# Supra-Salt Stacked Condensed Sections (SCS): Potential Indicators of Subsalt Stratigraphy*

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## Abstract

The development and understanding of allochthonous salt sheets has been the focus of intense scientific (McGuinness and Hossack, 1993, and others) and economic (Moore and Brooks, 1995) interest in recent years. Concurrently enhanced techniques in biostratigraphic analysis have advanced the comprehension of depositional and structural interaction to a level of greater precision. Depositional sequences of clastic sediments can be identified by the occurrence of bioevents and abundance patterns (Armentrout and Clement[1990] and others) in microfossil assemblages. Recognition and correlation of these patterns can be translated into useful techniques of subsalt stratigraphic prediction.

Reservoir prediction is a critically important component of subsalt petroleum exploration. It is dependent upon paleoenvironments of deposition, structural development (both pre- and post-salt sheet emplacement), and the impact of salt movement upon sediment transport fairways. This interaction of salt tectonism and sedimentation creates complex systems of potential subsalt hydrocarbon traps.

Over thirty wells have now penetrated allochthonous salt sheets on the offshore Louisiana and Texas continental shelf and slope and have encountered significant thicknesses of subsalt sedimentary section (Moore and Brooks, 1995). In addition, several hundred wells have been drilled into the tops of these sheets, yielding not only useful salt sheet well control, but also delineating useful stratigraphic information which can be used to interpret salt mechanics and subsalt stratigraphy. Most of these wells contain non-condensed normal sedimentary sections deposited during the evacuation of the salt after sheet emplacement. These sections are often expanded intervals associated with large regional listric faults and have been laterally displaced over significant distances on a decollement surface along the top of the sheet. However, in upwards of forty of these salt top wellbores, multiple condensed sections, stacked conformably in thin sequences on top of each other, are encountered in various thicknesses above the salt. Each of these condensed sections represents a time period of slow sediment accumulation marking an extended period of hemipelagic sedimentation. It is important to realize the significant time period represented by these thin stratigraphic intervals. Often four or five of these condensed sections, representing approximately 2-3 million years (Paleo Data, 1992), are encountered stacked on top of each other above the top of salt, and they represent a period of minimal clastic deposition. These intervals can be termed as stacked or mega-condensed sections, and their occurrence offers an opportunity to better understand both the suprasalt and subsalt stratigraphy. They are unique and offer an invaluable point of stratigrapahic control when encountered.

Within the wells that penetrated the top of salt and subsalt wells, at least four types of supra-salt sequence occurrences are evident. They are: 1) stacked condensed sections conformably deposited upon and coupled to the salt (coupled SCS), 2) stacked condensed sections that have decoupled from, and extended along, the top of the salt (decoupled SCS) as a unit, 3) coupled or decoupled normal thicknesses of individual sequences resting

conformably upon the salt, and 4) coupled or decoupled normal sequences that are significantly younger than the surrounding salt flank intervals, suggesting subaqueous erosion, non-deposition, or overthrusting.

Thus, three scenarios exist for the age relationship between supra-and subsalt sediments. First, a large sedimentary time gap may be present. This most often occurs along the updip edge of salt sheets where a large listric fault system formed above the salt. Second, the section can be conformable with little apparent missing section. Third, a prominent repeated section can occur when a stacked condensed section is present above the salt sheet. These repeated sections are of primary interest in understanding subsalt stratigraphy.

The most notable repeated sections occur in the publicly released South Marsh Island 200 #1 and Vermilion 356 #1 wells, but several other unreleased wells have also encountered repeated section (McGuinness and Hossack, 1993). All of these wells encountered stacked, condensed sections above salt and then penetrated subsalt time equivalent sediments that were from five to ten times as thick as the supra-salt sediments. In each of these two released wellbores, at least one of the repeated subsalt sedimentary sequences contained thick reservoir quality sandstone.

McGuinness and Hossack (1993) concluded that repeat sections demonstrated the extrusive glacier model of sheet development. They stated that these sediments can only be translated laterally with the sheet as it lengthens and they could not be preserved during sill-styled injection. These initial supra-salt sediments are deposited on sheet inflated highs, which minimizes the deposition of significant sediment thicknesses above the salt.

This is evidenced in models of supra-salt,bypassed-sand deposition from Simmons and Bryant (1992) on the modern day salt-supported continental slope. High resolution sonar-derived physiographic images demonstrate intrabasinal paleo structures underlain by inflating salt structures. These structures have only thin layers of subparallel sediments on top and are surrounded by deep interlobal and supralobal mini-slope basins filled with thick sand-rich sediments (i.e., Keathley Canyon 255 and Green Canyon 908 wells). Subsequent periods of salt canopy remobilization can extend the sheet fronts and edges over an ancestral mini-basin, carrying the equivalently aged, thin-stacked condensed secions (SCS) with it. It is significant that these thick sands encountered beneath salt are deposited in a lower bathyal (or deeper) paleoenvironment, which appears similar to some recently detailed accounts for significant deepwater GOM discoveries (Mahaffie, 1994; McGee, 1994). Sand-rich subsalt sediments can thus be penetrated after identifying the positions of the updip depocenters and upper slope fairways from where sediments can be transported downdip to lower slope-abyssal depocenters.

McGuinness and Hossack (1993) demonstrated a reconstruction-dependent method of subsalt age-prediction in which sediment extension was equivalent to sheet lengthening and the translational fault extension could be used to determine the footwall cutoff "by measuring back from the hangwall cutoff on top of the sheet a distance equal to the amount of extension." This is not always easily determined in the contorted, deeply buried salt environment of the present-day shelf and upper slope, but is a refined valid reconstructive technique, and reconstructions are useful in fully understanding these sediment/salt relationships.

## Conclusion

In conclusion, when stacked condensed sections are penetrated by wellbores directly above the top of an allochthonous salt sheet, limited subsalt biostratigraphic evidence demonstrates that the stacked condensed time section may be encountered in a repeated and thicker section of subsalt sediments. The subsalt section has a greater propensity for sand because of the ancestral paleotopographic relief associated with the salt sheet which results in sand-prone sediment-gravity deposits to bypass the inflated salt highs and accumulate in the basins surrounding salt scarp edges and fronts. Wellbores have confirmed these scenarios and suggest favorable conditions for subsalt sand deposition. It is important that subsalt explorers recognize stacked condensed sections (SCS) and implement these concepts in the future wells of the play. A significant thickness (4000+ ft) of subsalt section needs to be penetrated in future subsalt wells to adequately evaluate trapping opportunities below the salt in multiple sand potential sequences indicated by stacked condensed sections above the salt.

# SUPRA-SALT STACKED CONDENSED SECTIONS (SCS):

## *Potential Indicators of Subsalt Stratigraphy*

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# ACKNOWLEDGEMENTS

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# INTRODUCTION

- Depositional sequences of clastic sediments can be identified by the occurrence of bioevents and abundance patterns in microfossil assemblages

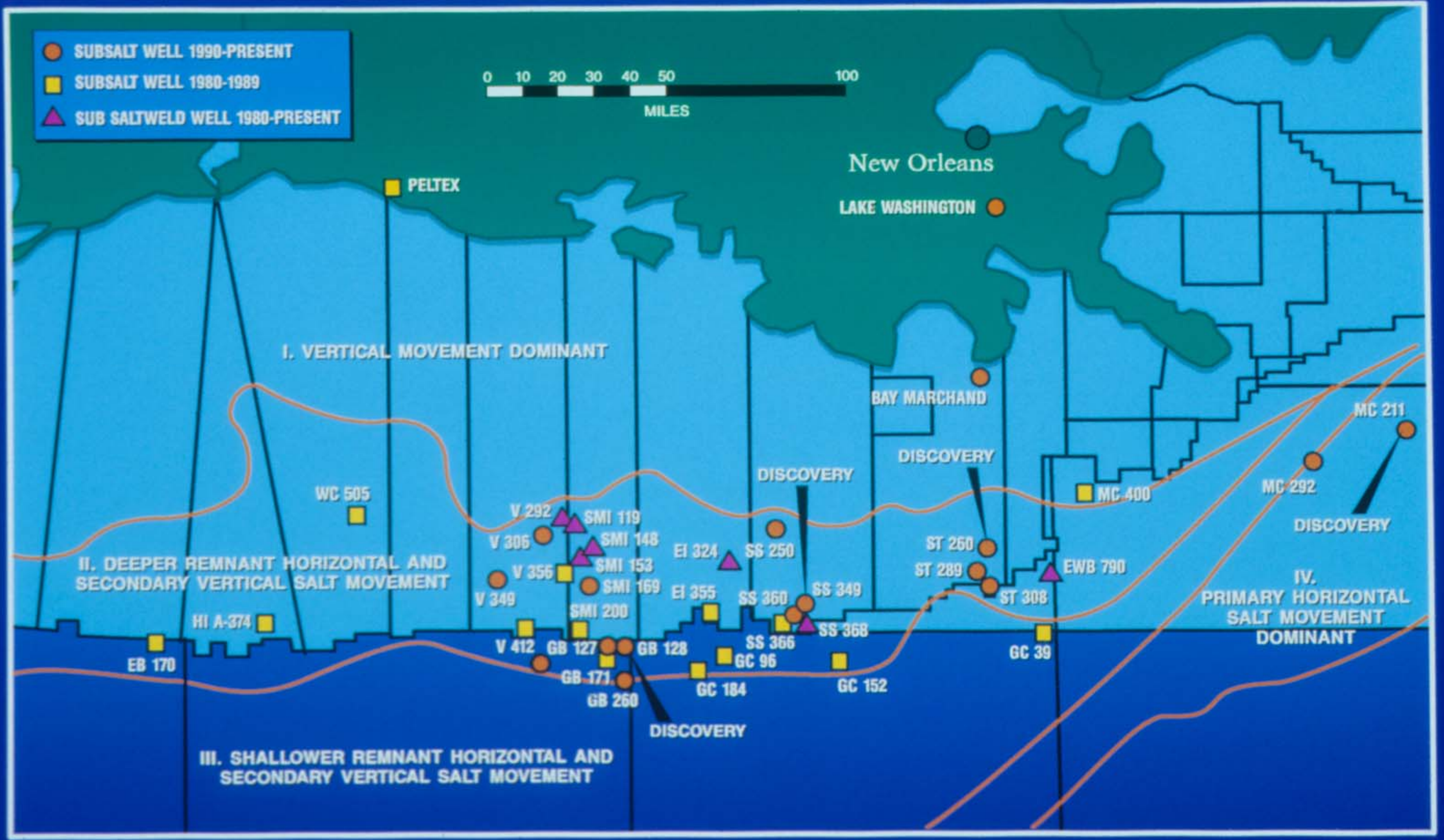
- Recognition and correlation of these sequences is a critical component of subsalt petroleum exploration

## *Reservoir Prediction is a critical component of subsalt petroleum exploration.*

- **Occurrence dependent on:**
  - **Paleoenvironments of Deposition**
  - **Structural Development (Pre & Post Salt Sheet Emplacement)**
  - **Impact of Salt Movement on Sediment Transport Fairways**

# OFFSHORE GULF OF MEXICO

## *Subsalt Wells and Salt Style Distribution*



# SIGNIFICANT SUB-SALT WELLS - FEDERAL OFFSHORE GULF OF MEXICO
## (MAJOR SHEET WELL PENETRATIONS)

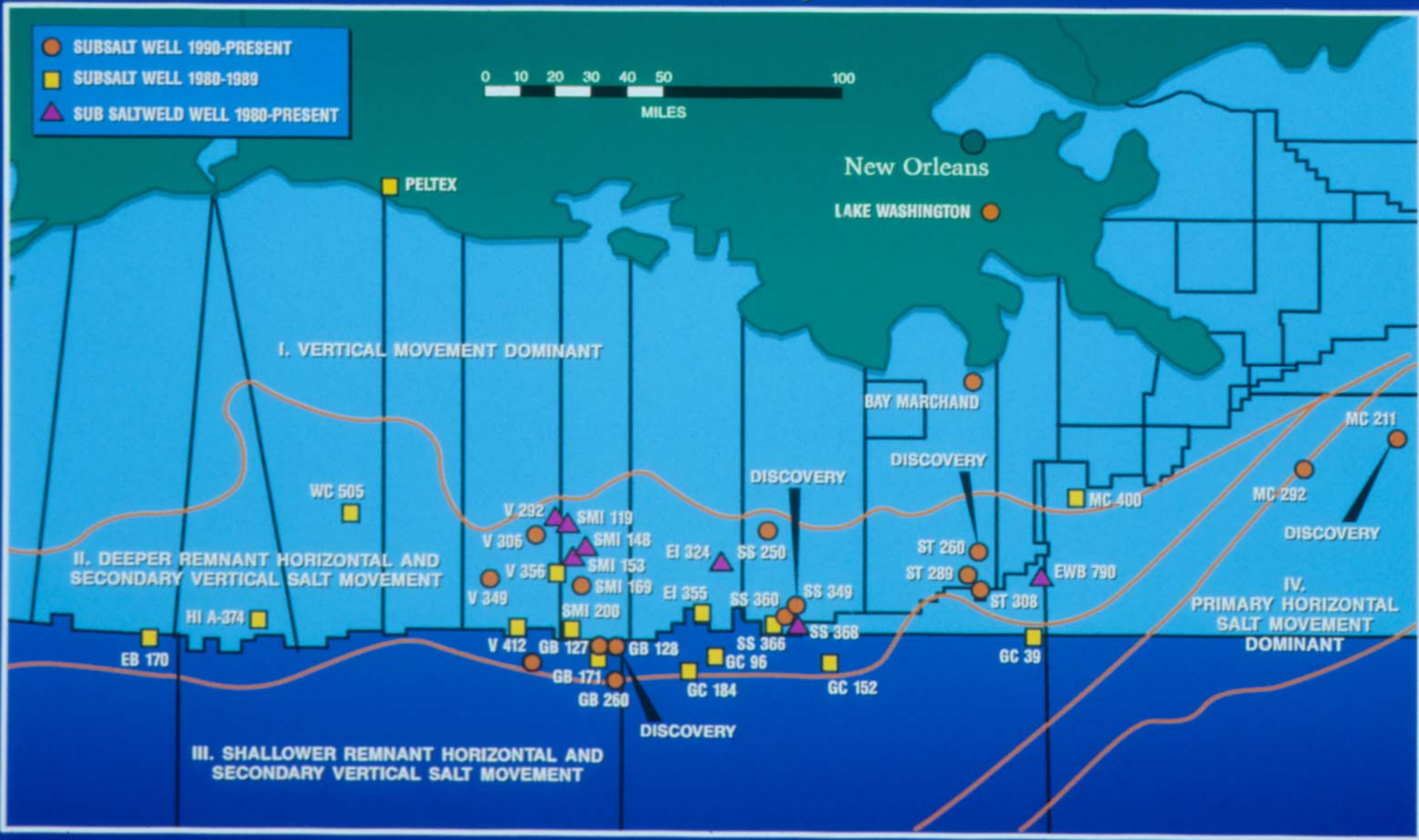
| WELL NAME | DATE DRLD (TD) | TOP OF SALT | BASE OF SALT | TVD THICKNESS OF SALT | DRLD MD WELL (TD) | DRLD TVD SEDIMENT THICKNESS BELOW SALT |
|---|---|---|---|---|---|---|
| Garden Banks 171 #1 Marathon | 05/84 | -8,400' | -9,510' | 1,110' | 10,597' | 997' |
| West Cameron 505 #2 Gulf | 09/84 | -13,900' | -15,590' | 1,690' | 18,500' | 2,820' |
| S. Marsh Island 200 #1 Diamond Shamrock | 02/86 | -8,730' | -9,720' | 990' | 13,500' | 3,700' |
| Vermilion 356 #1 Amoco | 12/87 | -8,400' | -10,500' | 2,100' | 17,000' | 6,360' |
| Lake Washington #1 Amoco (Onshore) | 04/90 | -9,350' | -13,410' | 4,075' | 21,241' | 7,781' |
| Miss. Canyon 211 #1 Exxon | 06/90 | -5,750' | -8,780' | 3,030' | 14,670' | 5,820' |
| Bay Marchand #1 Amoco | 05/91 | -9,820' | -14,160' | 4,340' | 18,277' | 4,260' |
| Garden Banks 165 #1 Chevron | 04/92 | -5,765' | -12,715' | 6,950' | 18,000' | 5,200' |
| South Marsh Is. 169 #1 Amoco | 12/93 | Confidential | Confidential | Confidential | 18,020' | Confidential |
| Ship Shoal 349 #1 Phillips | 10/93 | -7,603 | -11,428 | 3,825' | 16,500' | 4,990' |
| South Timbalier 260 #1 Phillips | 05/94 | Confidential | Confidential | Confidential | 16,610' | Confidential |
| Ship Shoal 349 #2 Phillips | 06/94 | Confidential | Confidential | Confidential | 18,603' | Confidential |
| Vermilion 349 #1 Anadarko | 06/94 | -9,550 | -12,010 | 2,460' | 16,146' | 4,046' |
| Ship Shoal 360 #2 Unocal | 08/94 | Confidential | Confidential | Confidential | 19,000' | Confidential |
| Ship Shoal 250 #1 Japex | 09/94 | -12,246' | -13,202' | 956' | 17,750' | 4,447' |
| South Timbalier 289 #1 CNG | 11/94 | -12,078' | -13,003' | 925' | 18,034' | 4,934' |
| Garden Banks 127 #1 Shell | 05/95 | Confidential | Confidential | Confidential | 14,730' | Confidential |
| Vermilion 308 #1 Amoco | 07/95 | Confidential | Confidential | Confidential | 20,399' | Confidential |
| Mississippi Canyon 292 #1 Texaco | 08/95 | Confidential | COnfidential | Confidential | 17,976' | Confidential |

