

*Extreme Evaporative Drawdown of the Gulf
of Mexico at the Paleocene-Eocene
Boundary*

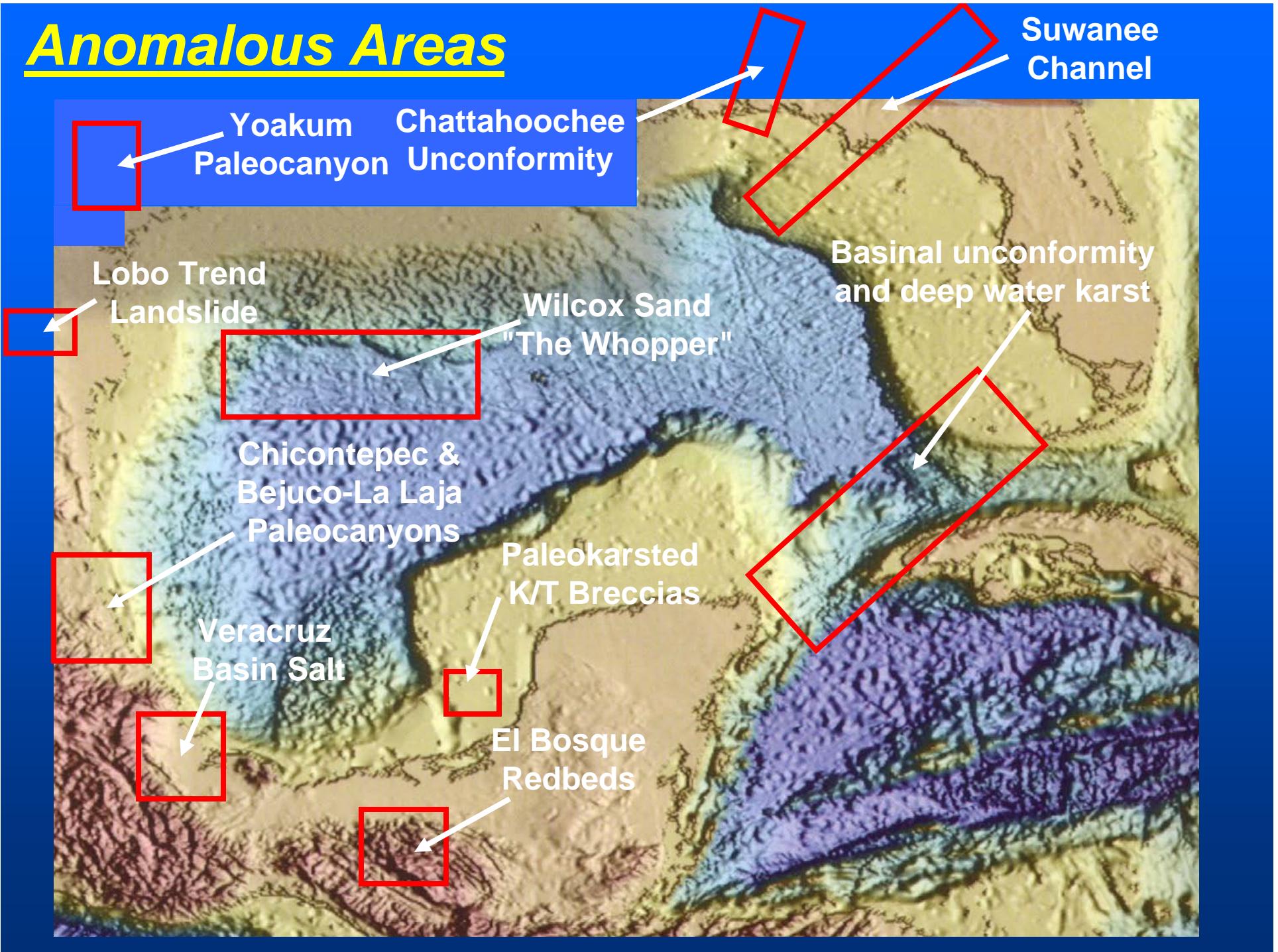
by

*Josh Rosenfeld, Independent
and Jon Blickwede, Statoil*

Why Propose a Localized G.O.M. Drawdown?

- *Several unusual geological features in the Gulf of Mexico can be explained by sea level drawdown at about the Paleocene-Eocene Boundary.*
- *There was no worldwide drawdown at that time.*

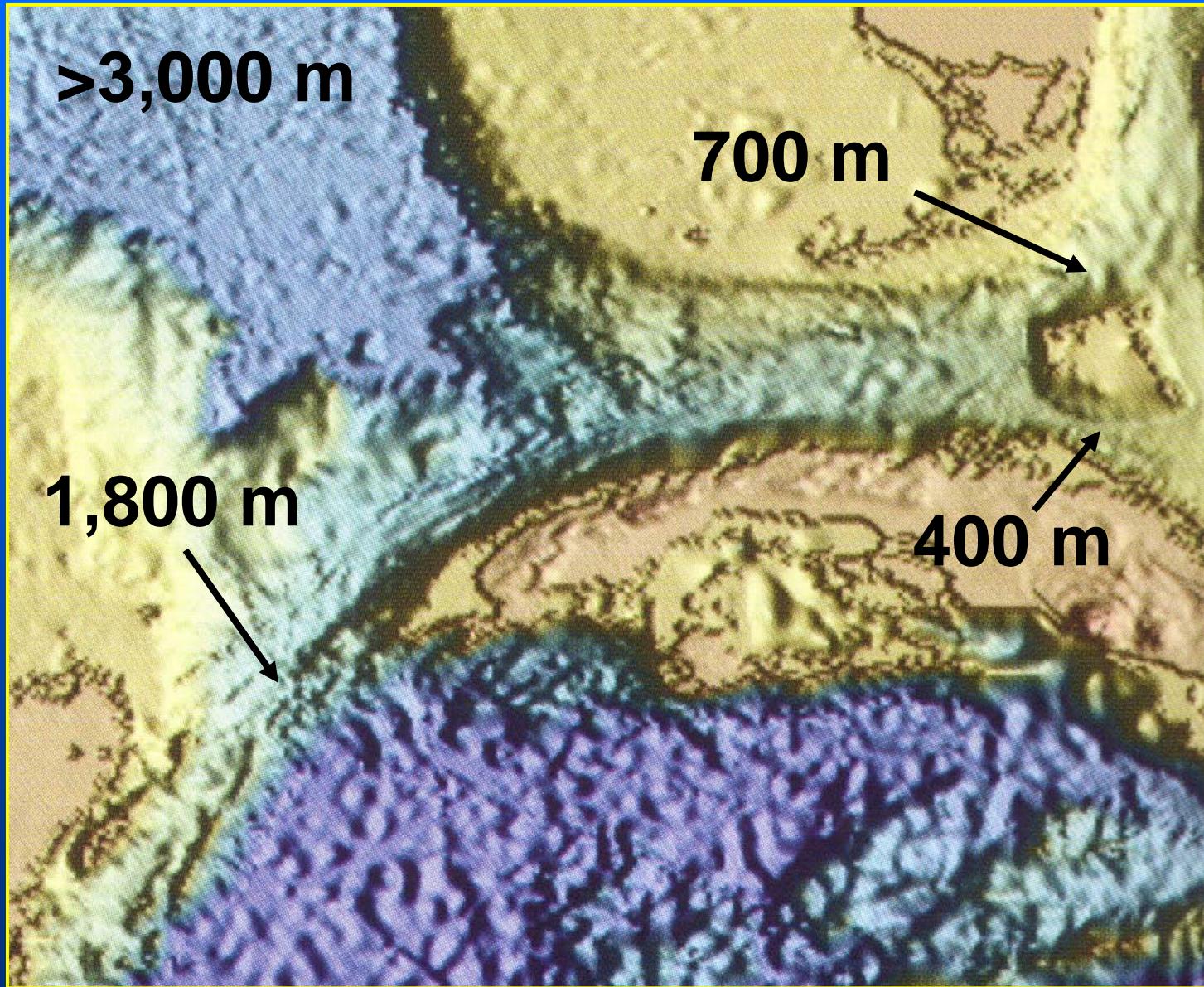
Anomalous Areas



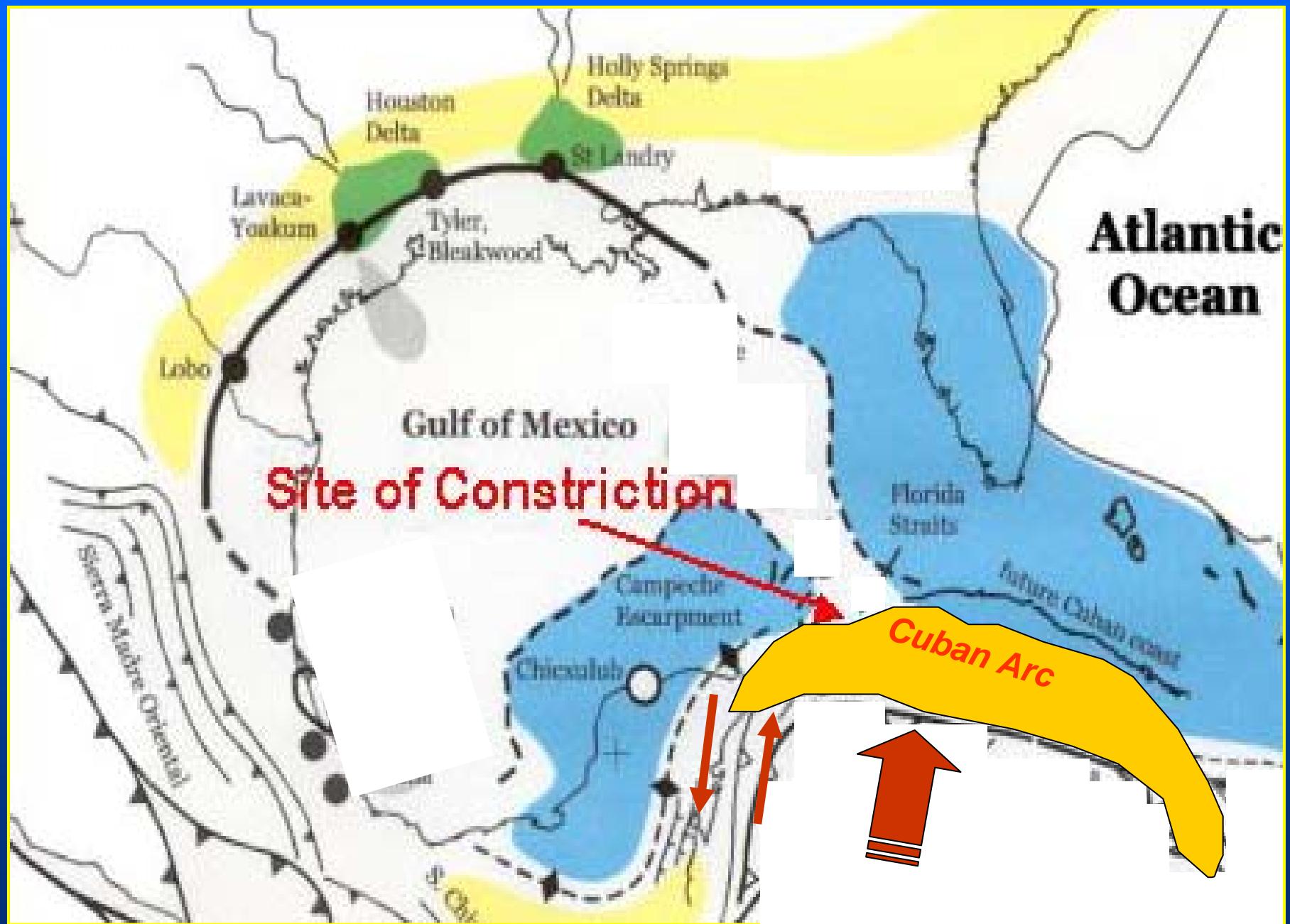
The Hypothesis:

- *The G.O.M. was isolated from the world ocean at the Paleocene-Eocene boundary when Cuba blocked the connection.*
- *The Gulf evaporated rapidly, lowering at least 1,000 meters within several thousand years.*
- *The period of isolation was short lived (< 1 MM years).*
- *Reconnection with the world ocean was sudden.*

