LOPHELIA II

Geologic Setting and Site Selection

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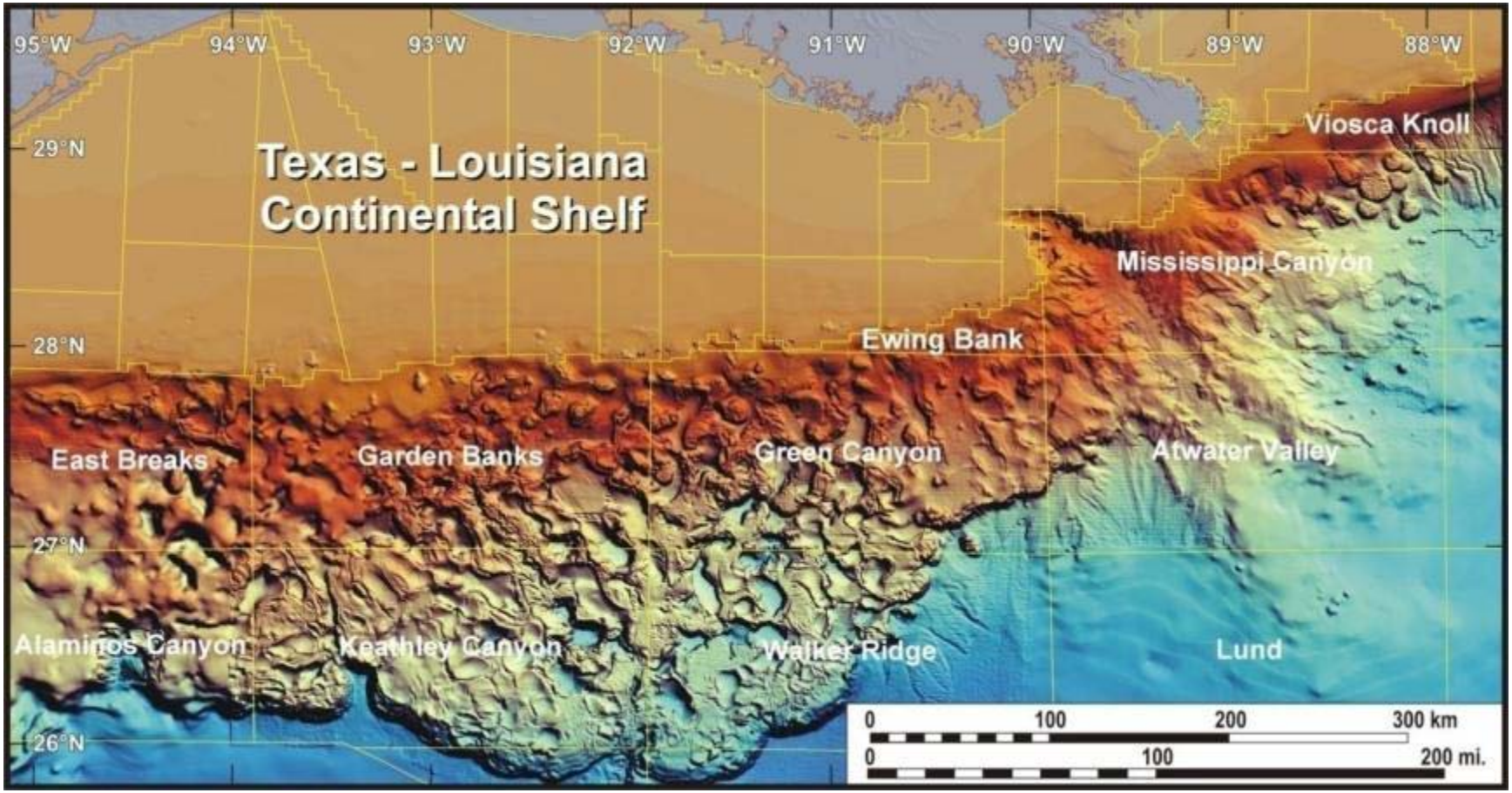
Presentation Points

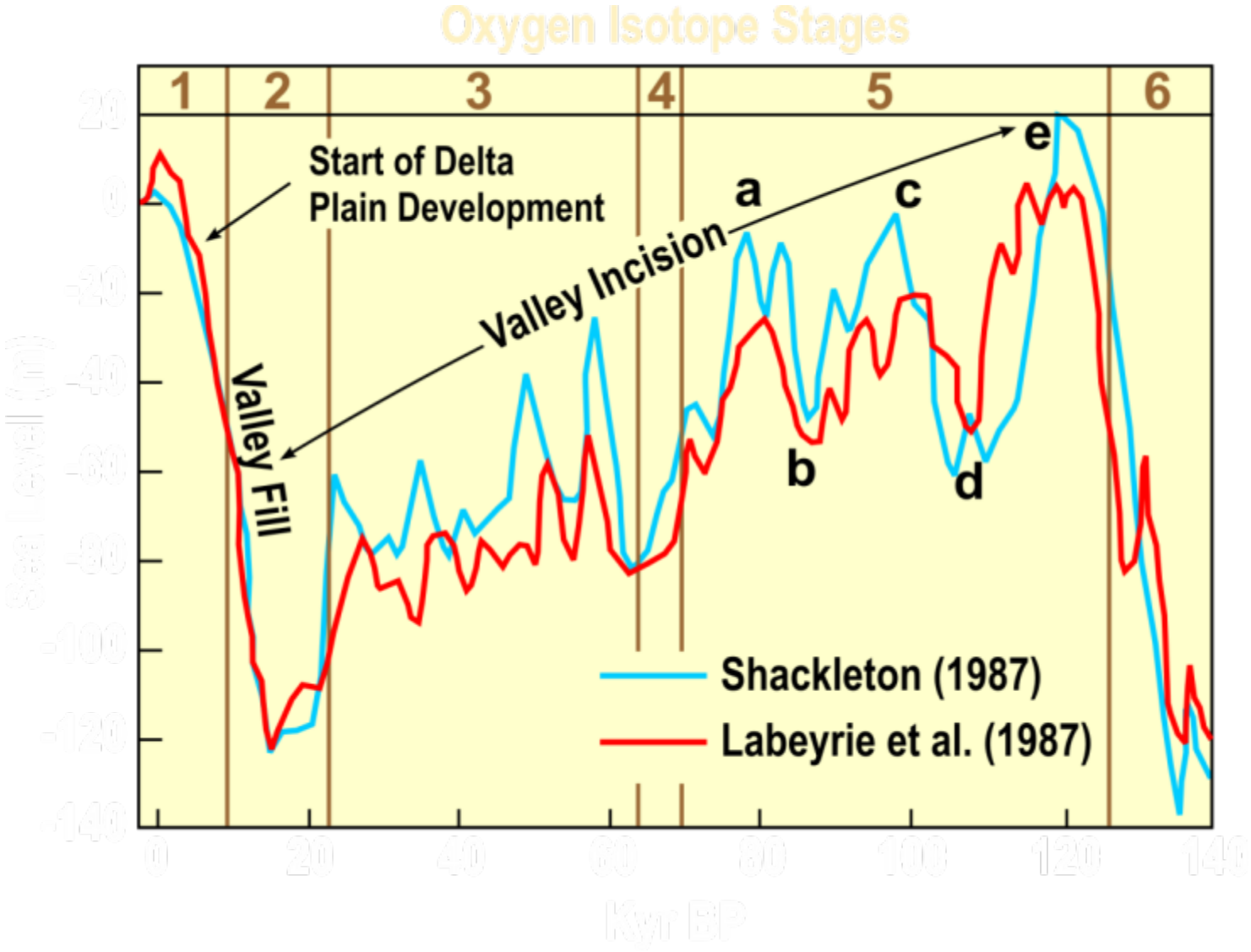
- Unique geologic setting
- Seismic database
- Analysis and site-selection criteria
- Seafloor verification
- Special project discovery

