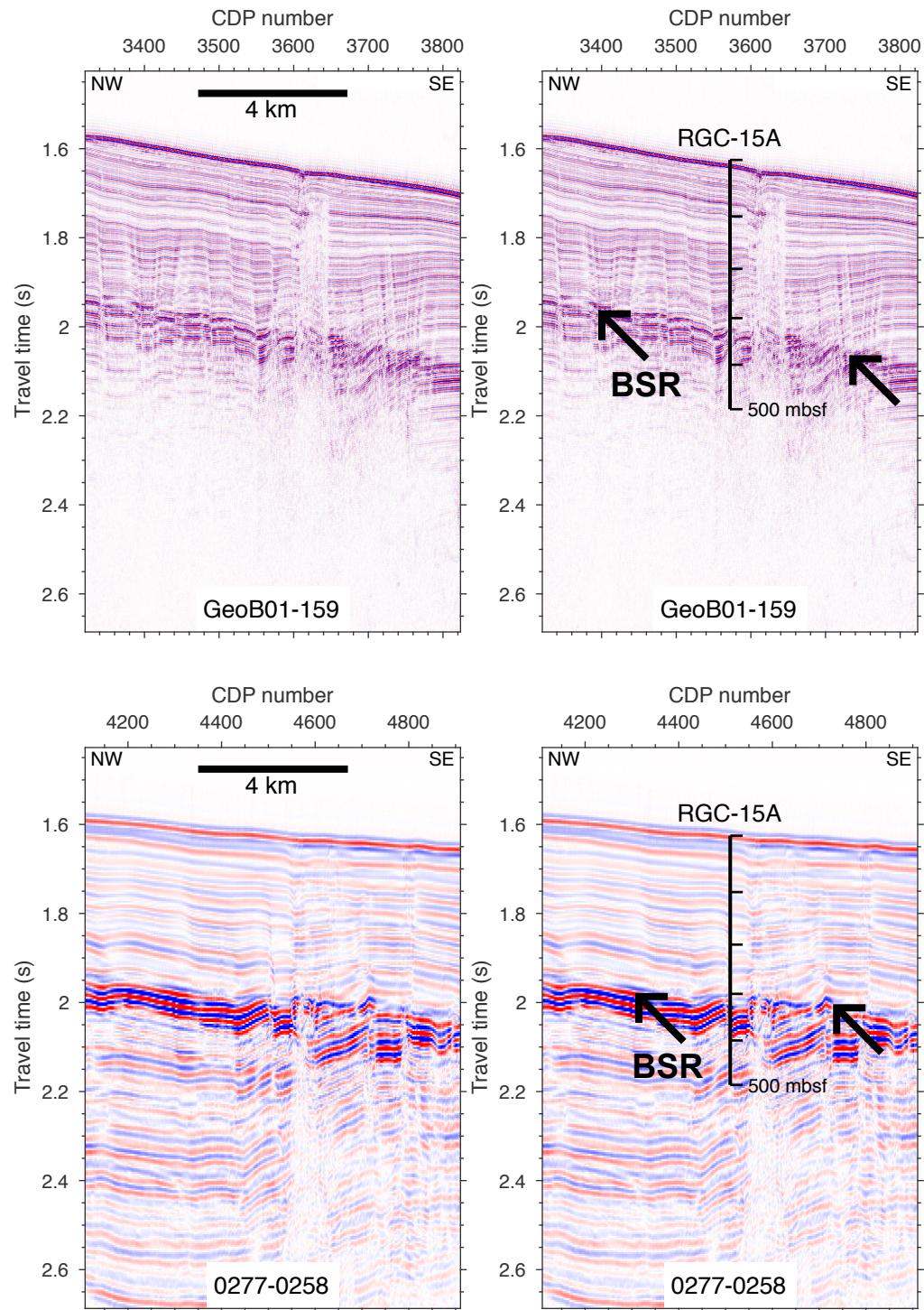
IODP proposal 910-Full2

Site RGC-15A



Site RGC-15A
 CDP 3572 on line GeoB01-159
 CDP 4510 on line 0277-0258
 Lat. -32.74982 / Long. -49.92467
 UTM 22S 600738.3 E / 6375936.5 N
 Water depth 1219 m
 Penetration 500 m

Data files will be submitted to the SSDB
 by the November 2018 deadline



IODP Site Forms

General Site Information

Section A: Proposal Information

Proposal Title:	Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)
Date Form Submitted:	2019-01-28 22:01:36
Site-Specific Objectives with Priority (Must include general objectives in proposal)	Sample a location near pockmarks on the upper slope of the Rio Grande Cone at the feather edge of the MHSZ. This site will allow for determining the variation in methanogenesis in a location where fluid advection may be important and where hydrates may be actively dissociating, providing key observations on the portion of the marine hydrate reservoir that is most sensitive to climatic change.
List Previous Drilling in Area:	