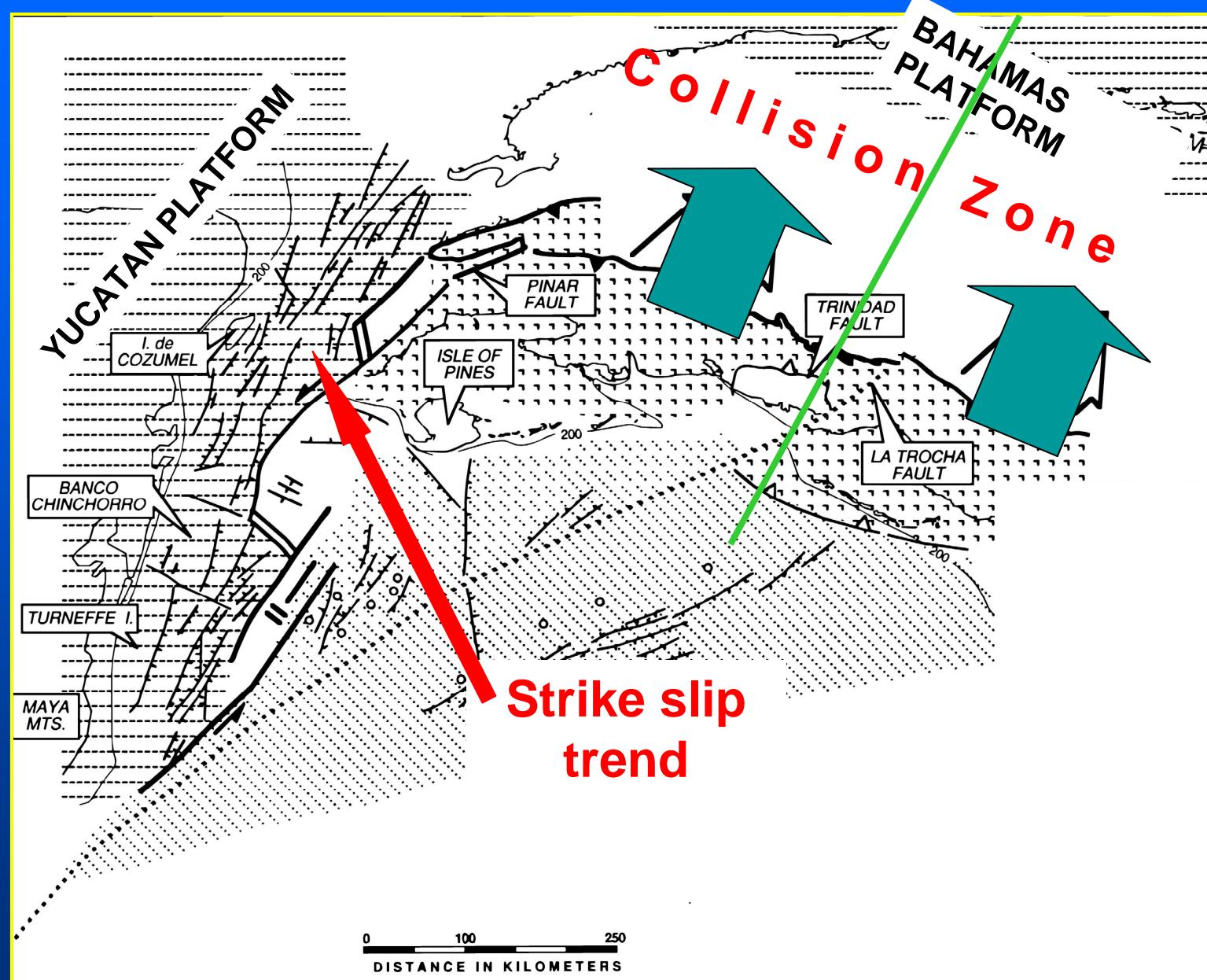
Actual G.O.M. Bathymetry



Isolation Mechanism

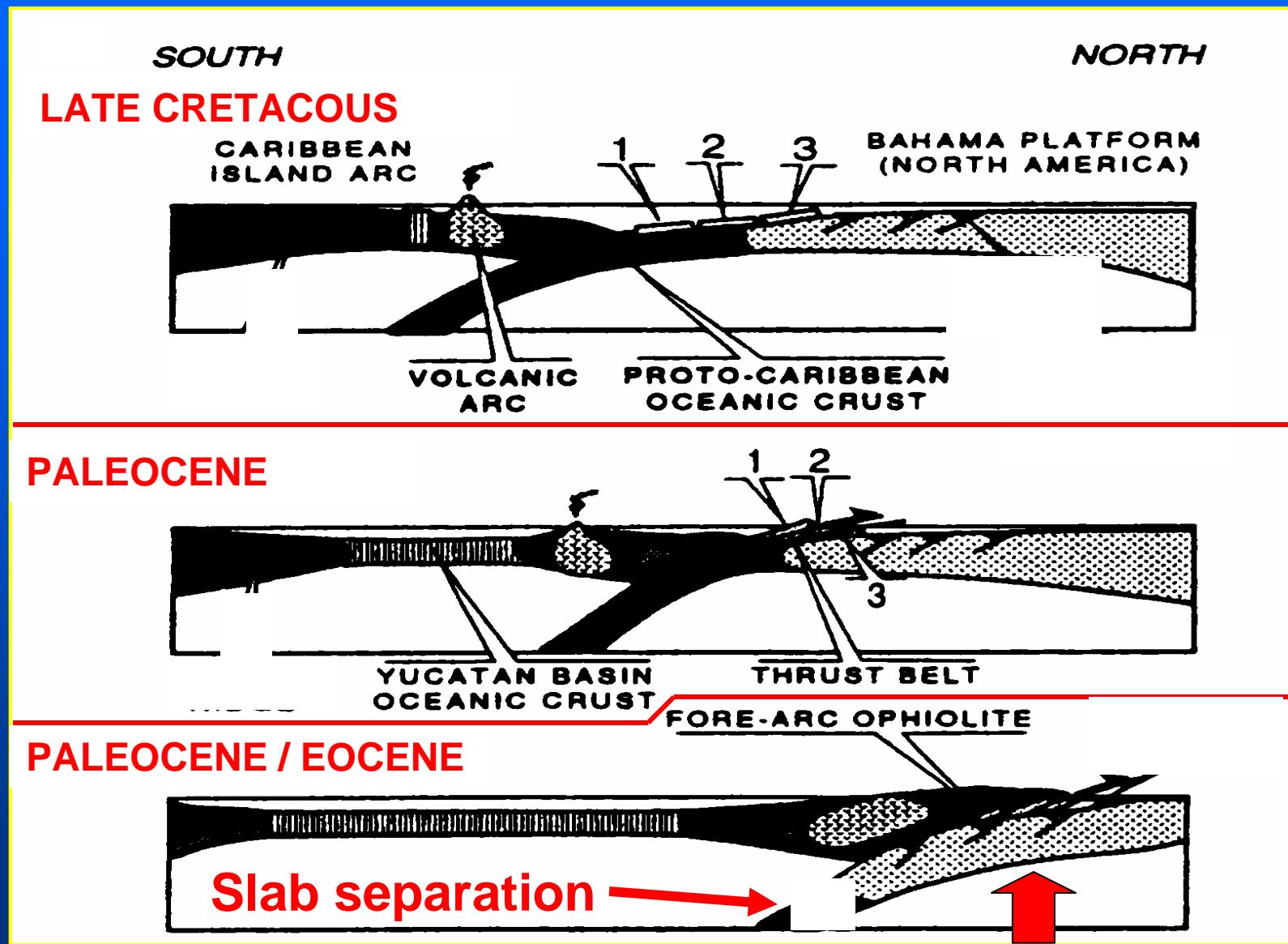


Yucatan Channel - Late Paleocene



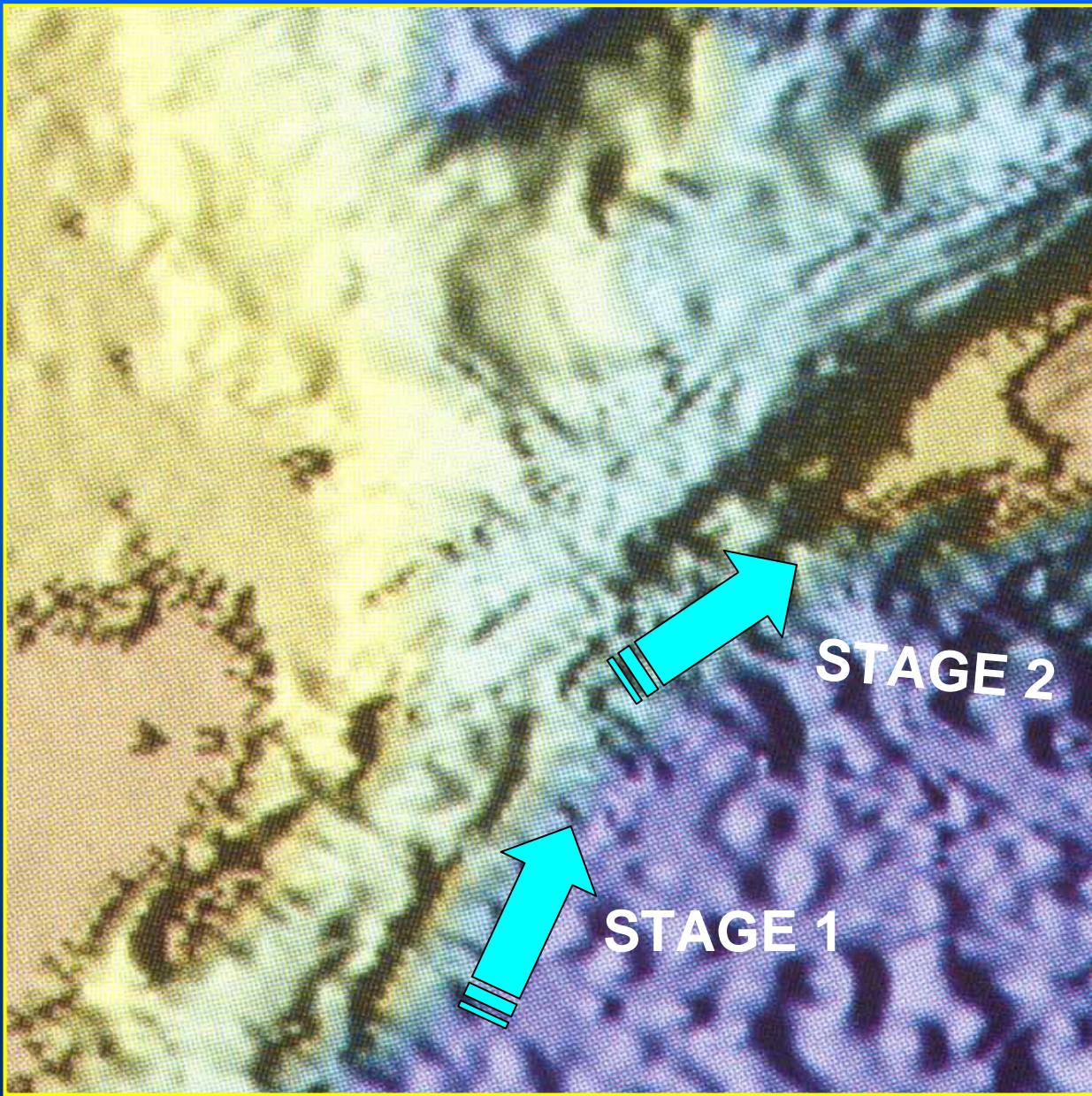
From Rosencrantz, 1990

Cuban Orogen



Adapted from Hutson, Mann and Renne, 1998

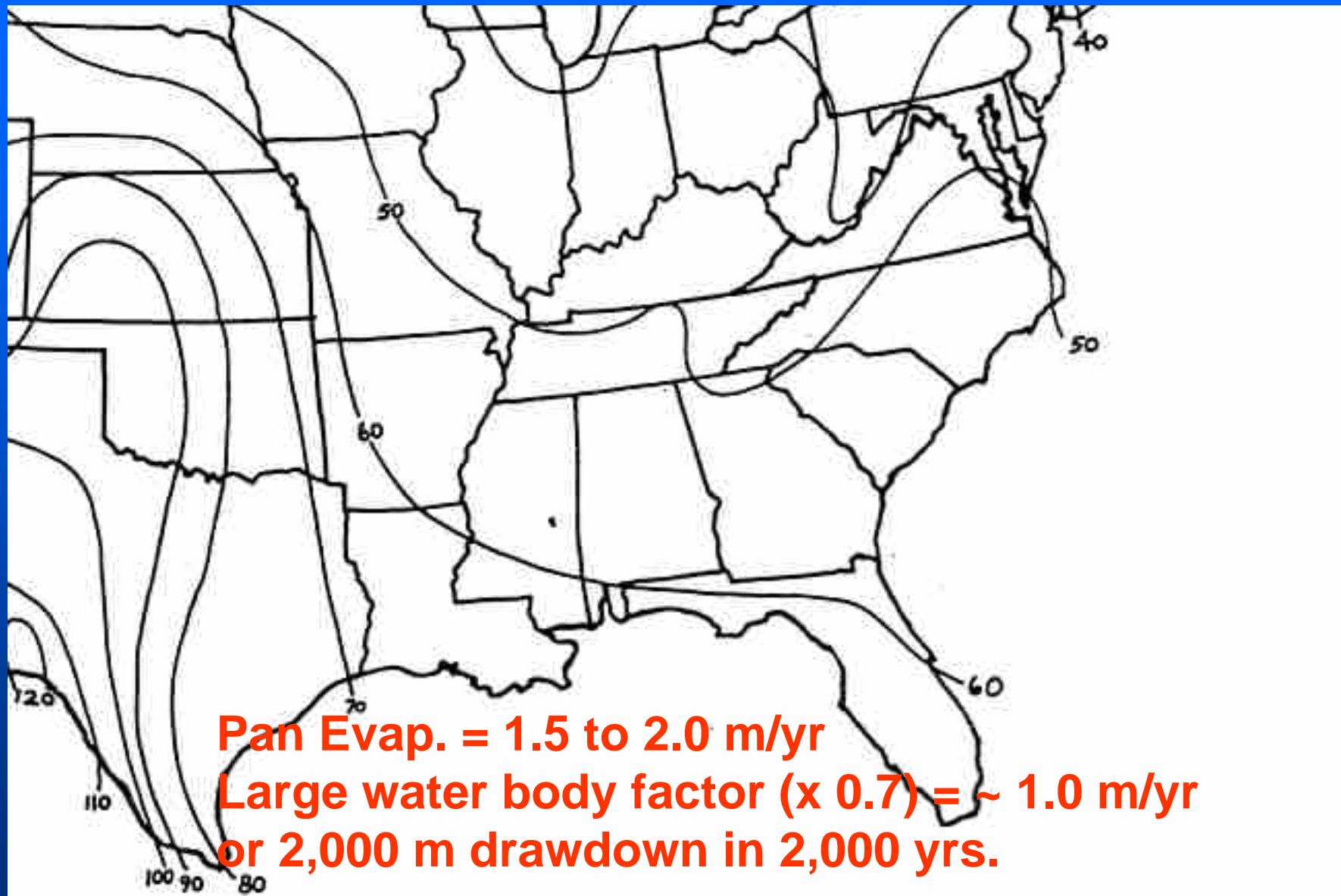
Cuba/Yucatán - Two Stage Strike Slip



Isolation Effects