Geologic Setting

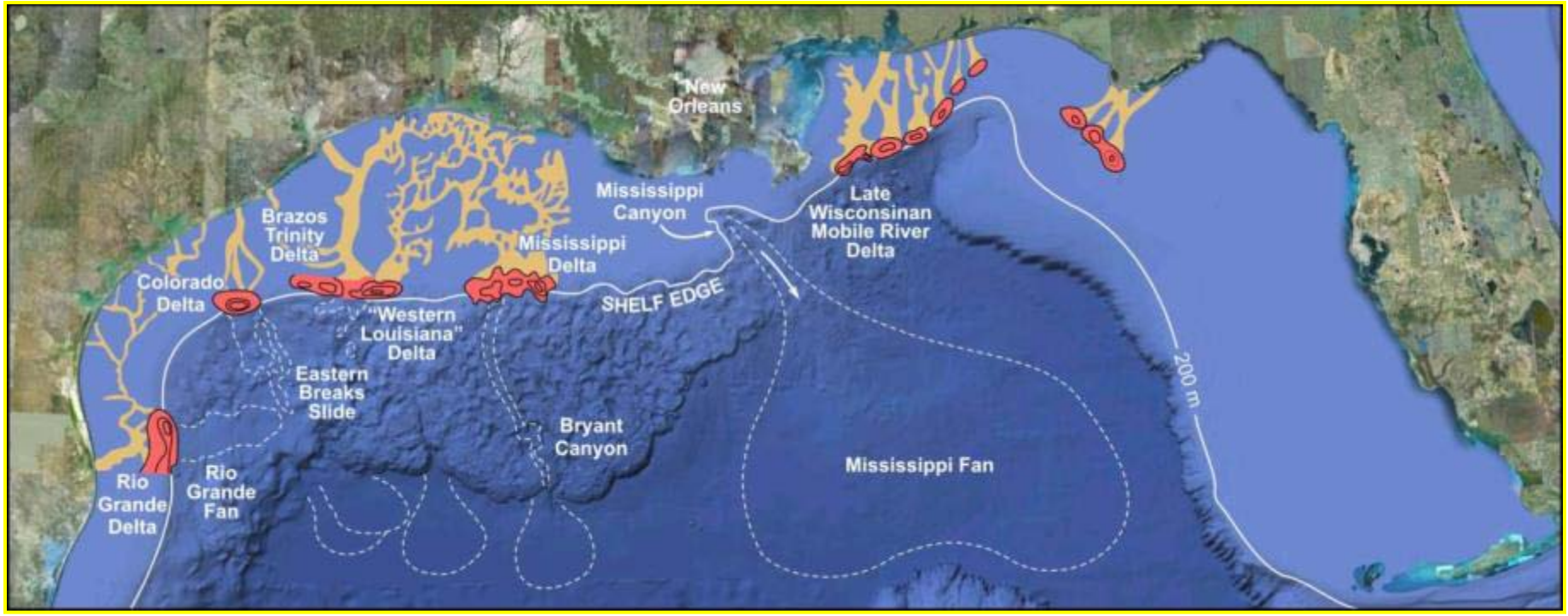
Louisiana Continental Slope



Sea Level History

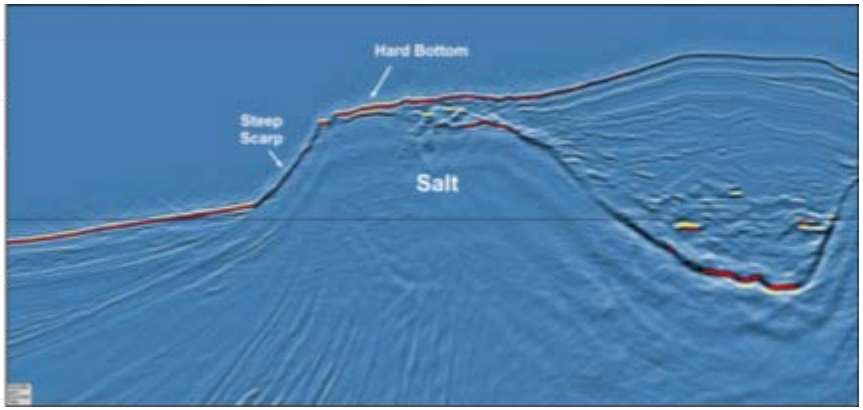


Falling to Lowstand Deposits Northern Gulf of Mexico

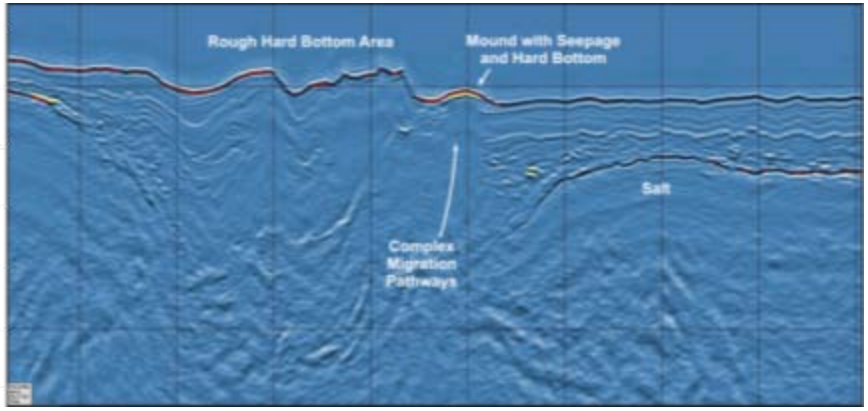


Sediment Loading, Salt Tectonics, Fluid-Gas Expulsion

GC 933
(WD ~ 1958 m)

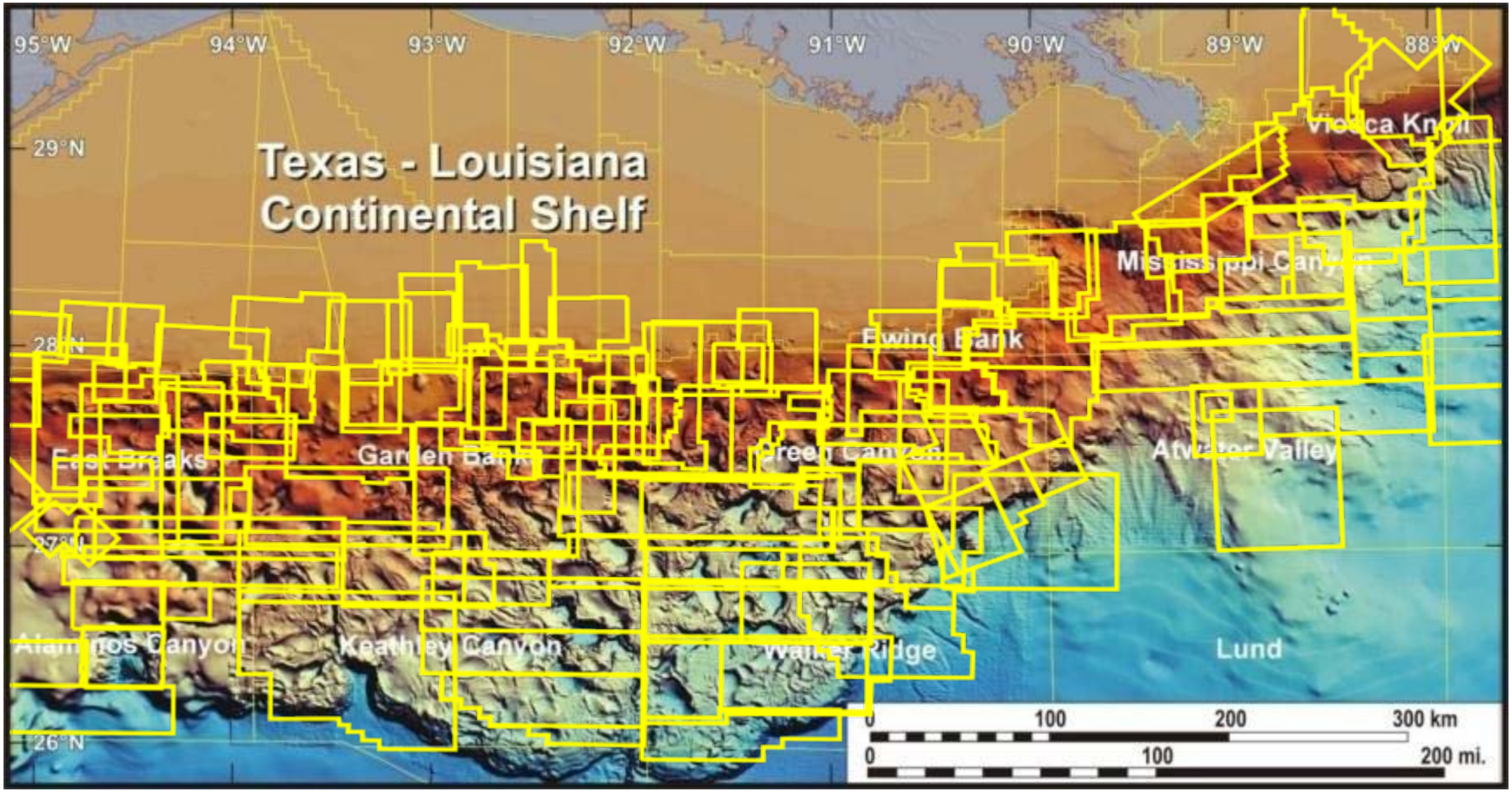


GC 794
(WD ~ 1540 m)