Section B: General Site Information

Site Name:	RGC-05C		Area or Location:	Rio Grande Cone
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#:			Jurisdiction:	Brazil
Latitude:	-33.43466		Distance to Land (km):	200
Longitude:	-50.45741		Water Depth (m):	607
Coordinate System:	WGS 84			
Priority of Site:	Primary <input checked="" type="checkbox"/>	Alternate <input type="checkbox"/>		

Section C: Operational Information

Proposed Penetration (m):

Sediments	Basement	Total Sediment Thickness (m)	Total Penetration (m)
200	0	8000	200

General Lithologies:

Marine mud and mudstone with minor amounts of intercalated sand and sandstone	
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Coring Plan (Specify or check):

Hole A: APC to 200 mbsf, 1-3 PCS cores

Hole B: Same as Hole A

Hole C: Same as Hole A, log

APC XCB RCB Re-entry PCS

Wireline Logging Plan:

Standard Measurement		Special Tools	
Wireline Logging	<input checked="" type="checkbox"/>	Magnetic Susceptibility	<input type="checkbox"/>
Porosity	<input type="checkbox"/>	Borehole Temperature	<input type="checkbox"/>
Density	<input checked="" type="checkbox"/>	Formation Image (Acoustic)	<input type="checkbox"/>
Gamma Ray	<input checked="" type="checkbox"/>	VSP (walkaway)	<input type="checkbox"/>
Resistivity	<input checked="" type="checkbox"/>	LWD	<input type="checkbox"/>
Sonic (Δt)	<input checked="" type="checkbox"/>		
Formation Image (Res)	<input checked="" type="checkbox"/>		
VSP (zero offset)	<input type="checkbox"/>		
Formation Temperature & Pressure	<input type="checkbox"/>		
Other Measurements:		Other Tools:	

Estimated Days:

Drilling / Coring	Logging	Total On-Site
2.3	0.6	2.9

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan:

Potential Harzards/Weather:

Shallow Gas	<input checked="" type="checkbox"/>	Complicated Seabed Condition	<input type="checkbox"/>	Hydrothermal Activity	<input type="checkbox"/>	Preferred weather window: Austral summer-fall (October-April). Spring has high winds and winter high waves and currents.						
Hydrocarbon	<input type="checkbox"/>	Soft Seabed	<input type="checkbox"/>	Landslide and Turbidity Current	<input type="checkbox"/>							
Shallow Water Flow	<input type="checkbox"/>	Currents	<input type="checkbox"/>	Gas Hydrate	<input checked="" type="checkbox"/>							
Abnormal Pressure	<input type="checkbox"/>	Fracture Zone	<input type="checkbox"/>	Diapir and Mud Volcano	<input type="checkbox"/>							
Man-made Objects (e.g. sea-floor cables, dump sites)	<input type="checkbox"/>	Fault	<input type="checkbox"/>	High Temperature	<input type="checkbox"/>							
H2S	<input type="checkbox"/>	High Dip Angle	<input type="checkbox"/>	Ice Conditions	<input type="checkbox"/>							
CO2	<input type="checkbox"/>											
Sensitive marine habitat (e.g. reefs, vents)												
Other: 1-3 pressure cores in each hole taken with the IODP PCS												

IODP Site Forms

Site Survey Detail

910-SRR2 for Site RGC-05C Submitted 2019-01-28 22:01:36

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 0277-0086 Position 4939
1b High resolution seismic reflection (crossing)	yes	Line: 0277-0205 Position 8877
2a Deep penetration seismic reflection (primary)	yes	Same as high-resolution seismic line
2b Deep penetration seismic reflection (crossing)	yes	Same as high-resolution seismic line
3 Seismic Velocity	yes	
4 Seismic Grid		
5a Refraction (surface)		
5b Refraction (bottom)		
6 3.5 kHz	yes	
7 Swath bathymetry	yes	Multibeam bathymetry with backscatter data
8a Side looking sonar (surface)		
8b Side looking sonar (bottom)		
9 Photography or video		
10 Heat Flow		
11a Magnetics		
11b Gravity		
12 Sediment cores		
13 Rock sampling		
14a Water current data		
14b Ice Conditions		
15 OBS microseismicity		
16 Navigation	yes	
17 Other		

IODP Site Forms

Environmental Protection

910-SRR2 for Site RGC-05C Submitted 2019-01-28 22:01:36

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to 200 mbsf, 1-3 PCS cores. Hole B: Same as Hole A . Hole C: Same as Hole A, log as shown on form #1
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	None known
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	None known
4. Indications of gas hydrates at this location	BSR at about 95 m below seafloor, nearby pockmarks have near-seafloor hydrates
5. Are there reasons to expect hydrocarbon accumulations at this site?	No
6. What "special" precautions will be taken during drilling?	Weighted mud to counteract possible gas flow in the borehole
7. What abandonment procedures need to be followed?	
8. Natural or manmade hazards which may affect ship's operations	
9. Summary: What do you consider the major risks in drilling at this site?	Possible gas beneath the base of the methane hydrate stability zone