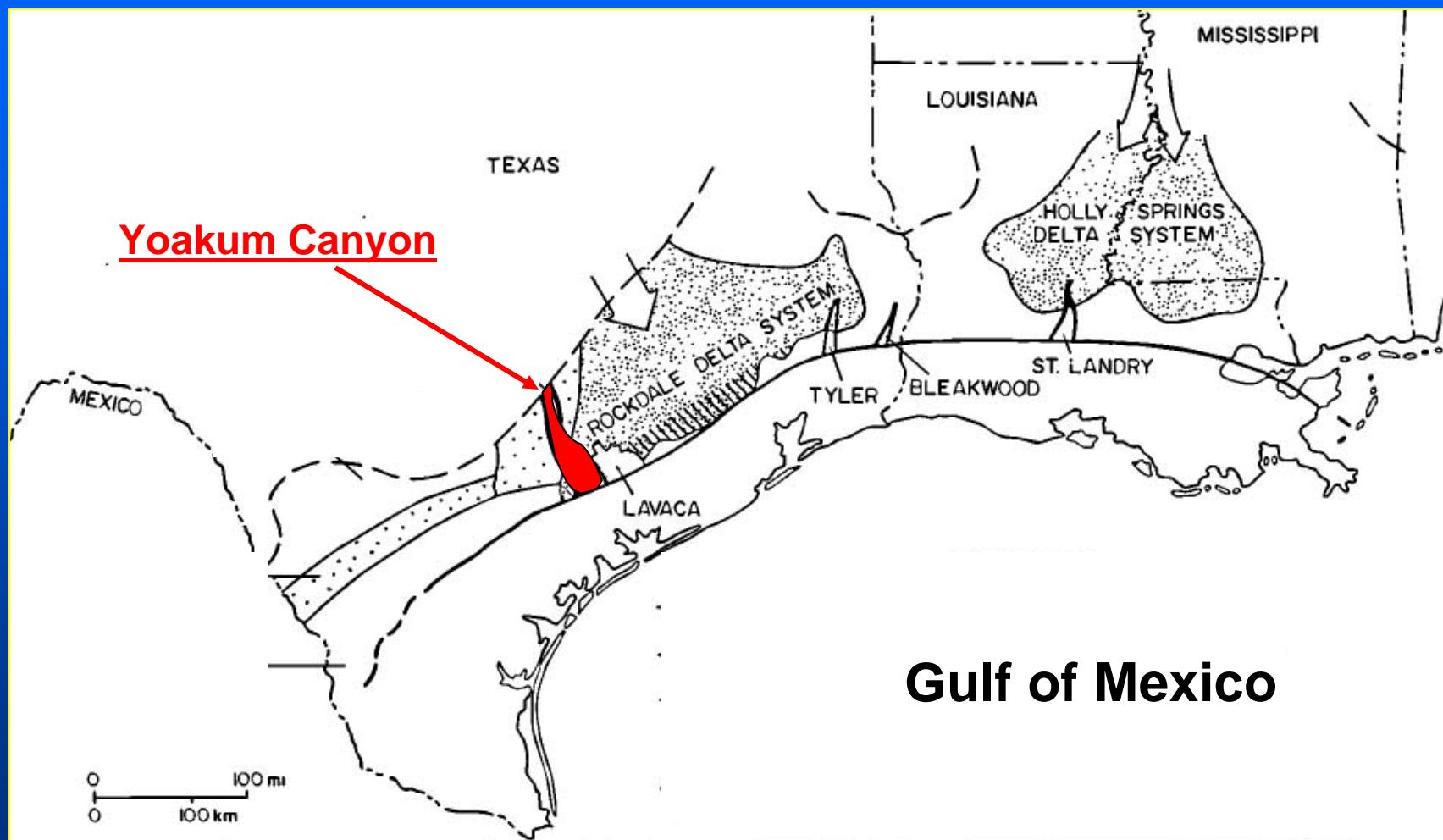
- *Rapid evaporation (Mediterranean Analog)*
- *Isostatic uplift (accentuated isolation)*
- *Slump of clastic shelf-edges and upper slopes*
- *Deep canyons across shelves and slopes*
- *Sediment bypass into central Gulf*
- *Karsting of shallow and deep water carbonates*
- *Localized salt deposition*
- *Massive hydrate release (P/E Thermal Max.)*

Evaporation Rate (inches/year)