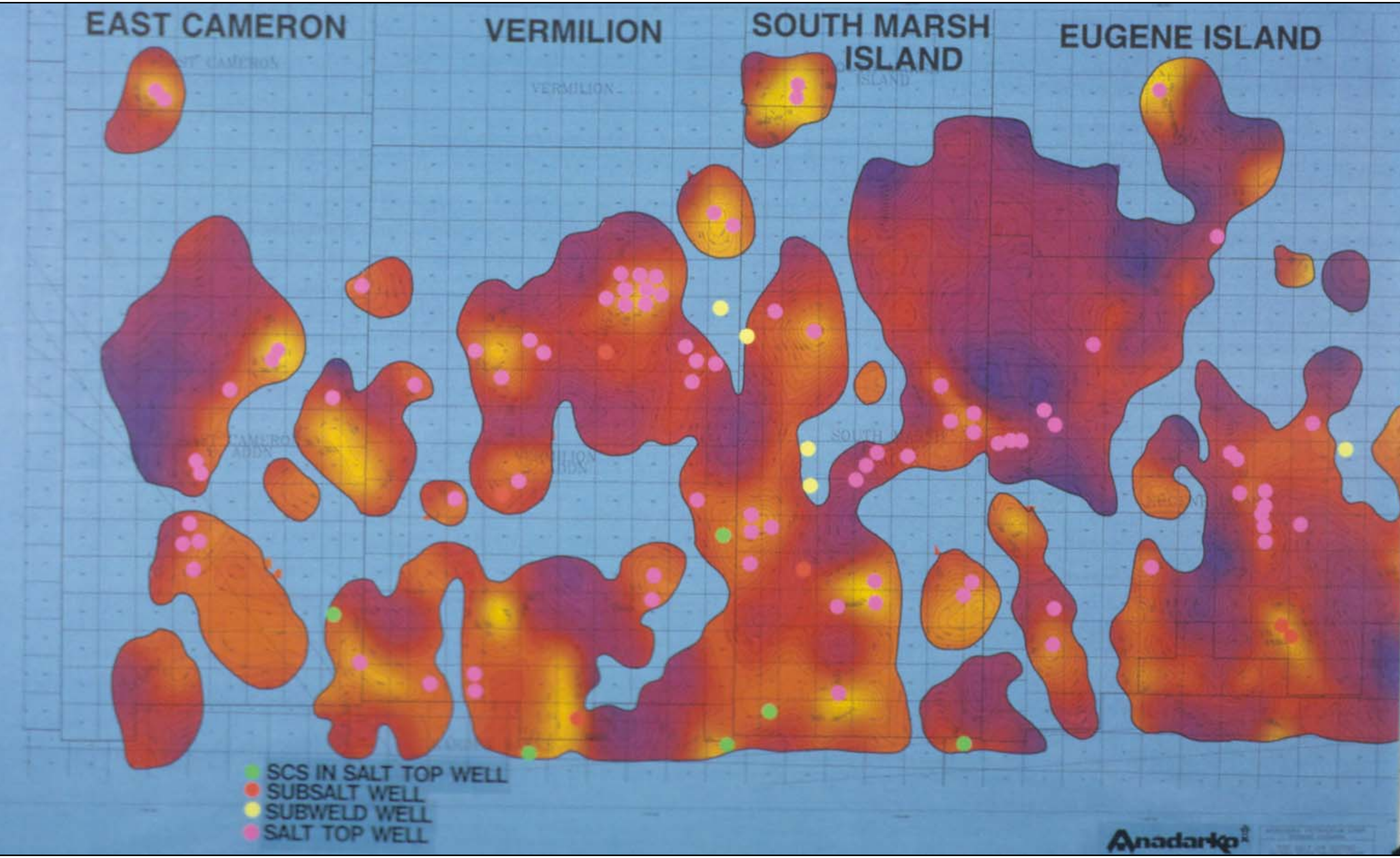
# SIGNIFICANT SUB-SALT WELLS - FEDERAL OFFSHORE GULF OF MEXICO
## (SHEET EDGE/FLANK AND SUB-WELD WELL PENETRATIONS)

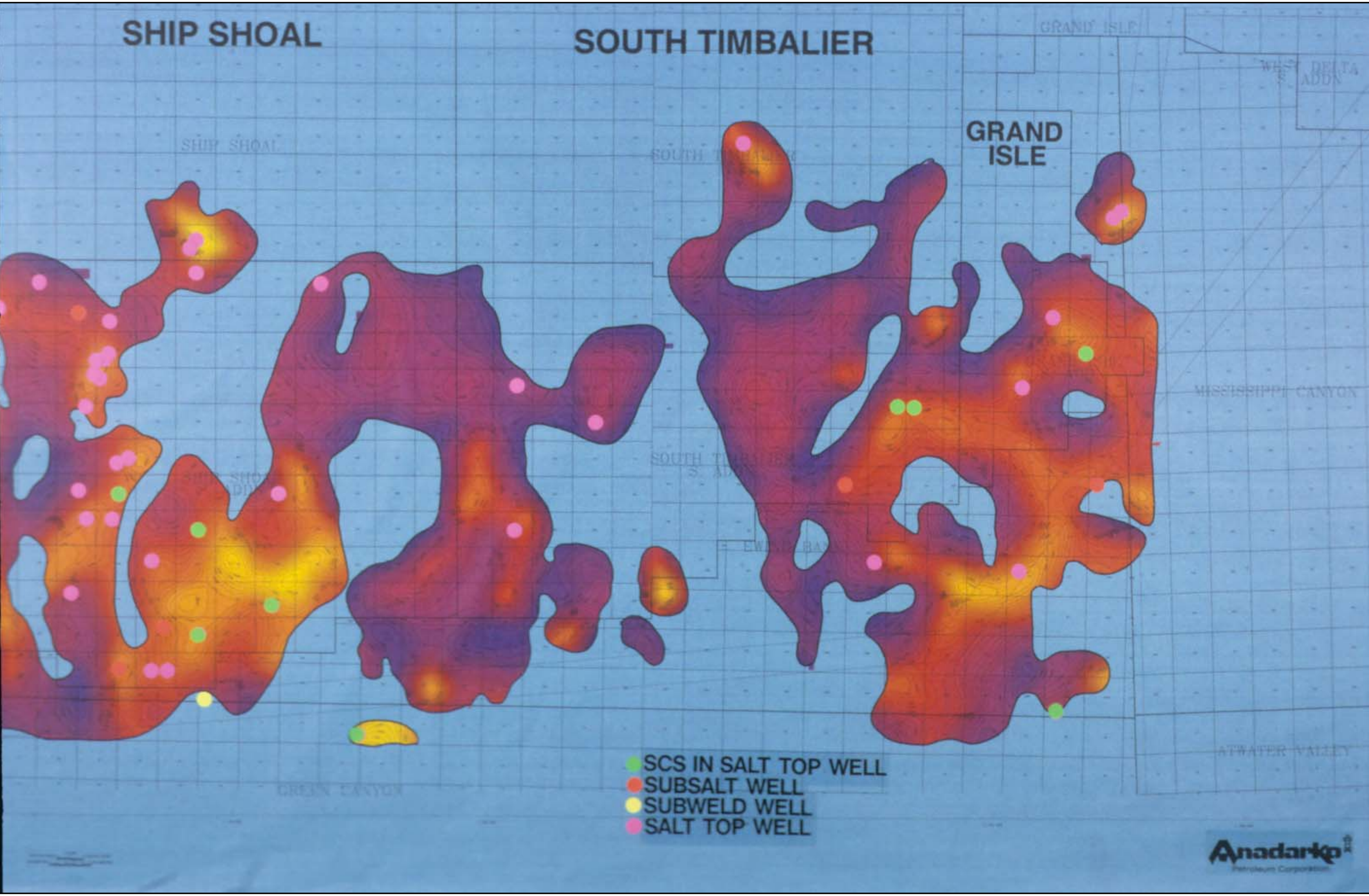
| WELL NAME | DATE DRLD (TD) | TOP OF SALT | BASE OF SALT | TVD THICKNESS OF SALT | DRLD MD WELL (TD) | DRLD TVD SEDIMENT THICKNESS BELOW SALT |
|---|---|---|---|---|---|---|
| S. Marsh Isl. 153 #3, Phillips | 8/73 | NA | NA | NA | 14,000' | NA |
| Cameron Parish Peltex #1 | 10/79 | -20,330' | -20,415' | 85' | 21,530' | 1,085' |
| S. Marsh Isl. 119 #1, Shell | 7/81 | NA | NA | NA | 17,700' | NA |
| Vermilion 292 #1, Shell | 3/83 | NA | NA | NA | 16,000' | NA |
| Ship Shoal 366 #2, Placid | 10/83 | -7,040'<br>-7,329'<br>-7,605' | -7,281'<br>-7,355'<br>TD in Salt | 241'<br>26'<br>513' + | 8,203' | 305'<br>Between Salts |
| Eugene Island 324 #1, Gulf | 03/84 | NA | NA | NA | 15,000' | NA |
| Green Canyon 98 #1, Conoco | 06/84 | -10,320' | -11,700' | 1,380' | 12,121' | 340' |
| Green Canyon 39 #1 ST1, Placid | 09/84 | -11,675'<br>-12,005' | -11,815'<br>TD in Salt | 140'<br>185' + | 12,294' | 190'<br>Between Salts |
| Mississippi Canyon 400 #1, Amoco | 01/85 | -10,710' | -14,160' | 3,450' | 16,000' | 1,840' |
| East Breaks 170 #1, Amoco | 08/85 | -16,075' | -16,325' | 250' | 17,500' | 1,100' |
| Mississippi Canyon 400 #2, Amoco | 09/85 | -14,230' | -15,220' | 1,290' | 17,010' | 1,700' |
| High Is. A-374 #1, Mobil | 09/85 | -7,575' | -7,825' | 250' | 15,000' | 7,100' |
| Green Canyon 152 #1STH1, Marathon | 12/85 | -11,350' | -12,470' | 1,130' | 16,281' MD | 1,623' |
| Ewing Bank 790 #1, Placid Oil | 6/86 | NA | NA | NA | 15,143' TVD | NA |
| Vermilion 412 #1, Mobil | 01/87 | -7,705' | -9,020' | 1,315' | 9,502' | 402' |
| Eugene Is. 385 #A-12, Union Texas | 07/88 | -12,450' | -12,510' | 60' | 14,104' | 74' |
| Eugene Is. 371 #B-4, Union Texas | 08/88 | 10,650' MD | 13,000' MD | 1,875' | 13,038' | 30' |
| S. Marsh Isl. 148 #1, Chevron/Tenneco | 12/88 | NA | NA | NA | 19,500' | NA |
| Green Canyon 184 #A-12, Conoco | 12/90 | -8,300' | -8,600' | 300' | 12,564' | 3,964' |
| Garden Banks 260 #1STH2, Amerada Hess | 05/93 | -14,098 | -16,108 | 2,010' | 18,848' TVD | 2,658' |
| Garden Banks 128 #1, Shell | 7/94 | Confidential | Confidential | Confidential | 17,477' TVD | Confidential |
| Ship Shoal 368 #1, Amerada Hess | 02/95 | NA | NA | NA | 15,774' TVD | NA |

# OFFSHORE GULF OF MEXICO

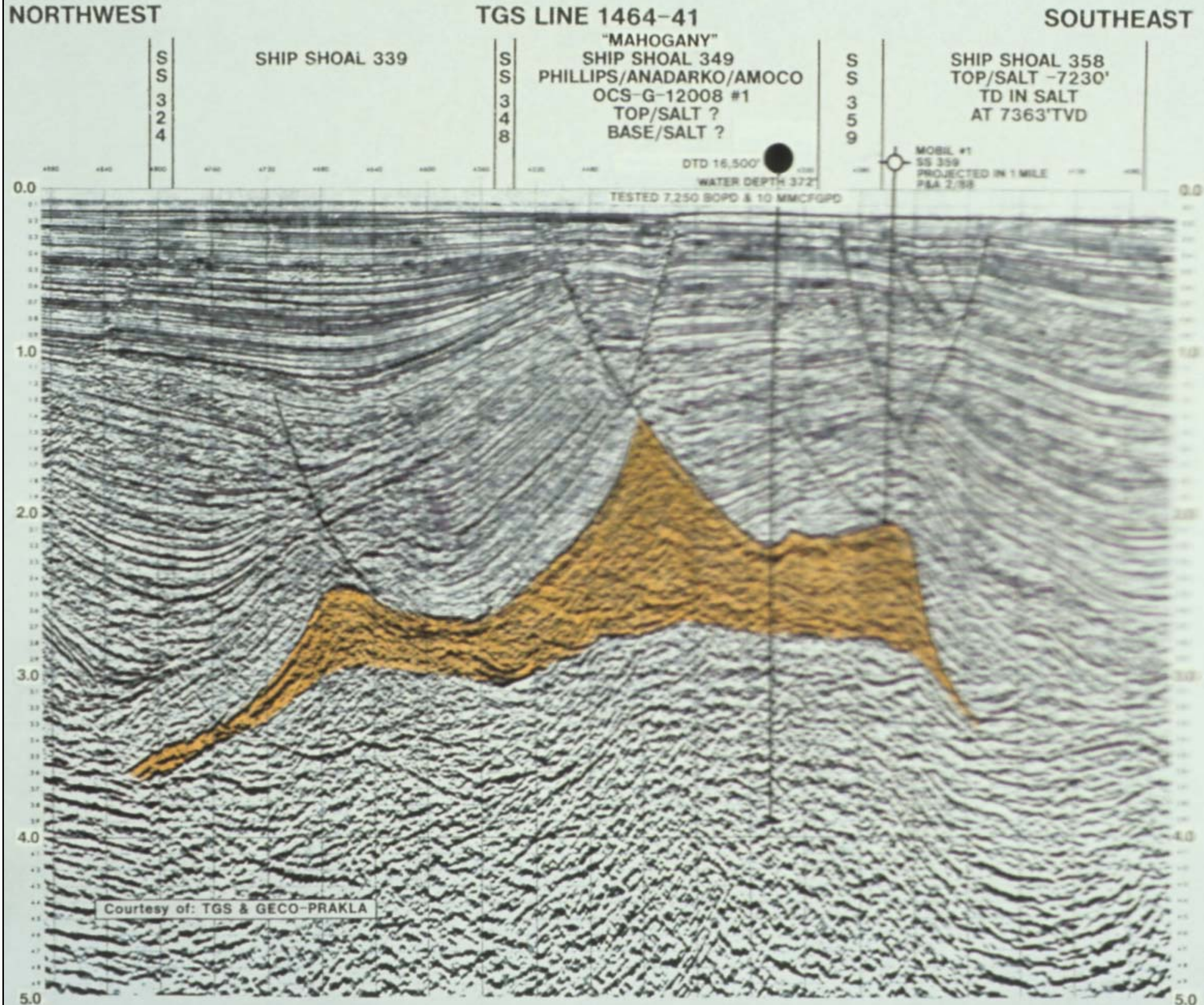
## *Subsalt Wells and Salt Style Distribution*




