# Sediment Coring to Ground-Truth Seismic and Test Sand Resource Potential in the Trinity River Paleo-valley, Offshore Galveston, TX

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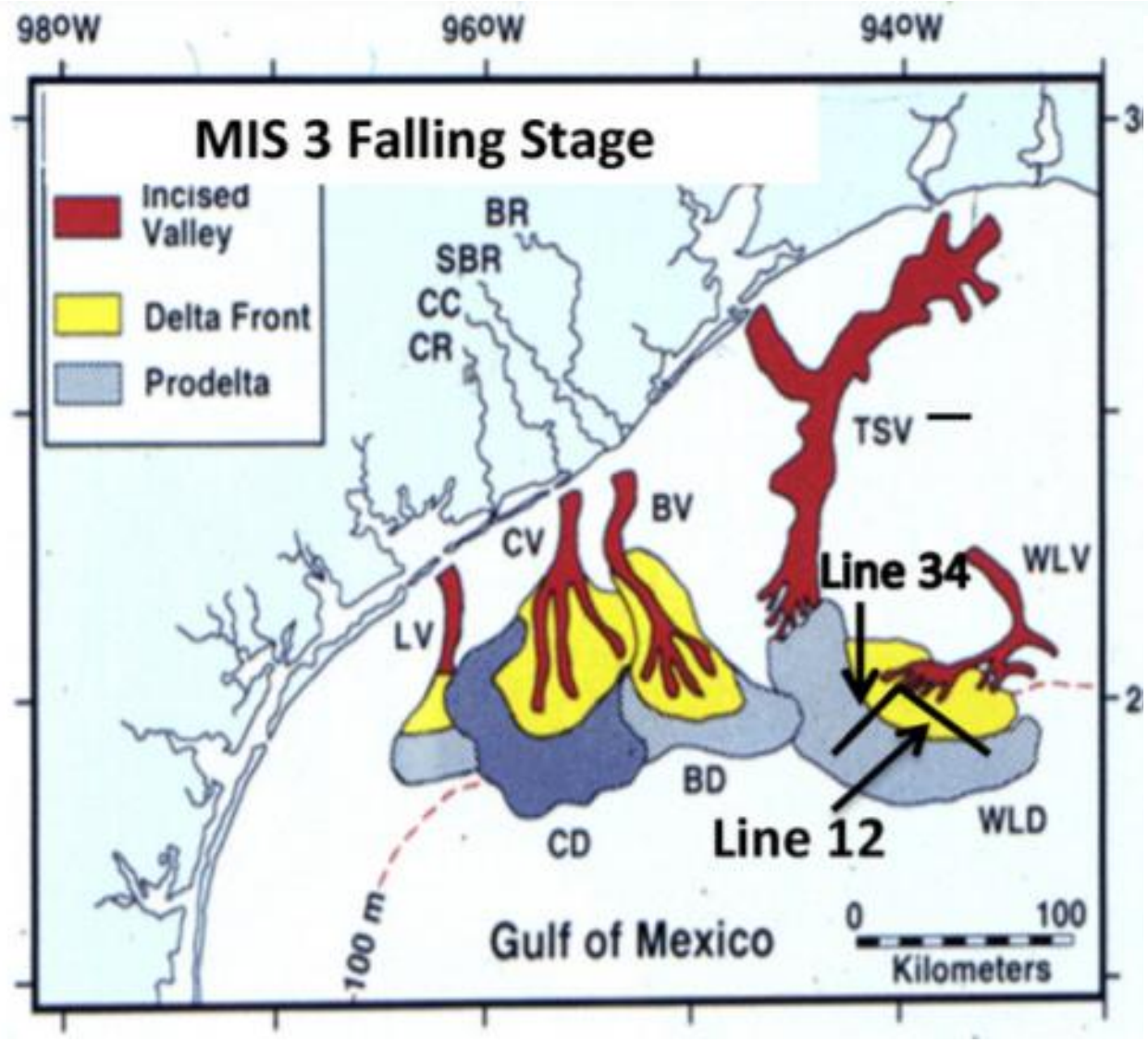
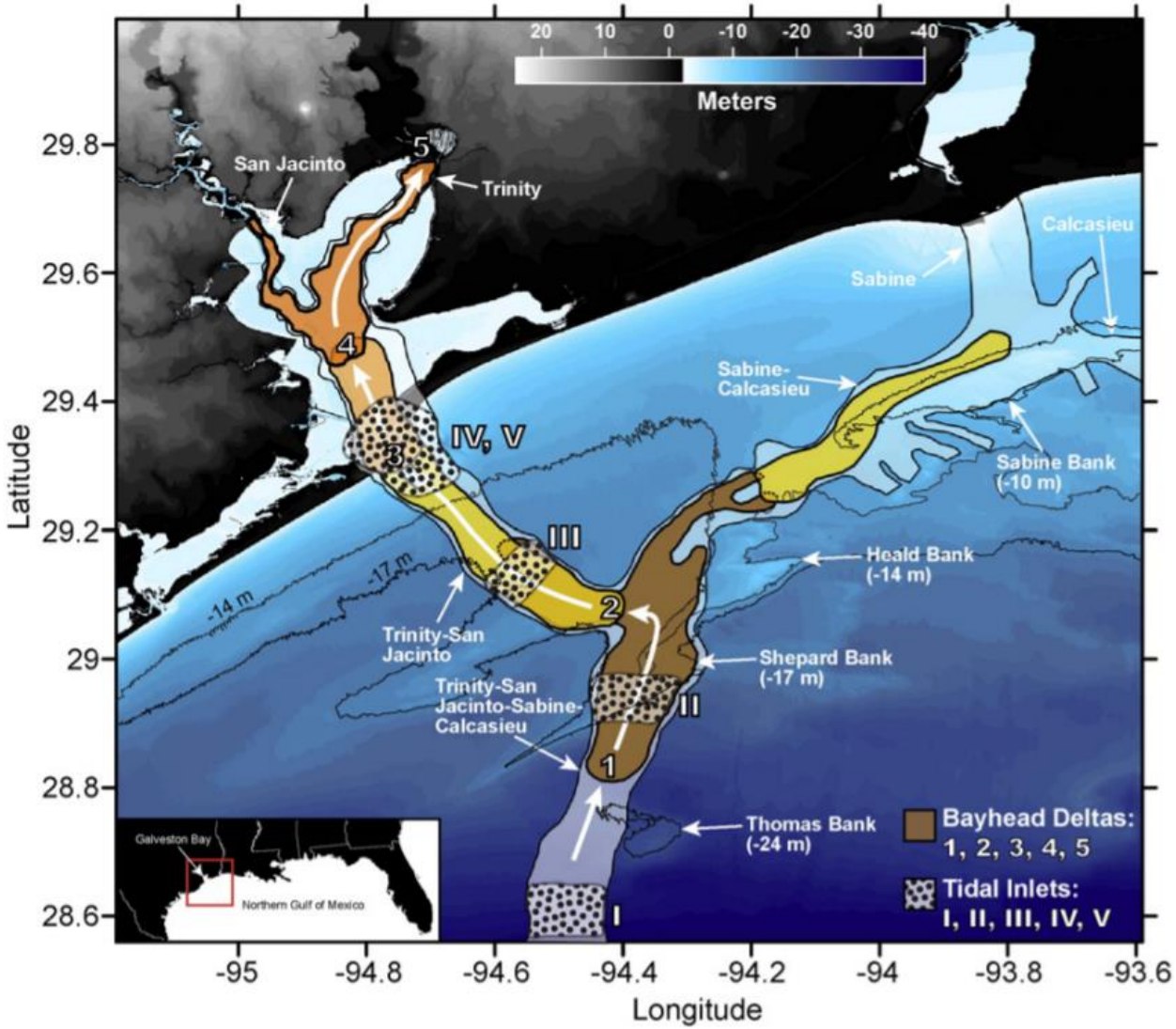
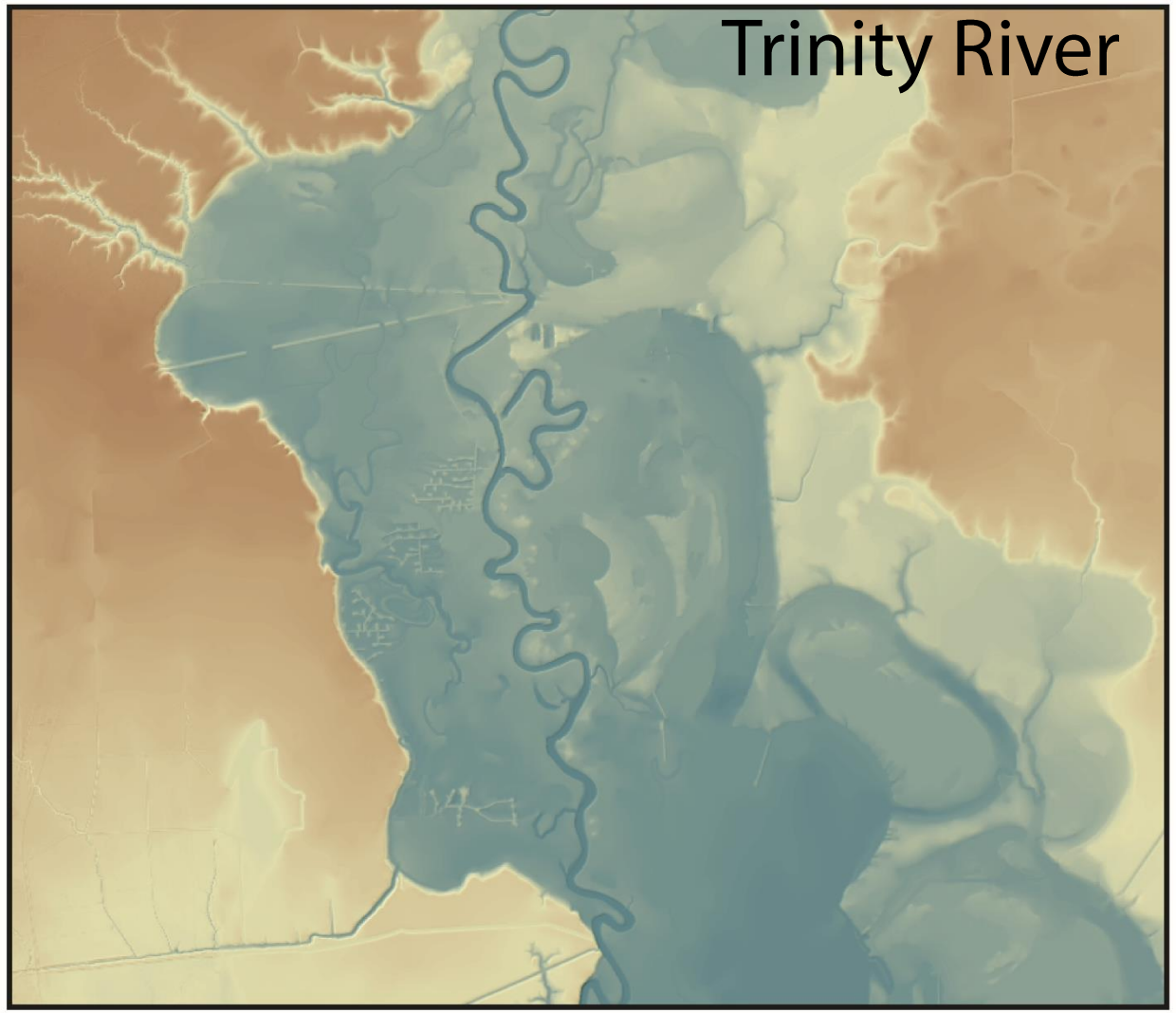
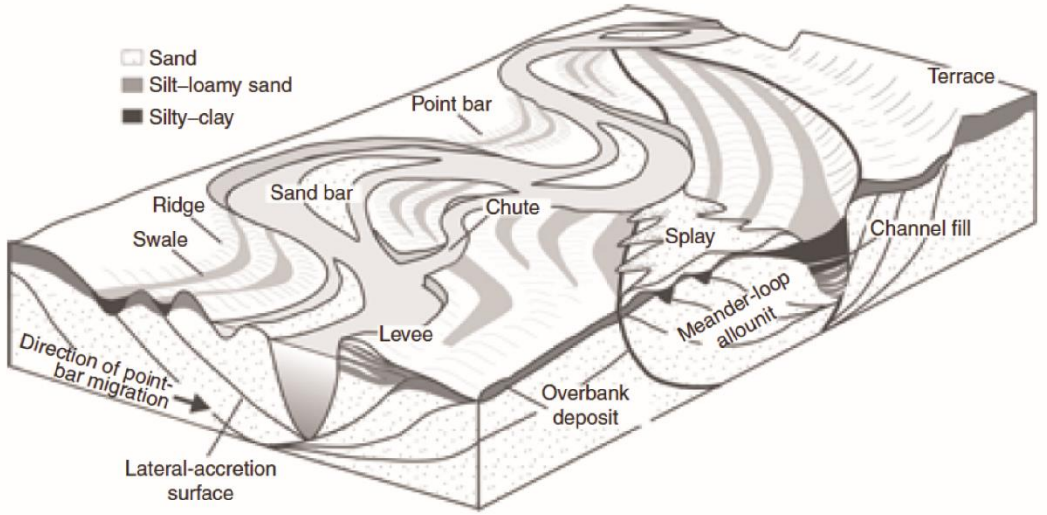
# Texas fluvial systems on the continental shelf