Source = National Science Digital Library

Yoakum Paleocanyon



From Galloway, Dingus and Paige, 1991

Yoakum Paleocanyon

~ 100 kms long
> 800 meters deep

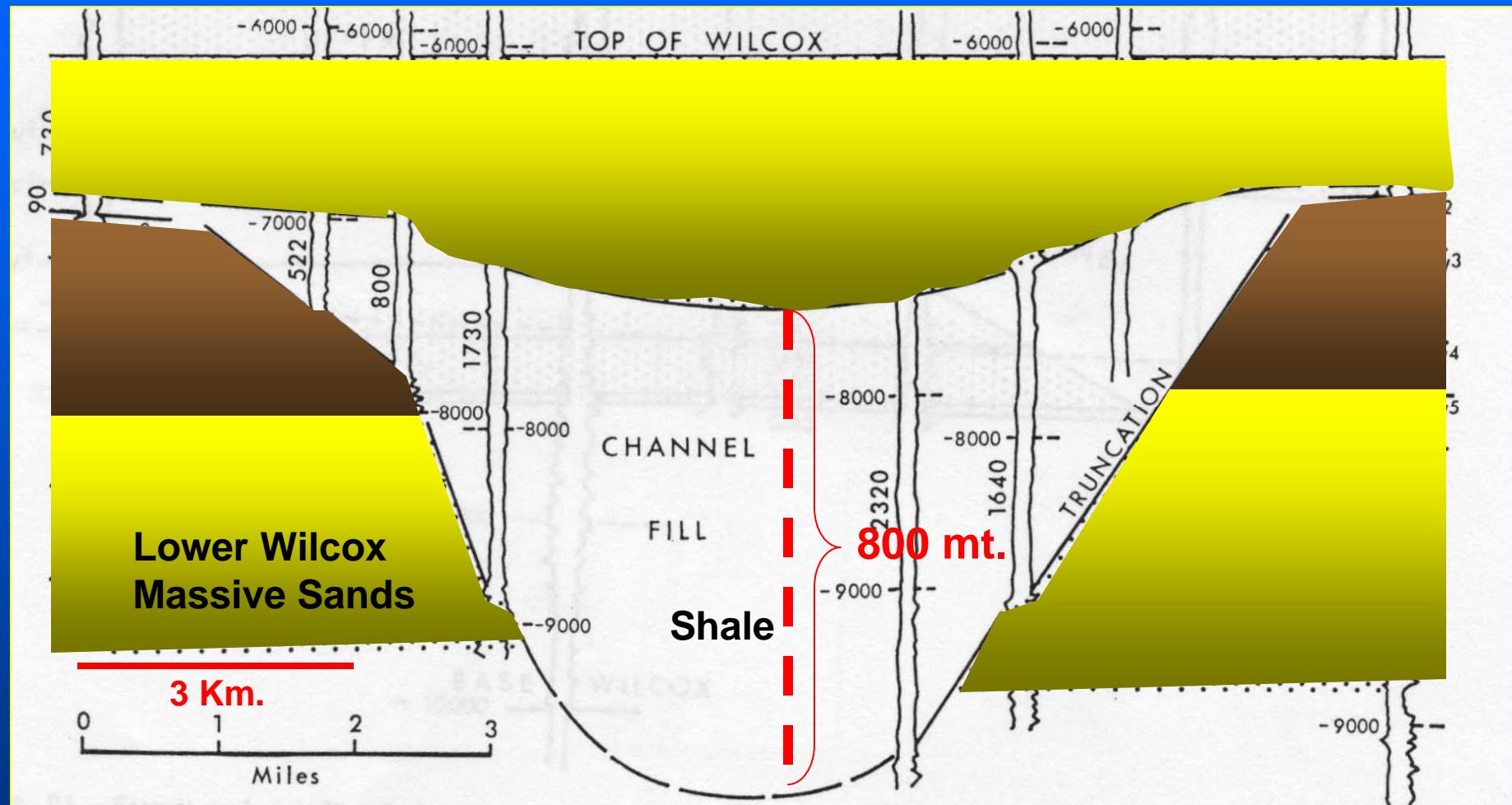
SHELF

SHELF

V.E. = ~10

From Galloway, Dingus and Paige, 1991

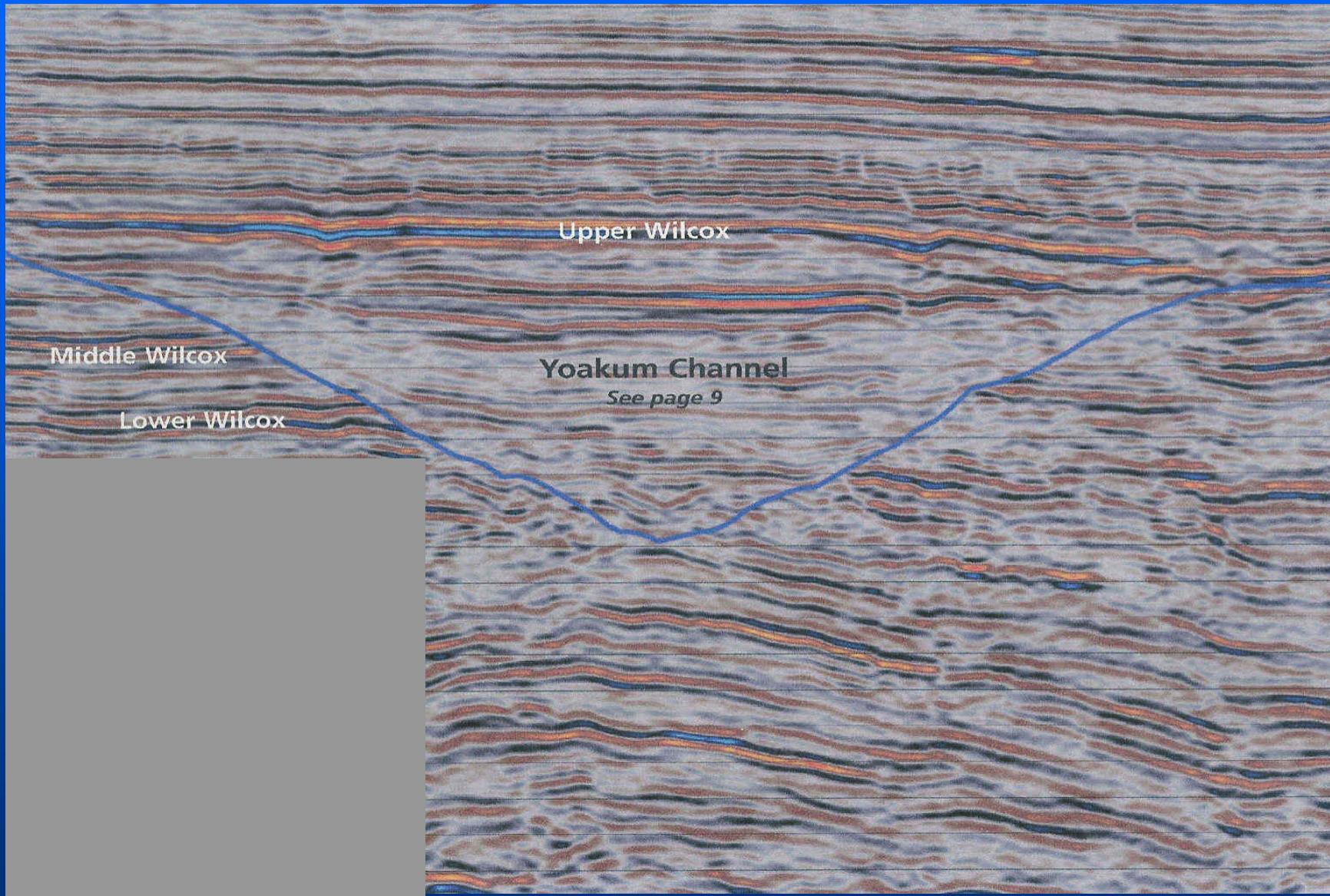
Yoakum Paleocanyon



V.E. = ~7.5

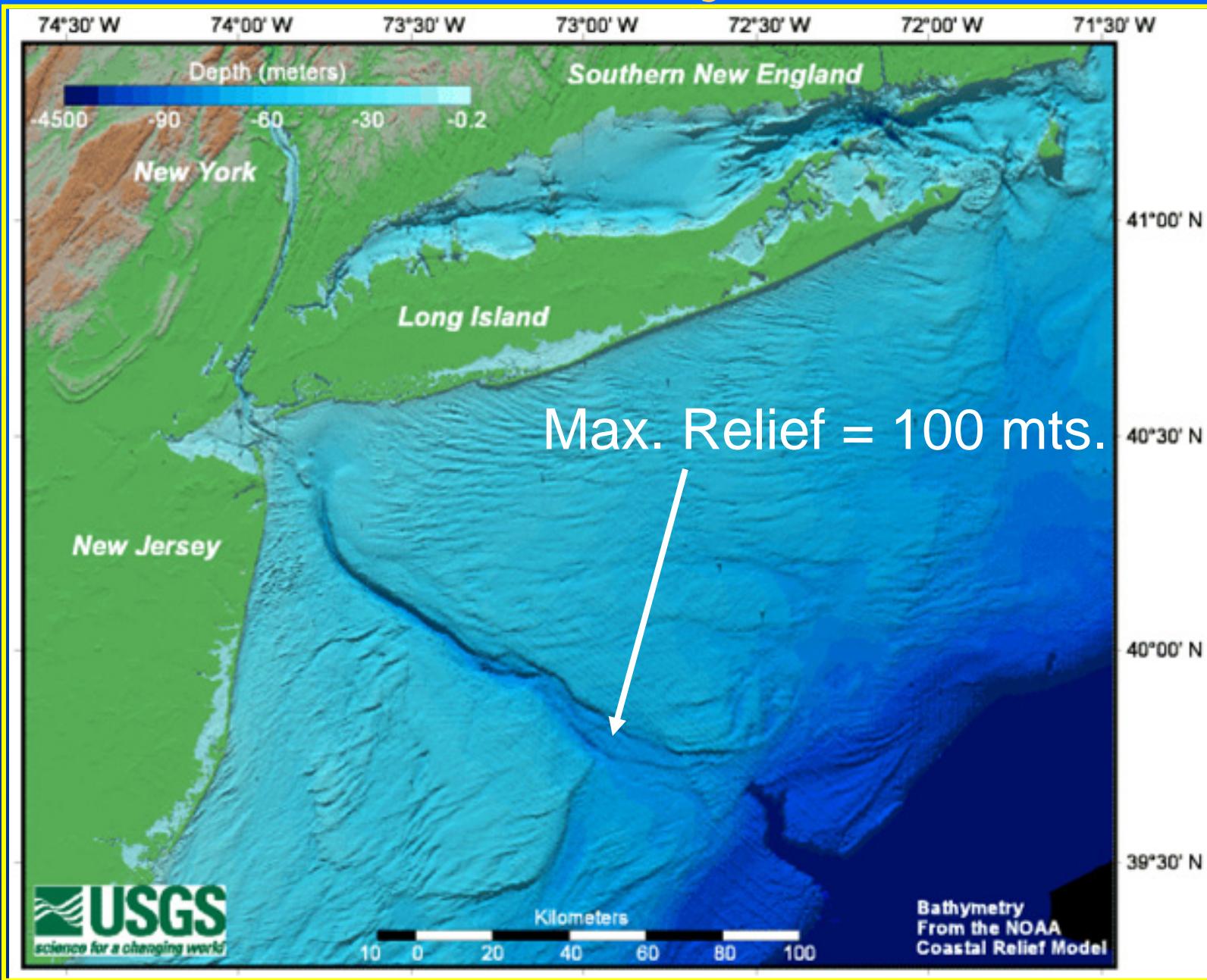
From Hoyt, 1959

Yoakum Canyon Seismic Section

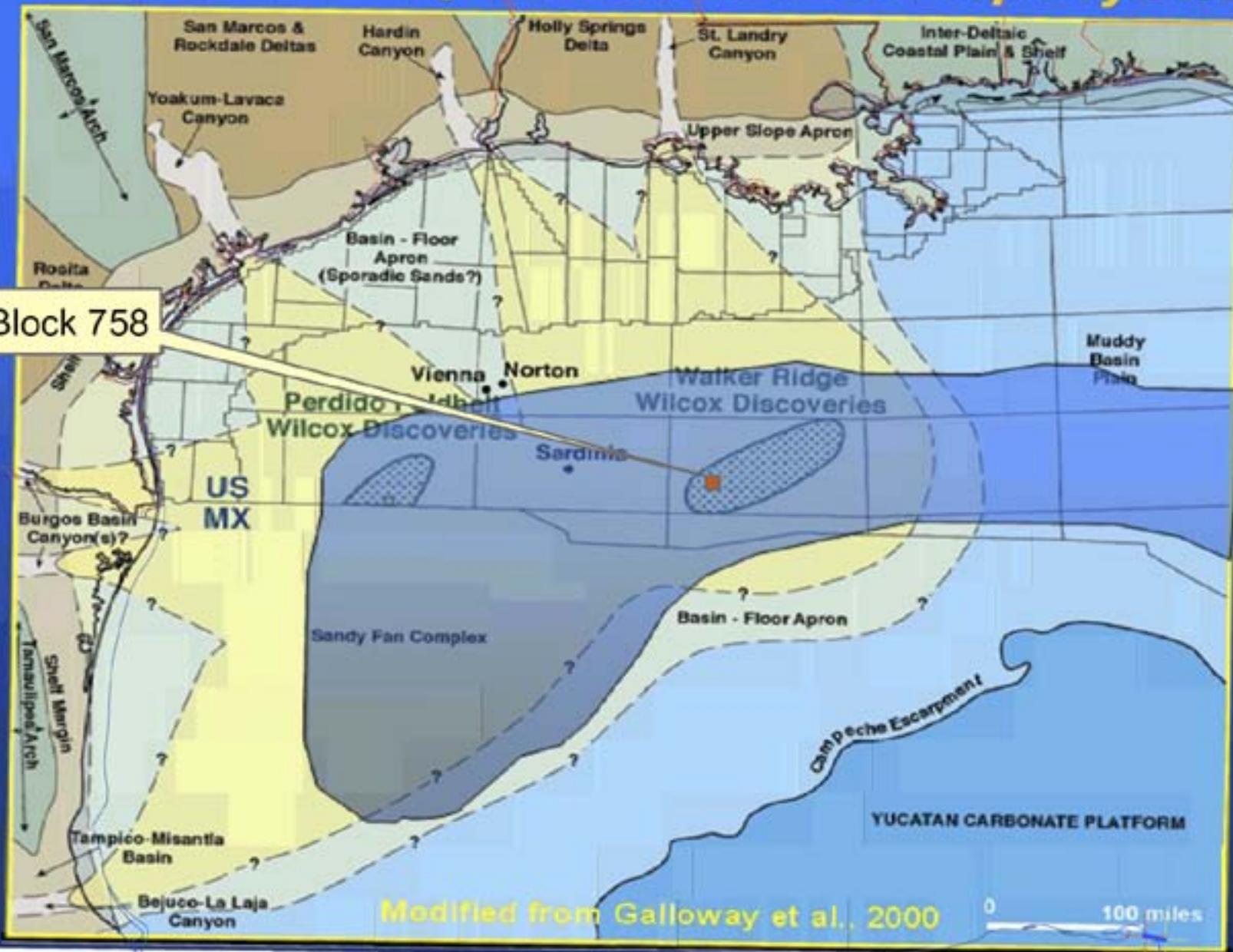