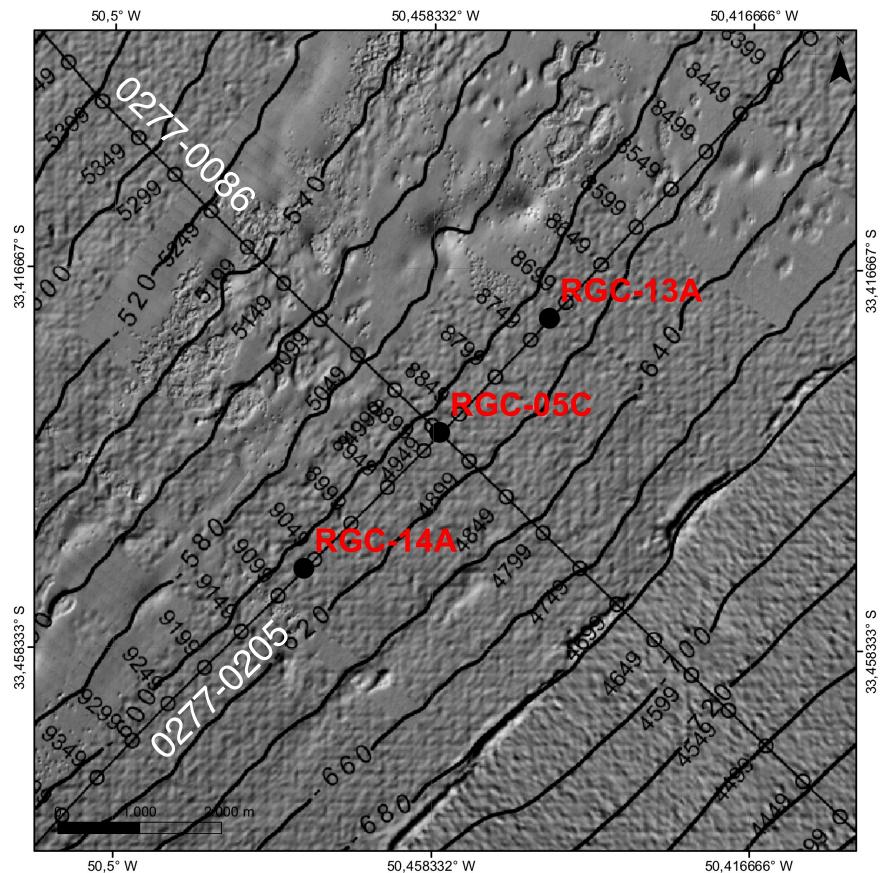
IODP Site Forms

Lithologies

910-SRR2 for Site RGC-05C Submitted 2019-01-28 22:01:36

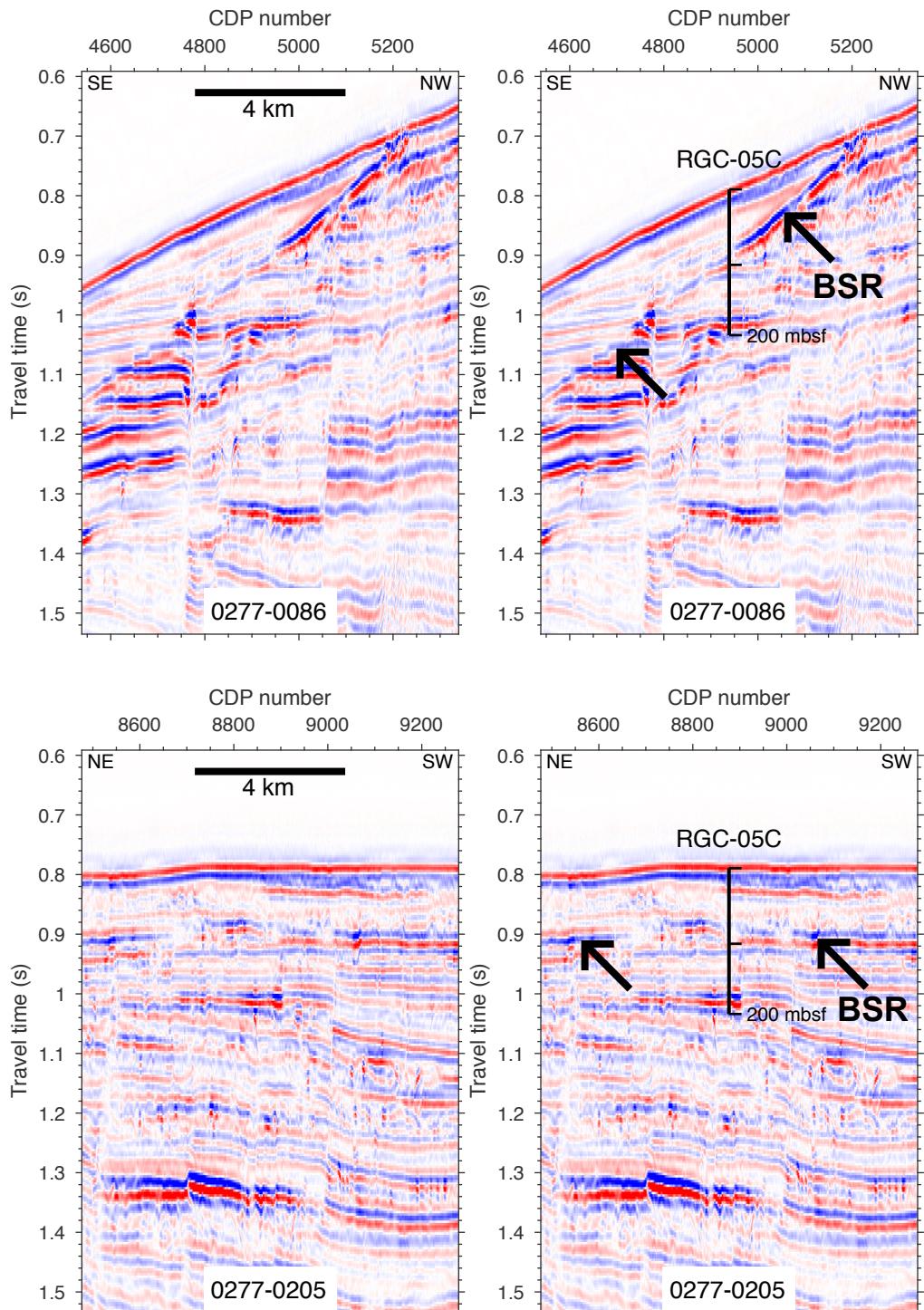
Subbottom depth (m)	Key reflectors, unconformities faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate(m/My)	Comments
0 - 200		1.8	1.6	Marine mud and mudstone with minor amounts of intercalated sand and sandstone		90	

IODP proposal 910-Full2
Site RGC-05C



Site RGC-05C
CDP 4939 on line 0277-0086
CDP 8877 on line 0277-0205
Lat. -33.43466 / Long. -50.45741
UTM 22S 550437.3 E / 6300393.4 N
Water depth 607 m
Penetration 200 m

Data files will be submitted to the SSDB
by the November 2018 deadline



IODP Site Forms

General Site Information

Section A: Proposal Information

Proposal Title:	Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)
Date Form Submitted:	2019-01-28 22:01:36
Site-Specific Objectives with Priority (Must include general objectives in proposal)	Alternate site with same site-specific objectives as RGC-05C.
List Previous Drilling in Area:	

Section B: General Site Information

Site Name:	RGC-13A		Area or Location:	Rio Grande Cone
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#:			Jurisdiction:	Brazil
Latitude:	-33.42207		Distance to Land (km):	200
Longitude:	-50.44317		Water Depth (m):	608