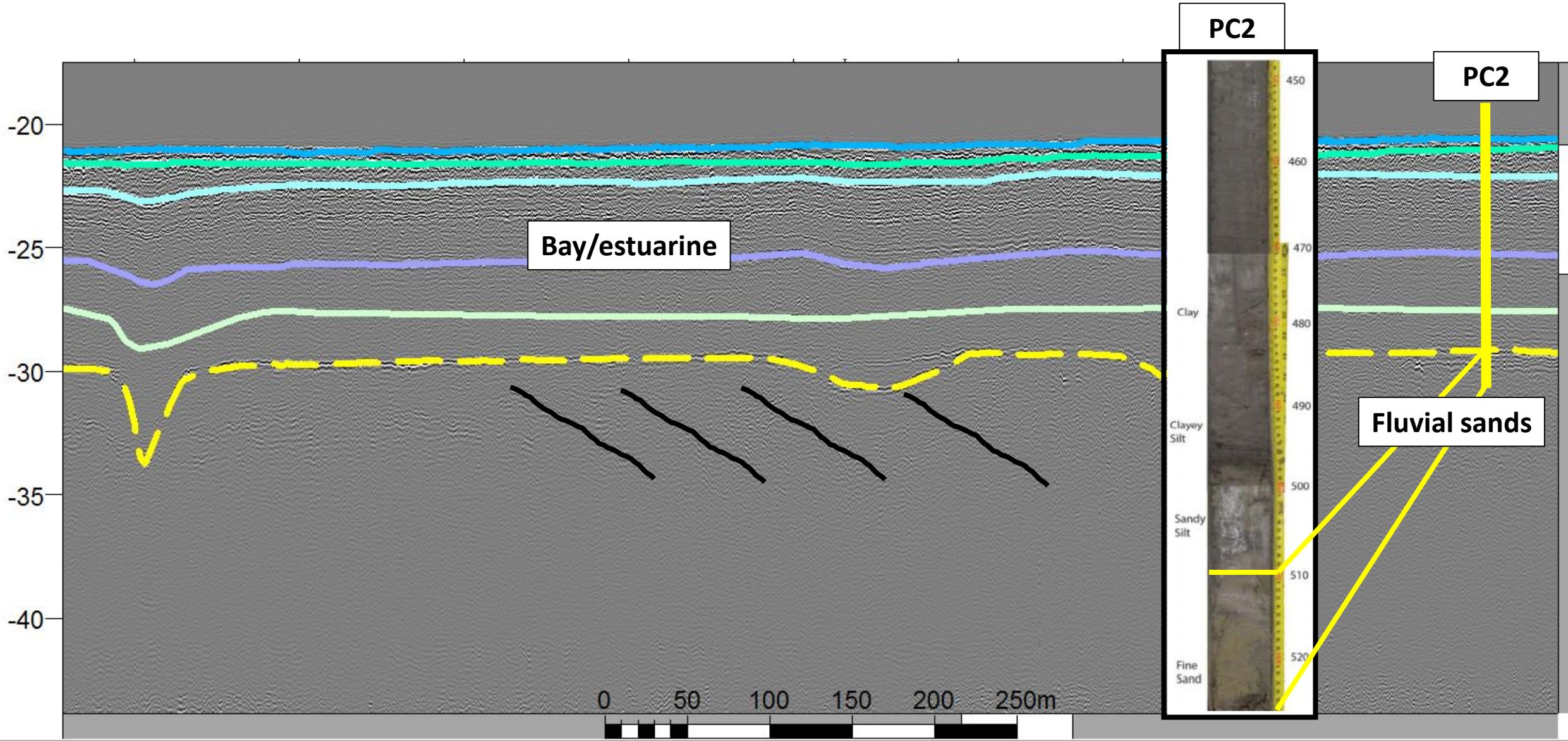
# Significant sand resources within fluvial systems