Cover - HGS Bulletin, April 2006

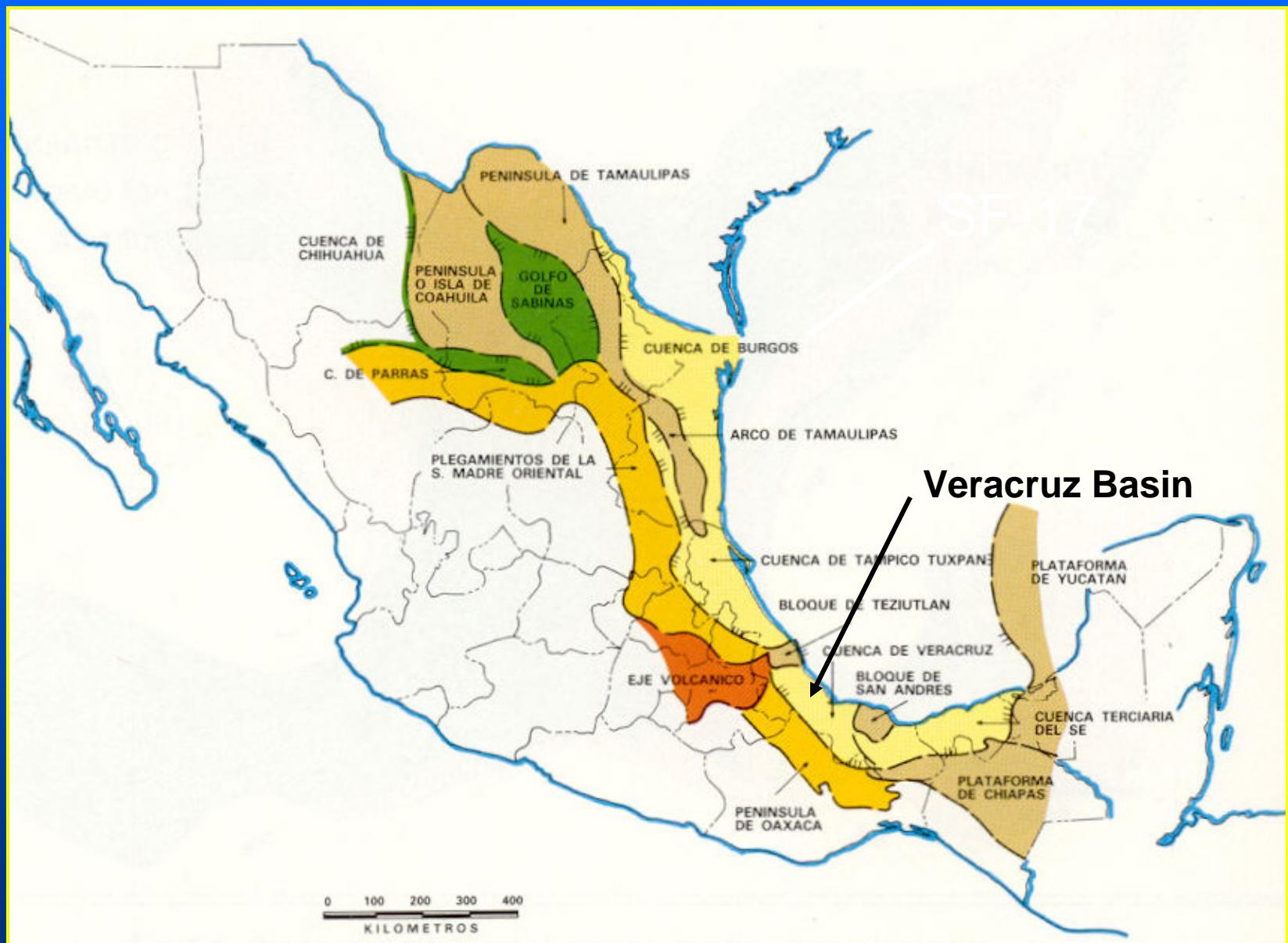
Hudson Canyon



Late Paleocene-Early Eocene Gross Deposystems

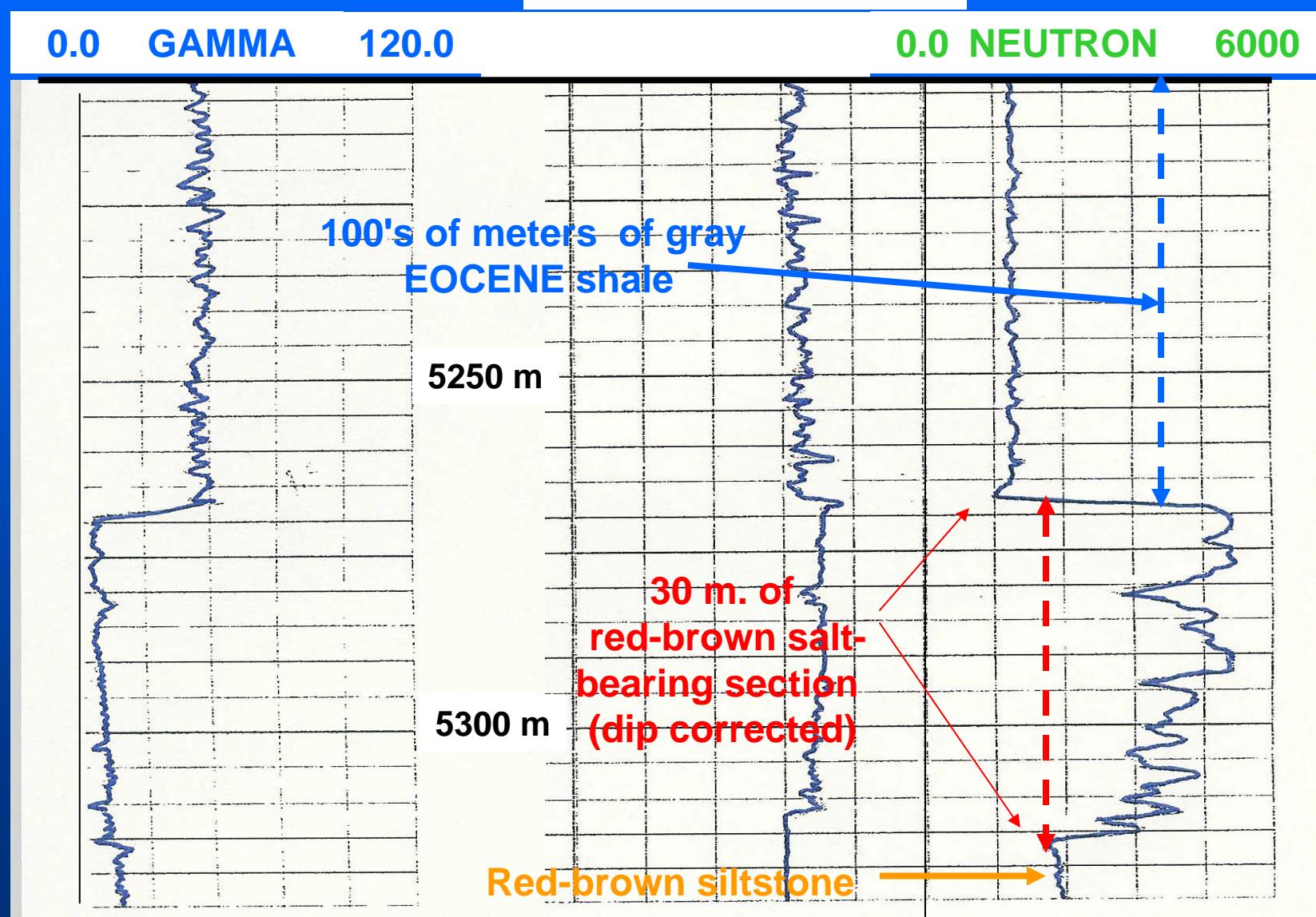


Veracruz Basin Location Map



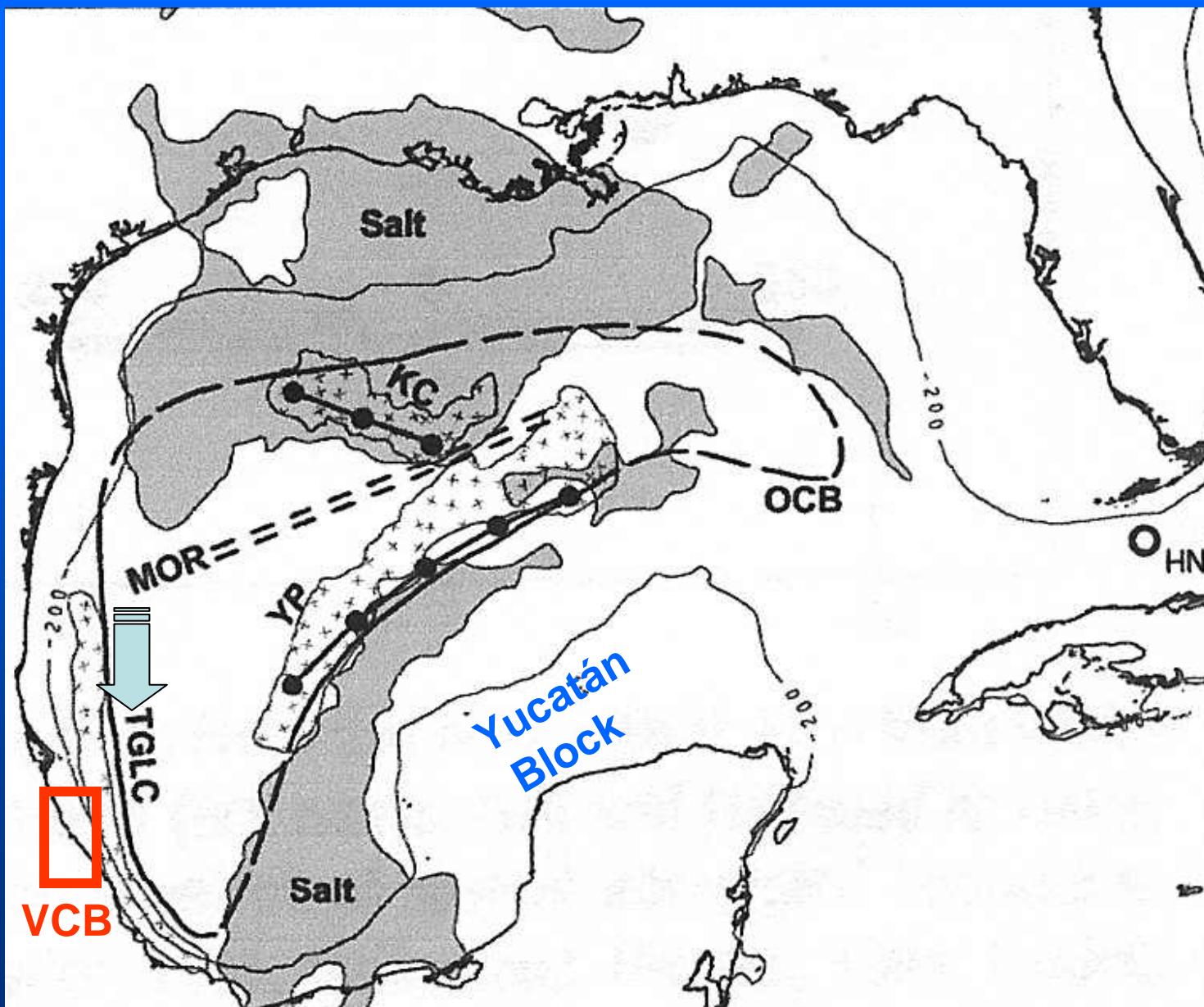
Pemex Mataespinio-101B

140 SONIC 40

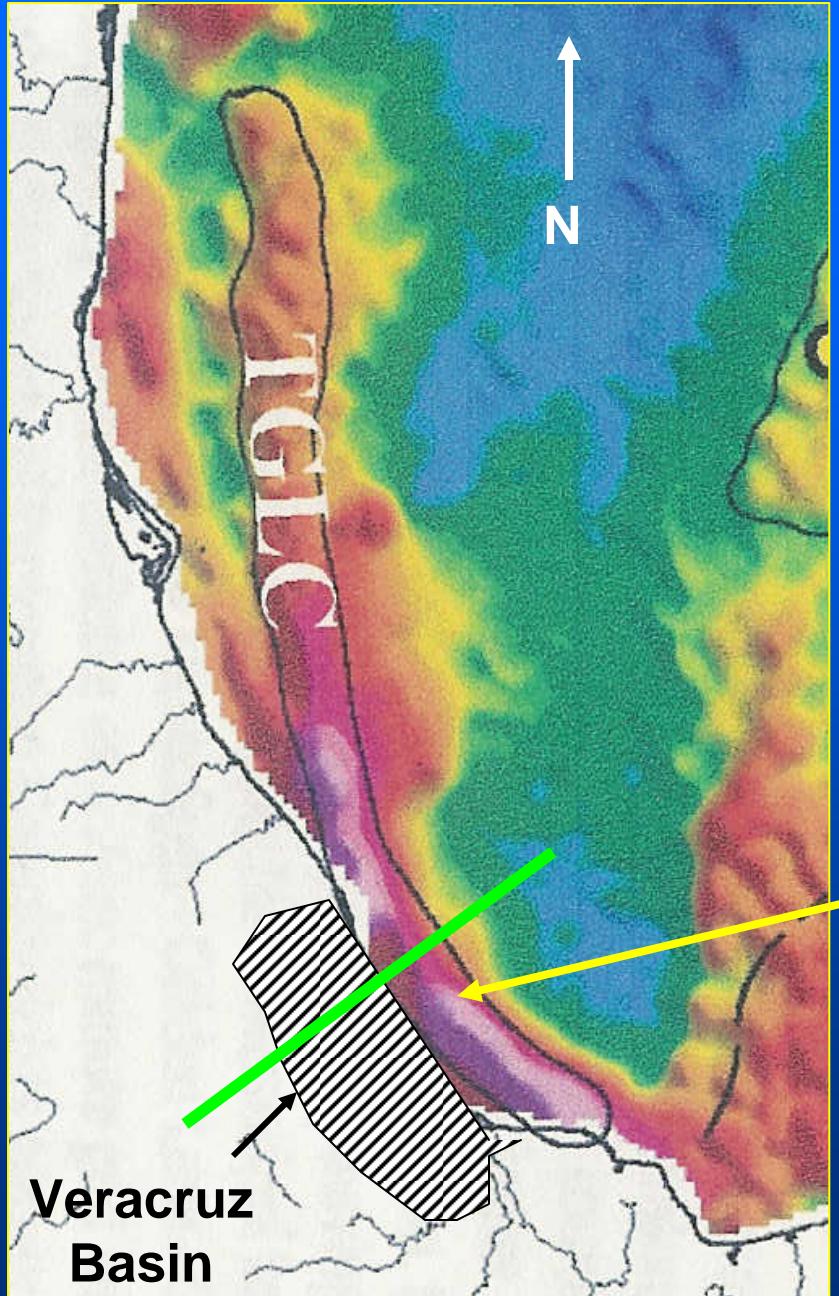


Copied with permission of Pemex: Thanks to Alfredo Guzmán and Rosalío Razo

Salt Distribution in G.O.M.