EAST CAMERON
VERMILION
SOUTH MARSH ISLAND
EUGENE ISLAND
SCS IN SALT TOP WELL
SUBSALT WELL
SUBWELD WELL
SALT TOP WELL
Anadarko

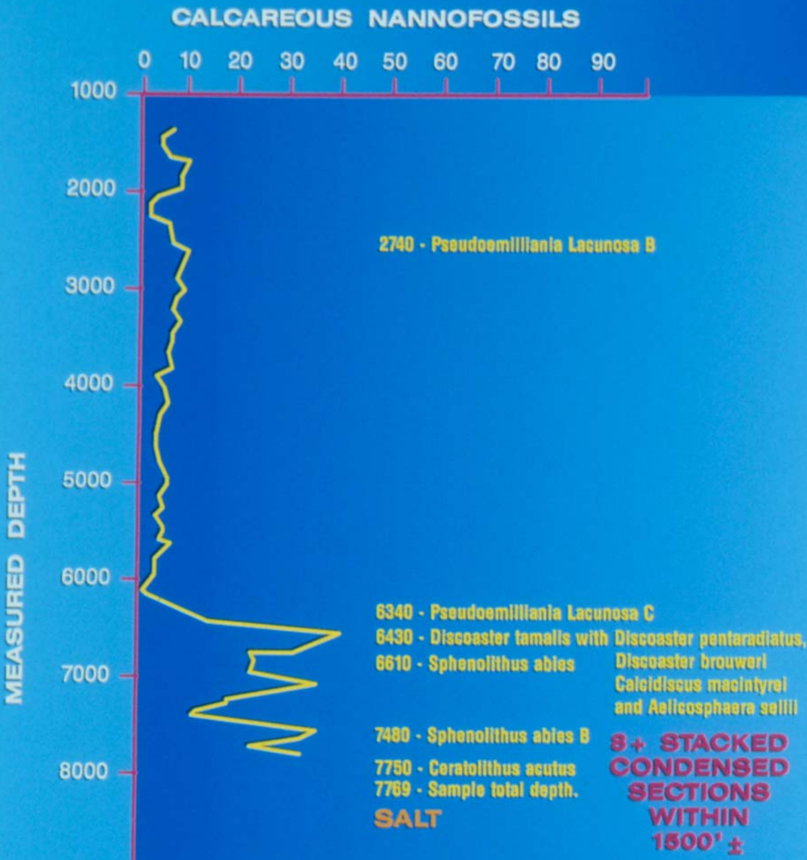


SHIP SHOAL
SOUTH TIMBALIER
GRAND ISLE
SHIP SHOAL
SOUTH TIMBALIER
GRAND ISLE
WEST DELTA S. ADDN
MISSISSIPPI CANYON
SOUTH TIMBALIER S. ADDN
EWING BANK
GREEN CANYON
ATWATER VALLEY
SCS IN SALT TOP WELL
SUBSALT WELL
SUBWELD WELL
SALT TOP WELL
Anadarko
Petroleum Corporation

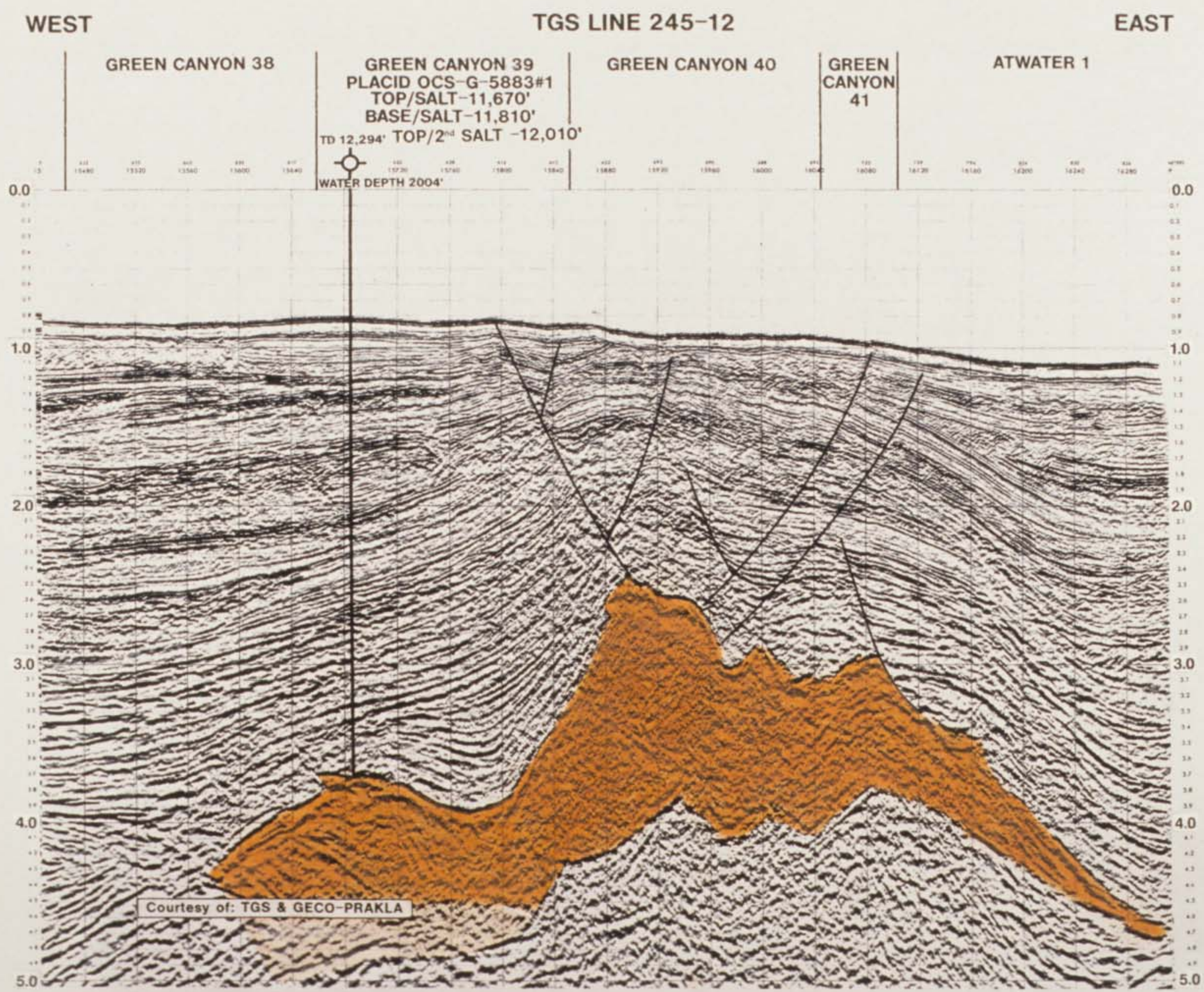


NORTHWEST
TGS LINE 1464-41
SOUTHEAST
SS 324
SHIP SHOAL 339
SS 348
"MAHOGANY"
SHIP SHOAL 349
PHILLIPS/ANADARKO/AMOCO
OCS-G-12008 #1
TOP/SALT ?
BASE/SALT ?
DTD 16,500'
WATER DEPTH 372'
TESTED 7,250 BOPD & 10 MMCFGPD
SS 359
SHIP SHOAL 358
TOP/SALT -7230'
TD IN SALT
AT 7363'TVD
MOBIL #1
SS 359
PROJECTED IN 1 MILE
P&A 2/88
0.0
1.0
2.0
3.0
4.0
5.0
Courtesy of: TGS & GECO-PRAKLA

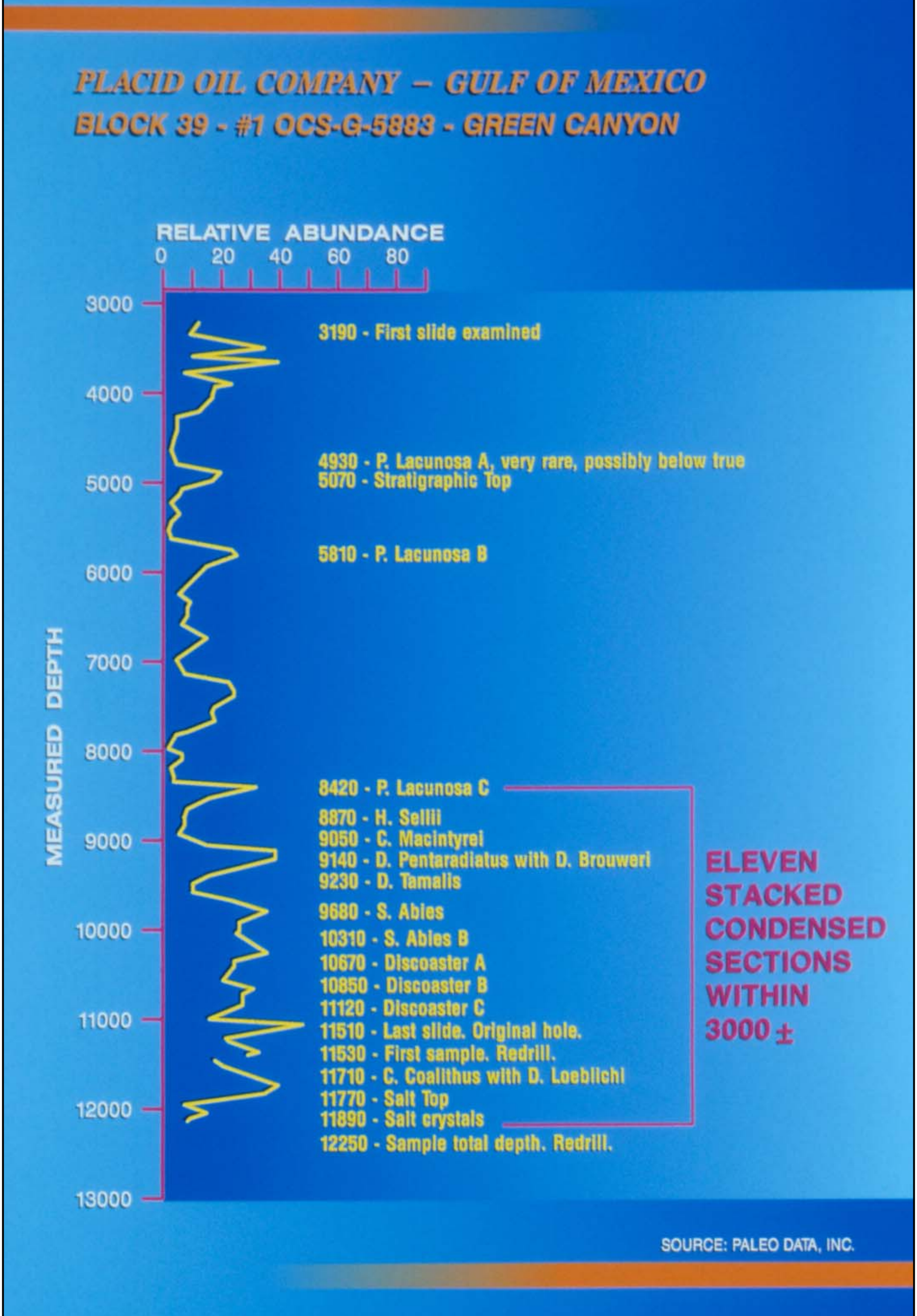
## MOBIL OIL CORPORATION - GULF OF MEXICO
## BLOCK 359 - #1 OCS-G-5586 - SHIP SHOAL AREA




SOURCE: PALEO-DATA, INC.



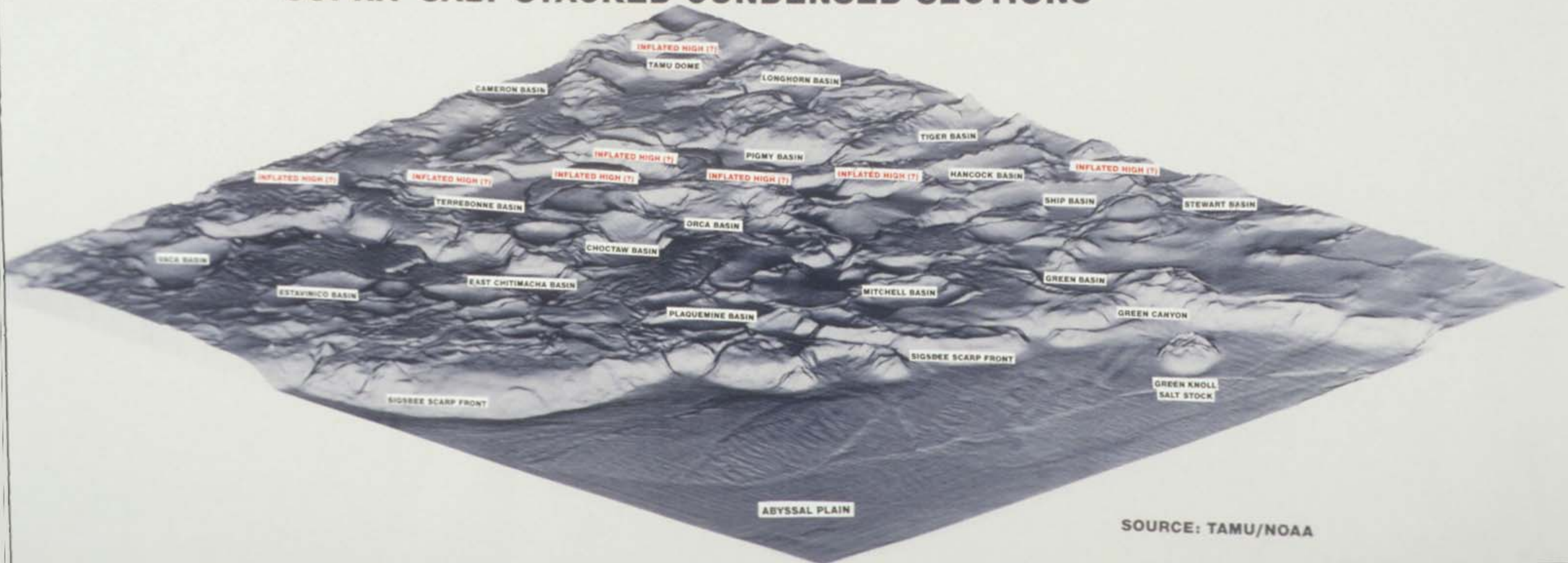
WEST
TGS LINE 245-12
EAST
GREEN CANYON 38
GREEN CANYON 39
PLACID OCS-G-5883#1
TOP/SALT-11,670'
BASE/SALT-11,810'
TD 12,294' TOP/2nd SALT -12,010'
GREEN CANYON 40
GREEN CANYON 41
ATWATER 1
WATER DEPTH 2004'
0.0
1.0
2.0
3.0
4.0
5.0
Courtesy of: TGS & GECO-PRAKLA



PLACID OIL COMPANY – GULF OF MEXICO
BLOCK 39 - #1 OCS-G-5883 - GREEN CANYON
RELATIVE ABUNDANCE
0
20
40
60
80
MEASURED DEPTH
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
3190 - First slide examined
4930 - P. Lacunosa A, very rare, possibly below true
5070 - Stratigraphic Top
5810 - P. Lacunosa B
8420 - P. Lacunosa C
8870 - H. Sellii
9050 - C. Macintyrei
9140 - D. Pentaradiatus with D. Brouweri
9230 - D. Tamalis
9680 - S. Abies
10310 - S. Abies B
10670 - Discoaster A
10850 - Discoaster B
11120 - Discoaster C
11510 - Last slide. Original hole.
11530 - First sample. Redrill.
11710 - C. Coalithus with D. Loeblichi
11770 - Salt Top
11890 - Salt crystals
12250 - Sample total depth. Redrill.
ELEVEN STACKED CONDENSED SECTIONS WITHIN 3000 ±
SOURCE: PALEO DATA, INC.