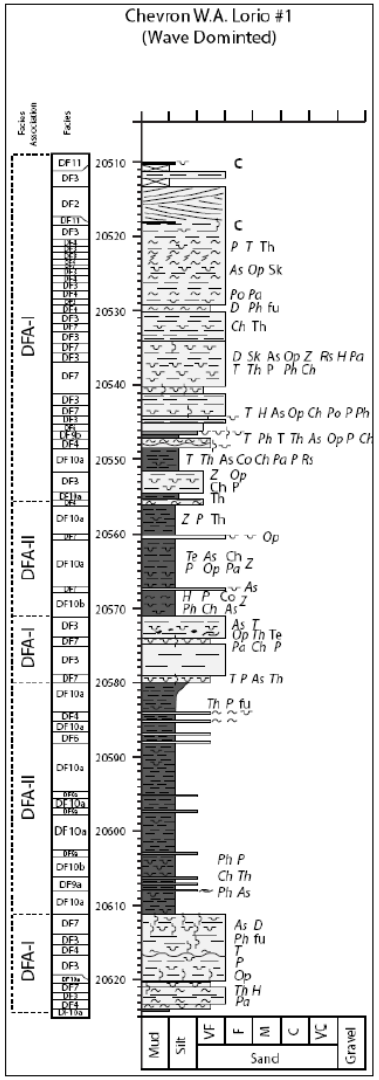




**Dunne et al., 2013**

# Significant sand resources within fluvial systems

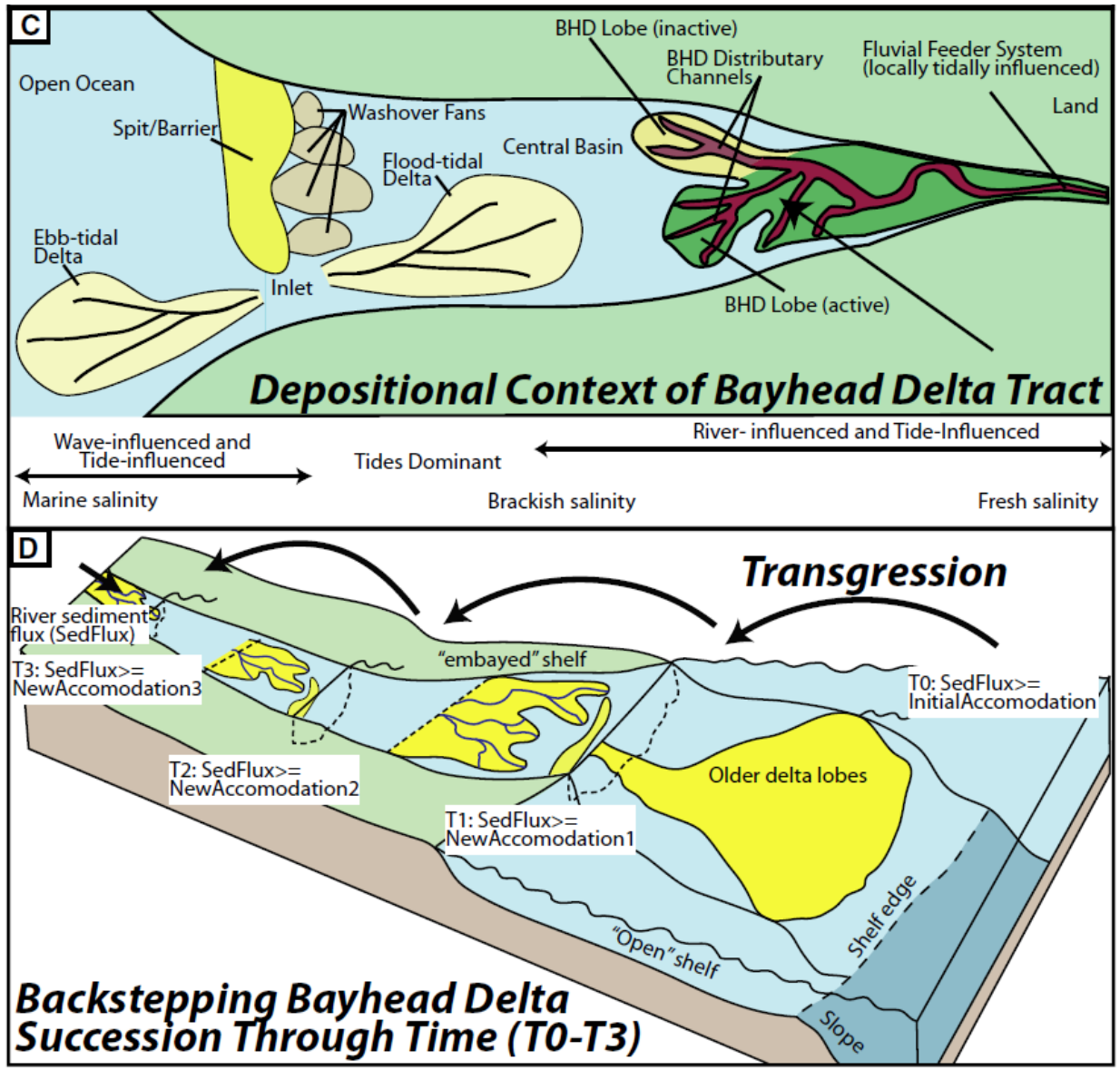


# Significant sand resources in estuarine systems, too



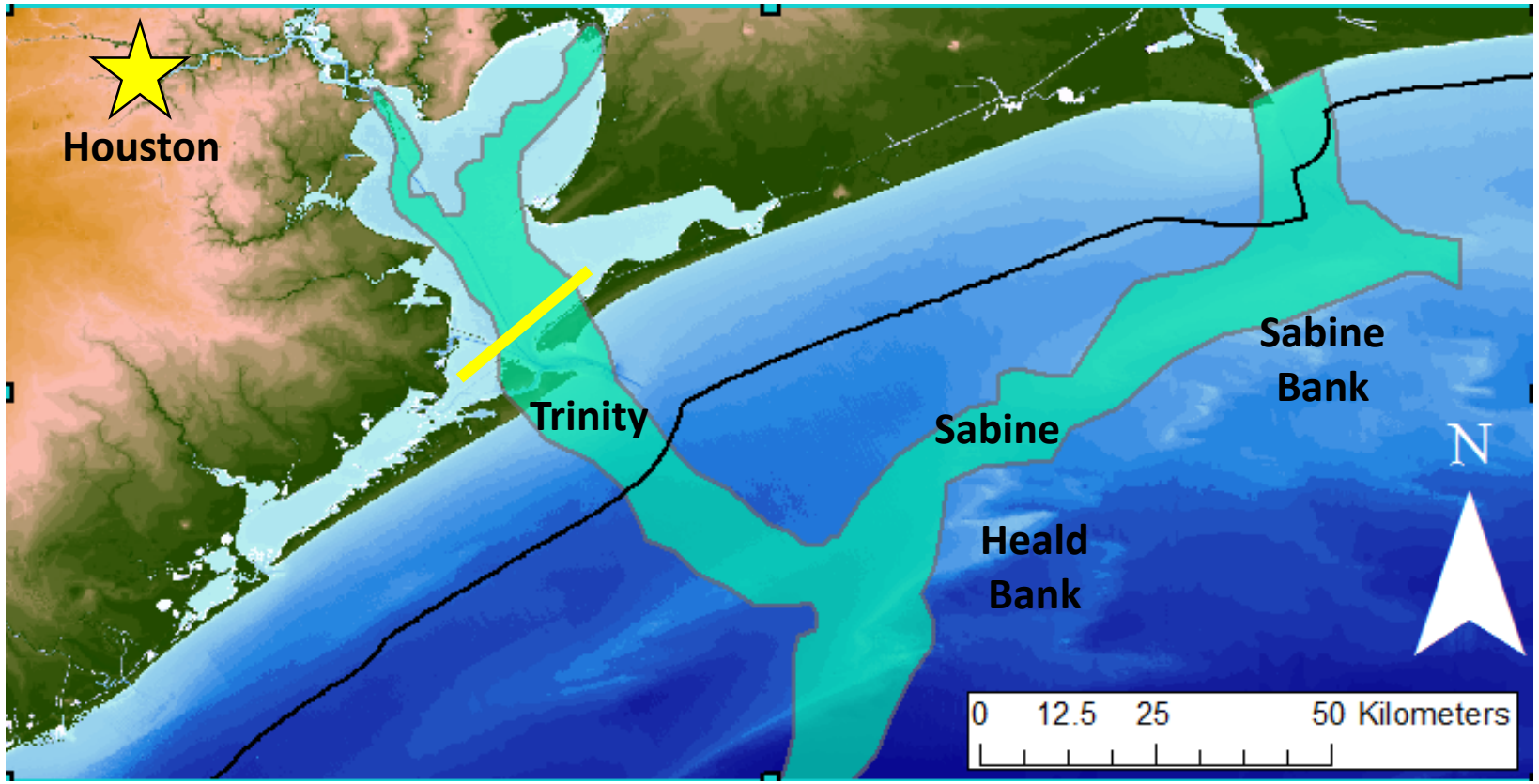

Woolf, 2012

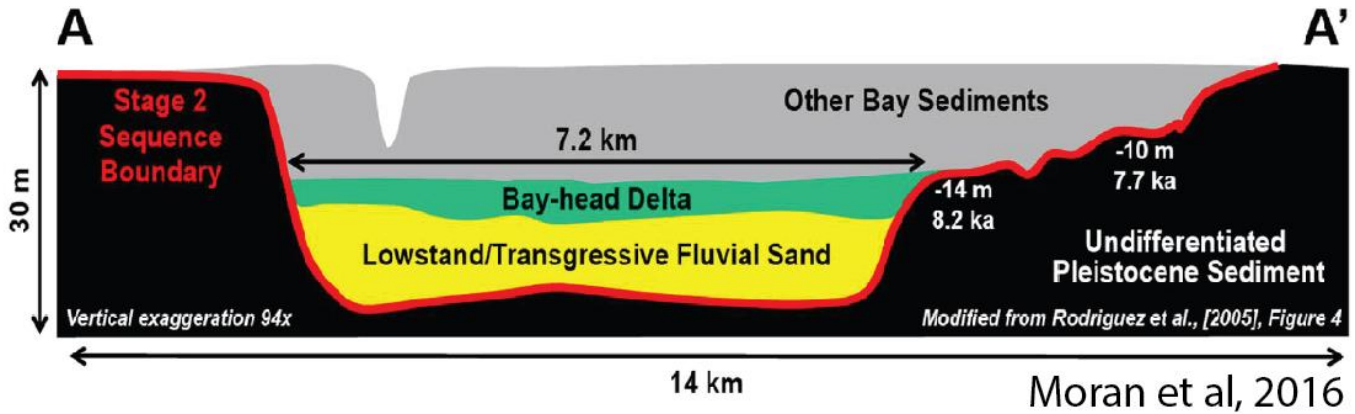
- Bayhead deltas, washover fans, and flood- and ebb-tide deltas are all potential sand resources
- Probably thinner and finer-grained, but significantly shallower in the section




Aschoff et al., (2018) *Sedimentology*

# Trinity River Paleo-valley



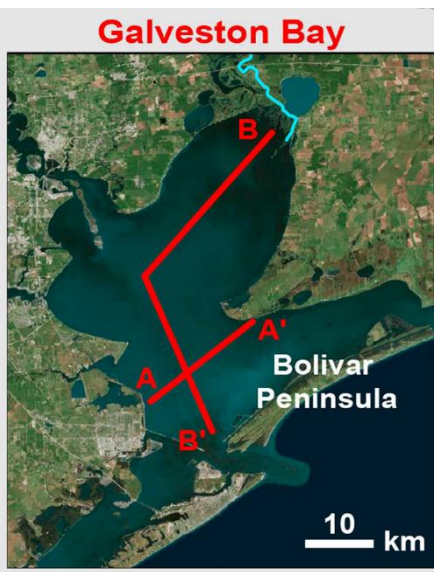

Moran et al, 2016

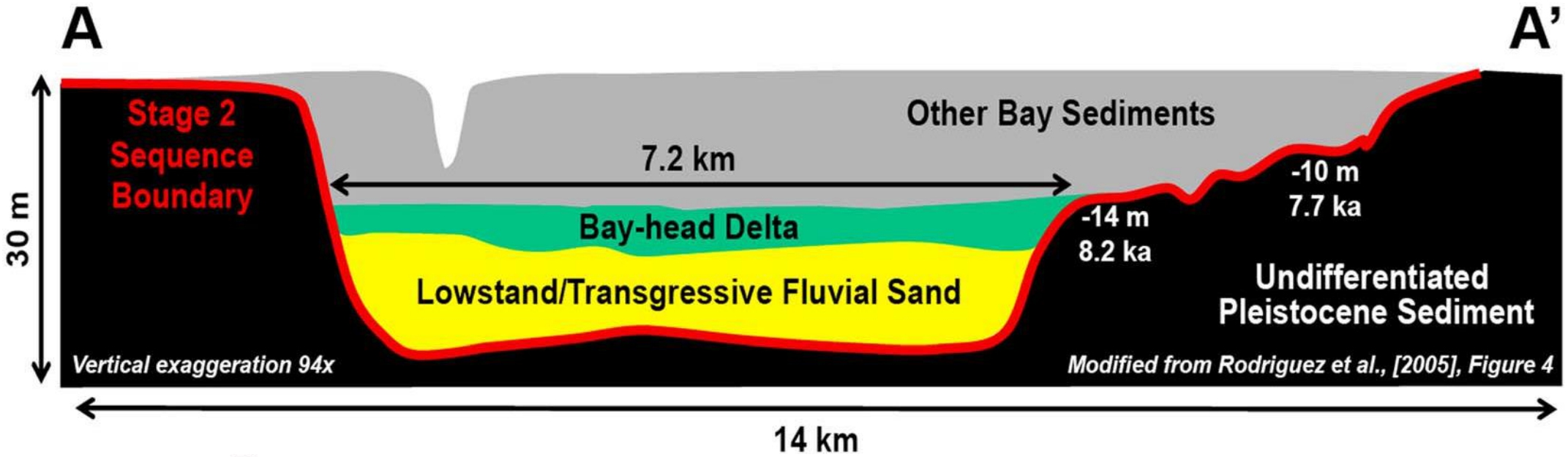
Extent of valley geometry fairly well constrained

