ODP *Proceedings, Scientific Results*, Volume 164: Chapter 25: Figure 1. Seismic transect across the Blake Ridge overlain by symbols indicating direct observation of gas hydrate and indicators of gas hydrate dissociation. In addition, downhole logging measurements, in situ gas concentrations, and pore-water chlorinity concentrations are plotted as lines with depth. Interpretative horizons and zones are inferred from a synthesis of these observations.

w incorporated in gas h

ation of core

v

wnhole-log

Shotpoints 780 750 700 650 600 550 500 450 400 390

USGS Line 95-1

994

Resistivity (Ωm) 0.6 0.8 1 1.2 1.4 1.5
Porosity (%) 45 55 65 75
Acoustic velocity (km/s) 1.4 1.5 1.6 1.7 1.8 1.9 2
2799 mbsl
100 mbsf
TD 703.5

995

Resistivity (Ωm) 0.6 0.8 1 1.2 1.4 1.5
Porosity (%) 45 55 65 75
Acoustic velocity (km/s) 1.4 1.5 1.6 1.7 1.8 1.9 2
2778 mbsl
100 mbsf
TD 704.6

997

Resistivity (Ωm) 0.6 0.8 1 1.2 1.4 1.5
Porosity (%) 45 55 65 75
Acoustic velocity (km/s) 1.4 1.5 1.6 1.7 1.8 1.9 2
2770 mbsl
100 mbsf
TD 750.7

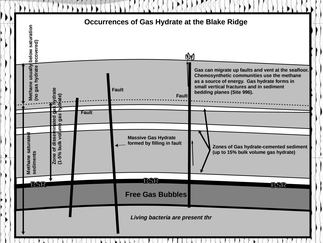
Crest of the Blake Ridge

Depth (meters below sea level) 2800 2900 3000 3100 3200 3300 3400 3500 3600

Methane Saturation
Pressure Coring System in situ gas (995-997 avg.)
0 0.5 1 1.5 2
(mol/L) pore space

BSR
Predicted Base of Gas Hydrate Stability
Free Gas Zone
fault-filling gas h
ydrate

Chlorinity (mM) 400 440 480 520 560
VSP Velocity (m/s) 1400 1500 1600 1700 1800 1900



Distance 1000-m intervals

Legend

Do

Coring method

Acoustic velocity (km/s) 1.4 1.5 1.6 1.7 1.8 1.9 2
Porosity (%) 45 55 65 75
Resistivity (Ωm) 0.6 0.8 1 1.2 1.4 1.5

Interpretive horizons

VSP Velocity (m/s) 1400 1500 1600 1700 1800 1900
Pore-Water Chlorinity (mM) 400 440 480 520 560

Direct obser

GH Recovered gas hydrate

S Soupy sediment (excess water from dissociated gas hydrate)

TA Core temperature anomaly (endothermic reaction of gas hydrate dissociation)

XCB|APC - Advanced piston corer

XCB|APC - Extended core barrel

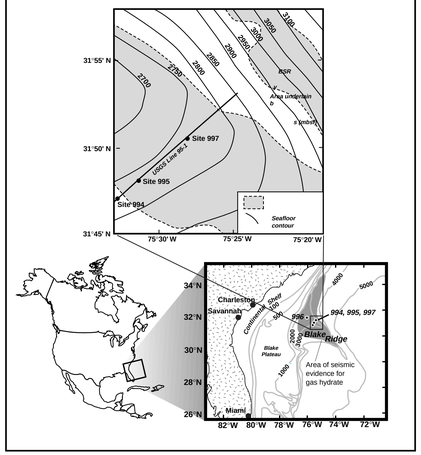
Inferred gas hydrate

Horizons based on:
- -Observed gas hydrate
- -Observed soupy sediments
- -Downhole logging
- -Chlorinity anomalies
- -Temperature anomalies

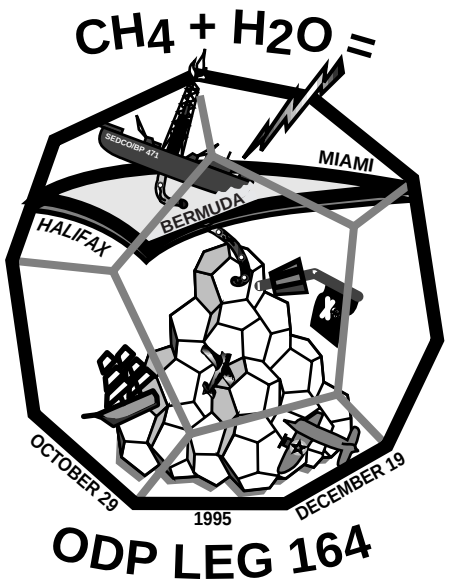
BGHS (Base of gas hydrate stability)
(Based on observed borehole temperatures)

Free gas zones
(Based on VSP, PCS gas concentration, and the BSR)

Location



ODP *Proceedings, Scientific Results,* Volume 164: Chapter 25: Figure 1. Seismic transect across the Blake Ridge overlain by symbols indicating direct observation of gas hydrate and indicators of gas hydrate dissociation. In addition, downhole logging measurements, in situ gas concentrations, and pore-water chlorinity concentrations are plotted as lines with depth. Interpretative horizons and zones are inferred from a synthesis of these observations.



780 750 700

2.60

994

Resistivity (Ωm)

0.6 0.8 1 1.2 1.4 1.5

Porosity (%)

45 55 65 75

Acoustic velocity (km/s)