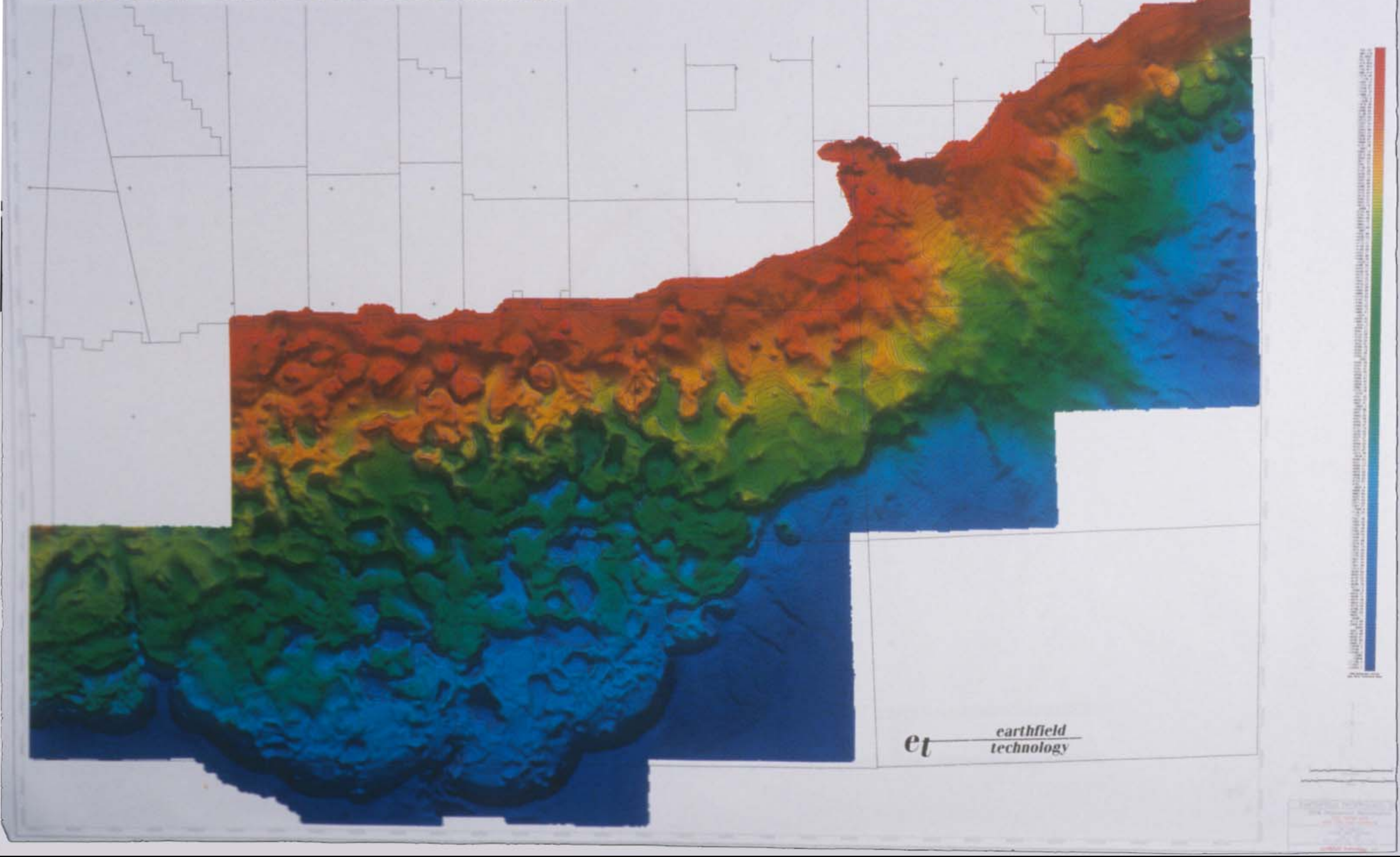

94 00
92 00
90 00
88 00
29 00
28 00
27 00
26 00
LUND
earthfield
technology

# OVERTHRUST SIGSBEE SALT SHEET / PLATFORM
# PRESENT DAY – WALKER RIDGE/GREEN CANYON
# INTRA–BASINAL SALT INFLATED HIGHS WITH POSSIBLE
# SUPRA–SALT STACKED CONDENSED SECTIONS

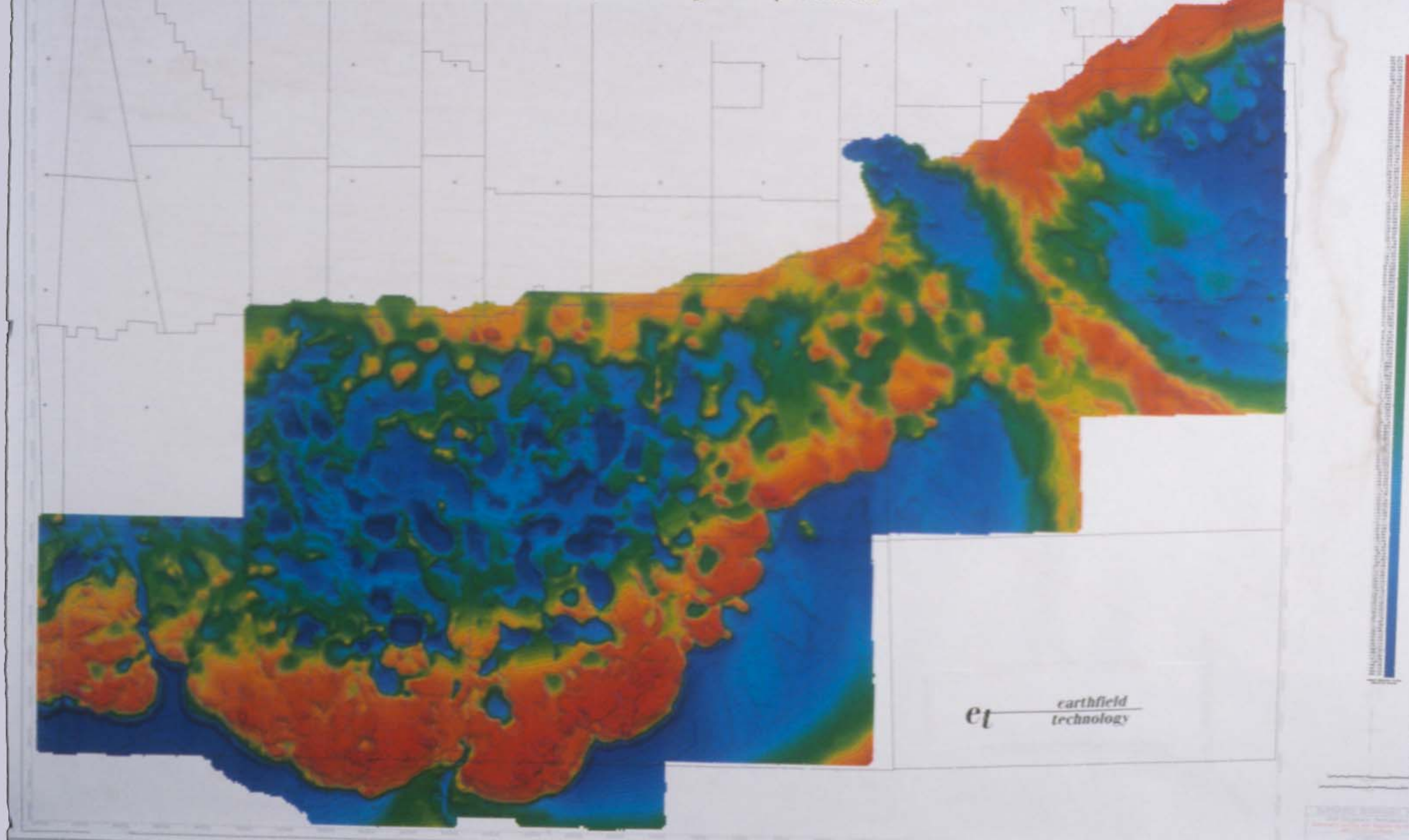



SOURCE: TAMU/NOAA

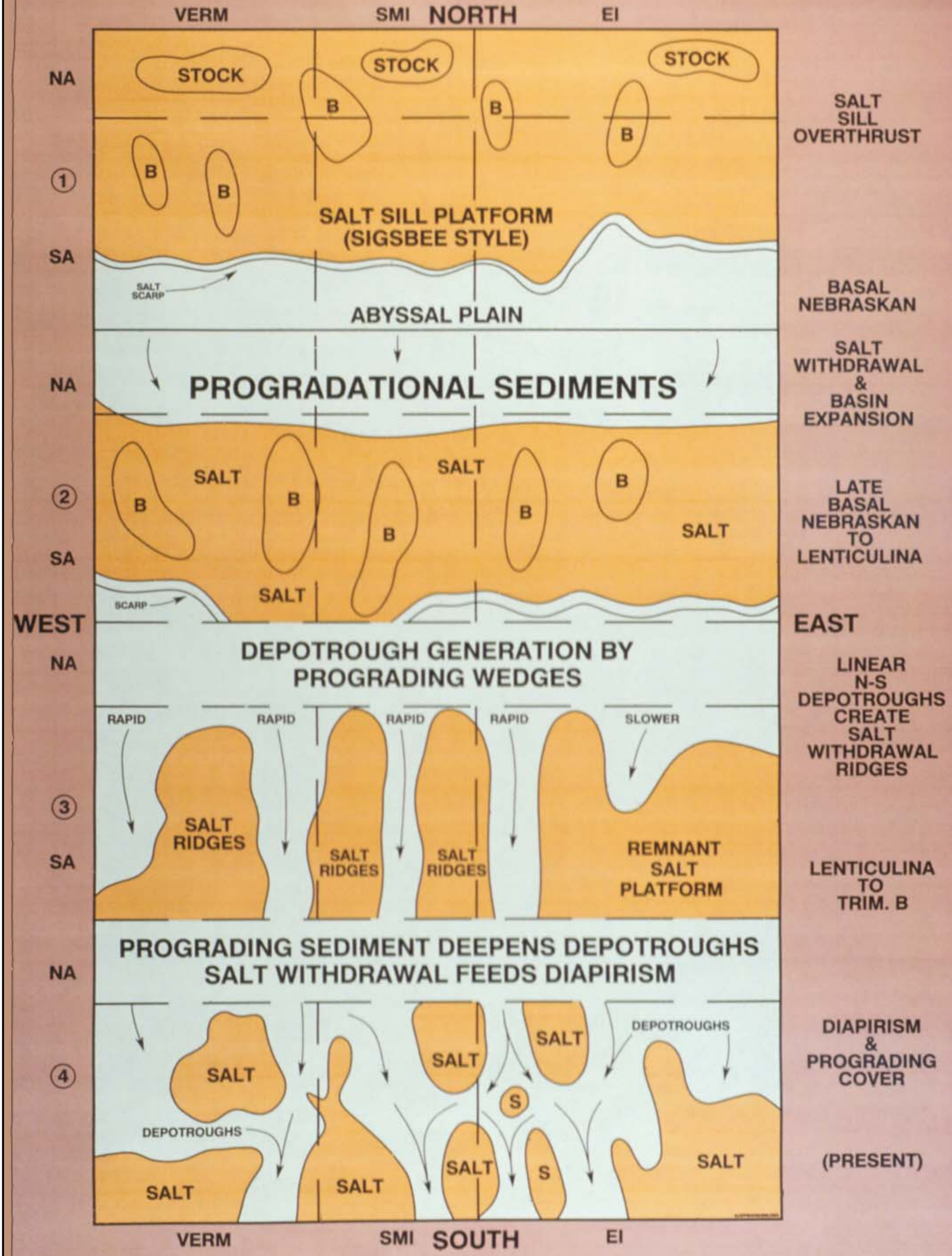
Bathymetry Map - Smoothed, False-color, Relief Image



Residual Bathymetry Map - Smoothed, False-color Image with Regional Dip Removed

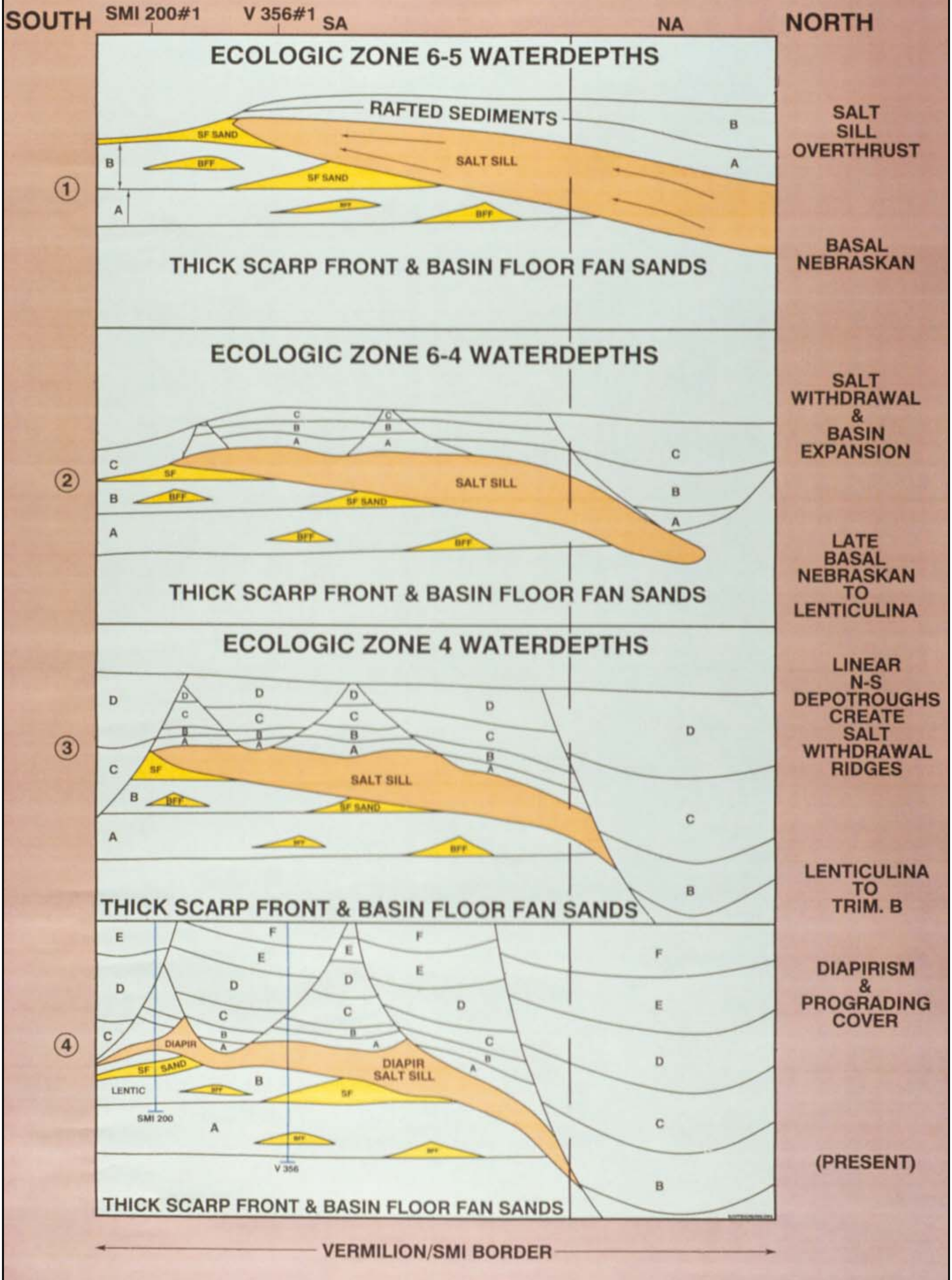


# EVOLUTION OF SALT STYLES




(PLANVIEW)

# EVOLUTION OF SALT STYLES



## Four Types of Supra Salt Sequence Occurrences:

1. Stacked Condensed Sections (SCS) coupled and conformably deposited upon the salt
2. Stacked Condensed Sections (SCS) decoupled from and extended along the top of salt
3. Normal thickness of individual sequences coupled or decoupled that set conformably upon the salt
4. Normal thicknesses of individual sequences coupled or decoupled that are much younger than the surrounding salt flank intervals suggesting subaqueous erosion or non-deposition