Coordinate System:	WGS 84			
Priority of Site:	Primary <input type="checkbox"/>	Alternate <input checked="" type="checkbox"/>		

Section C: Operational Information

Proposed Penetration (m):

Sediments	Basement	Total Sediment Thickness (m)	Total Penetration (m)
200	0	8000	200

General Lithologies:

Marine mud and mudstone with minor amounts of intercalated sand and sandstone	
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Coring Plan (Specify or check):

Hole A: APC to 200 mbsf, 1-3 PCS cores

Hole B: Same as Hole A

Hole C: Same as Hole A, log

APC XCB RCB Re-entry PCS

Wireline Logging Plan:

Standard Measurement		Special Tools	
Wireline Logging	<input checked="" type="checkbox"/>	Magnetic Susceptibility	<input type="checkbox"/>
Porosity	<input type="checkbox"/>	Borehole Temperature	<input type="checkbox"/>
Density	<input checked="" type="checkbox"/>	Formation Image (Acoustic)	<input type="checkbox"/>
Gamma Ray	<input checked="" type="checkbox"/>	VSP (walkaway)	<input type="checkbox"/>
Resistivity	<input checked="" type="checkbox"/>	LWD	<input type="checkbox"/>
Sonic (Δt)	<input checked="" type="checkbox"/>		
Formation Image (Res)	<input checked="" type="checkbox"/>		
VSP (zero offset)	<input type="checkbox"/>		
Formation Temperature & Pressure	<input type="checkbox"/>		
Other Measurements:		Other Tools:	