1.4 1.5 1.6 1.7 1.8 1.9 2

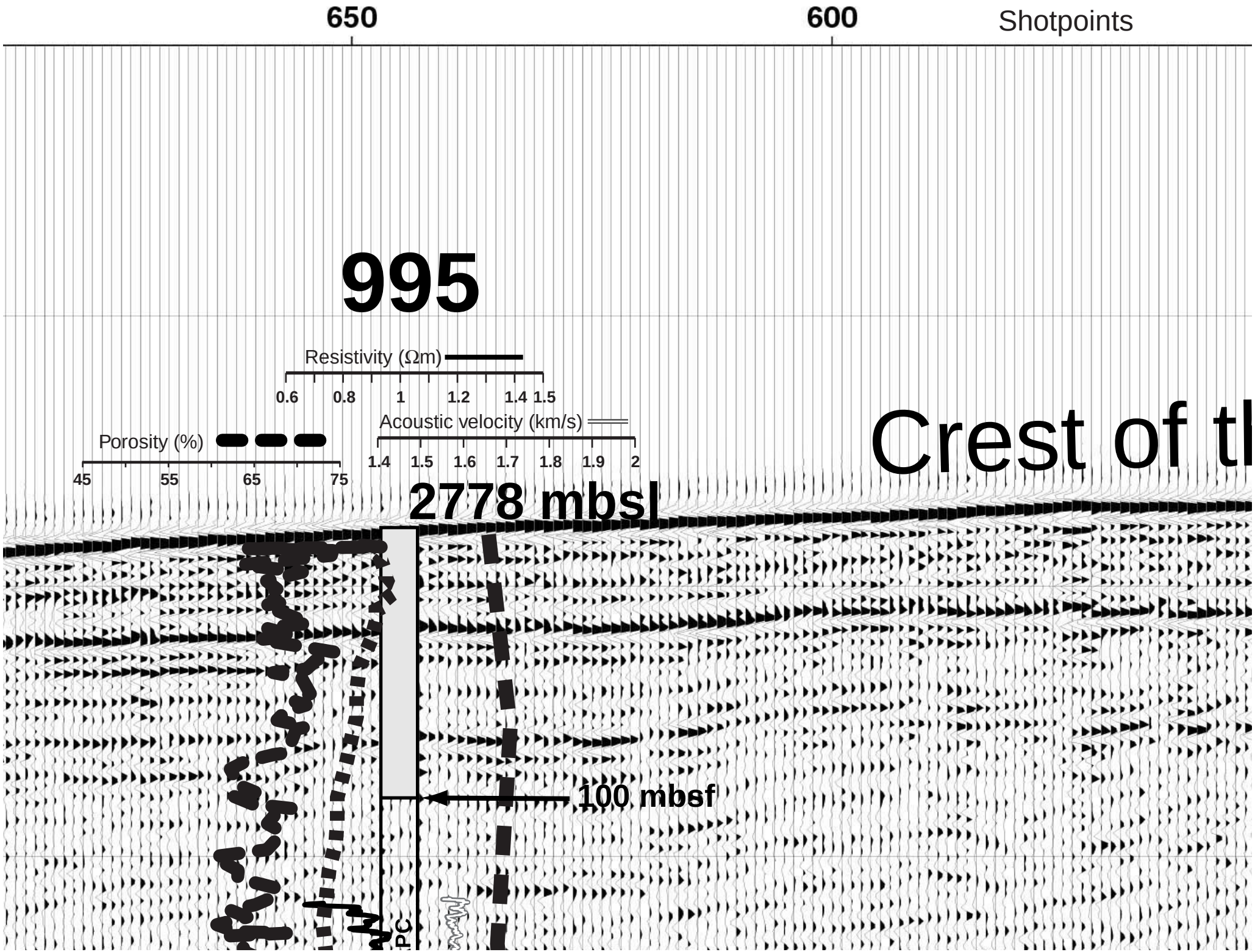
2799 mbsl

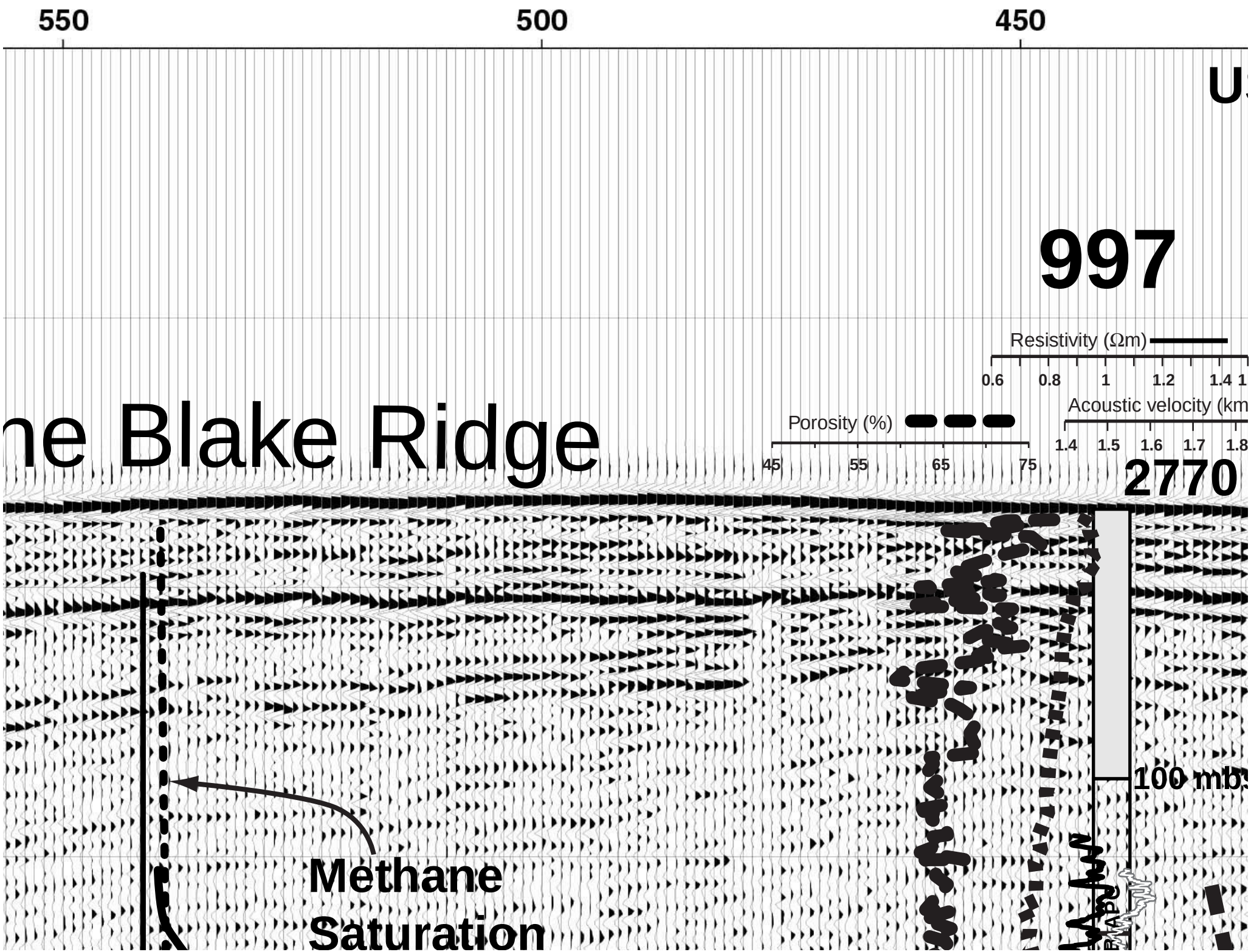
2800

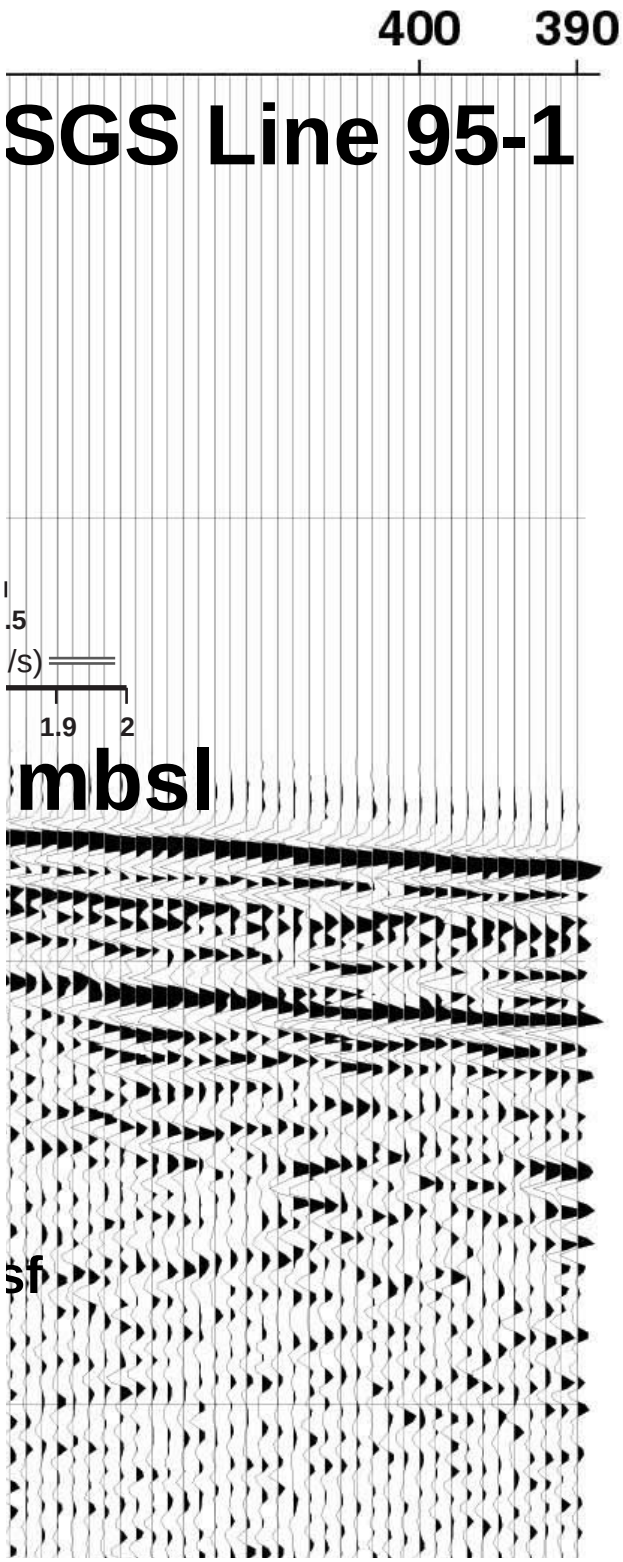
S

2900

100 mbsf


650
600
Shotpoints
995
Resistivity (Ωm)
0.6
0.8
1
1.2
1.4
1.5
Acoustic velocity (km/s)
1.4
1.5
1.6
1.7
1.8
1.9
2
Porosity (%)
45
55
65
75
Crest of tl
2778 mbsl
100 mbsf
PC


550
500
450
997
Resistivity (Ωm)
0.6
0.8
1
1.2
1.4
Porosity (%)
45
55
65
75
Acoustic velocity (km
1.4
1.5
1.6
1.7
1.8
2770
ne Blake Ridge
100 mb
Methane
Saturation



Legend

Downhole-logging measurements

Acoustic velocity (km/s)

1.4 1.5 1.6 1.7 1.8 1.9 2

Porosity (%)

45 55 65 75

Resistivity (Ωm)

0.6 0.8 1 1.2 1.4 1.5

Vertical seismic velocity measurement

VSP Velocity (m/s)

1400 1500 1600 1700 1800 1900

Core and sample measurements

Pore-Water Chlorinity (mM)