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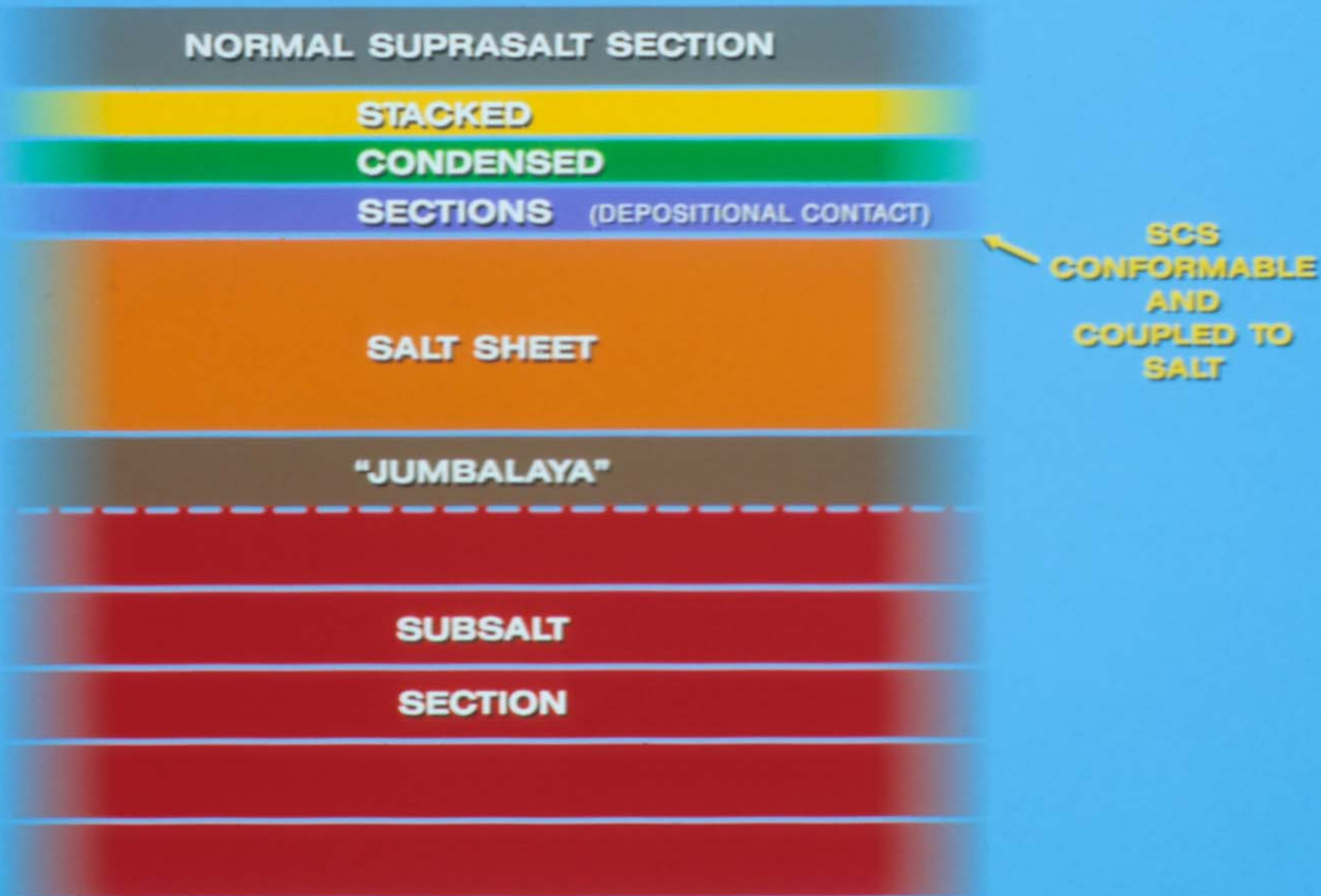
NORMAL SUPRASALT SECTION
STACKED
CONDENSED
SECTIONS (DEPOSITIONAL CONTACT)
SCS
CONFORMABLE
AND
COUPLED TO
SALT
SALT SHEET
"JUMBALAYA"
SUBSALT
SECTION

## Four Types of Supra Salt Sequence Occurrences:

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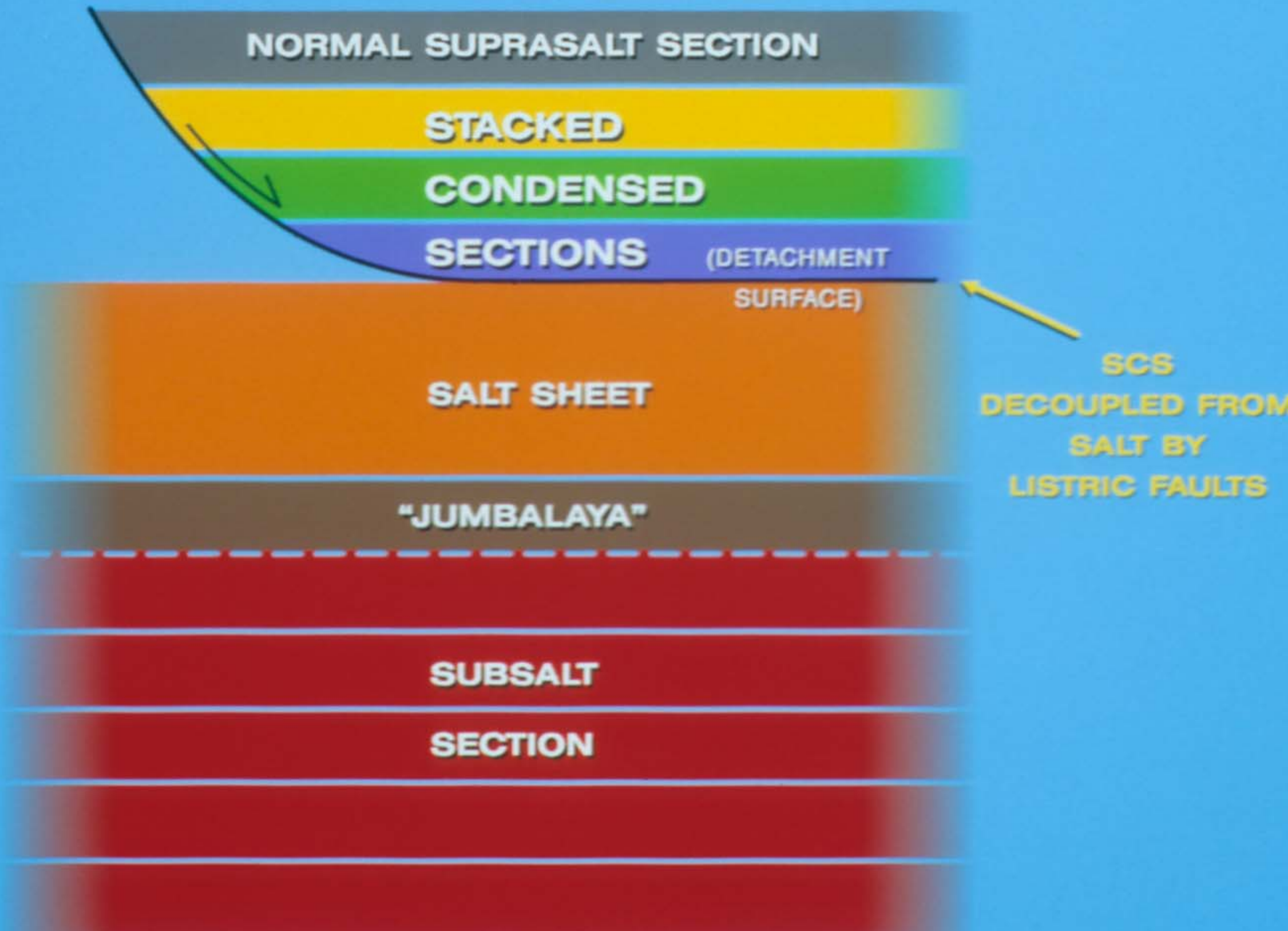
NORMAL SUPRASALT SECTION
STACKED
CONDENSED
SECTIONS
(DETACHMENT
SURFACE)
SALT SHEET
"JUMBALAYA"
SUBSALT
SECTION
SCS
DECOUPLED FROM
SALT BY
LISTRIC FAULTS

# Four Types of Supra Salt Sequence Occurrences:

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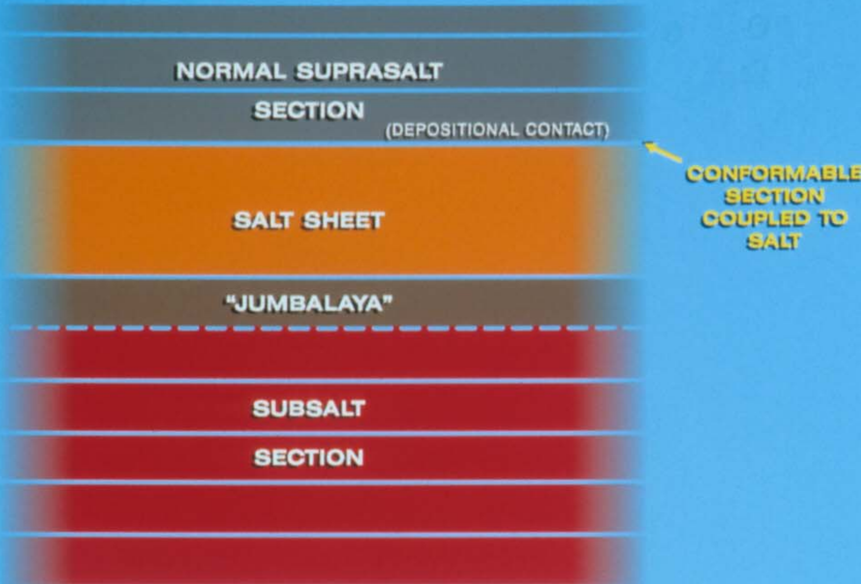
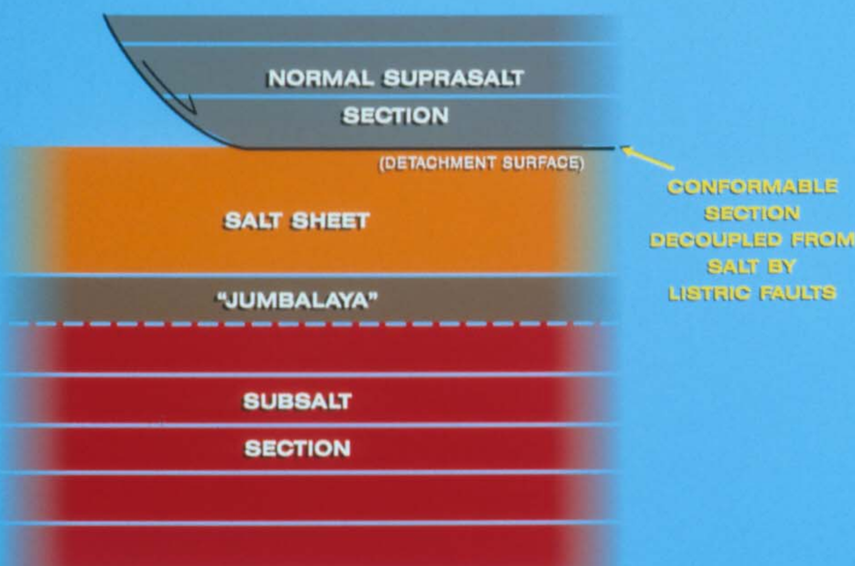

NORMAL SUPRASALT
SECTION
(DEPOSITIONAL CONTACT)
CONFORMABLE SECTION COUPLED TO SALT
SALT SHEET
"JUMBALAYA"
SUBSALT
SECTION

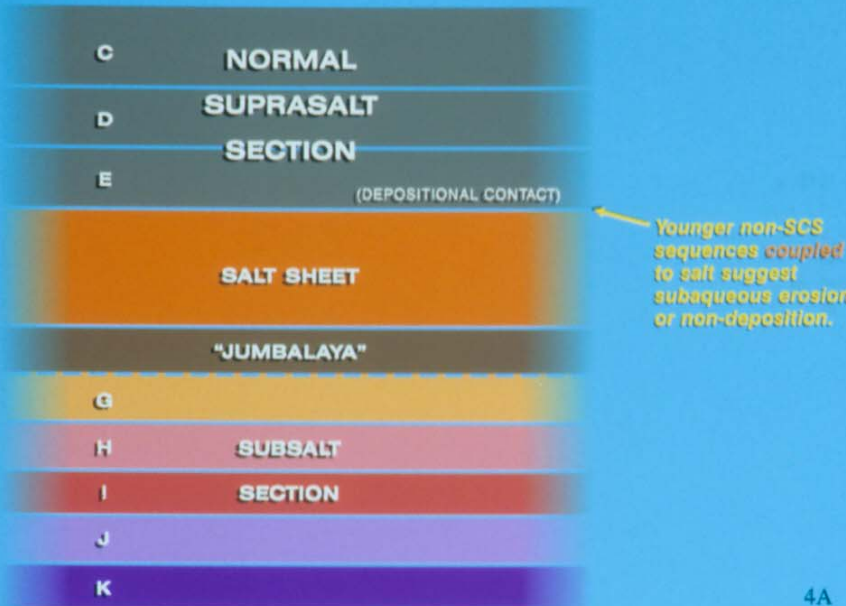
3A


NORMAL SUPRASALT
SECTION
(DETACHMENT SURFACE)
CONFORMABLE SECTION DECOUPLED FROM SALT BY LISTRIC FAULTS
SALT SHEET
"JUMBALAYA"
SUBSALT
SECTION

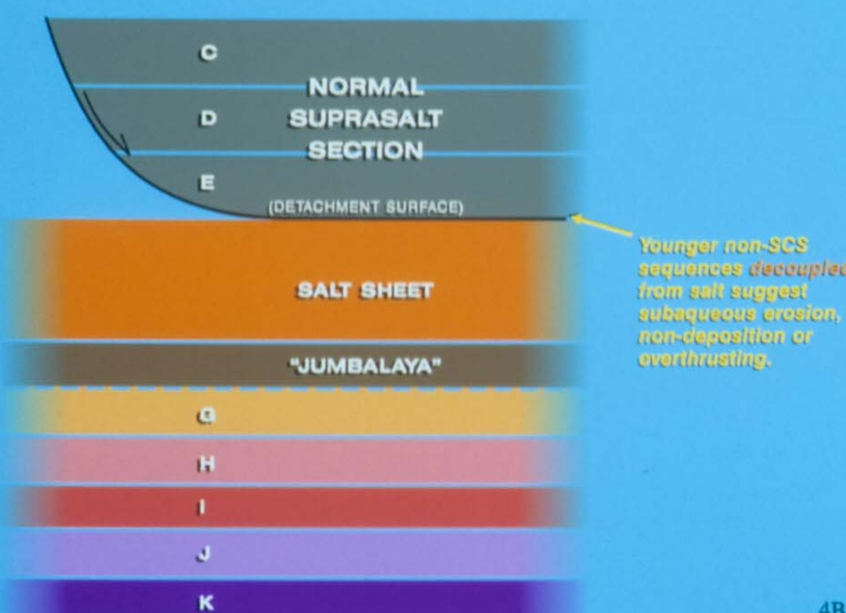
3B

## *Four Types of Supra Salt Sequence Occurrences:*

1. Stacked Condensed Sections (SCS) coupled and conformably deposited upon the salt
2. Stacked Condensed Sections (SCS) decoupled from and extended along the top of salt
3. Normal thickness of individual sequences coupled or decoupled that set conformably upon the salt
4. Normal thicknesses of individual sequences coupled or decoupled that are much younger than the surrounding salt flank intervals suggesting subaqueous erosion or non-deposition


C
NORMAL
D
SUPRASALT
E
SECTION
(DEPOSITIONAL CONTACT)
SALT SHEET
"JUMBALAYA"
G
H
SUBSALT
I
SECTION
J
K
Younger non-SCS sequences coupled to salt suggest subaqueous erosion or non-deposition.

4A


C
NORMAL
D
SUPRASALT
SECTION
E
(DETACHMENT SURFACE)
SALT SHEET
"JUMBALAYA"
G
H
I
J
K
Younger non-SCS sequences decoupled from salt suggest subaqueous erosion, non-deposition or overthrusting.