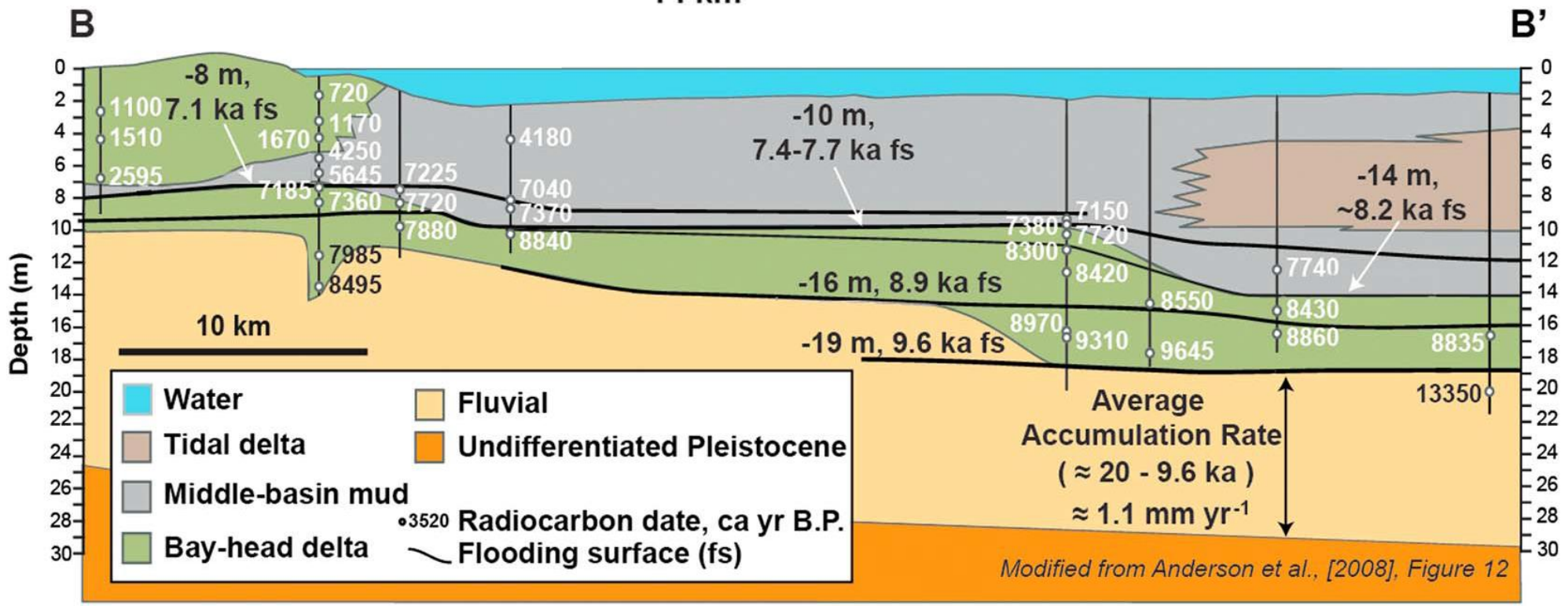
But what actually makes up a valley?

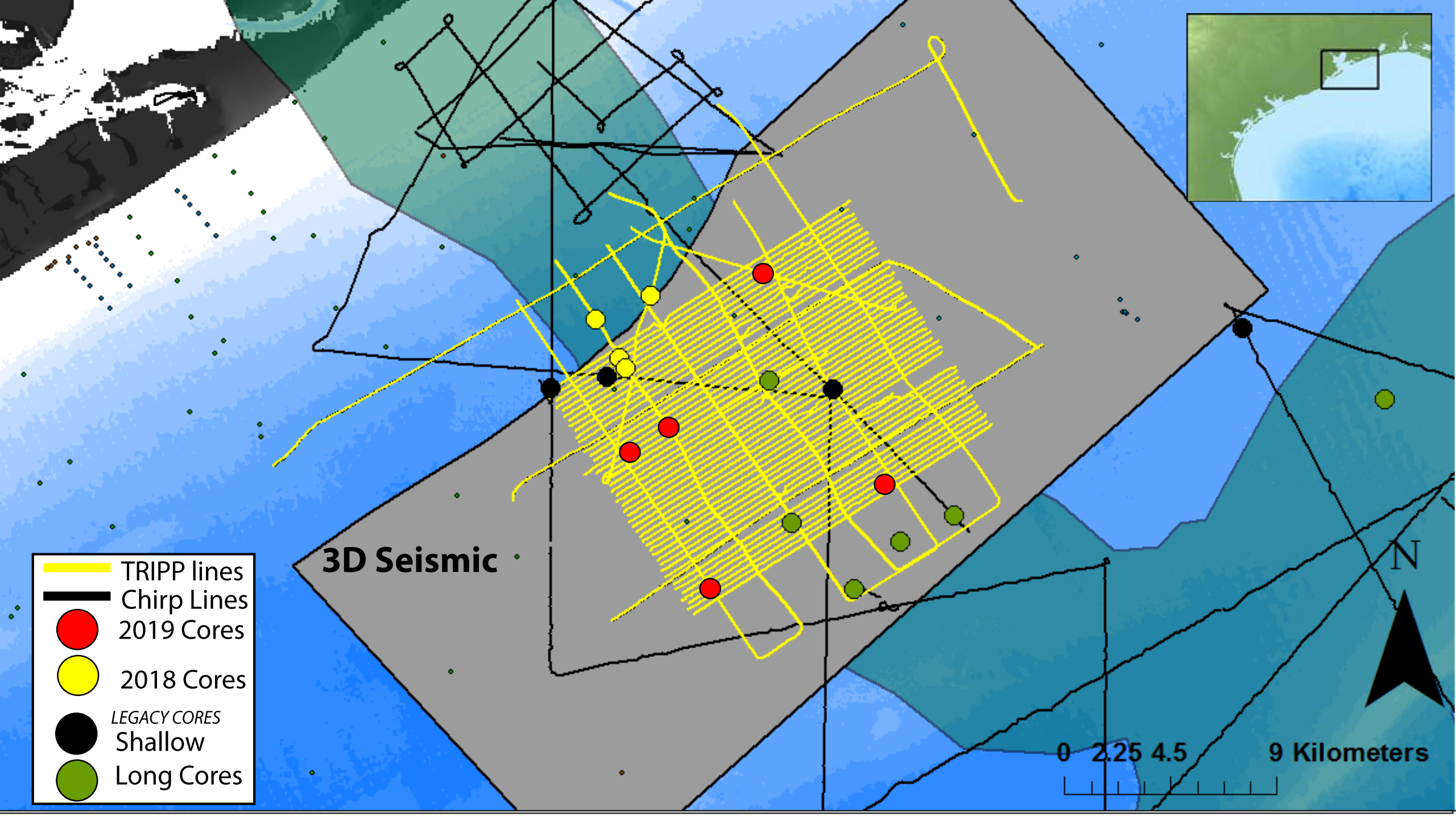
Internal stratigraphic architecture?

How do coastal rivers respond to transgression and how does the shelf evolve?