Estimated Days:

Drilling / Coring	Logging	Total On-Site
2.3	0.6	2.9

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan:

Potential Harzards/Weather:

Shallow Gas	<input checked="" type="checkbox"/>	Complicated Seabed Condition	<input type="checkbox"/>	Hydrothermal Activity	<input type="checkbox"/>	Preferred weather window: Austral summer-fall (October-April). Spring has high winds and winter high waves and currents.						
Hydrocarbon	<input type="checkbox"/>	Soft Seabed	<input type="checkbox"/>	Landslide and Turbidity Current	<input type="checkbox"/>							
Shallow Water Flow	<input type="checkbox"/>	Currents	<input type="checkbox"/>	Gas Hydrate	<input checked="" type="checkbox"/>							
Abnormal Pressure	<input type="checkbox"/>	Fracture Zone	<input type="checkbox"/>	Diapir and Mud Volcano	<input type="checkbox"/>							
Man-made Objects (e.g. sea-floor cables, dump sites)	<input type="checkbox"/>	Fault	<input type="checkbox"/>	High Temperature	<input type="checkbox"/>							
H2S	<input type="checkbox"/>	High Dip Angle	<input type="checkbox"/>	Ice Conditions	<input type="checkbox"/>							
CO2	<input type="checkbox"/>											
Sensitive marine habitat (e.g. reefs, vents)												
Other: 1-3 pressure cores in each hole taken with the IODP PCS												

IODP Site Forms

Site Survey Detail

910-SRR2 for Site RGC-13A Submitted 2019-01-28 22:01:36

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 0277-0090 Position 8856
1b High resolution seismic reflection (crossing)	yes	Line: 0277-0205 Position 8723
2a Deep penetration seismic reflection (primary)	yes	Same as high-resolution seismic line
2b Deep penetration seismic reflection (crossing)	yes	Same as high-resolution seismic line
3 Seismic Velocity	yes	
4 Seismic Grid		
5a Refraction (surface)		
5b Refraction (bottom)		
6 3.5 kHz	yes	
7 Swath bathymetry	yes	Multibeam bathymetry with backscatter data
8a Side looking sonar (surface)		
8b Side looking sonar (bottom)		
9 Photography or video		
10 Heat Flow		
11a Magnetics		
11b Gravity		
12 Sediment cores		
13 Rock sampling		
14a Water current data		
14b Ice Conditions		
15 OBS microseismicity		
16 Navigation	yes	
17 Other		

IODP Site Forms

Environmental Protection

910-SRR2 for Site RGC-13A Submitted 2019-01-28 22:01:36

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to 200 mbsf, 1-3 PCS cores. Hole B: Same as Hole A. Hole C: Same as Hole A, log as shown on form #1
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	None known
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	None known
4. Indications of gas hydrates at this location	BSR at about 87 m below seafloor, nearby pockmarks have near-seafloor hydrates
5. Are there reasons to expect hydrocarbon accumulations at this site?	No
6. What "special" precautions will be taken during drilling?	Weighted mud to counteract possible gas flow in the borehole
7. What abandonment procedures need to be followed?	
8. Natural or manmade hazards which may affect ship's operations	
9. Summary: What do you consider the major risks in drilling at this site?	Possible gas beneath the base of the methane hydrate stability zone