400 440 480 520 560

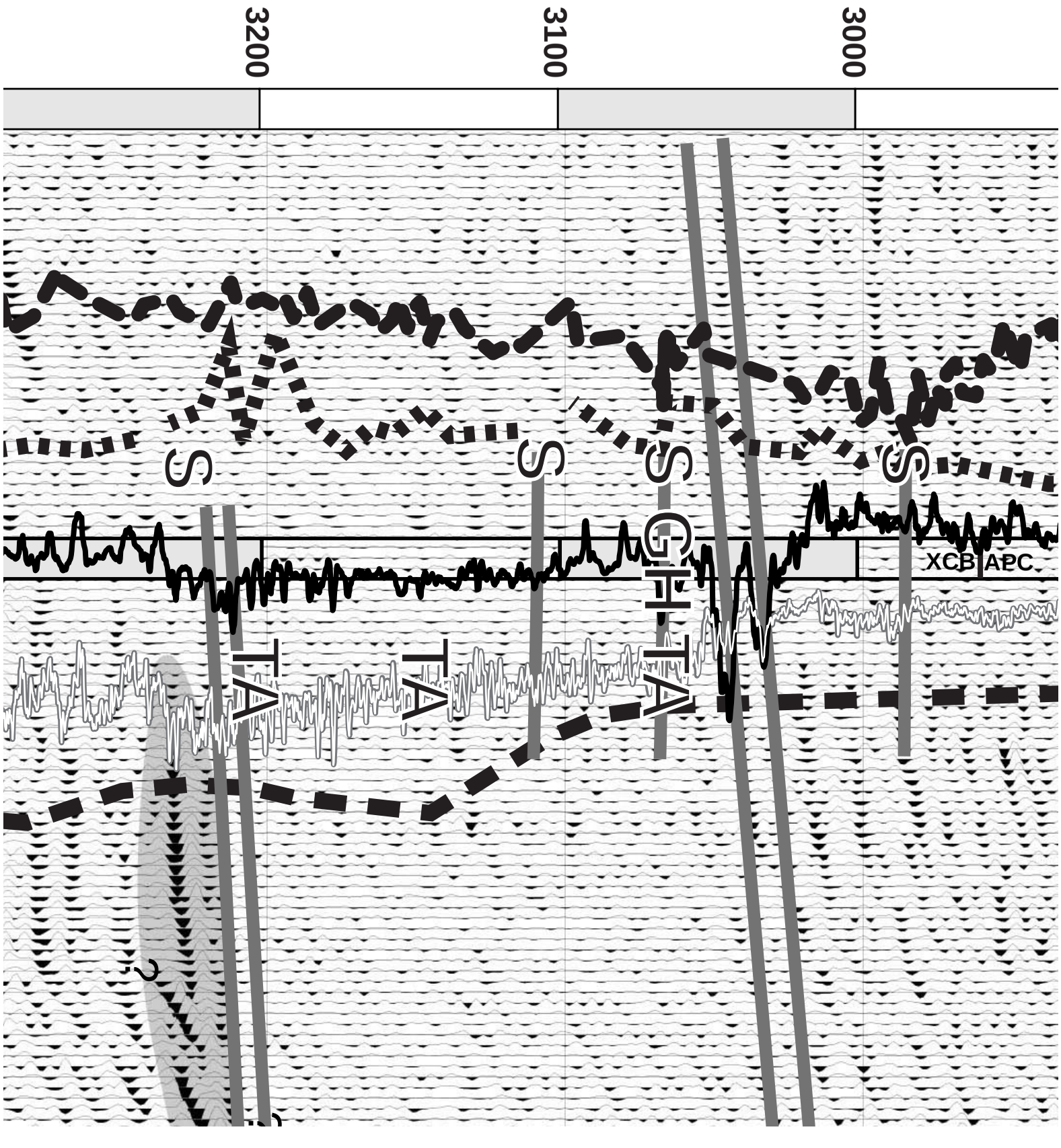
Direct observation of core

GH Recovered gas hydrate

S Soupy sediment (excess water from dissociated gas hydrate)

TA Core temperature anomaly

th (meters below sea level)



XCBA
S
TA
TA
TA
S
S
S GH TA
TA
BSR
?
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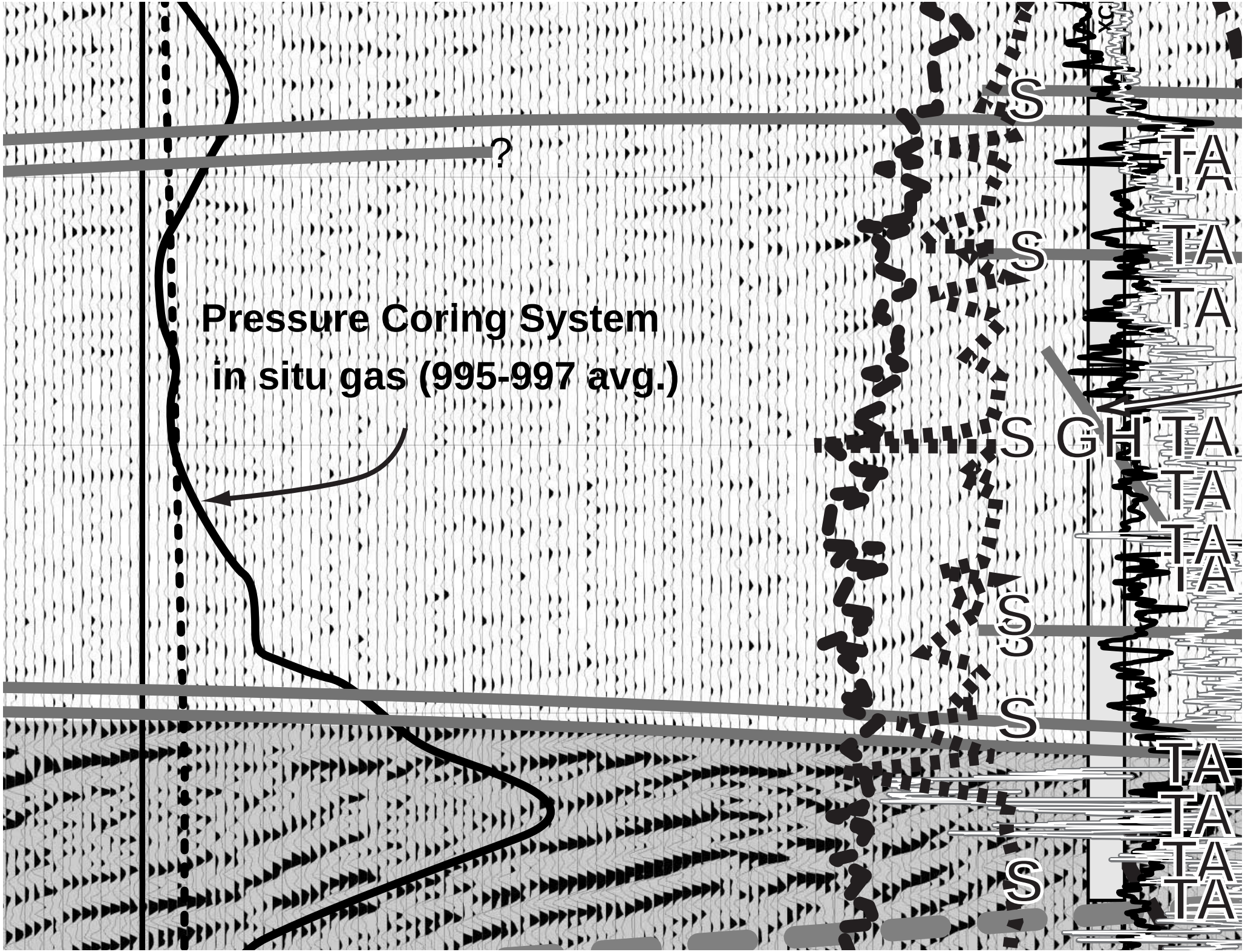
?