4B

## *Results in three significant scenarios for age relationships between supra and subsalt sediments:*

1. *Large sedimentary time gap*
2. *Conformable, with little apparent missing section*
3. *Significant Repeat Section below salt, occurring when SCS is present above salt*

***Results in three significant scenarios for age relationships between supra and subsalt sediments:***

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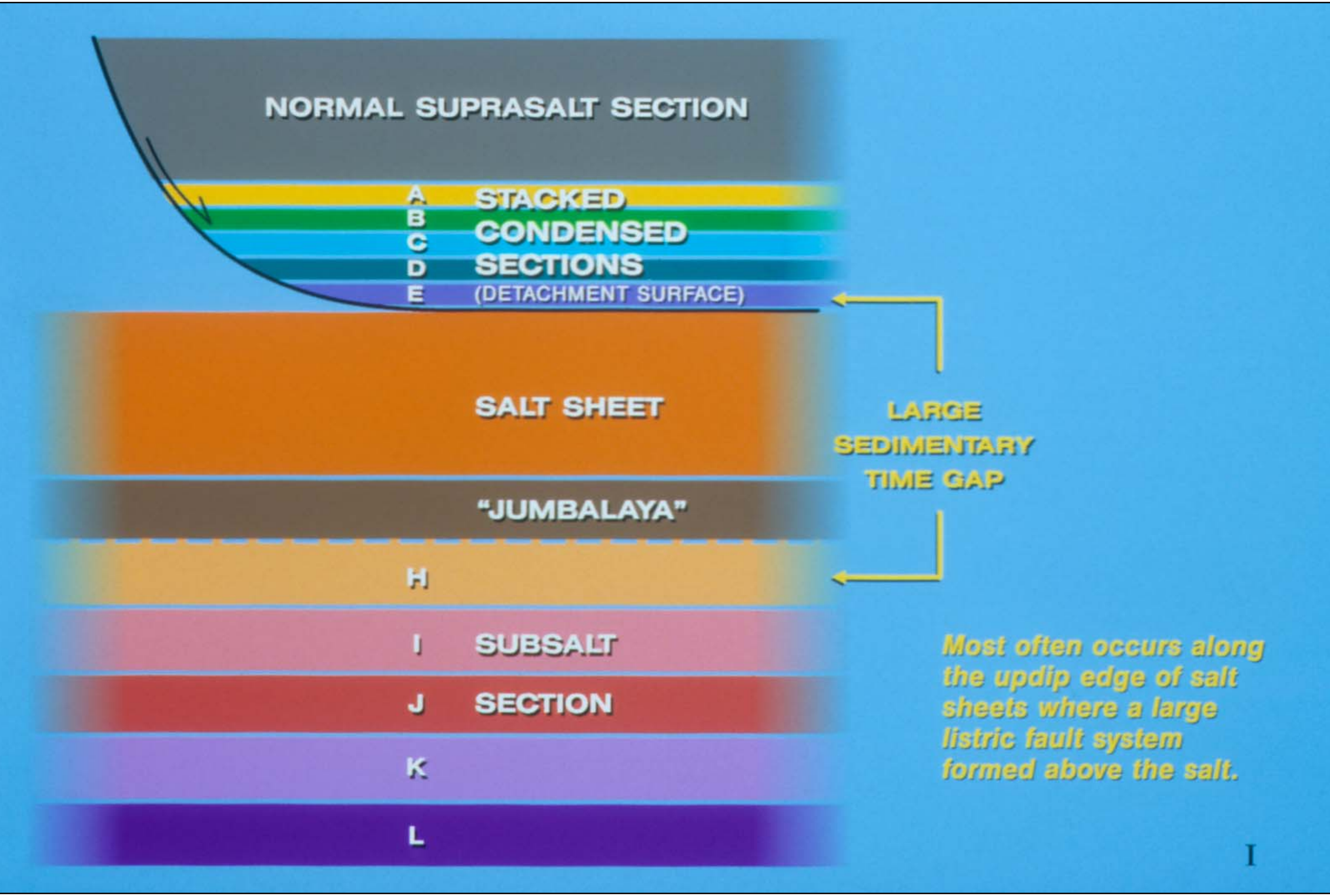
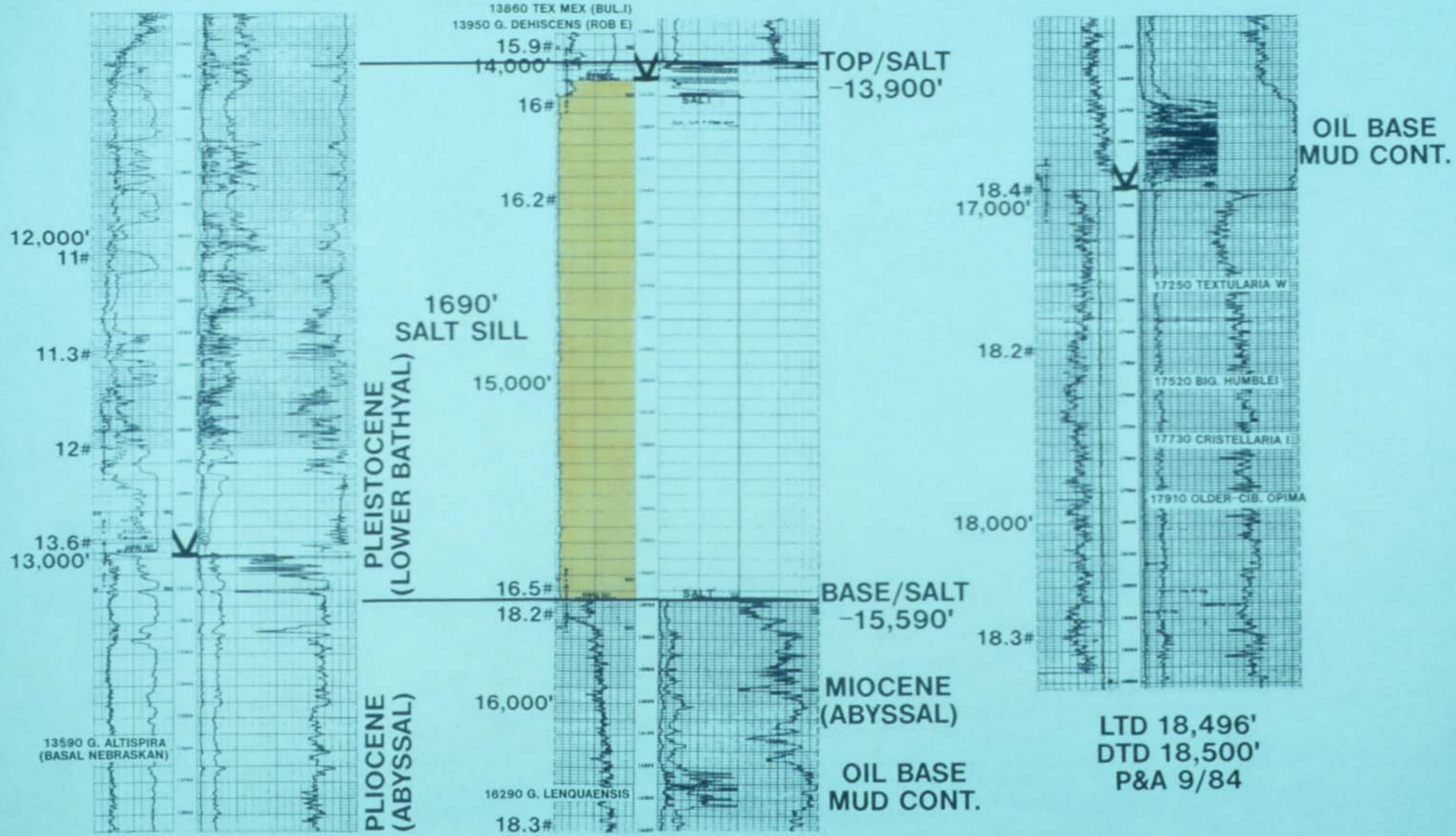
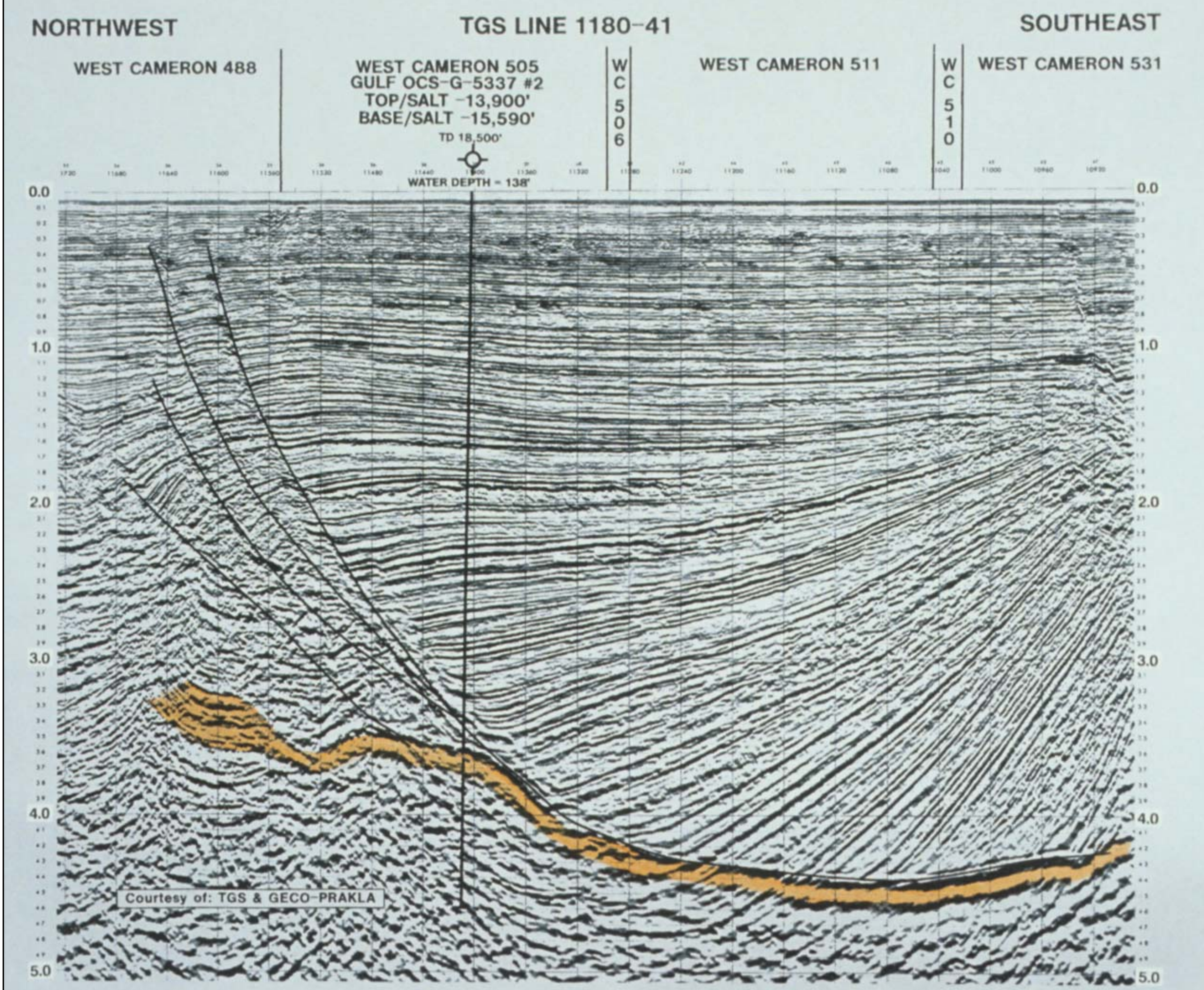

NORMAL SUPRASALT SECTION
A
B
C
D
E
STACKED
CONDENSED
SECTIONS
(DETACHMENT SURFACE)
SALT SHEET
"JUMBALAYA"
H
I
J
K
L
SUBSALT
SECTION
LARGE
SEDIMENTARY
TIME GAP
Most often occurs along the updip edge of salt sheets where a large listric fault system formed above the salt.
I