IODP Site Forms

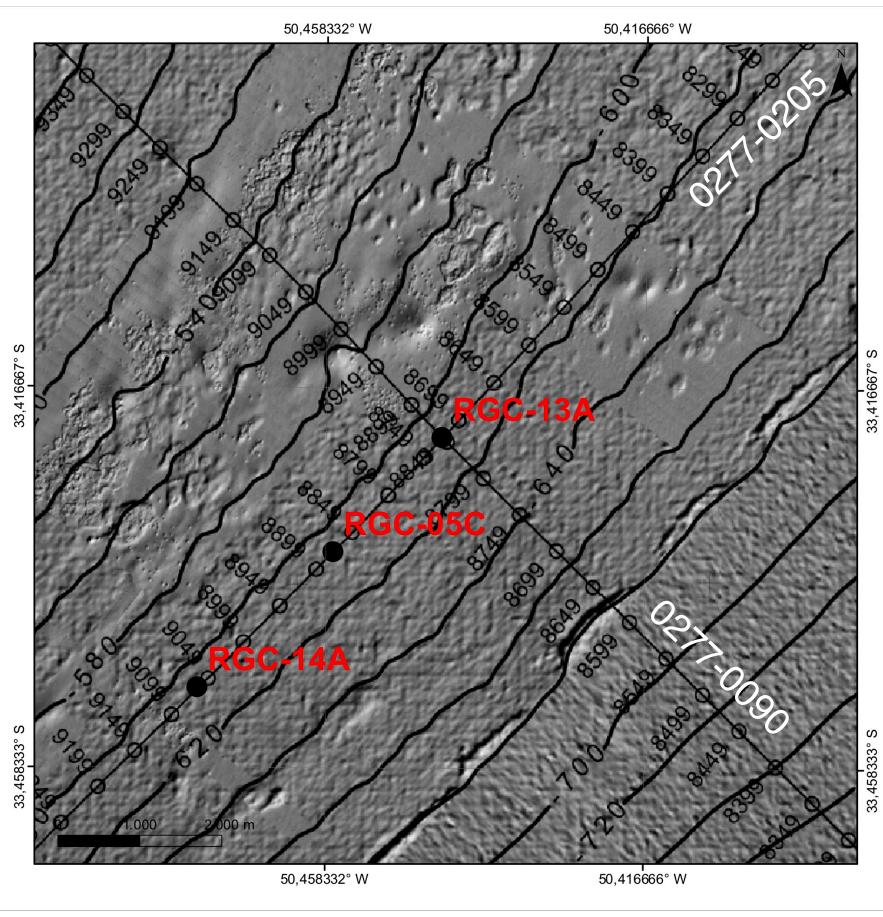
Lithologies

910-SRR2 for Site RGC-13A Submitted 2019-01-28 22:01:36

Subbottom depth (m)	Key reflectors, unconformities faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate(m/My)	Comments
0 - 200		1.8	1.6	Marine mud and mudstone with minor amounts of intercalated sand and sandstone		90	