?
Pressure Coring System
in situ gas (995-997 avg.)
S
S
S GH
S
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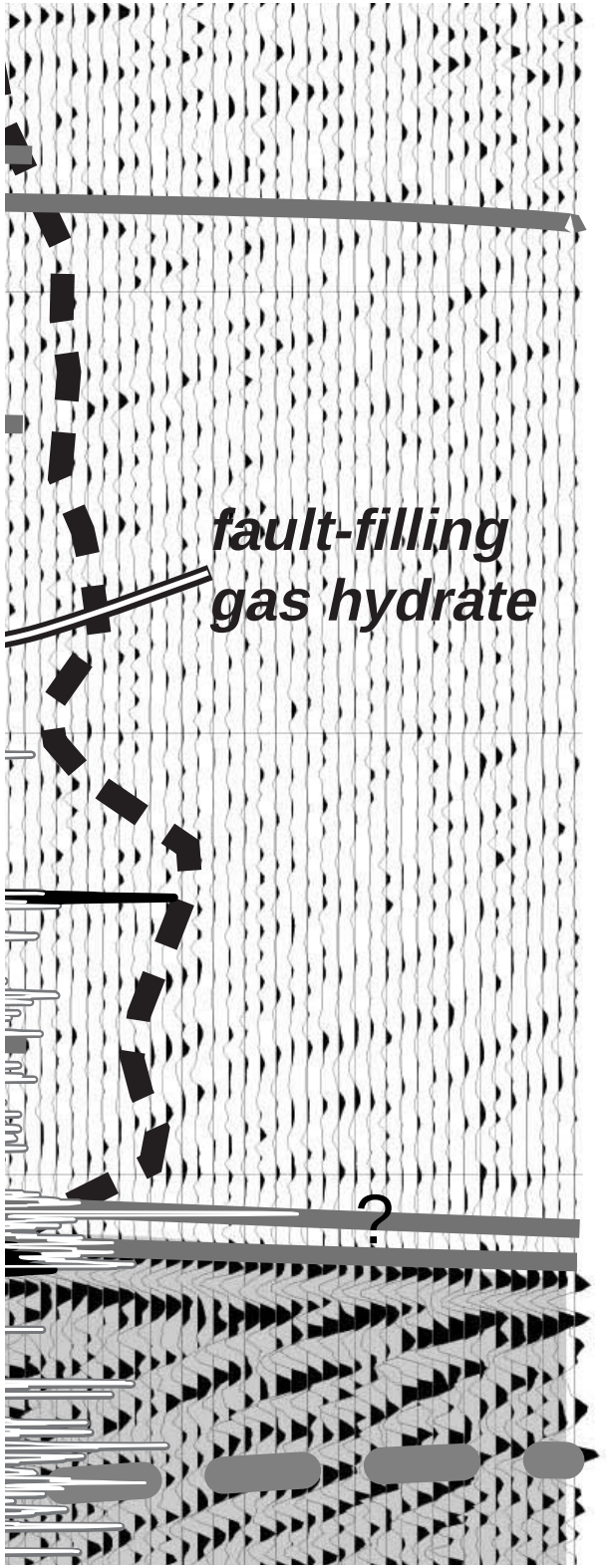
S
TA
TA
TA
TA
TA
TA
TA
TA
TA
TA



(endothermic reaction of
gas hydrate dissociation)

Coring method

XCB|APC

- **Advanced piston corer**
- **Extended core barrel**

Interpretive horizons

Inferred gas hydrate

Horizons based on:

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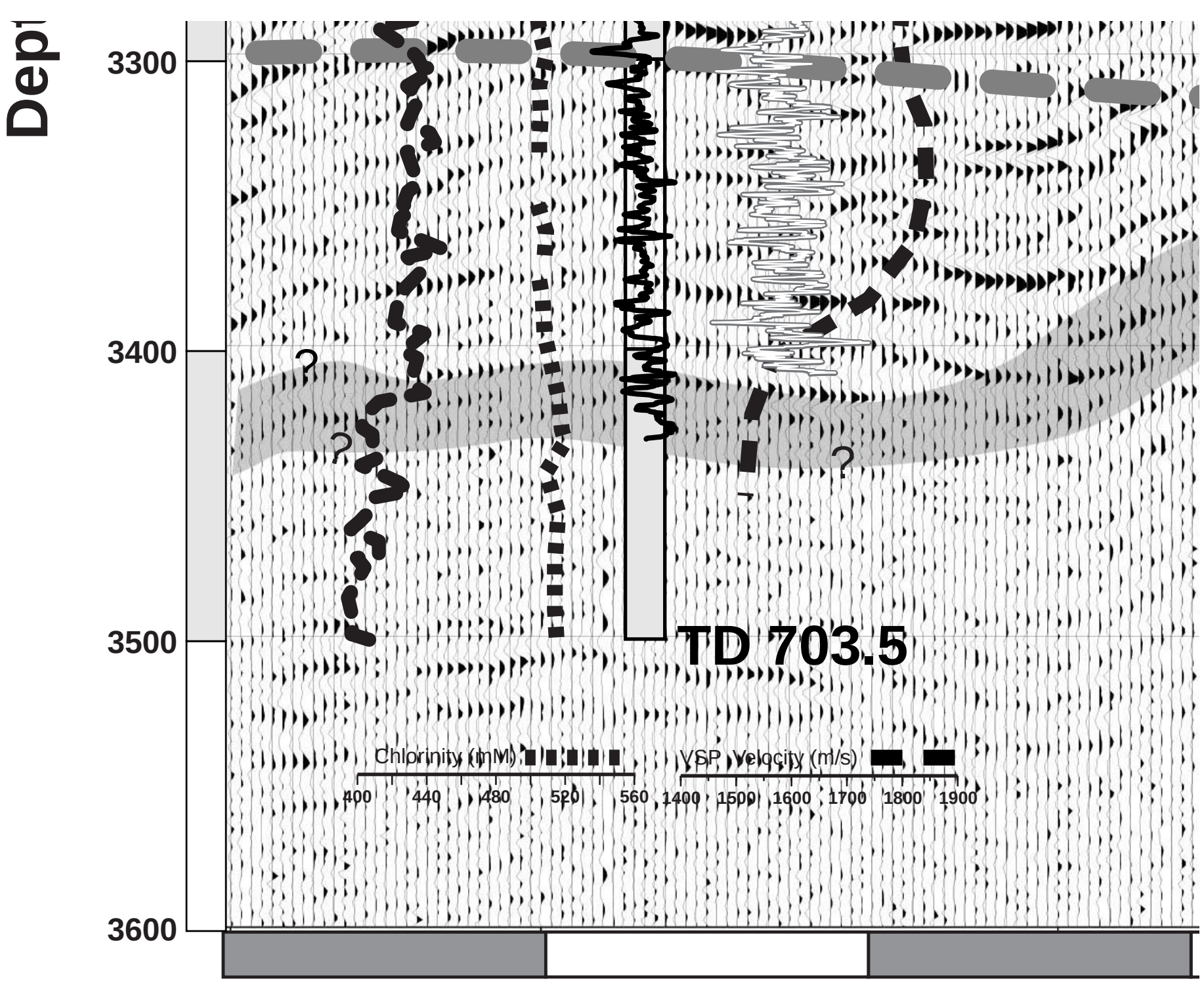
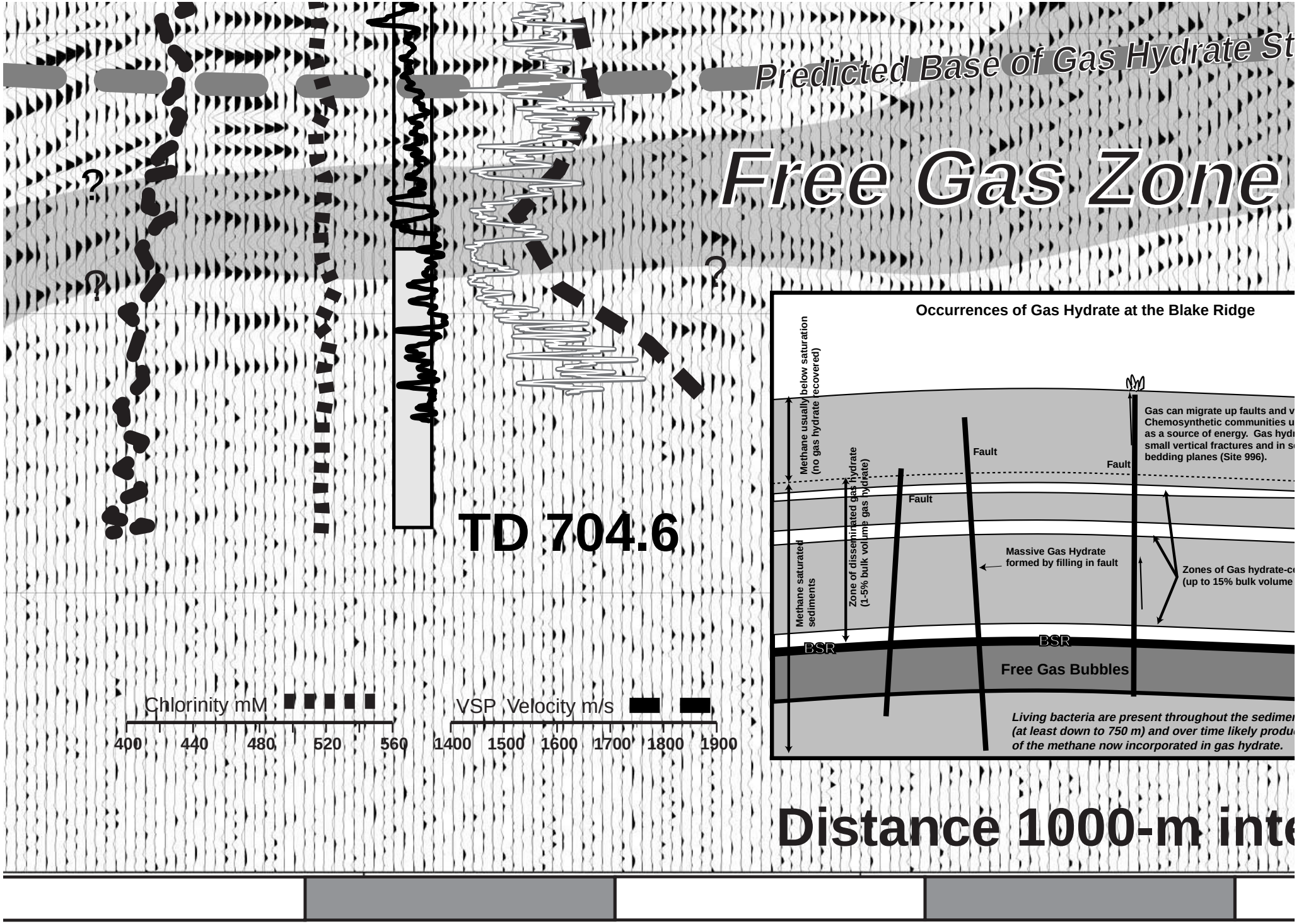
- **-Observed soupy sediments**
- **-Downhole logging**
- **-Chlorinity anomalies**
- **-Temperature anomalies**