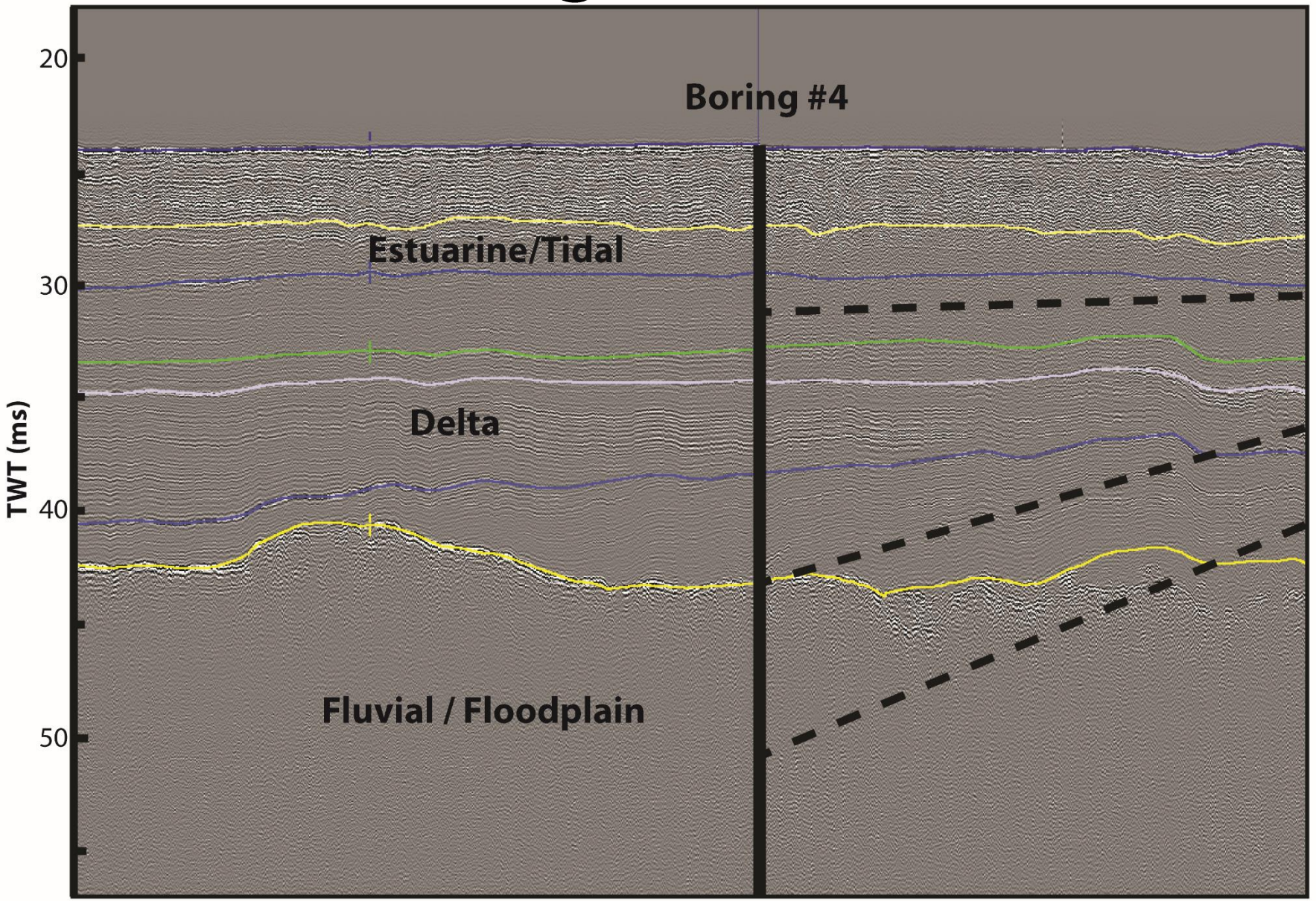

Galveston Bay
B
A'
A
Bolivar
Peninsula
B'
10
km

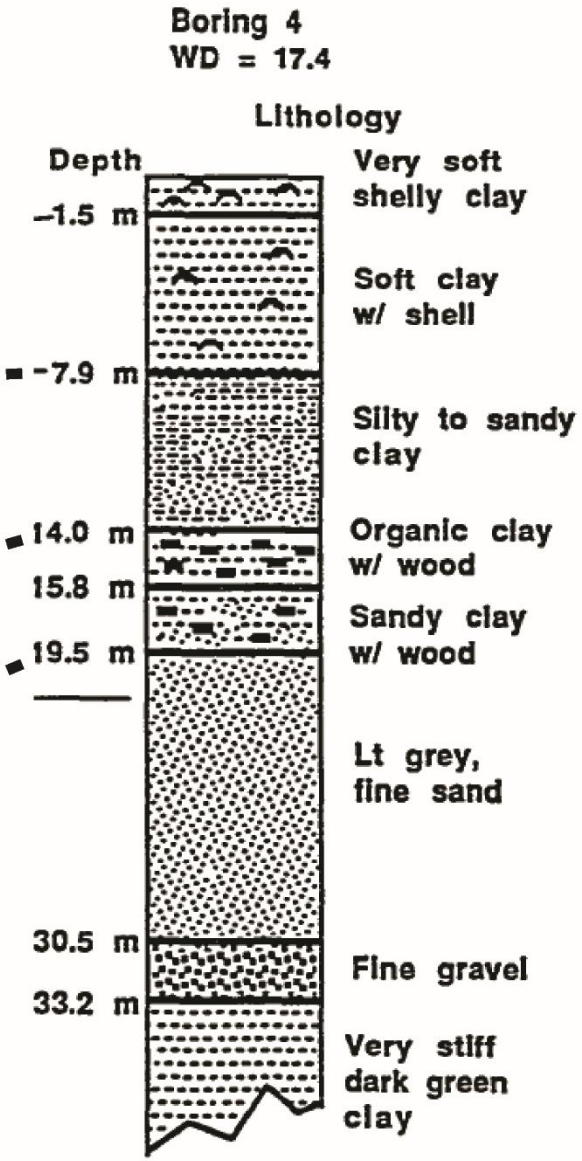

A
A'
Stage 2
Sequence
Boundary
Other Bay Sediments
7.2 km
30 m
Bay-head Delta
Lowstand/Transgressive Fluvial Sand
-14 m
8.2 ka
-10 m
7.7 ka
Undifferentiated
Pleistocene Sediment
Vertical exaggeration 94x
Modified from Rodriguez et al., [2005], Figure 4
14 km


B
B'
Depth (m)
-8 m,
7.1 ka fs
-10 m,
7.4-7.7 ka fs
-14 m,
~8.2 ka fs
-16 m, 8.9 ka fs
-19 m, 9.6 ka fs
10 km
1100
1510
2595
1670
720
1170
4250
5645
7185
7225
7360
7720
7880
4180
7040
7370
8840
7985
8495
7380
8300
7150
7720
8420
8970
9310
9645
8550
7740
8430
8860
8835
13350
Water
Tidal delta
Middle-basin mud
Bay-head delta
Fluvial
Undifferentiated Pleistocene
3520 Radiocarbon date, ca yr B.P.
Flooding surface (fs)
Average
Accumulation Rate
( ≈ 20 - 9.6 ka )
≈ 1.1 mm yr-1
Modified from Anderson et al., [2008], Figure 12


TRIPP lines
Chirp Lines
2019 Cores
2018 Cores
LEGACY CORES
Shallow
Long Cores
3D Seismic
N
0 2.25 4.5
9 Kilometers