Seismic Database

Louisiana Continental Slope 3-D-Seismic Coverage



Analysis and Site Selection Procedures

Site Selection Process

ID TARGETS
Review
Geo-Bio-Archeo Data

PRIORITIZE TARGETS
Cross-correlations of data

CONFIRM TARGETS & DEFINE BOUNDARIES
Drift Camera-AUV-ROV

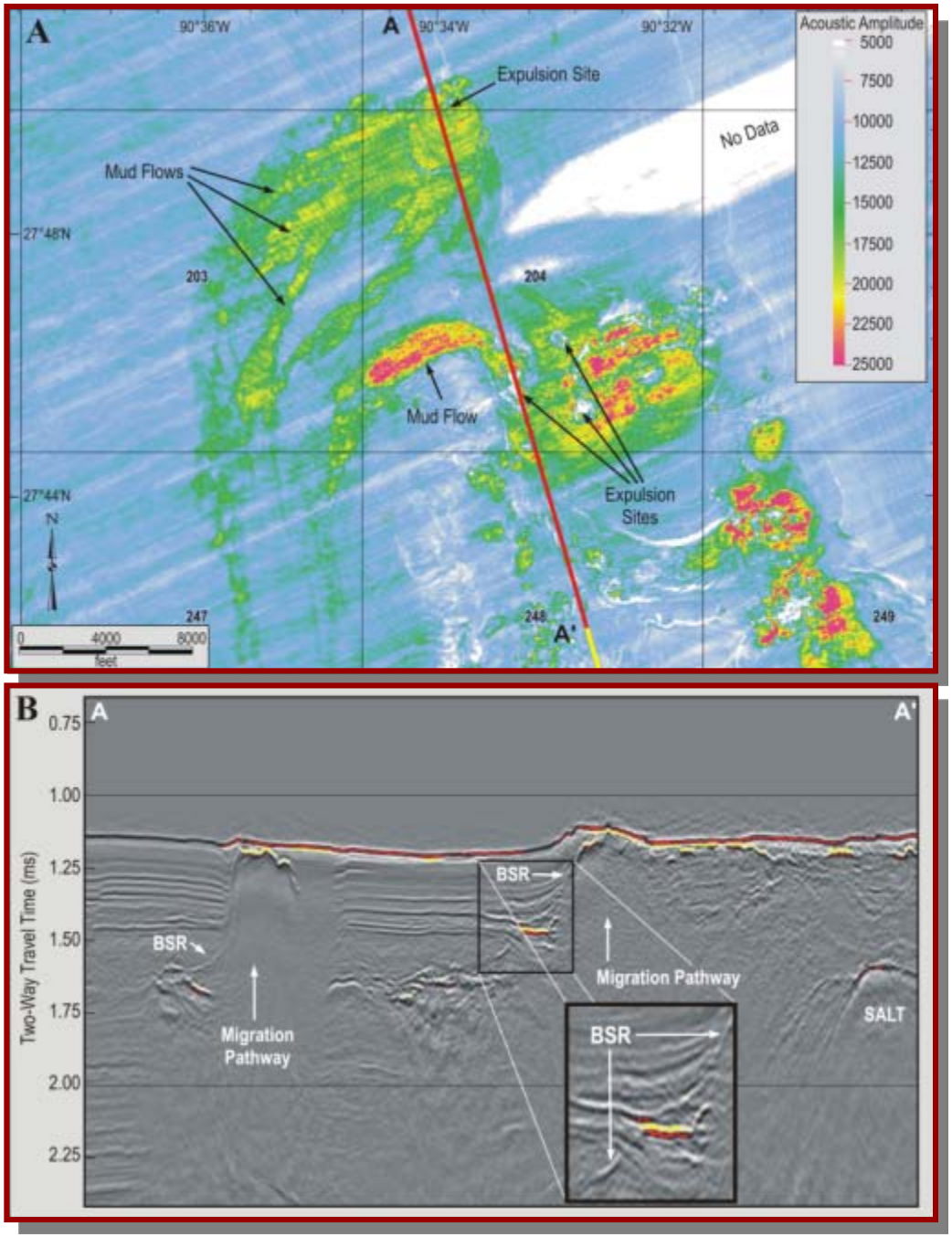
SITE SELECTION EFFORT

Data Characteristics and Procedures

1. Used GeoQuest's IESX interpretation software
2. Seafloor identified (auto- and hand-picked) — generally a strong reflector
3. Posted seafloor amplitude extraction for survey and selected sites of interest
4. **High positives — hard-bottom areas**
5. **Low positives or negatives — gas-rich sediments**
6. Plan-view amplitude patterns — flows, cones, etc.
7. Seismic profiles — identify migration pathways
8. Care taken to identify non-expulsion anomalies

Rapid Fluid-Gas Delivery System

- Obvious flow patterns
- Low reflectivity expulsion centers
- Limited chemosynthetic communities



Using 3-D Seismic Surface Attribute Data, over 16,000 Seepage Sites Have Been Mapped: Potential Deep Coral Community Sites