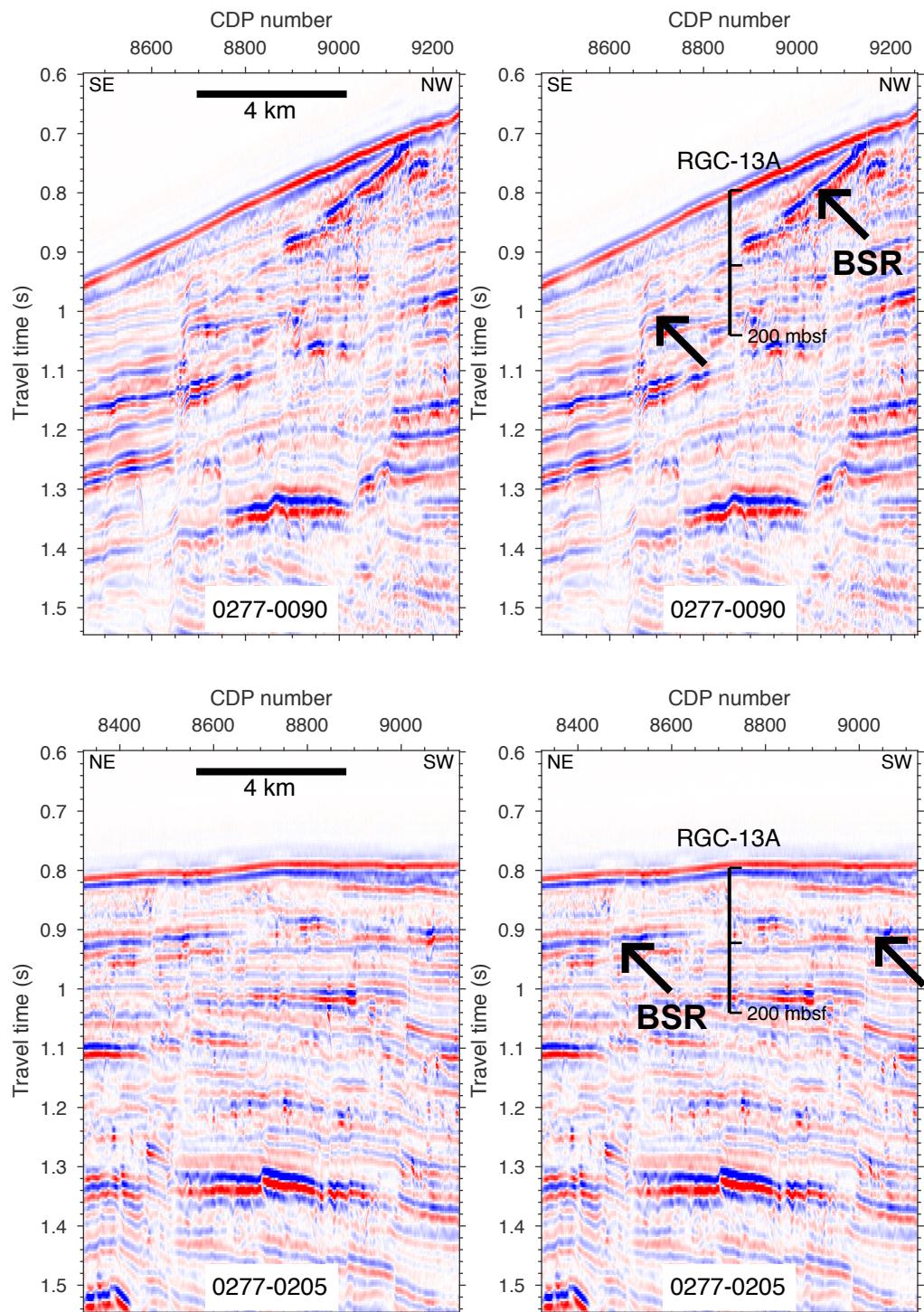
IODP proposal 910-Full2

Site RGC-13A



Site RGC-13A
 CDP 8856 on line 0277-0090
 CDP 8723 on line 0277-0205
 Lat. -33.42207 / Long. -50.44317
 UTM 22S 551768.1 E / 6301782.7 N
 Water depth 608 m
 Penetration 200 m

Data files will be submitted to the SSDB
 by the November 2018 deadline



IODP Site Forms

General Site Information

Section A: Proposal Information

Proposal Title:	Carbon cycling in methane-charged continental margin sediments: Rio Grande Cone (Brazil)
Date Form Submitted:	2019-01-28 22:01:36
Site-Specific Objectives with Priority (Must include general objectives in proposal)	Alternate site with same site-specific objectives as RGC-05C.
List Previous Drilling in Area:	

Section B: General Site Information

Site Name:	RGC-14A		Area or Location:	Rio Grande Cone
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#:			Jurisdiction:	Brazil
Latitude:	-33.44959		Distance to Land (km):	200
Longitude:	-50.47509		Water Depth (m):	607
Coordinate System:	WGS 84			
Priority of Site:	Primary <input type="checkbox"/>	Alternate <input checked="" type="checkbox"/>		

Section C: Operational Information

Proposed Penetration (m):

Sediments	Basement	Total Sediment Thickness (m)	Total Penetration (m)
200	0	8000	200

General Lithologies:

Marine mud and mudstone with minor amounts of intercalated sand and sandstone	
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Coring Plan (Specify or check):

Hole A: APC to 200 mbsf, 1-3 PCS cores Hole B: Same as Hole A Hole C: Same as Hole A, log	APC <input checked="" type="checkbox"/> XCB <input checked="" type="checkbox"/> RCB <input type="checkbox"/> Re-entry <input type="checkbox"/> PCS <input checked="" type="checkbox"/>
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Wireline Logging Plan:

Standard Measurement		Special Tools	
Wireline Logging	<input checked="" type="checkbox"/>	Magnetic Susceptibility	<input type="checkbox"/>
Porosity	<input type="checkbox"/>	Borehole Temperature	<input type="checkbox"/>
Density	<input checked="" type="checkbox"/>	Formation Image (Acoustic)	<input type="checkbox"/>
Gamma Ray	<input checked="" type="checkbox"/>	VSP (walkaway)	<input type="checkbox"/>
Resistivity	<input checked="" type="checkbox"/>	LWD	<input type="checkbox"/>
Sonic (Δt)	<input checked="" type="checkbox"/>		
Formation Image (Res)	<input checked="" type="checkbox"/>		
VSP (zero offset)	<input type="checkbox"/>		
Formation Temperature & Pressure	<input type="checkbox"/>		
Other Measurements:		Other Tools:	

Estimated Days:

Drilling / Coring	Logging	Total On-Site
2.3	0.6	2.9

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan:

Potential Harzards/Weather:

Shallow Gas	<input checked="" type="checkbox"/>	Complicated Seabed Condition	<input type="checkbox"/>	Hydrothermal Activity	<input type="checkbox"/>	Preferred weather window: Austral summer-fall (October-April). Spring has high winds and winter high waves and currents.						
Hydrocarbon	<input type="checkbox"/>	Soft Seabed	<input type="checkbox"/>	Landslide and Turbidity Current	<input type="checkbox"/>							
Shallow Water Flow	<input type="checkbox"/>	Currents	<input type="checkbox"/>	Gas Hydrate	<input checked="" type="checkbox"/>							
Abnormal Pressure	<input type="checkbox"/>	Fracture Zone	<input type="checkbox"/>	Diapir and Mud Volcano	<input type="checkbox"/>							
Man-made Objects (e.g. sea-floor cables, dump sites)	<input type="checkbox"/>	Fault	<input type="checkbox"/>	High Temperature	<input type="checkbox"/>							
H2S	<input type="checkbox"/>	High Dip Angle	<input type="checkbox"/>	Ice Conditions	<input type="checkbox"/>							
CO2	<input type="checkbox"/>											
Sensitive marine habitat (e.g. reefs, vents)												
Other: 1-3 pressure cores in each hole taken with the IODP PCS												