# Platform borings confirm basal fluvial sands

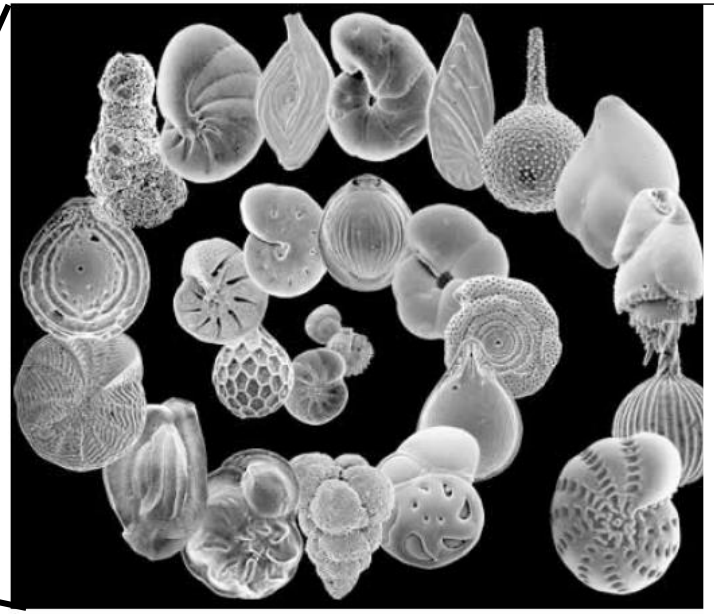


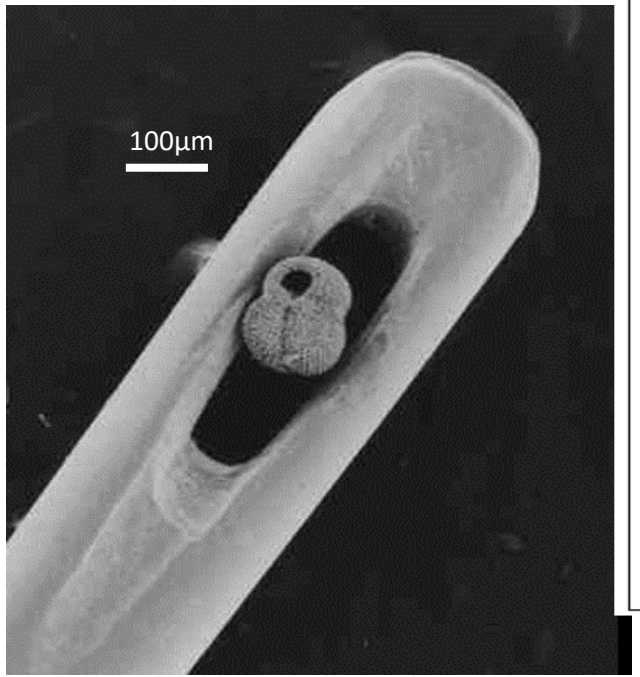



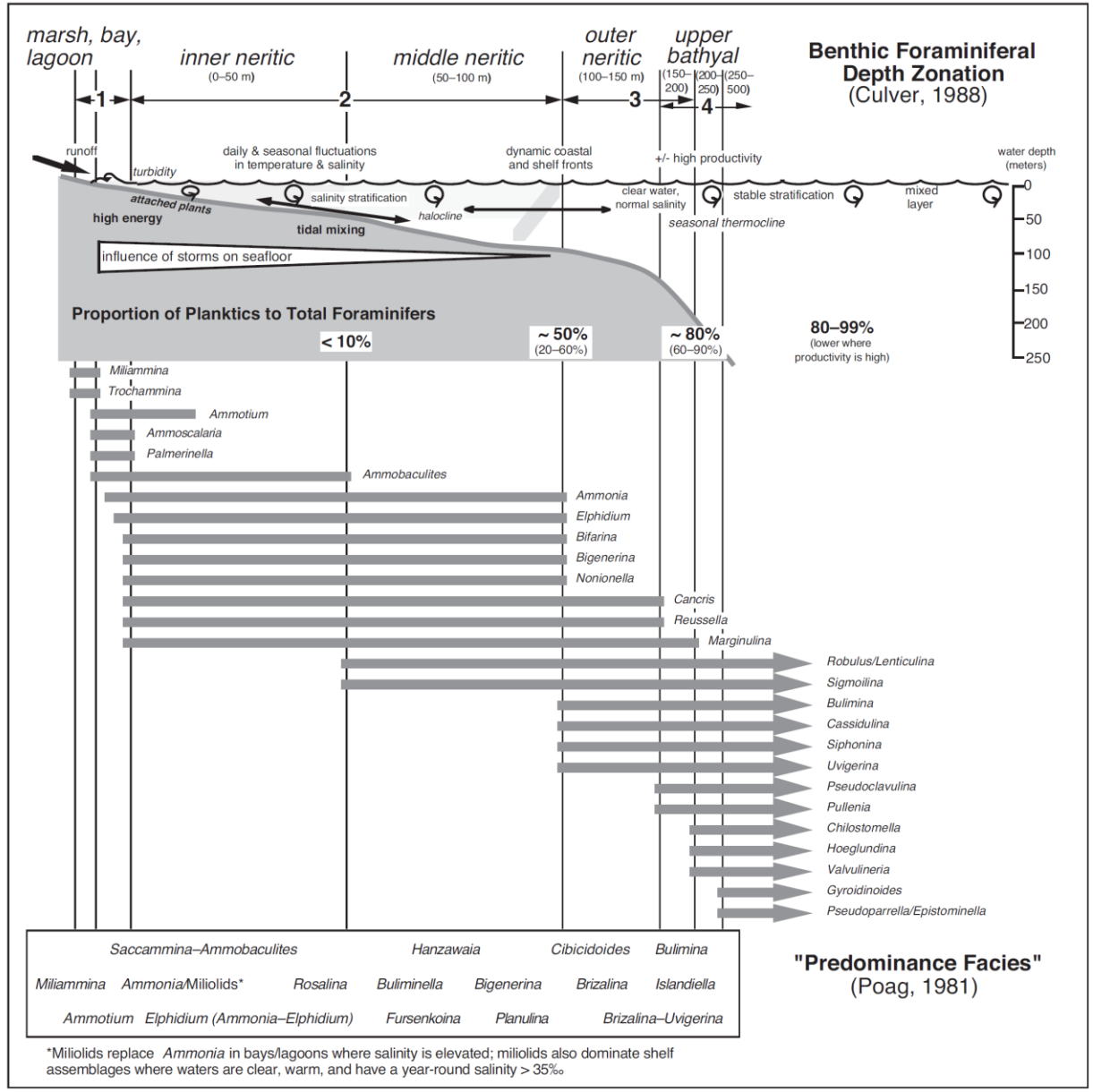

Thomas, 1991

# Coring


# Foraminifera Provide a Tool to Determine Depositional Environment





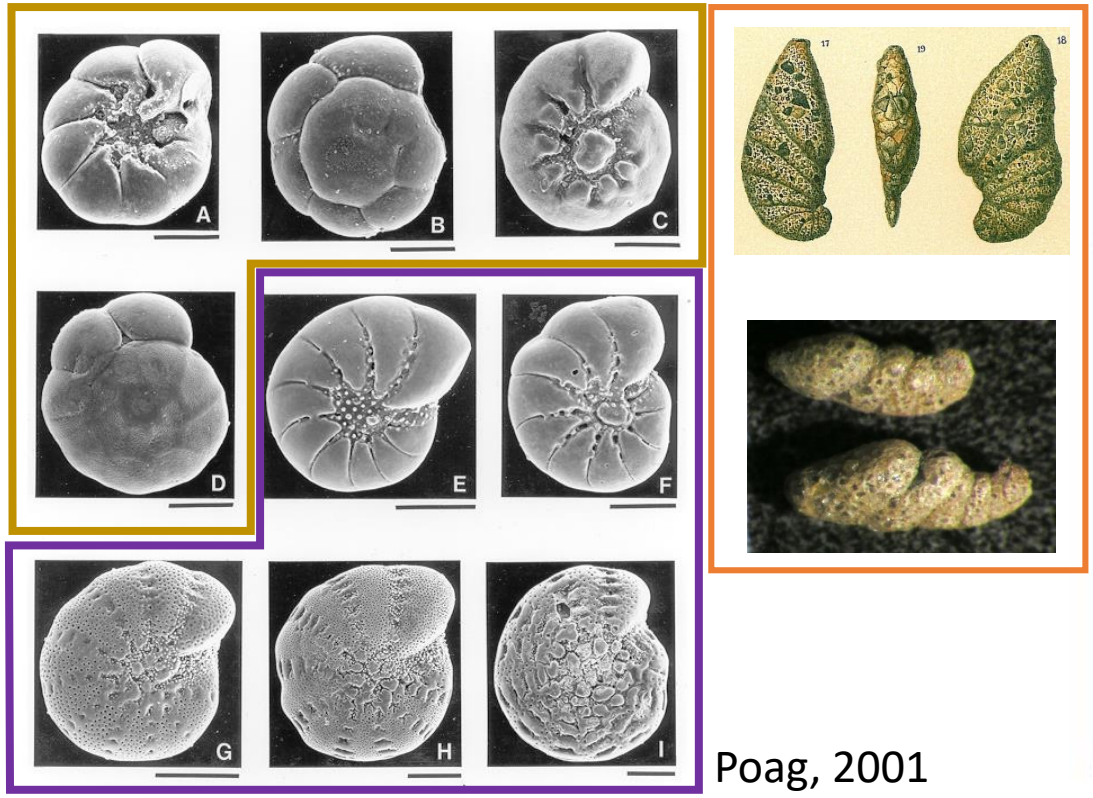




Leckie and Olson, 2003

# Galveston Bay Species

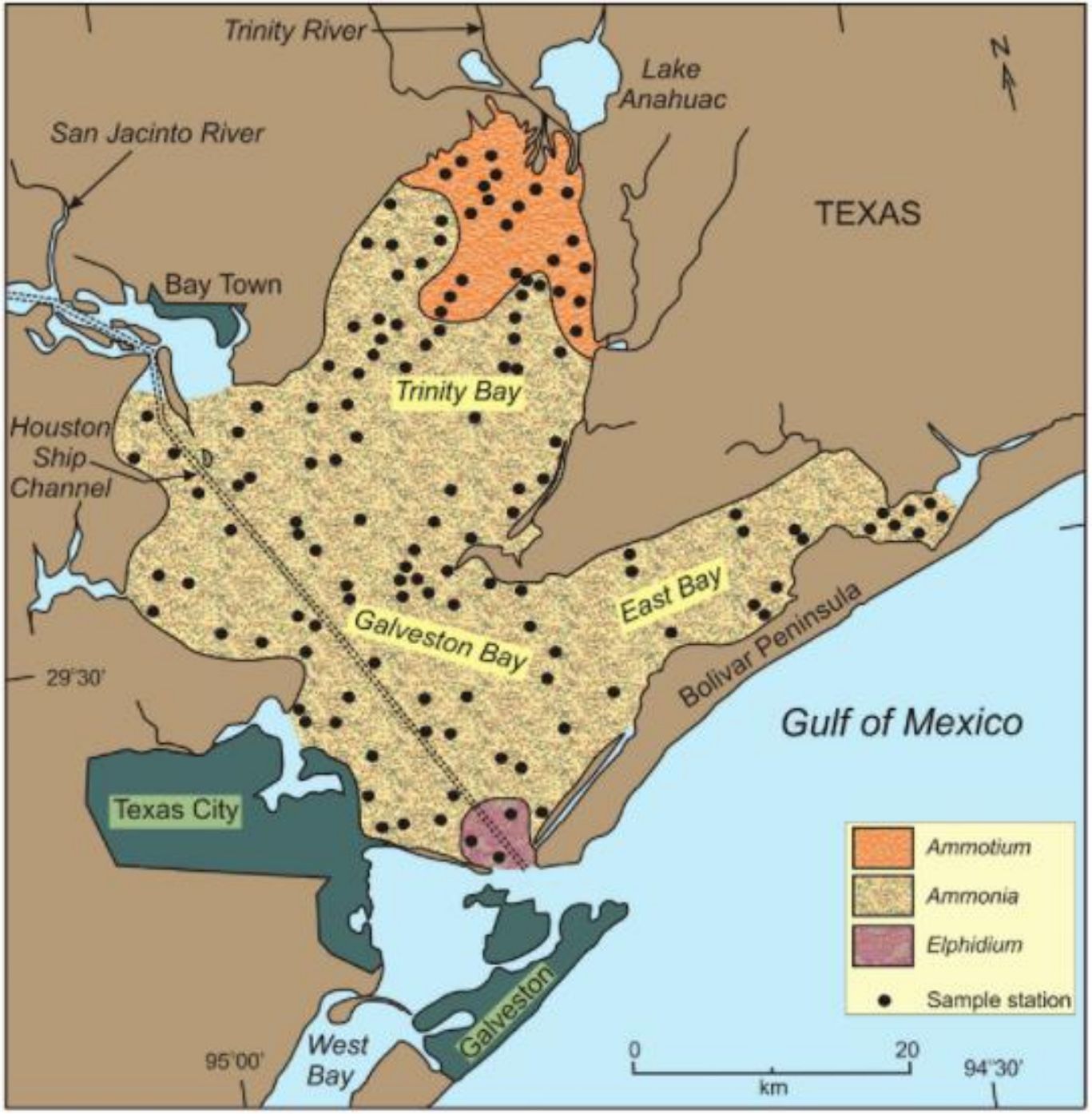
3 Biofacies:

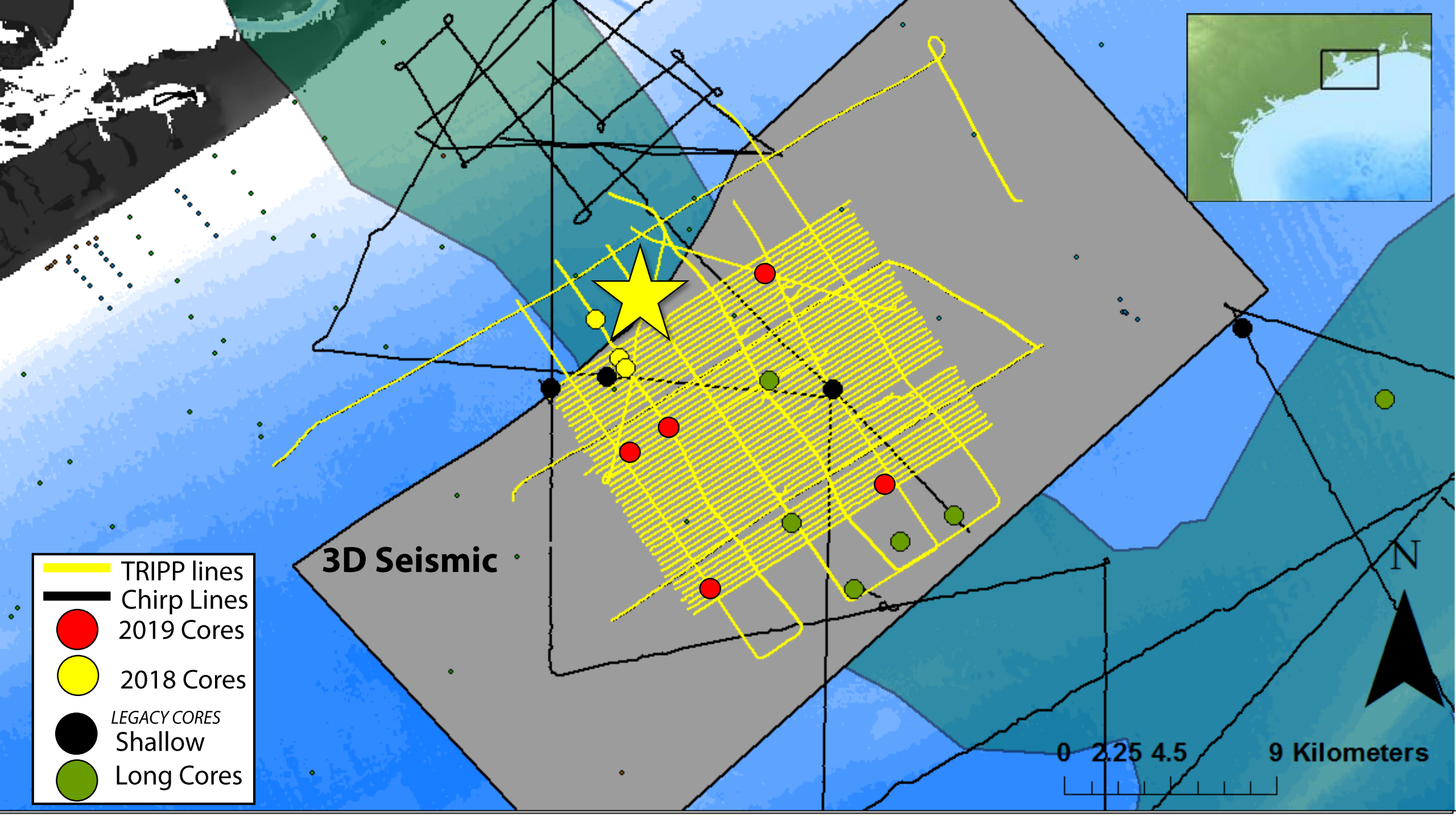
- *Elphidium* (bay mouth)
- *Ammonia* (central bay)
- *Ammotium* (upper bay)



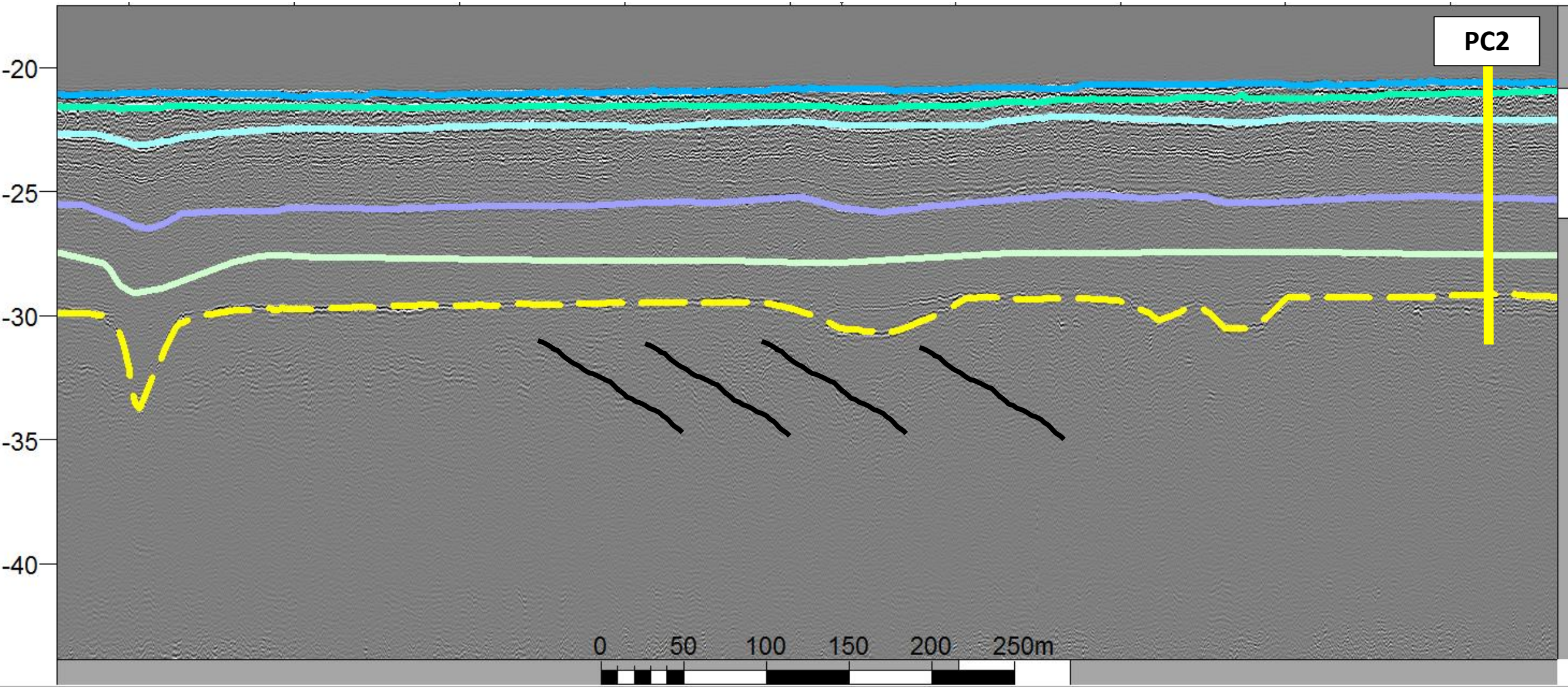

Poag, 2001






TRIPP lines
Chirp Lines
2019 Cores
2018 Cores
LEGACY CORES
Shallow
Long Cores
3D Seismic
N
0 2.25 4.5
9 Kilometers