Site Selection Criteria

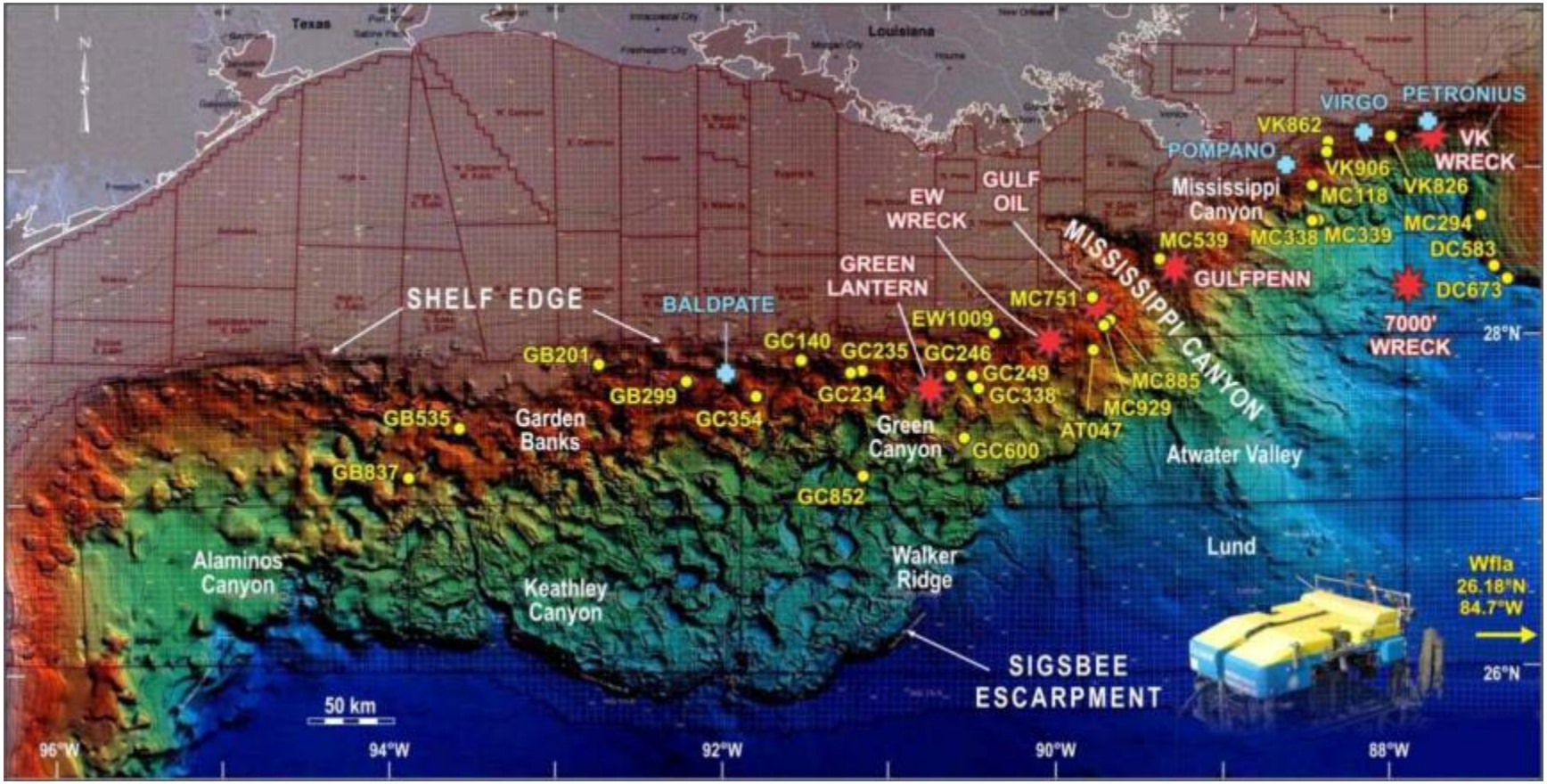
- Depth Range 1: shelf edge to 1,000 m
- Depth Range 2: 1,000 m to 2,000 m
- Hard Bottom (surface reflectivity anomaly)
- Rough Bottom (topographic highs)
- Variable Bathymetric Configurations
- Special Steep Slope Settings (concentration of deep ocean currents)

Seafloor Verification

Sites Visited: *Lophelia* Project

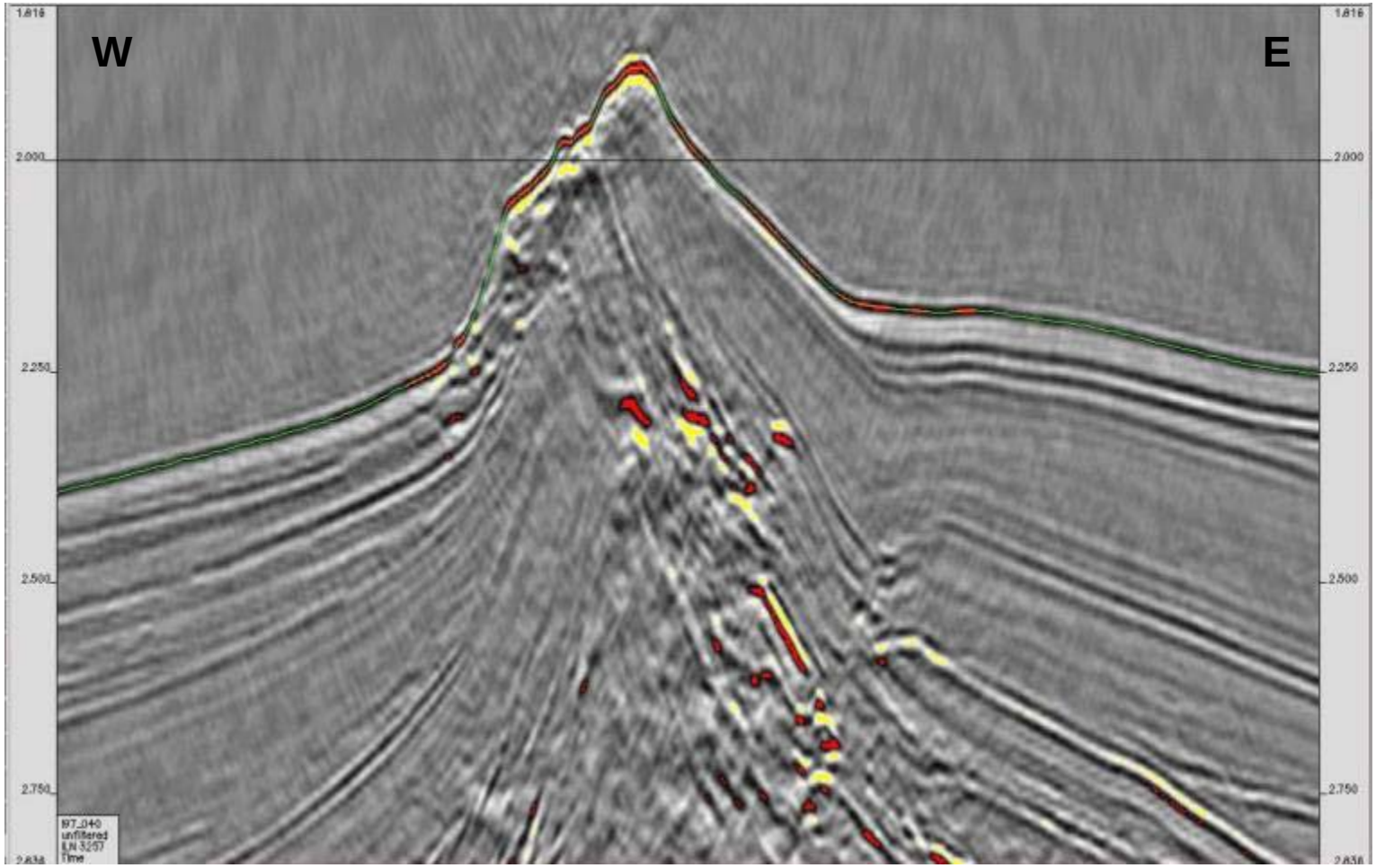
site	lat	long	depth	Jason Cruise		Sentry Cruise		Nancy Foster Cruise	
				2009	2010	photo	multibeam	video	multibeam
GB201	27.7903	92.74300	525					x	x
GB299	27.6856	92.22344	355	x	x				
GB535	27.4257	93.58819	530	x	x	x	x		x
GB837	27.1197	93.89694	880				x		
GC140	27.8202	91.54463	259		x			x	x
GC234	27.747	91.22447	500					x	x
GC235	27.7428	91.19191	530	x					
GC246	27.7149	90.64978	811		x	x			x
GC249	27.7381	90.52076	780		x				
GC338	27.6488	90.47948	939	x	x				
GC354	27.6005	91.82379	515		x				x
GC600	27.3664	90.56417	1250			x	x		
GC852	27.1118	91.16488	1410	x					
MC118	28.8527	88.49258	880		x				
MC294	28.6743	87.481	1400	x					
MC338	28.6723	88.47647	1370		x				
MC339	28.6328	88.44917	1425			x			
MC539	28.4132	89.40154	630						x
MC751	28.1911	89.80375	450	x	x			x	x
MC885	28.0647	89.69509	627		x	x			x
MC929	28.0205	89.72825	633						x
EW1009	27.9545	89.99404	556						x
AT047	27.89	89.79425	835	x					x
VK826	29.1611	88.01688	457	x	x	x	x		x
VK862	29.1071	88.38459	317						x
VK906	29.0851	88.38475	380	x	x			x	x
DC583	28.3871	87.38143	2440	x					
Wfla	26.1841	84.70741	425	x					
DC673	28.3125	87.30147	2400		x				