IODP Site Forms

Site Survey Detail

910-SRR2 for Site RGC-14A Submitted 2019-01-28 22:01:36

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 0277-0080 Position 1415
1b High resolution seismic reflection (crossing)	yes	Line: 0277-0205 Position 9063
2a Deep penetration seismic reflection (primary)	yes	Same as high-resolution seismic line
2b Deep penetration seismic reflection (crossing)	yes	Same as high-resolution seismic line
3 Seismic Velocity	yes	
4 Seismic Grid		
5a Refraction (surface)		
5b Refraction (bottom)		
6 3.5 kHz	yes	
7 Swath bathymetry	yes	Multibeam bathymetry with backscatter data
8a Side looking sonar (surface)		
8b Side looking sonar (bottom)		
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10 Heat Flow		
11a Magnetics		
11b Gravity		
12 Sediment cores		
13 Rock sampling		
14a Water current data		
14b Ice Conditions		
15 OBS microseismicity		
16 Navigation	yes	
17 Other		

IODP Site Forms

Environmental Protection

910-SRR2 for Site RGC-14A Submitted 2019-01-28 22:01:36

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to 200 mbsf, 1-3 PCS cores. Hole B: Same as Hole A. Hole C: Same as Hole A, log as shown on form #1
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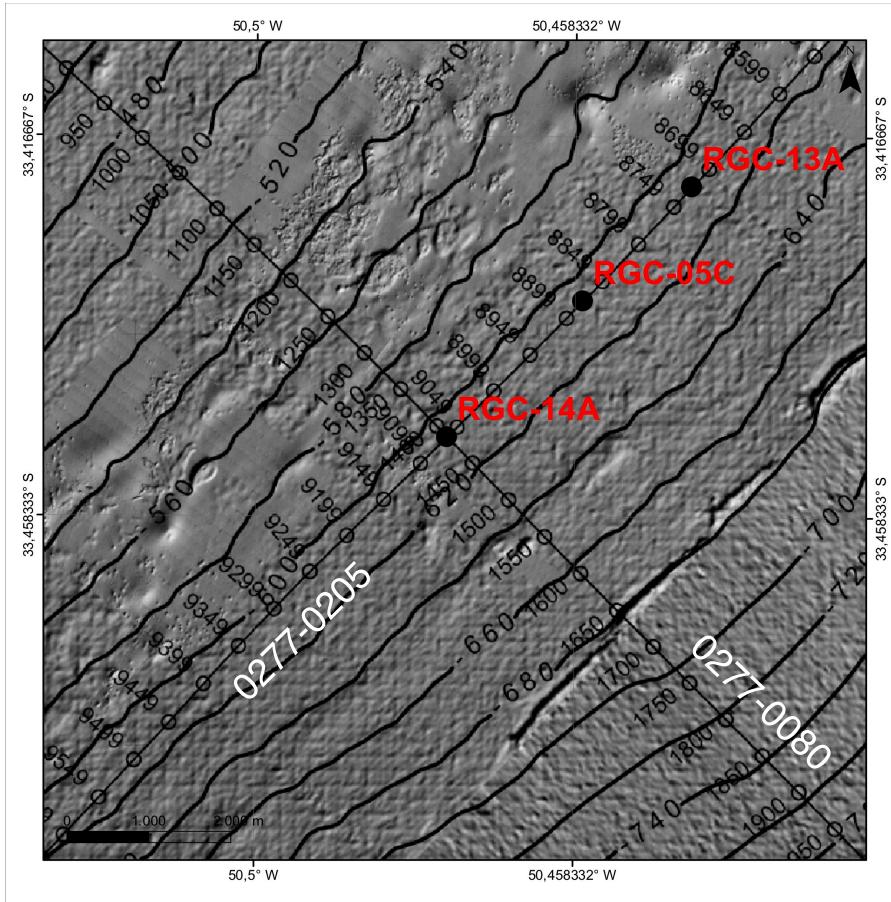
IODP Site Forms

Lithologies

910-SRR2 for Site RGC-14A Submitted 2019-01-28 22:01:36

Subbottom depth (m)	Key reflectors, unconformities faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate(m/My)	Comments
0 - 200		1.8	1.6	Marine mud and mudstone with minor amounts of intercalated sand and sandstone		90	

IODP proposal 910-Full2
Site RGC-14A



Site RGC-14A
CDP 1415 on line 0277-0080
CDP 9063 on line 0277-0205
Lat. -33.44959 / Long. -50.47509
UTM 22S 548785.2 E / 6298746.3 N
Water depth 607 m
Penetration 200 m

Data files will be submitted to the SSDB
by the November 2018 deadline