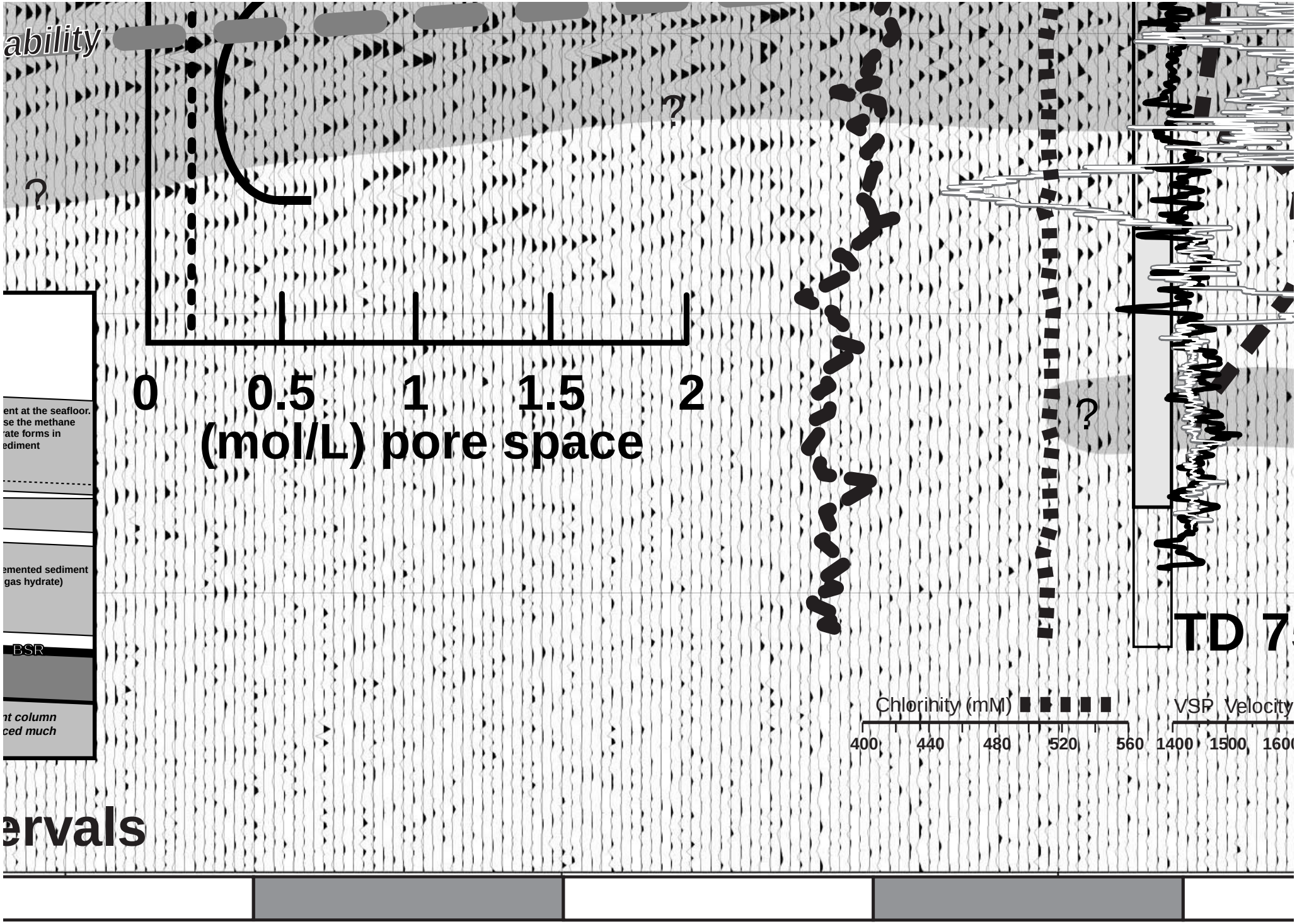
BGHS (Base of gas hydrate stability)
(Based on observed borehole temperatures)

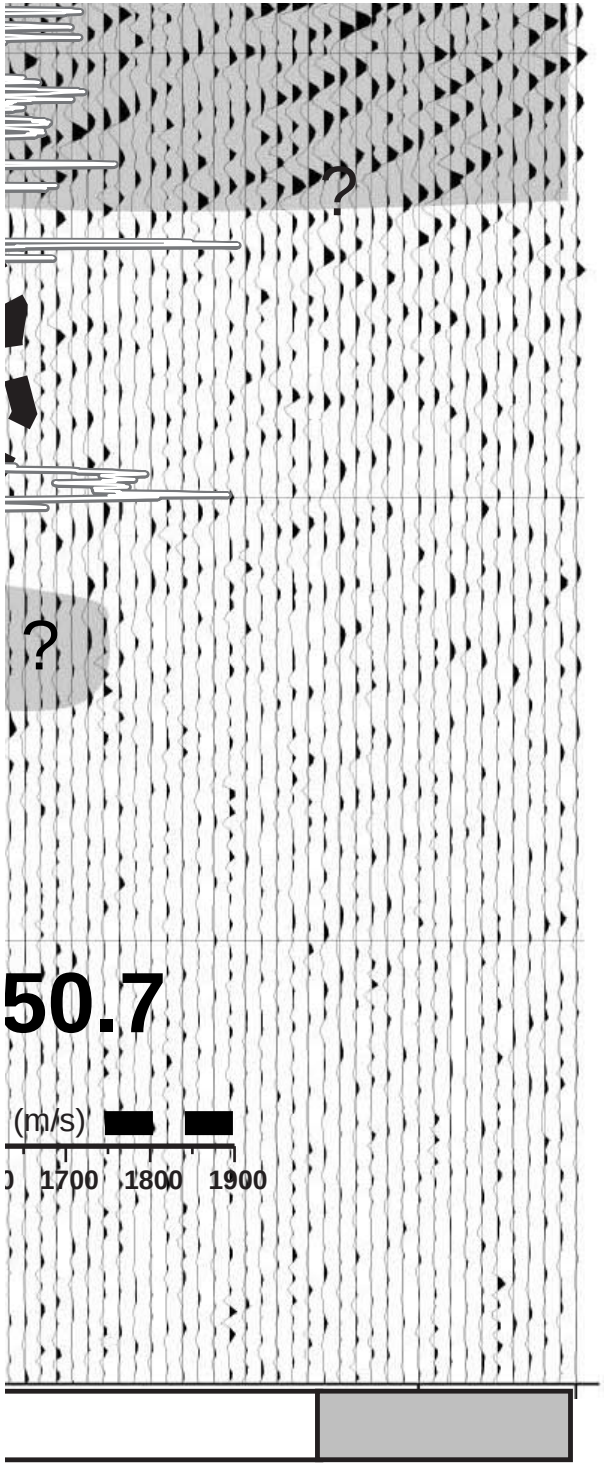
Free gas zones
(Based on VSP, PCS gas concentration, and the BSR)

Location


Dept
3300
3400
3500
3600
?
?
?
TD 703.5
Chlorinity (mM)
400
440
480
520
560
VSP Velocity (m/s)
1400
1500
1600
1700
1800
1900