Lophelia Project Sites



GC 852

E-W Oriented Profile



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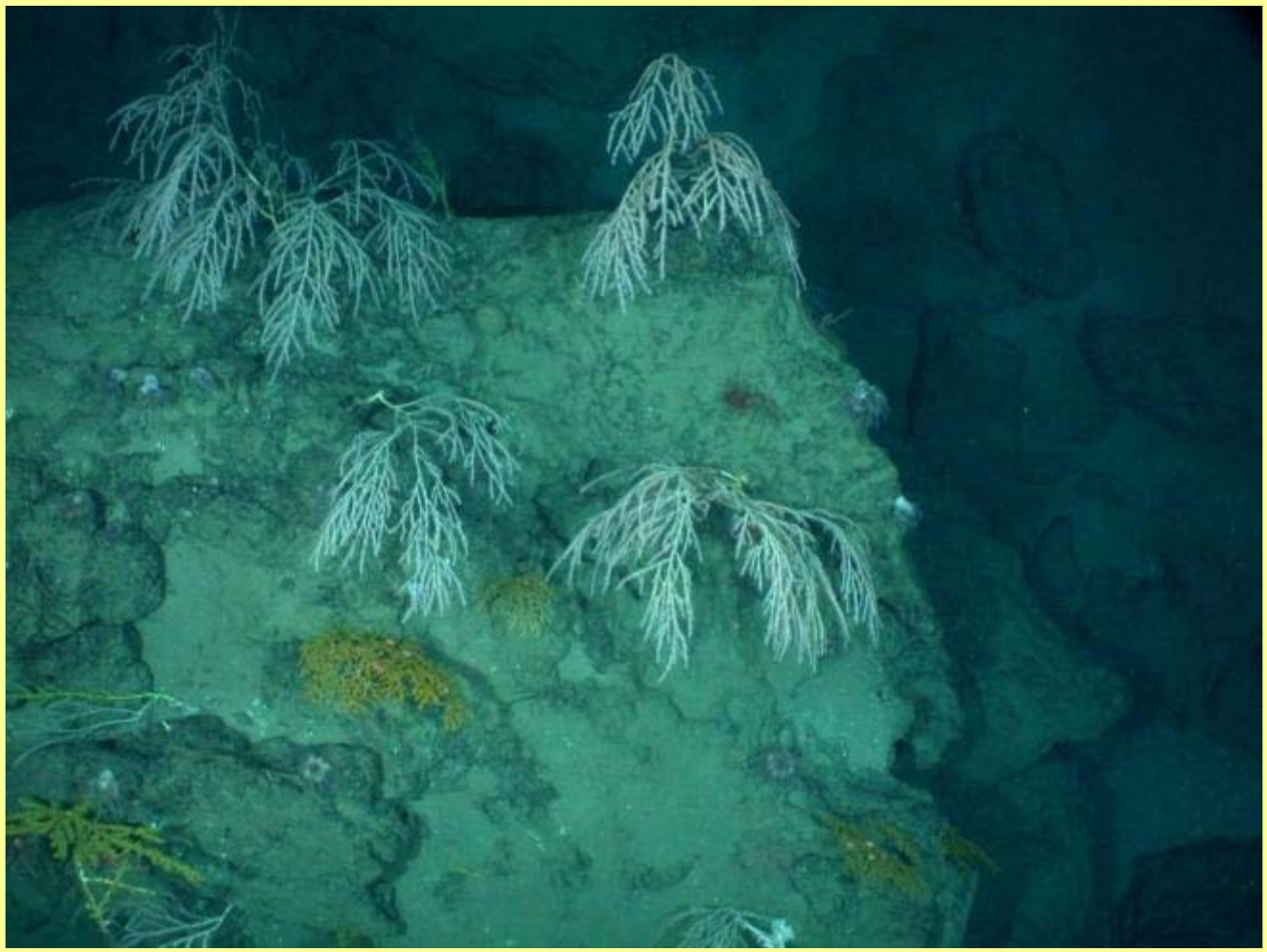
Gorgonians (soft corals) in a Strong Current