# GULF #2
# OCS-G-5337
# WEST CAMERON 505

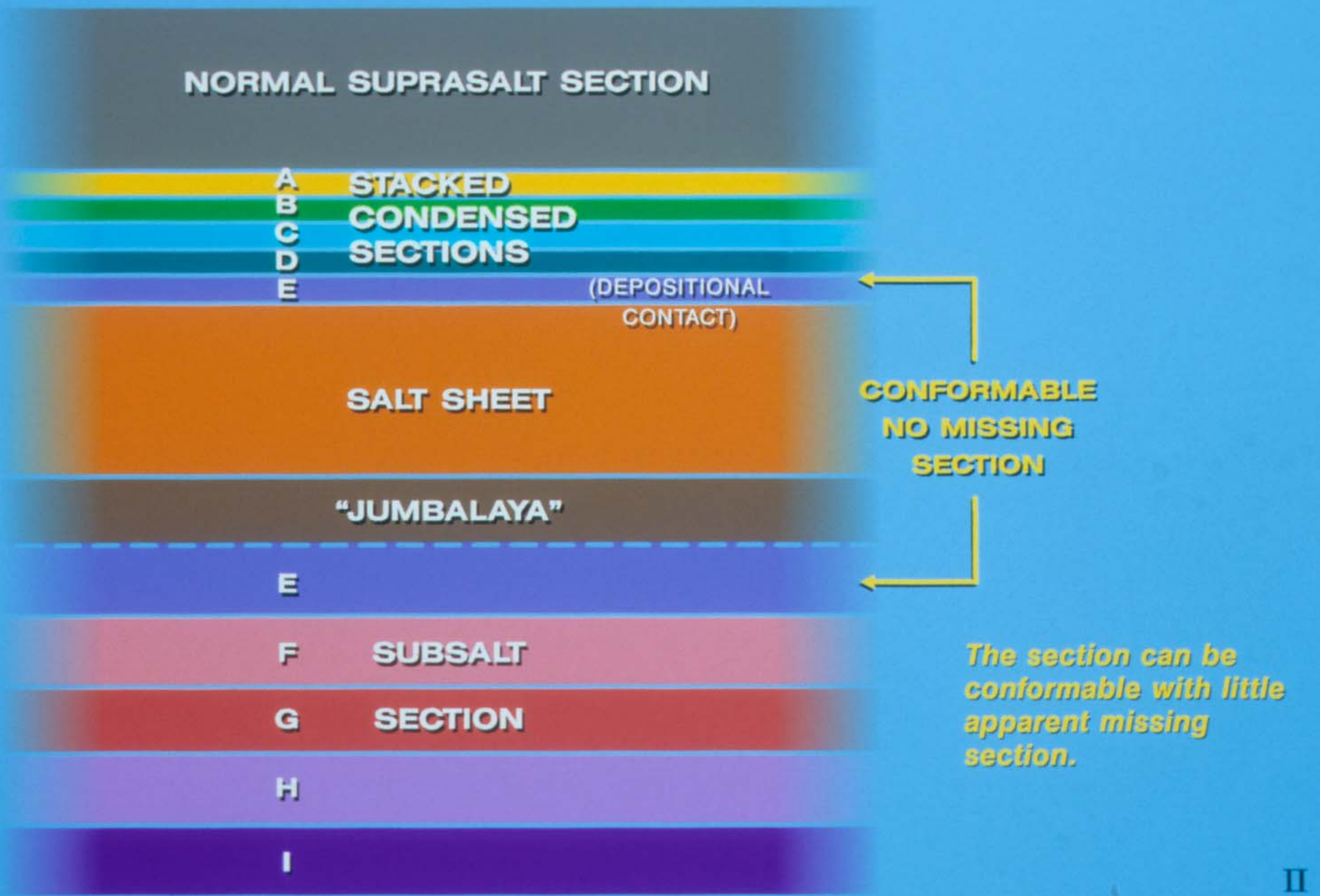


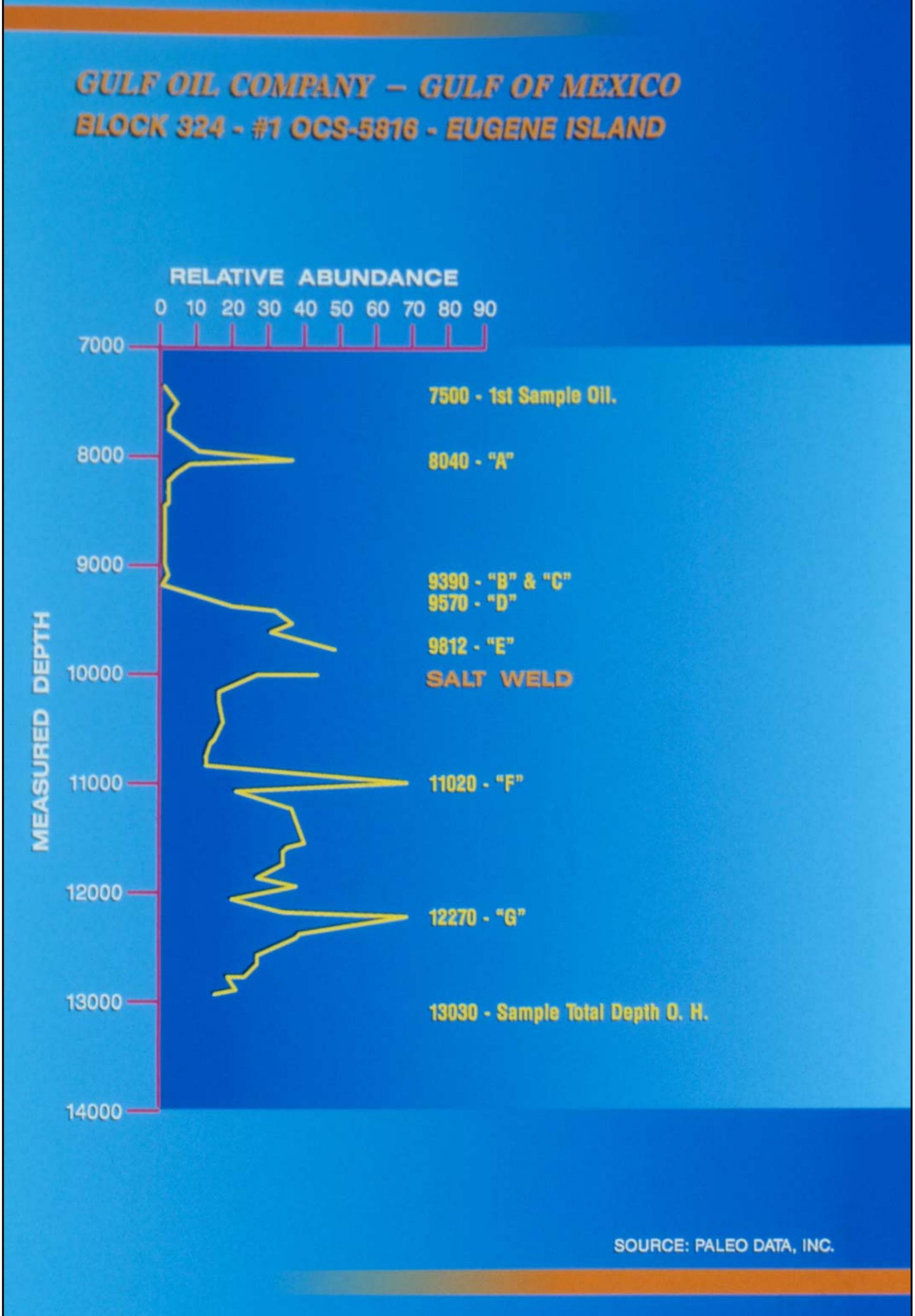


NORTHWEST
TGS LINE 1180-41
SOUTHEAST
WEST CAMERON 488
WEST CAMERON 505
GULF OCS-G-5337 #2
TOP/SALT -13,900'
BASE/SALT -15,590'
TD 18,500'
WC 506
WEST CAMERON 511
WC 510
WEST CAMERON 531
WATER DEPTH = 138'
0.0
1.0
2.0
3.0
4.0
5.0
Courtesy of: TGS & GECO-PRAKLA

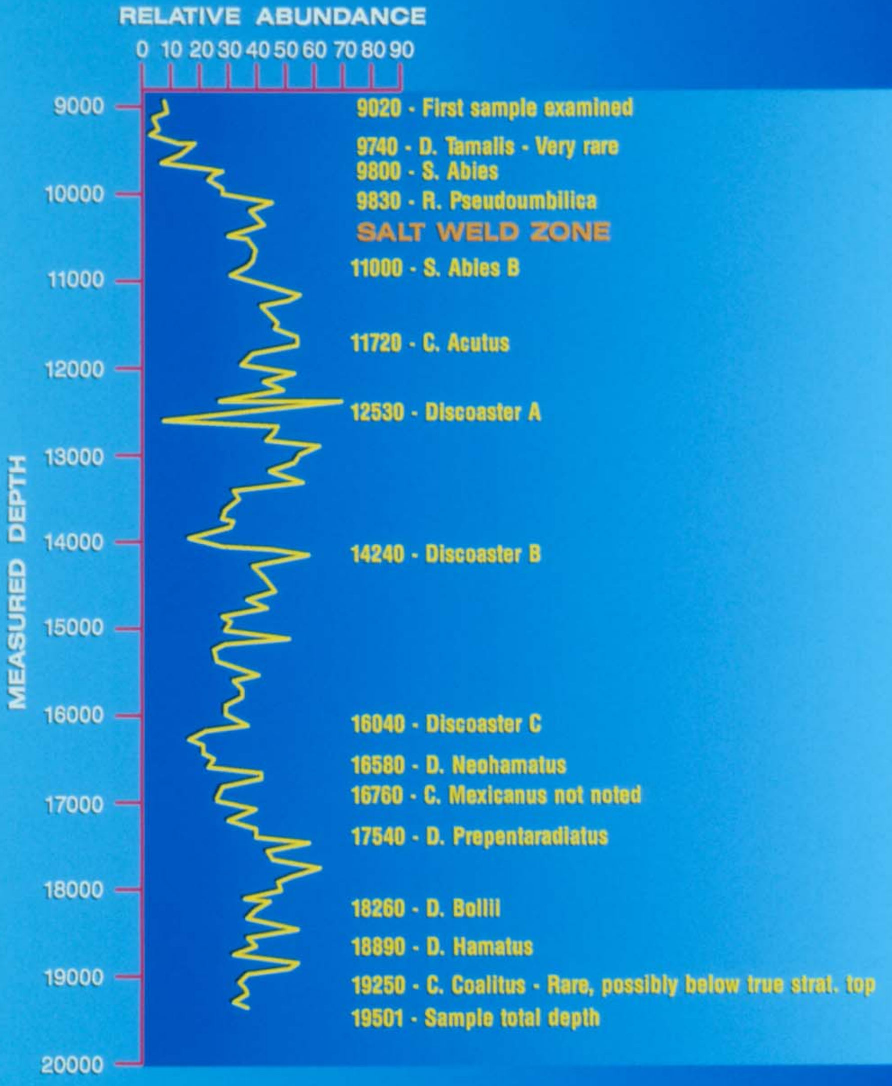
## *Results in three significant scenarios for age relationships between supra and subsalt sediments:*

1. *Large sedimentary time gap*
2. *Conformable, with little apparent missing section*
3. *Significant Repeat Section below salt, occurring when SCS is present above salt*


NORMAL SUPRASALT SECTION
A
B
C
D
E
STACKED
CONDENSED
SECTIONS
(DEPOSITIONAL
CONTACT)
SALT SHEET
CONFORMABLE
NO MISSING
SECTION
"JUMBALAYA"
E
F
SUBSALT
G
SECTION
H
I
The section can be conformable with little apparent missing section.
II

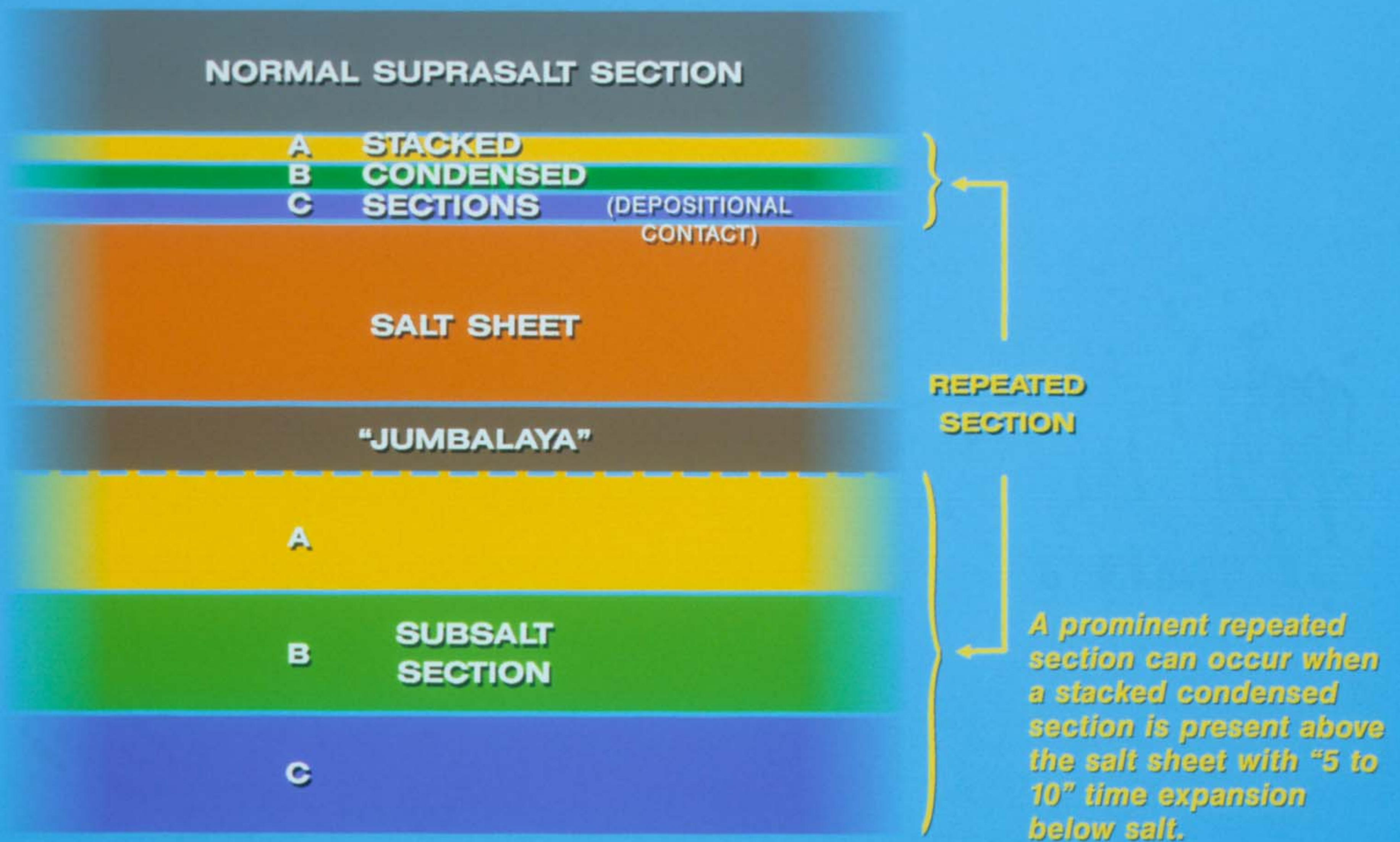

GULF OIL COMPANY – GULF OF MEXICO
BLOCK 324 - #1 OCS-5816 - EUGENE ISLAND
RELATIVE ABUNDANCE
0 10 20 30 40 50 60 70 80 90
MEASURED DEPTH
7000
8000
9000
10000
11000
12000
13000
14000
7500 - 1st Sample Oil.
8040 - "A"
9390 - "B" & "C"
9570 - "D"
9812 - "E"
SALT WELD
11020 - "F"
12270 - "G"
13030 - Sample Total Depth O. H.
SOURCE: PALEO DATA, INC.