From Bird et. al, 2005

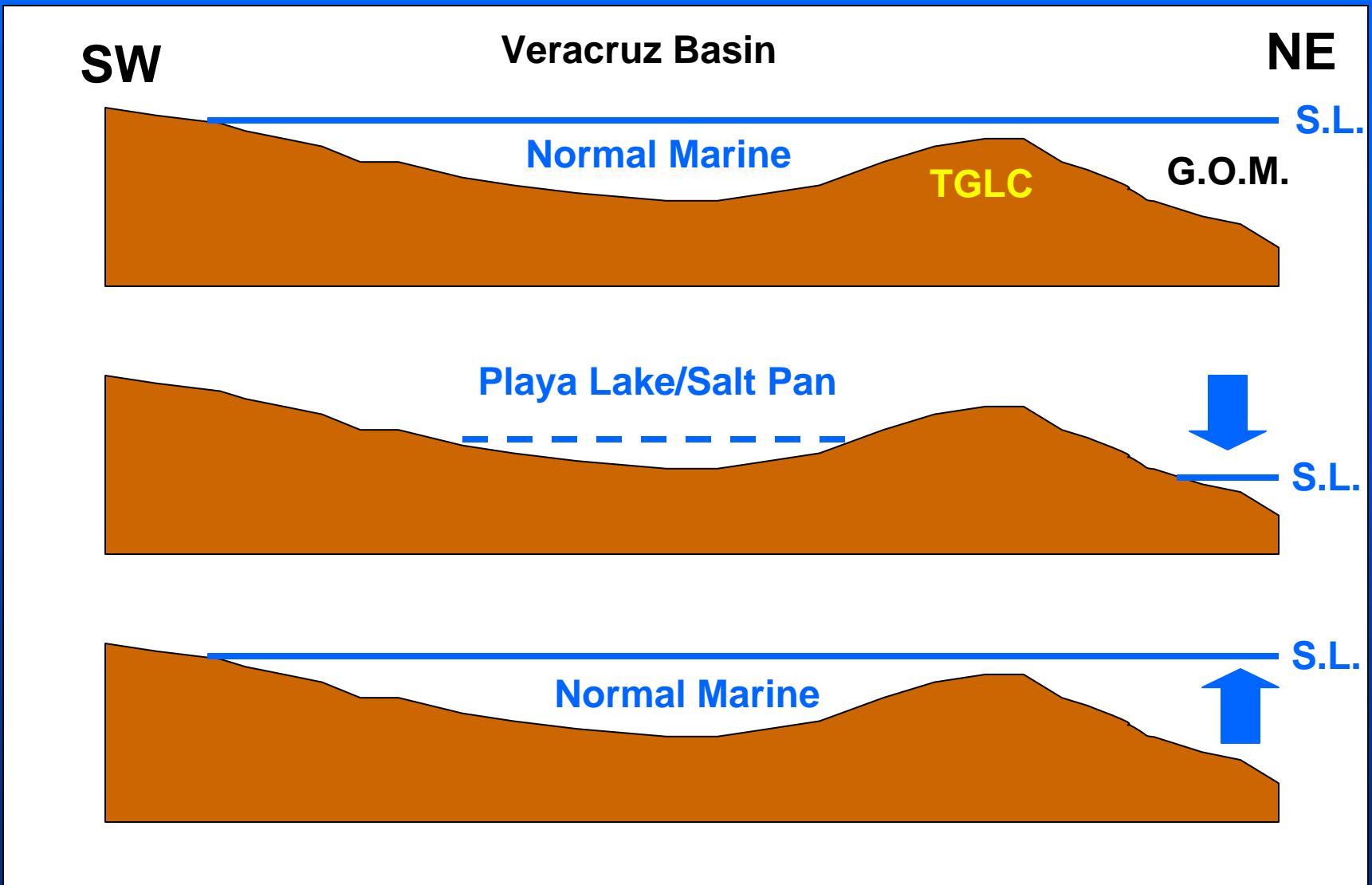


*Veracruz Basin
Separated from
GOM by
Transform Ridge*

TGLC = Tamaulipas-Golden
Lane-Chiapas Transform
(Free Air Gravity High and
Structural High)