Predicted Base of Gas Hydrate St
Free Gas Zone
?
?
?
TD 704.6
Chlorinity mM
400
440
480
520
560
VSP Velocity m/s
1400
1500
1600
1700
1800
1900
Occurrences of Gas Hydrate at the Blake Ridge
Methane usually below saturation (no gas hydrate recovered)
Gas can migrate up faults and v
Chemosynthetic communities u
as a source of energy. Gas hydr
small vertical fractures and in s
bedding planes (Site 996).
Fault
Fault
Fault
Zone of disseminated gas hydrate (1-5% bulk volume gas hydrate)
Methane saturated sediments
Massive Gas Hydrate formed by filling in fault
Zones of Gas hydrate-c
(up to 15% bulk volume
BSR
BSR
Free Gas Bubbles
Living bacteria are present throughout the sedimen
(at least down to 750 m) and over time likely produ
of the methane now incorporated in gas hydrate.
Distance 1000-m inte


ability
?
?
?
0
0.5
1
1.5
2
(mol/L) pore space
ent at the seafloor.
se the methane
ate forms in
ediment
emented sediment
gas hydrate)
BSR
nt column
ced much
TD 7
Chlorinity (mM)
400
440
480
520
560
VSP Velocity
1400
1500
1600
ervals


?
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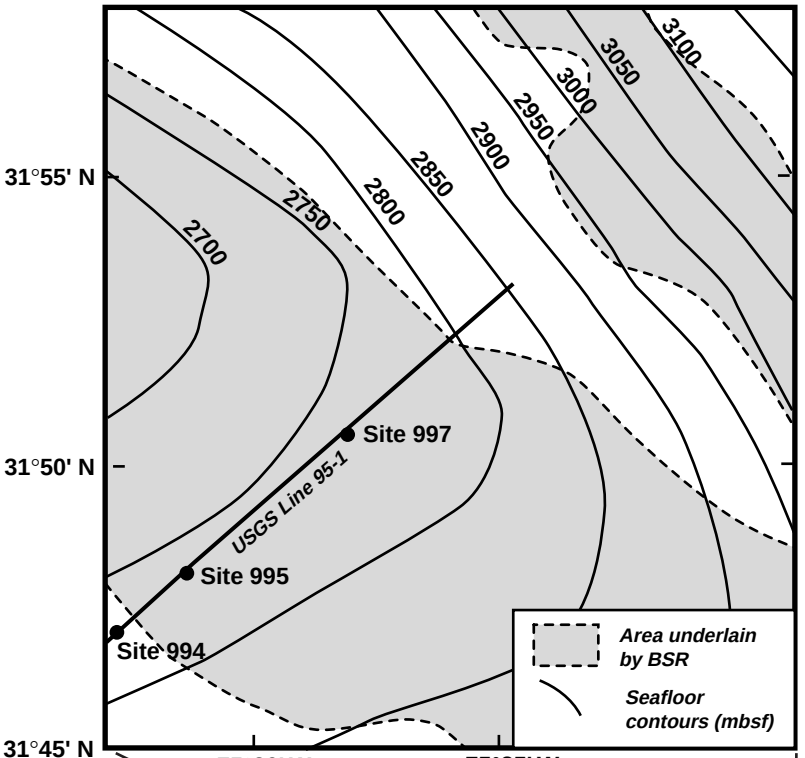
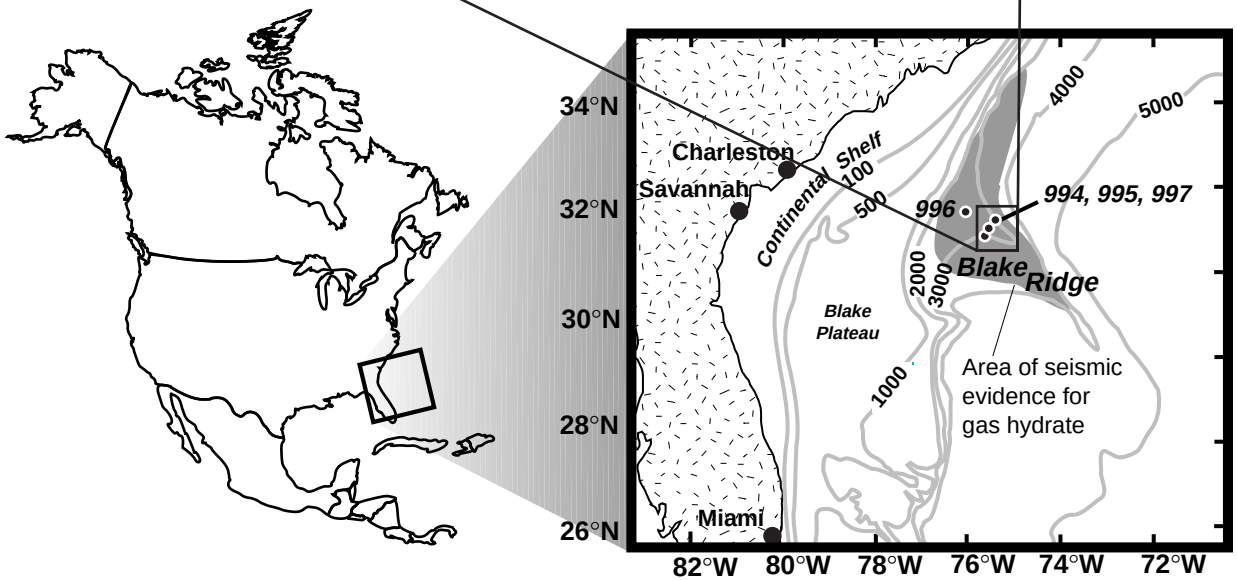
50.7
(m/s)
1700
1800
1900


31°55' N
31°50' N
31°45' N
75°30' W
75°25' W
75°20' W
2700
2750
2800
2850
2900
2950
3000
3050
3100
Site 997
Site 995
Site 994
USGS Line 95-1
Area underlain by BSR
Seafloor contours (mbsf)


34°N
32°N
30°N
28°N
26°N
82°W
80°W
78°W
76°W
74°W
72°W
Charleston
Savannah
Miami
Continental Shelf
100
500
1000
2000
3000
4000
5000
996
994, 995, 997
Blake Ridge
Blake Plateau
Area of seismic evidence for gas hydrate