# CHEVRON/TENNECO – GULF OF MEXICO
## BLOCK 148 - #1 OCS-G-8685 - SOUTH MARSH ISLAND

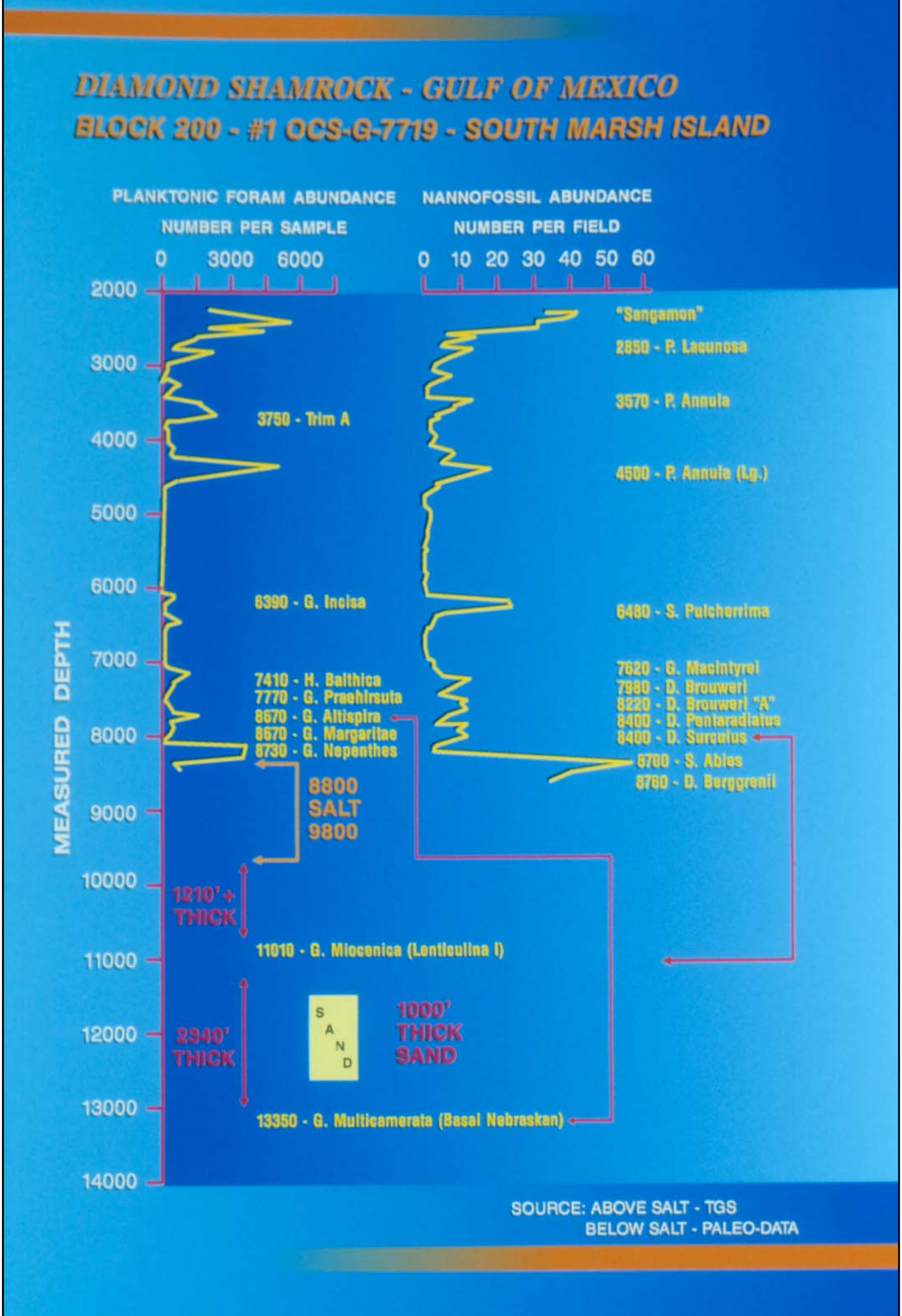


***Results in three significant scenarios for age relationships between supra and subsalt sediments:***

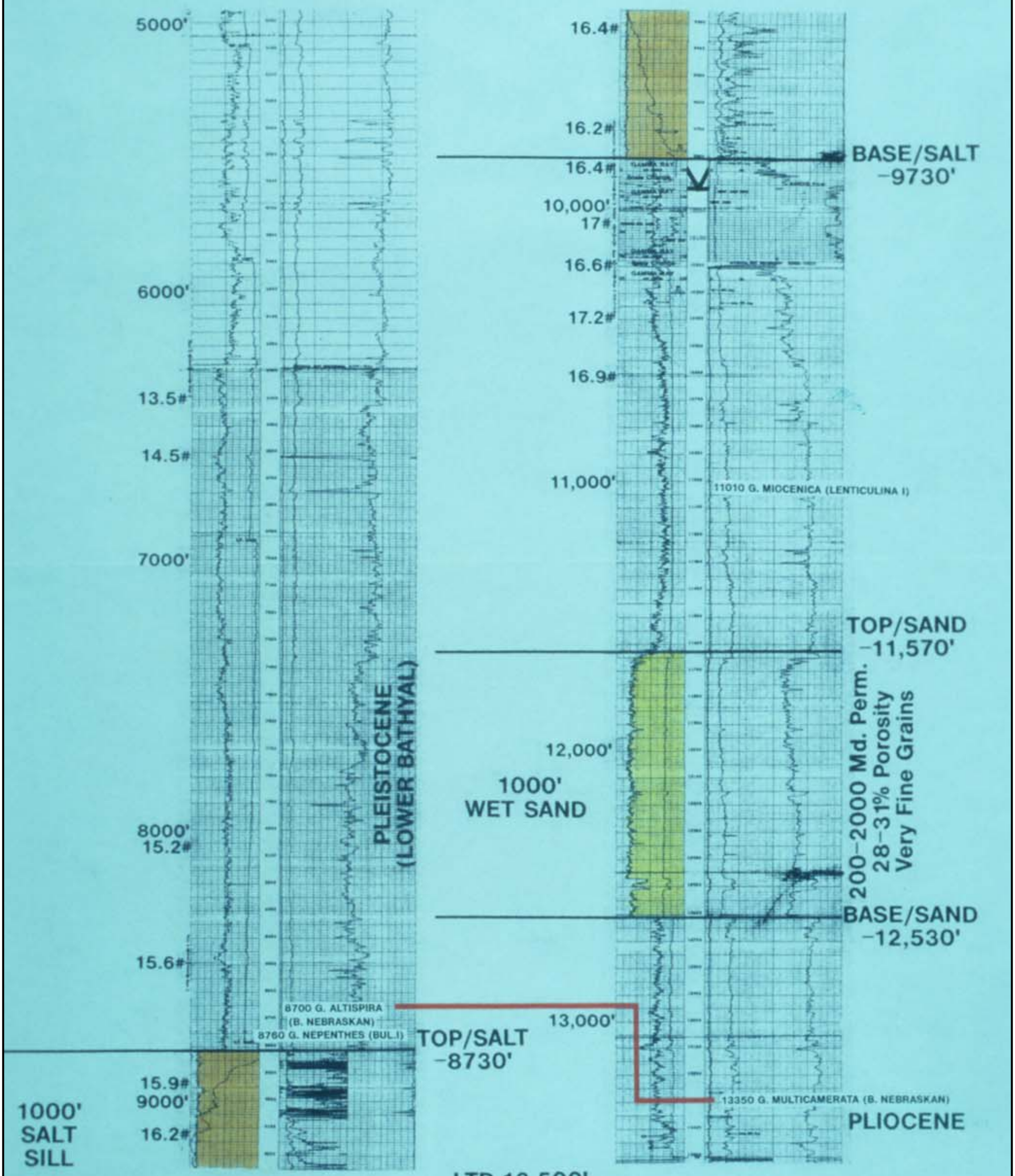
1. ***Large sedimentary time gap***
2. ***Conformable, with little apparent missing section***
3. ***Significant Repeat Section below salt, occurring when SCS is present above salt***



NORMAL SUPRASALT SECTION
A STACKED
B CONDENSED
C SECTIONS
(DEPOSITIONAL CONTACT)
SALT SHEET
"JUMBALAYA"
A
B
SUBSALT SECTION
C
REPEATED SECTION
A prominent repeated section can occur when a stacked condensed section is present above the salt sheet with "5 to 10" time expansion below salt.


DIAMOND SHAMROCK - GULF OF MEXICO
BLOCK 200 - #1 OCS-G-7719 - SOUTH MARSH ISLAND
PLANKTONIC FORAM ABUNDANCE
NUMBER PER SAMPLE
0 3000 6000
NANNOFOSSIL ABUNDANCE
NUMBER PER FIELD
0 10 20 30 40 50 60
MEASURED DEPTH
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
"Sangamon"
2850 - P. Lacunosa
3570 - P. Annula
3750 - Trim A
4500 - P. Annula (Lg.)
6390 - G. Incisa
6480 - S. Pulcherrima
7620 - G. Macintyrei
7410 - H. Balthica
7980 - D. Brouweri
7770 - G. Praehirsuta
8220 - D. Brouweri "A"
8670 - G. Altispira
8400 - D. Pentaradiatus
8670 - G. Margaritae
8400 - D. Surculus
8730 - G. Nepenthes
8700 - S. Abies
8760 - D. Berggrenii
8800
SALT
9800
1210' +
THICK
11010 - G. Miocenica (Lenticulina I)
2340'
THICK
SAND
1000'
THICK
SAND
13350 - G. Multicamerata (Basal Nebraskan)
SOURCE: ABOVE SALT - TGS
BELOW SALT - PALEO-DATA

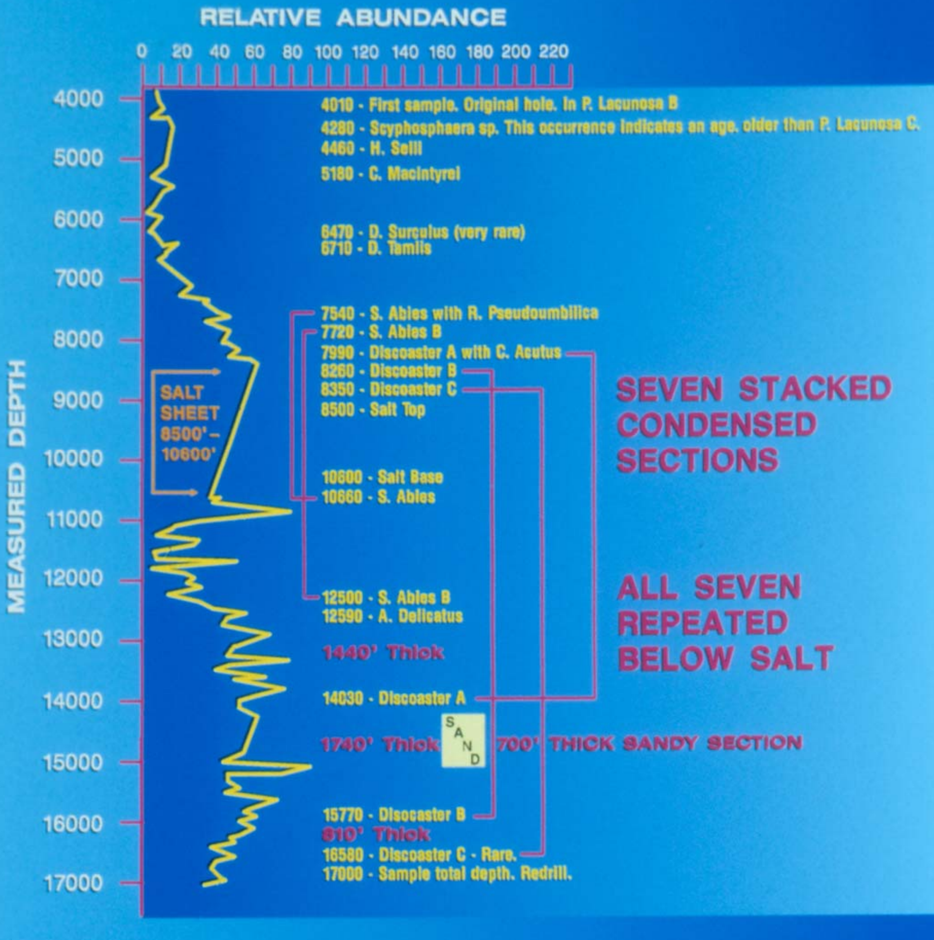
# DIAMOND SHAMROCK #1
## OCS-G-7719
## SOUTH MARSH ISLAND 200




LTD 13,500'
DTD 13,500'
P&A 2/86

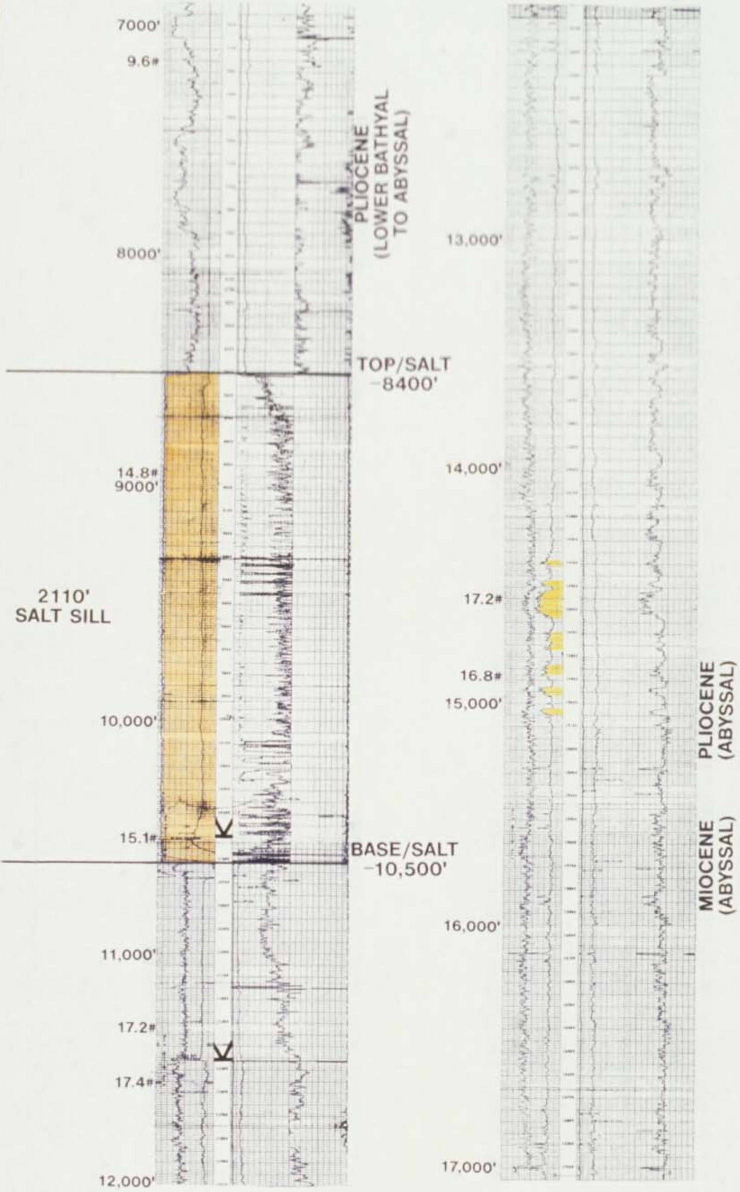
# AMOCO PRODUCTION COMPANY – GULF OF MEXICO

## BLOCK 356 - #1 OCS-G-7690 - VERMILION

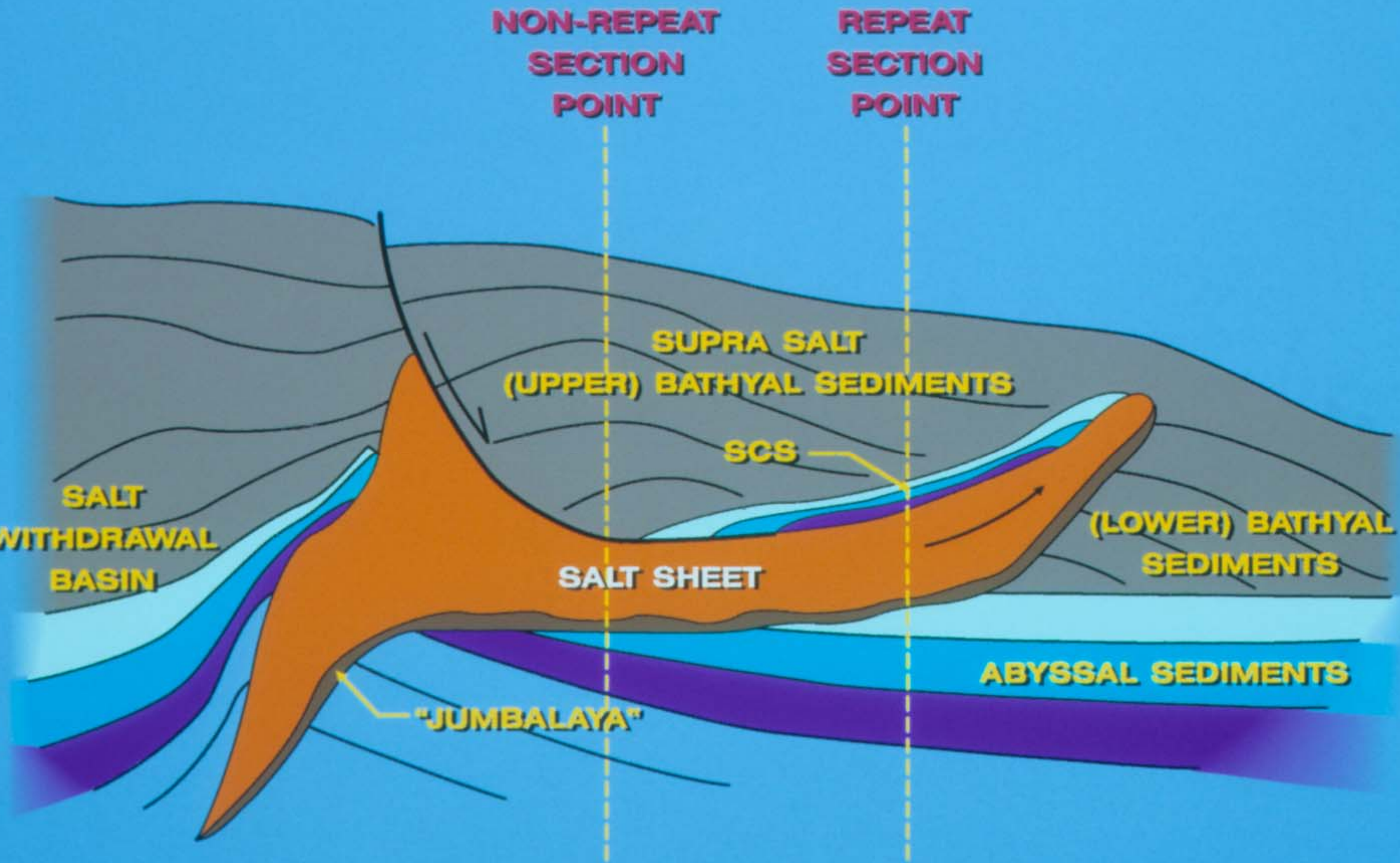



SOURCE: PALEO DATA, INC.

**AMOCO #1**
**OCS-G-7690**
**VERMILION 356**




LTD 17,034'
DTD 17,000'
P&A 12/87


NON-REPEAT SECTION POINT
REPEAT SECTION POINT
SUPRA SALT (UPPER) BATHYAL SEDIMENTS
SCS
SALT WITHDRAWAL BASIN
SALT SHEET
(LOWER) BATHYAL SEDIMENTS
ABYSSAL SEDIMENTS
"JUMBALAYA"

# CONCLUSIONS

- Stacked Condensed Sections(SCS) or "Mega-Condensed Sections" encountered above allochthonous salt sheets suggest that thicker and "repeated" sequences of age equivalent sediments may be encountered below the salt sheet.

- Subsalt sediments below SCS may have greater propensity for sand due to sand prone gravity driven depositon bypassing these salt inflated highs and accumulating around salt scarp edges and fronts. All prior to sheet thrusting with rafted SCS on sheet surface.

- Thick intervals of subsalt sediments (4,000+) should be penetrated in future wellbores below salt sheets to encounter all subsalt age equivalent sequences seen in the rafted SCS supra salt.

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and Western Geophysical

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Paleo Data/GECO, 1992, Gulf of Mexico Chronostratigraphic Correlation Chart.

Simmons, G.R., and W.R. Bryant, 1992, Slope sedimentation above an allochthonous salt substrate, northwest Gulf of Mexico: AAPG Annual Convention Abstracts, 1992, Calgary, p. 120.