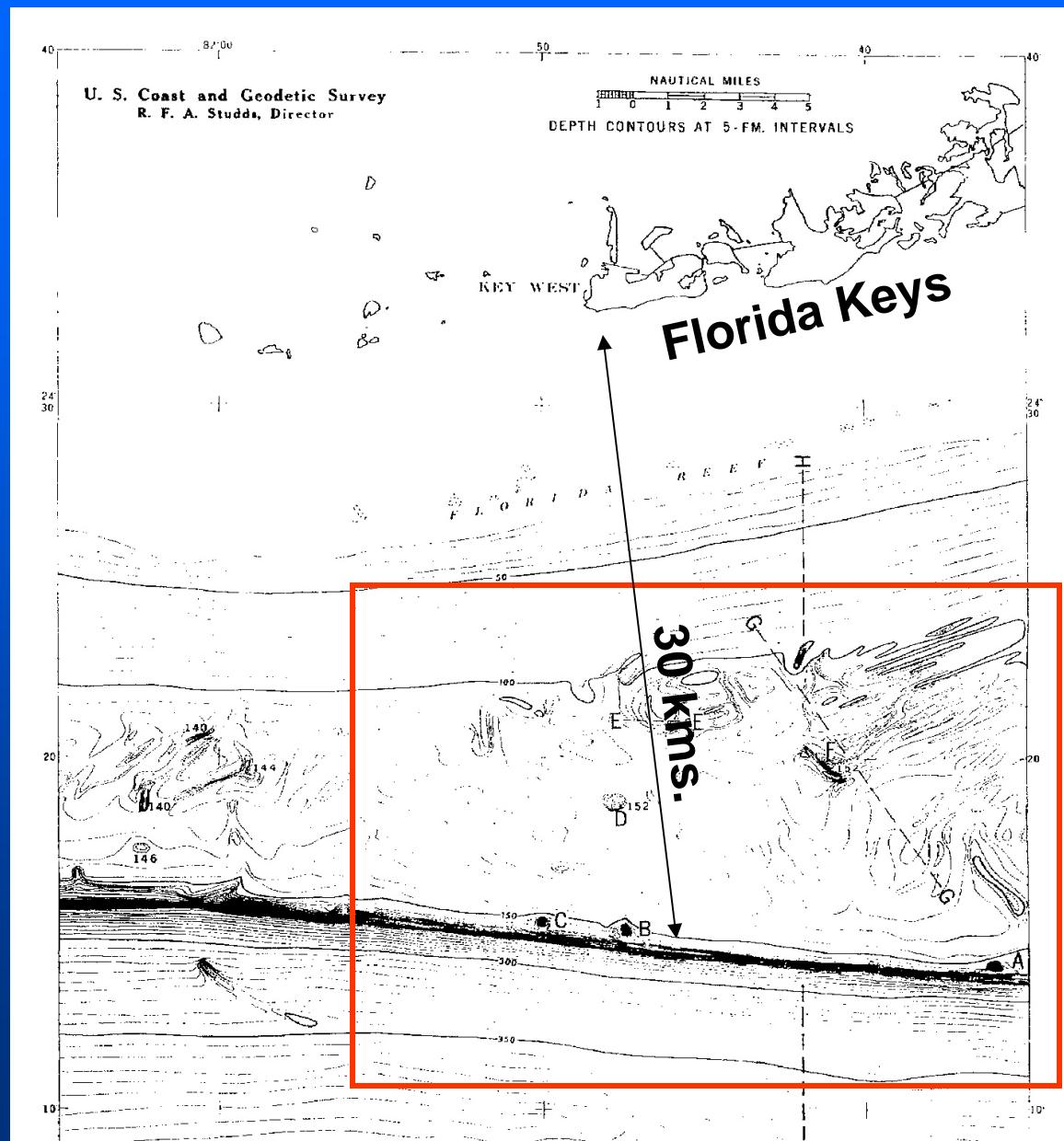
From Bird et. al, 2005

Veracruz Basin Salt Explanation



Deep Water Karst

Sinkholes on Florida Slope

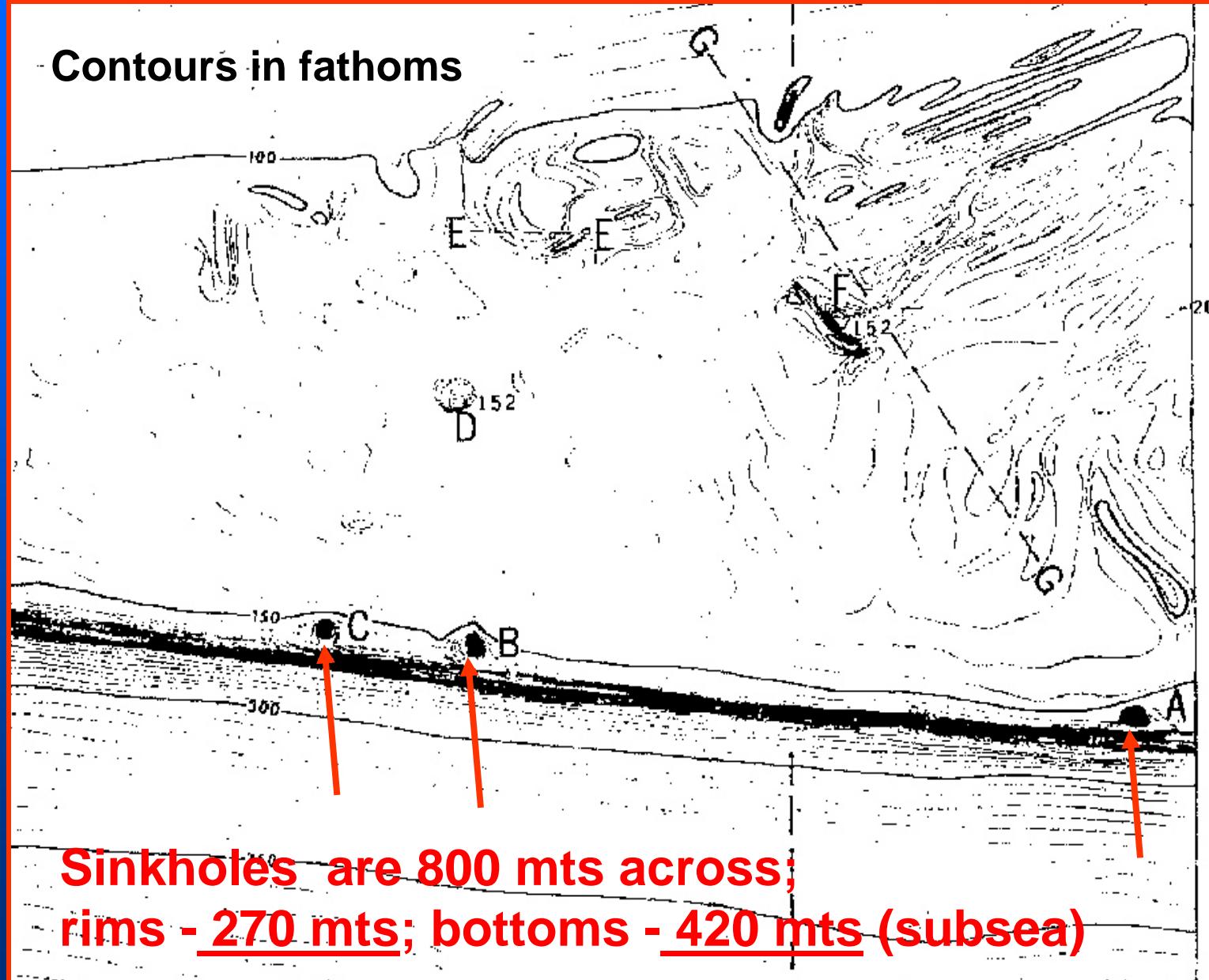


Jordan, 1954

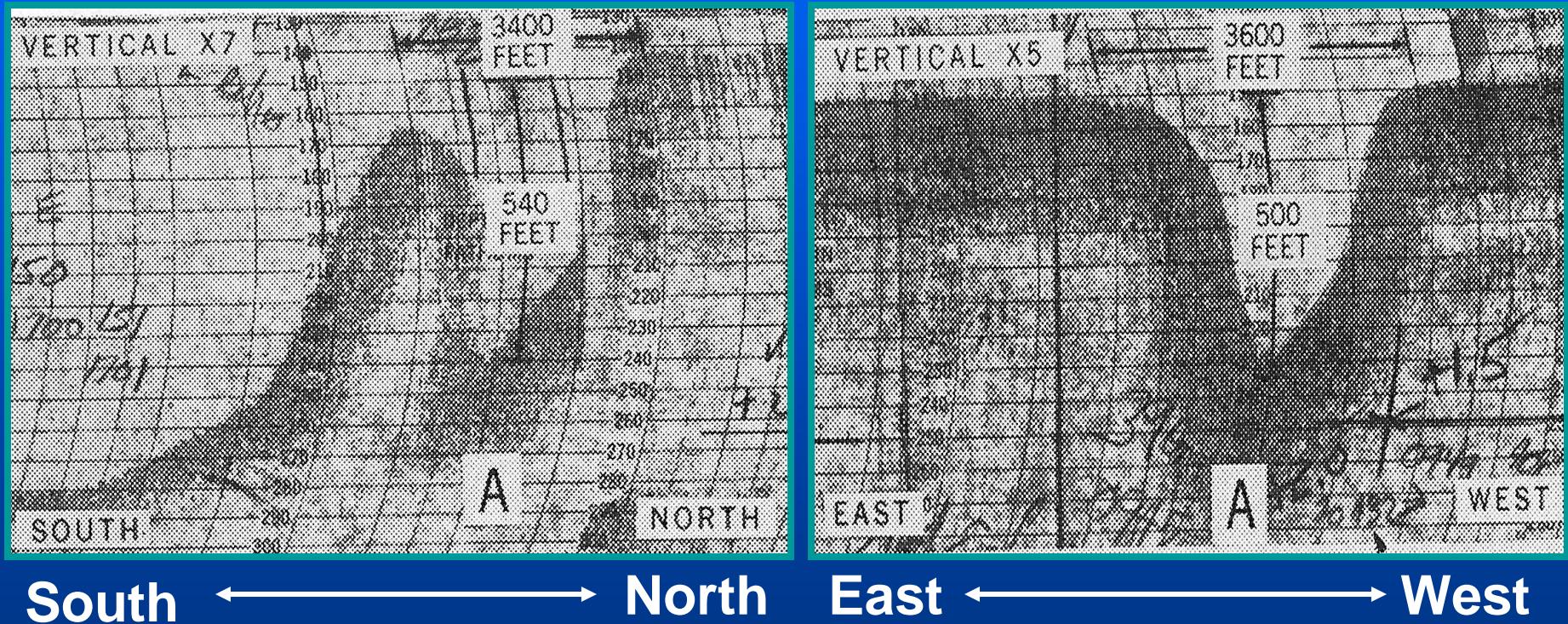
Sinkholes in Deep Water - Florida Slope

JR1

Contours in fathoms



Sinkhole "A" - Florida Slope



Jordan, 1954

Cuban Seismic Line 208

~200 kms.

CU000102	CU000105	DIGI-1001PI	DIGI-1121PI	CU000119P	CU000113	CU000123
3520 3820 4120 4420 4720 5020 5320 5620 5920 6220 6520 6820 7120 7420 7720 8020 8320 8620 8920 9220 9520 9820 10120 10420 10720 11020 11320 11620 11920 12220 12520 12820 13120 13420 13720 14020 14320 14620 14920 15220 15520 15820 16120 16420 16720 17020 17320 17620 17920 18220 18520 18820 19120						
1076 1176 1276 1376 1476 1576 1676 1776 1876 1976 2076 2176 2276 2376 2476 2576 2676 2776 2876 2976 3076 3176 3276 3376 3476 3576 3676 3776 3876 3976 4076 4176 4276 4376 4476 4576 4676 4776 4876 4976 5076 5176 5276 5376 5476 5576 5676 5776 5876 5976 6076 6176 6276						

S

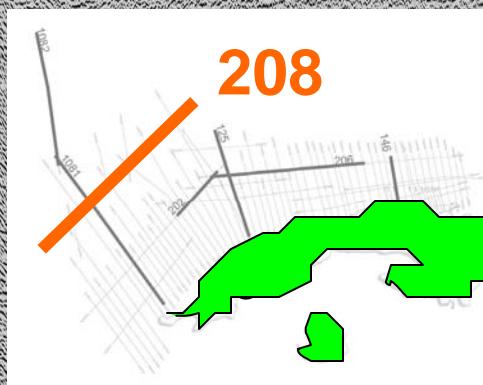
N

1,000 mts.

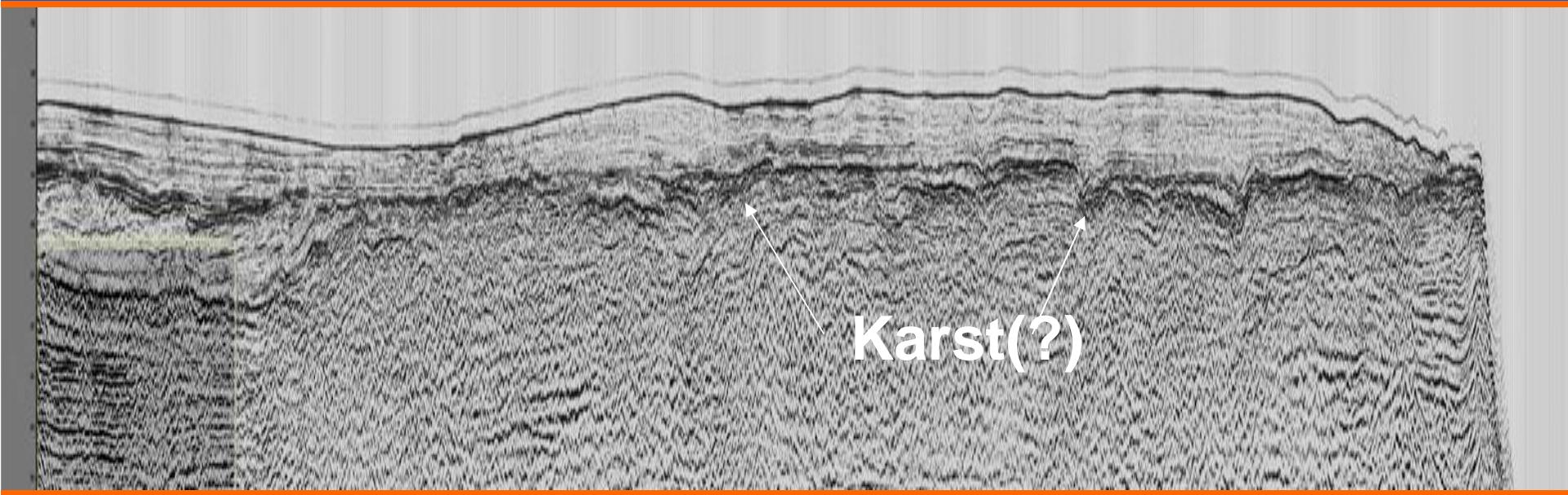
Yucatan

Catoche
Knoll

V.E. = 17



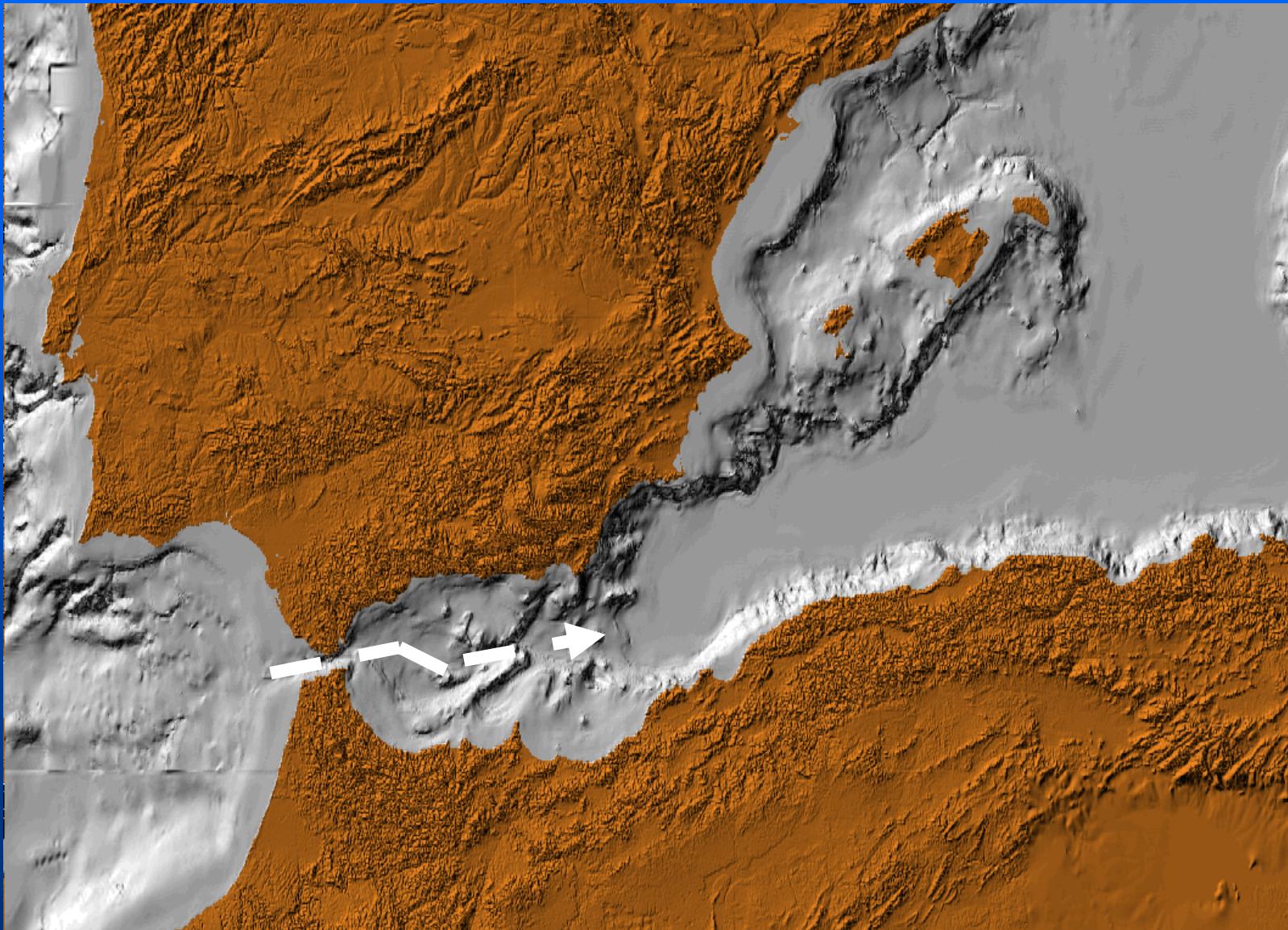
Cuban Seismic Line 208 (Magnified)