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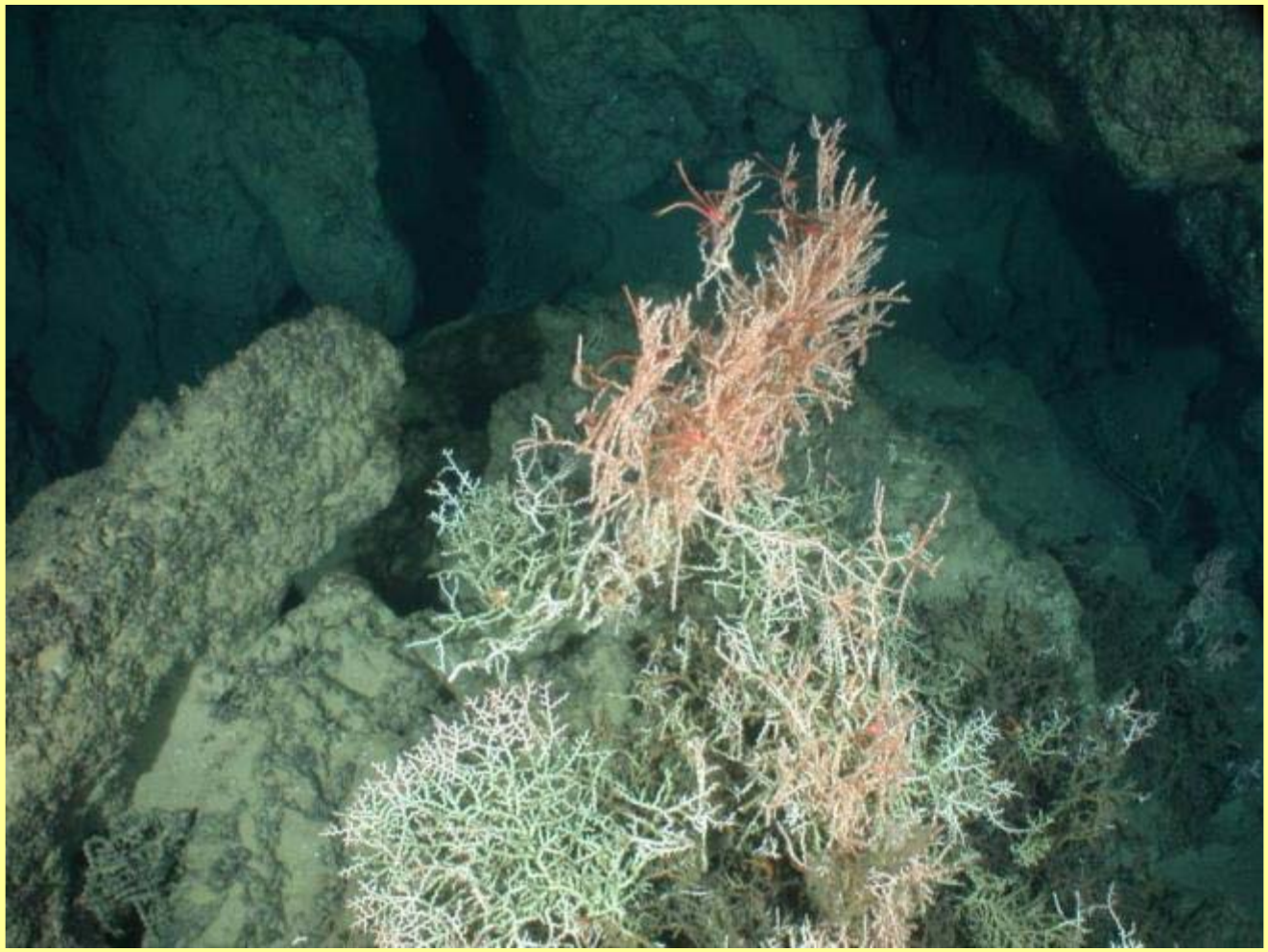
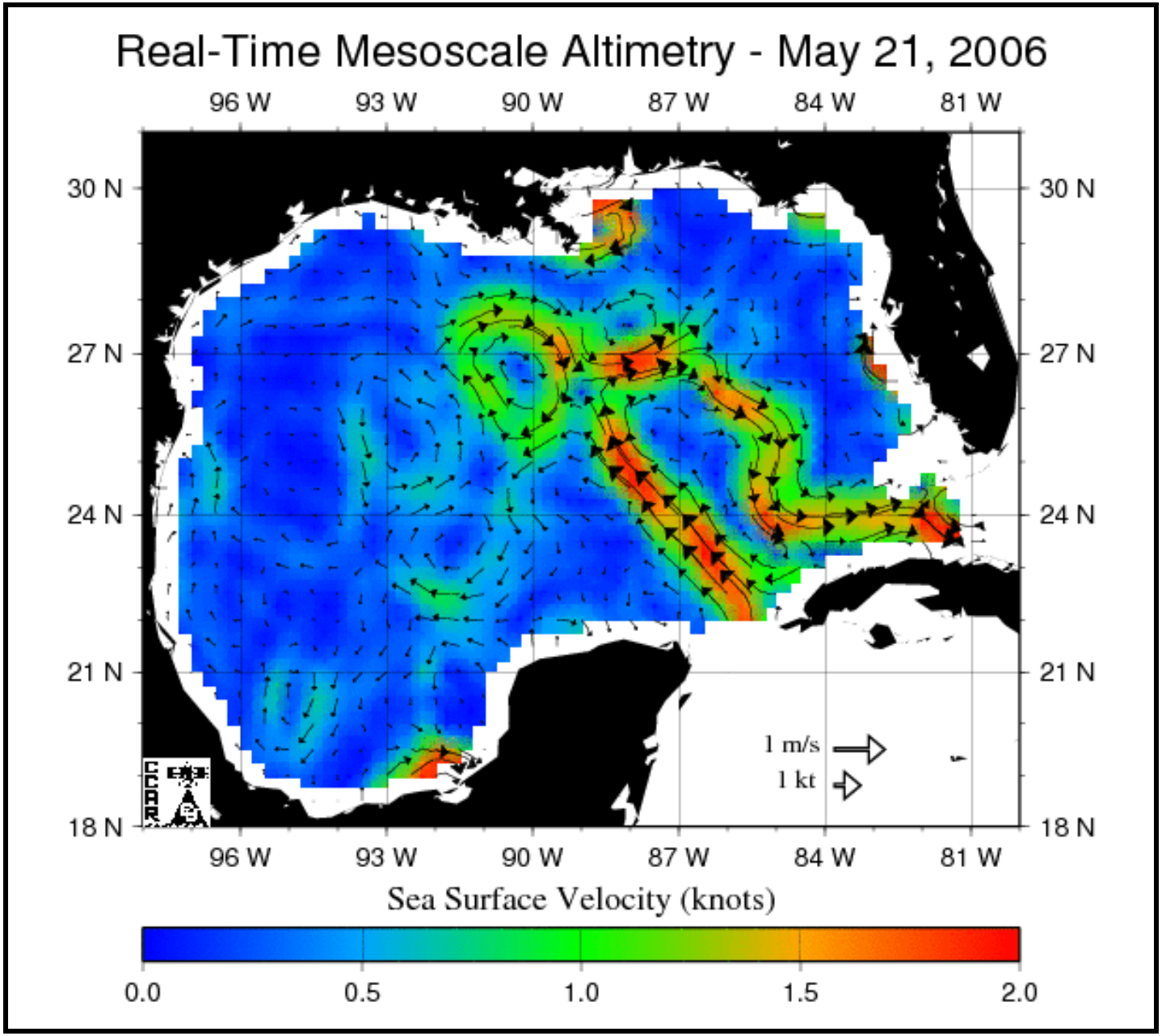
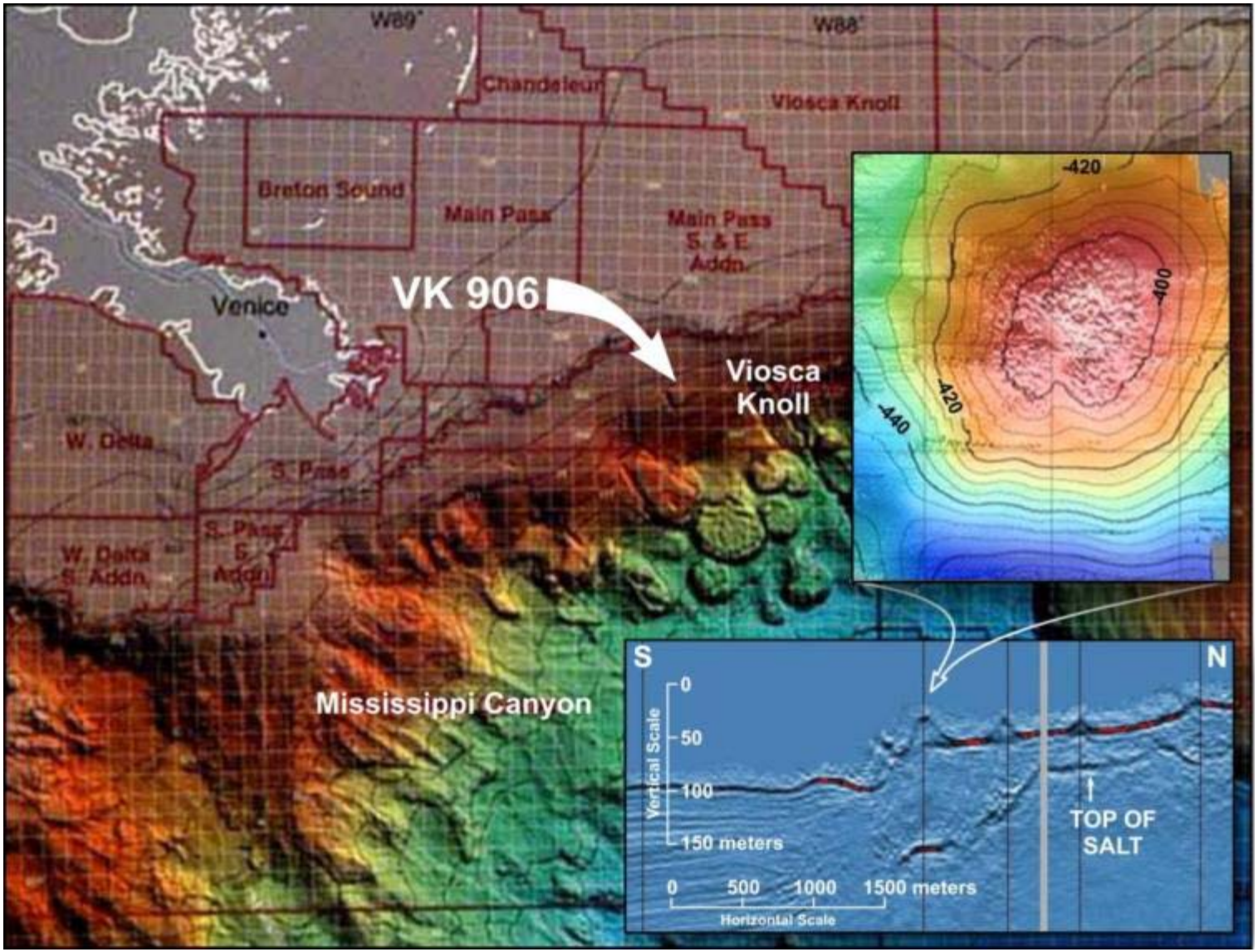
Hard Corals on Authigenic Carbonate Substrates




Real-Time Mesoscale Altimetry - May 21, 2006
96 W
93 W
90 W
87 W
84 W
81 W
30 N
27 N
24 N
21 N
18 N
1 m/s
1 kt
Sea Surface Velocity (knots)
0.0
0.5
1.0
1.5
2.0

Lophelia Project Discovery: First *Lophelia* Mound in the Gulf of Mexico


W89°
W88°
Chandeleur
Viosca Knoll
Breton Sound
Main Pass
Main Pass S. & E. Addn.
VK 906
Venice
Viosca Knoll
W. Delta
S. Pass
S. Pass E. Addn.
W. Delta S. Addn.
Mississippi Canyon
-420
-400
-420
-440
S
N
0
50
100
150 meters
Vertical Scale
0
500
1000
1500 meters
Horizontal Scale
TOP OF SALT

References

Labeyrie, L.D., J. C. Duplessy, and P.L. Blanc. 1987. Variations in mode of formation and temperature of ocean deep waters over the past 125,00 years. Nature 327:477–482.

Shackleton, N. J. 1987. Oxygen isotopes, ice volume, and sea level. Quaternary Science Reviews 5:183–190.