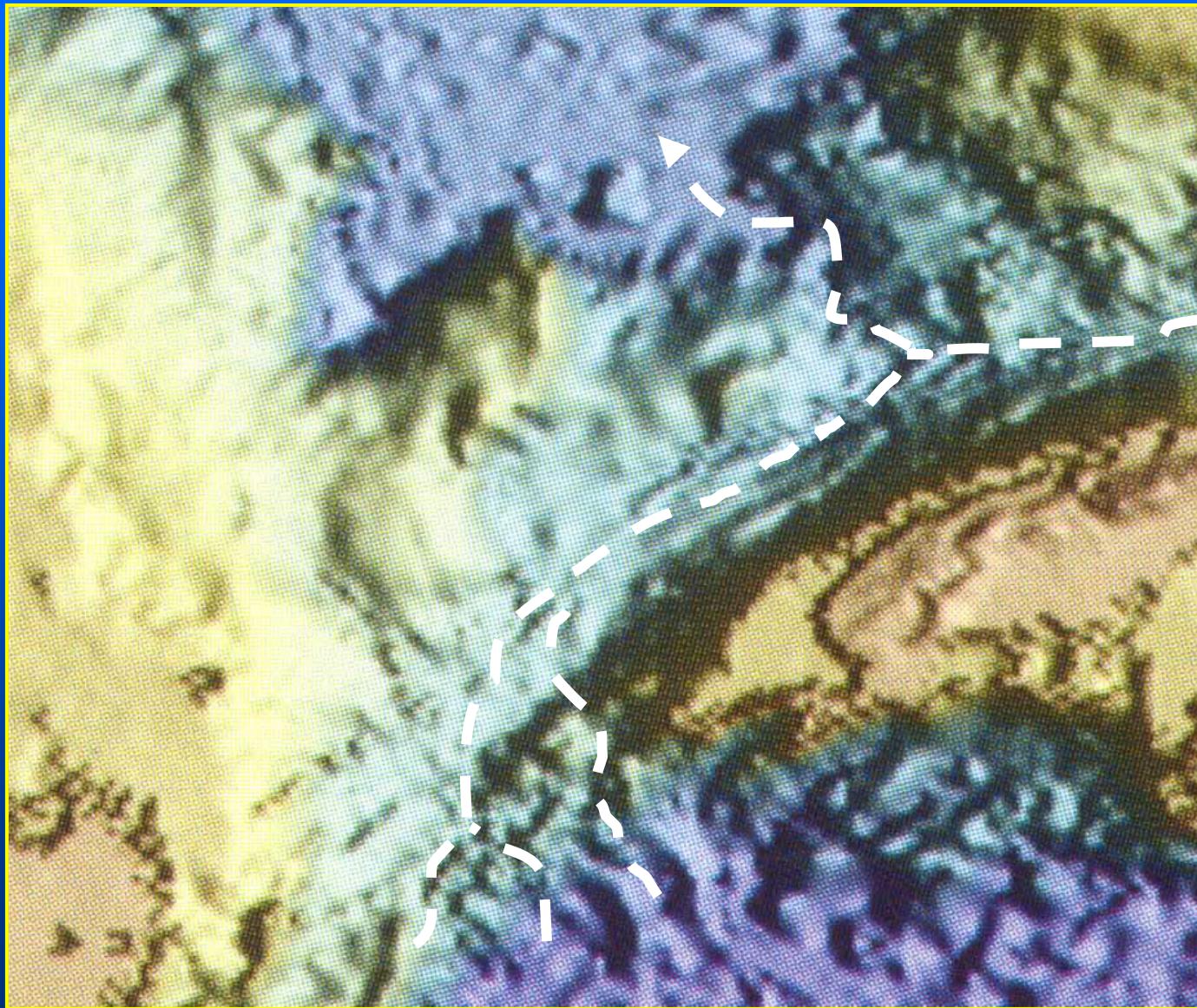
Return to World Sea Level

- *At breakthrough, inflow rapidly overwhelmed evaporation.*
- *Isostatic subsidence of the basin and its margins accelerated flooding (additional entry points).*
- *Erosion deepened and widened re-entry channels.*

Straits of Gibralter - Refill Canyon



G.O.M. Refill Canyon System



Possible Refill Routes

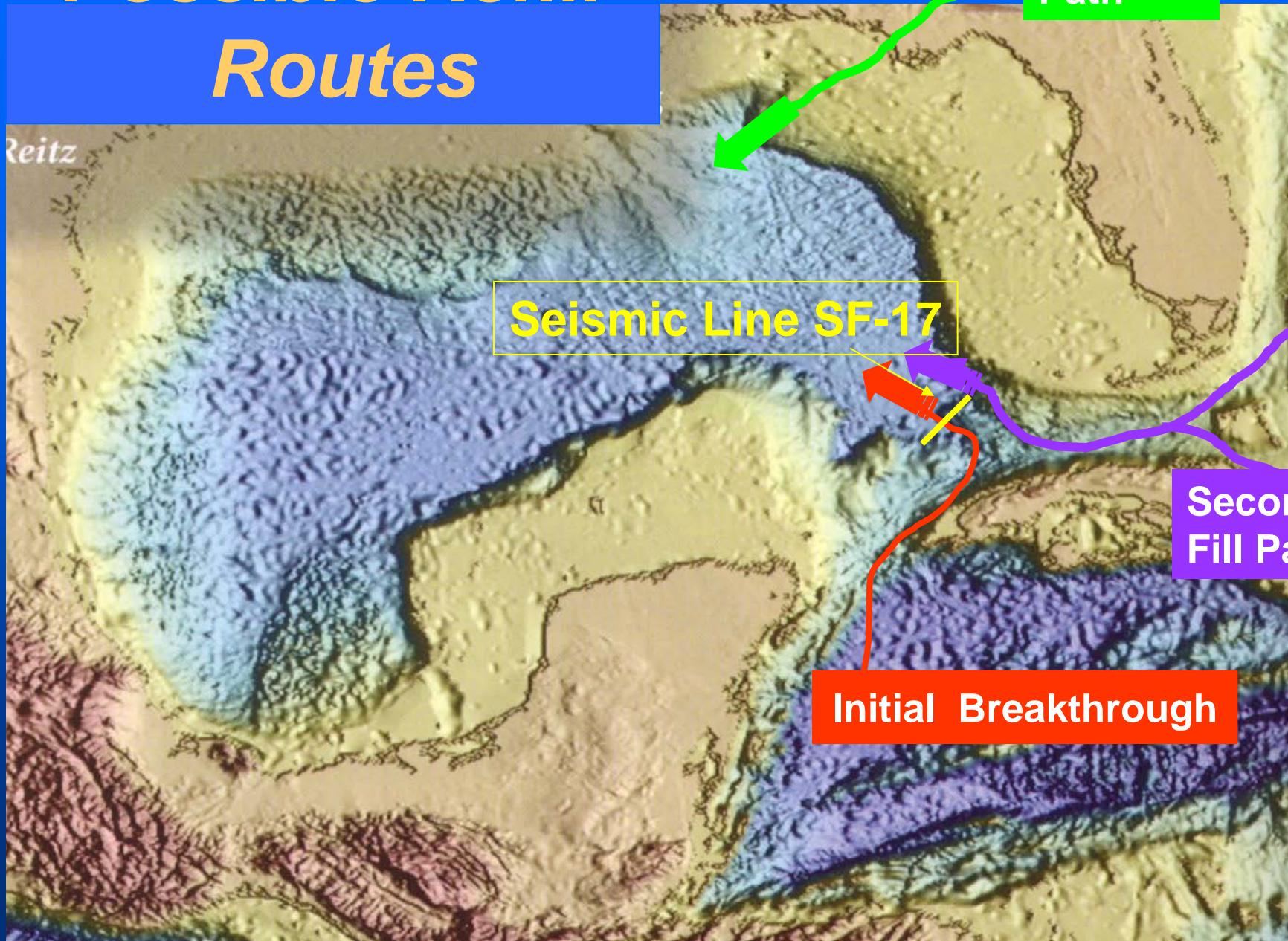
Reitz

Third Fill
Path

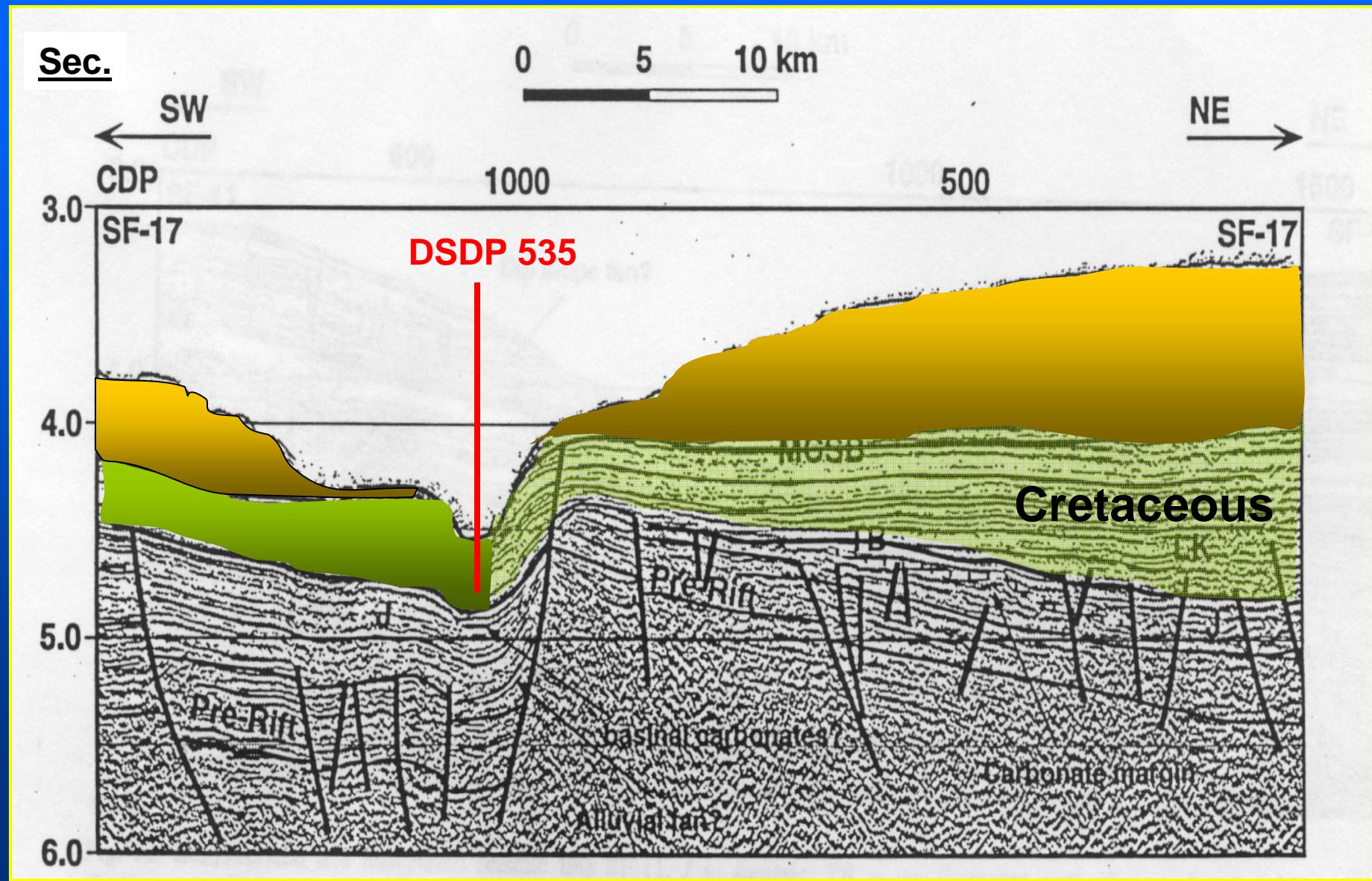
Seismic Line SF-17

Second
Fill Path

Initial Breakthrough



Line SF-17 Across Thalweg



DSDP 535

Mts	Lithology	Unit	Description	Age
0	0	I	Clays and oozes with some sandstones	Holocene to Pleistocene
100	100	II	Bioturbated and banded laminated limestone with distal debris layers	Cenomanian
400	400	III	Laminated limestone rich organic matter marls, gray limestone	Albian - Upper Hauterivian

Some Petroleum Implications

- *Widespread, thick Lower Wilcox sands 100's of kms basinward of contemporaneous shelves.*
- *Vicksburg Embayment holds a major paleocanyon*
 - *Lobo Trend is collapsed headwall*
 - *Wilcox, Vicksburg and Frio are canyon fill.*
- *Karst-enhanced porosity in carbonate reservoirs*
 - *Golden Lane (shallow water deposition)*
 - *Poza Rica and Cantarell (deep water deposition)*