# PC-2 Fluvial Terrace and Estuarine bay fill



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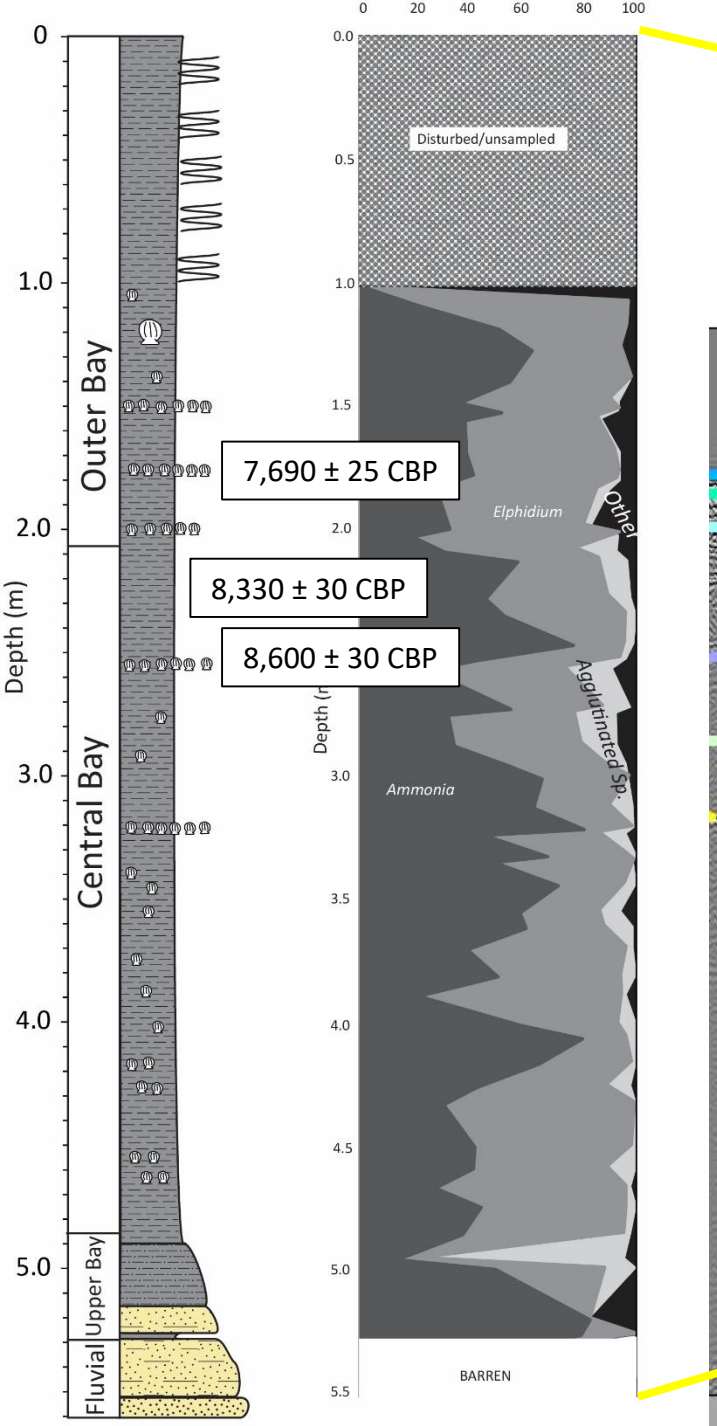
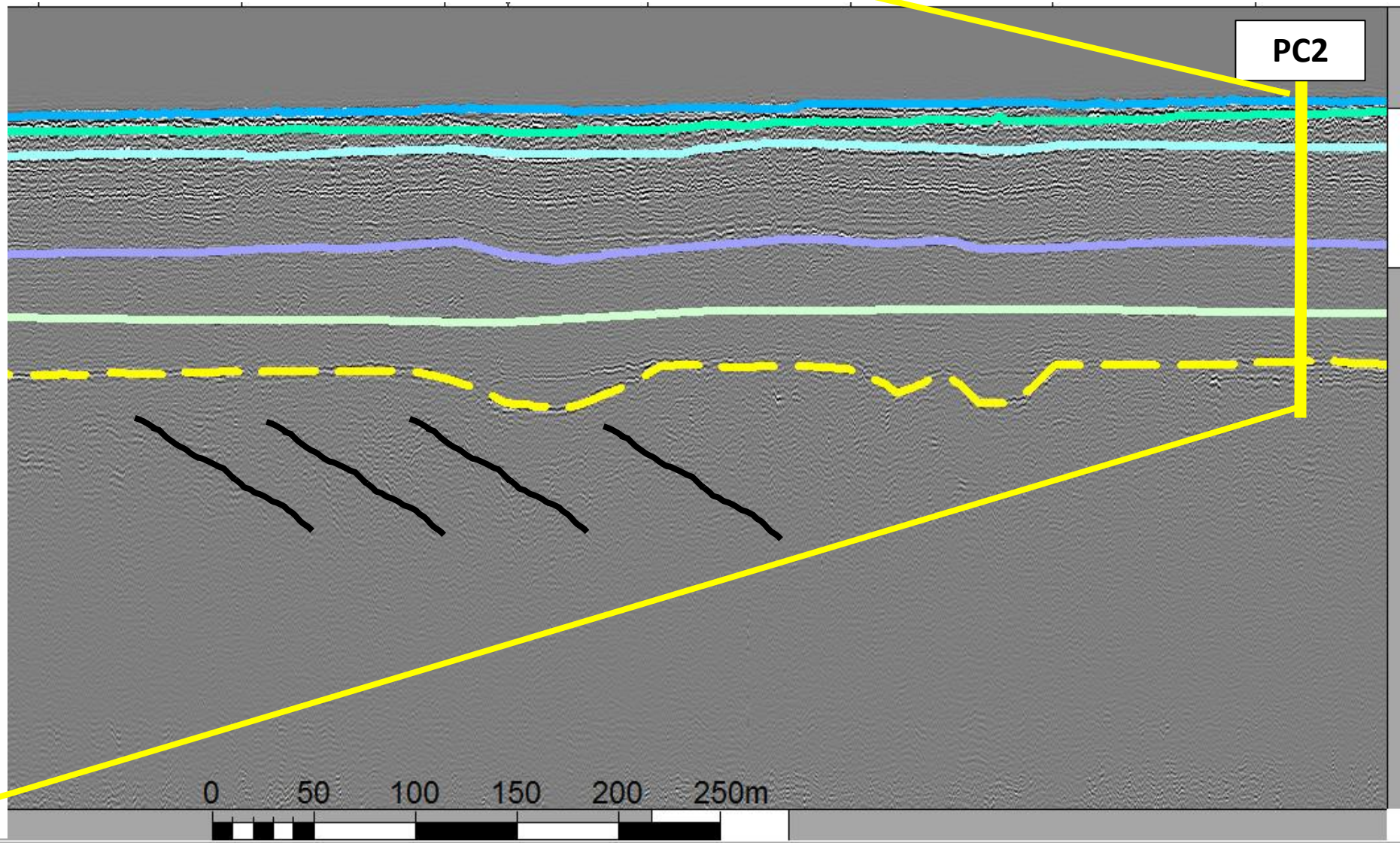
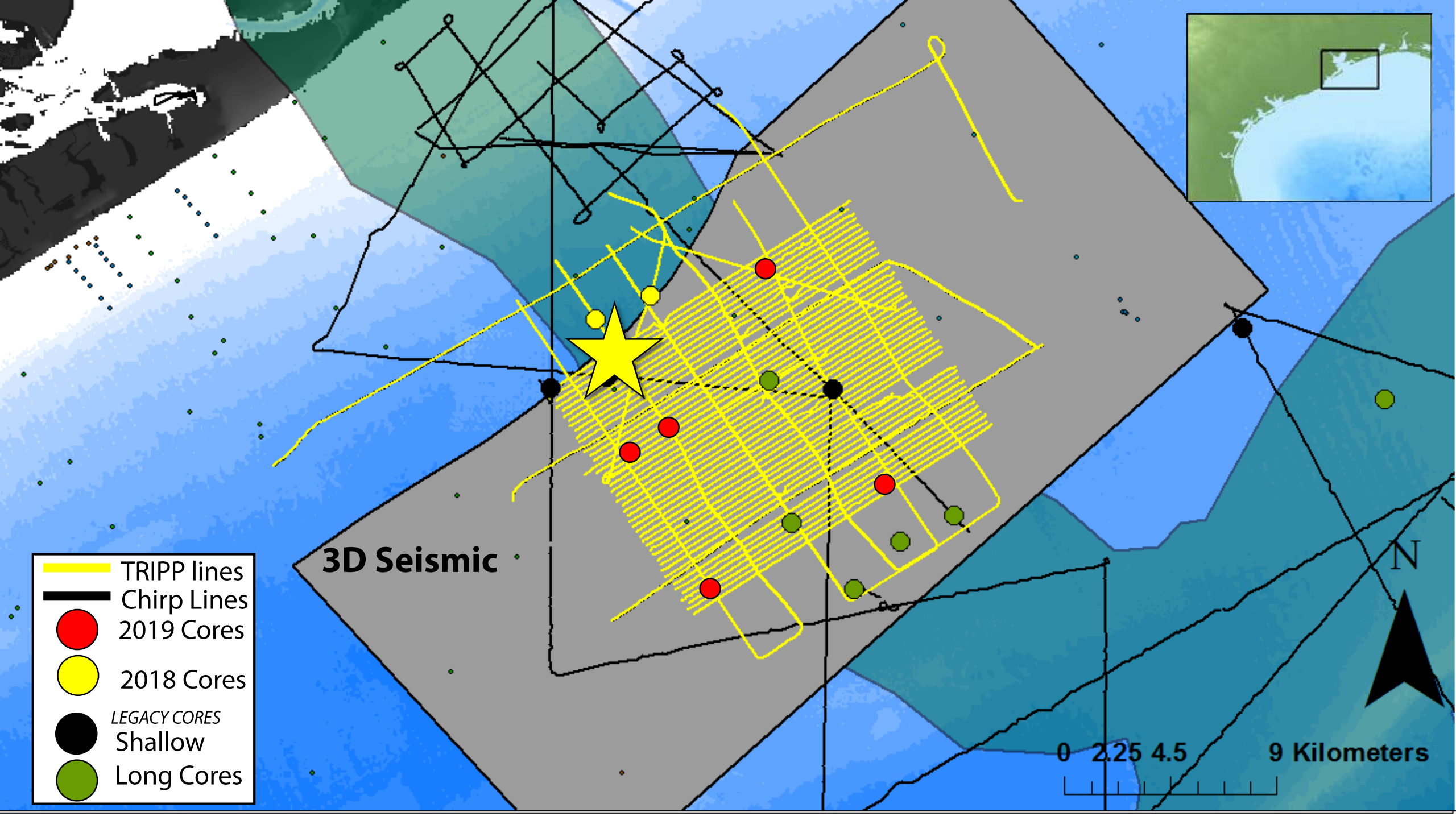


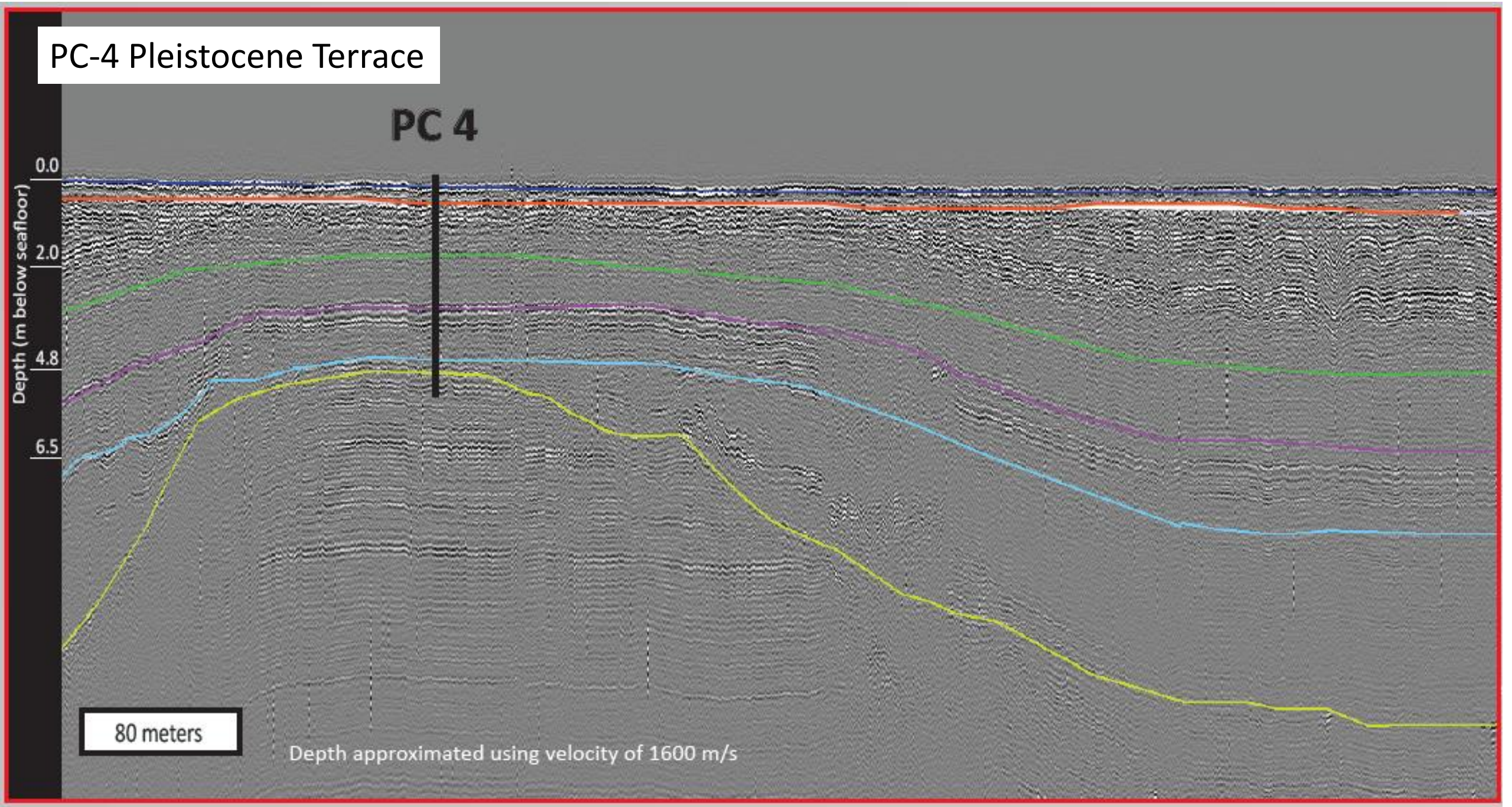




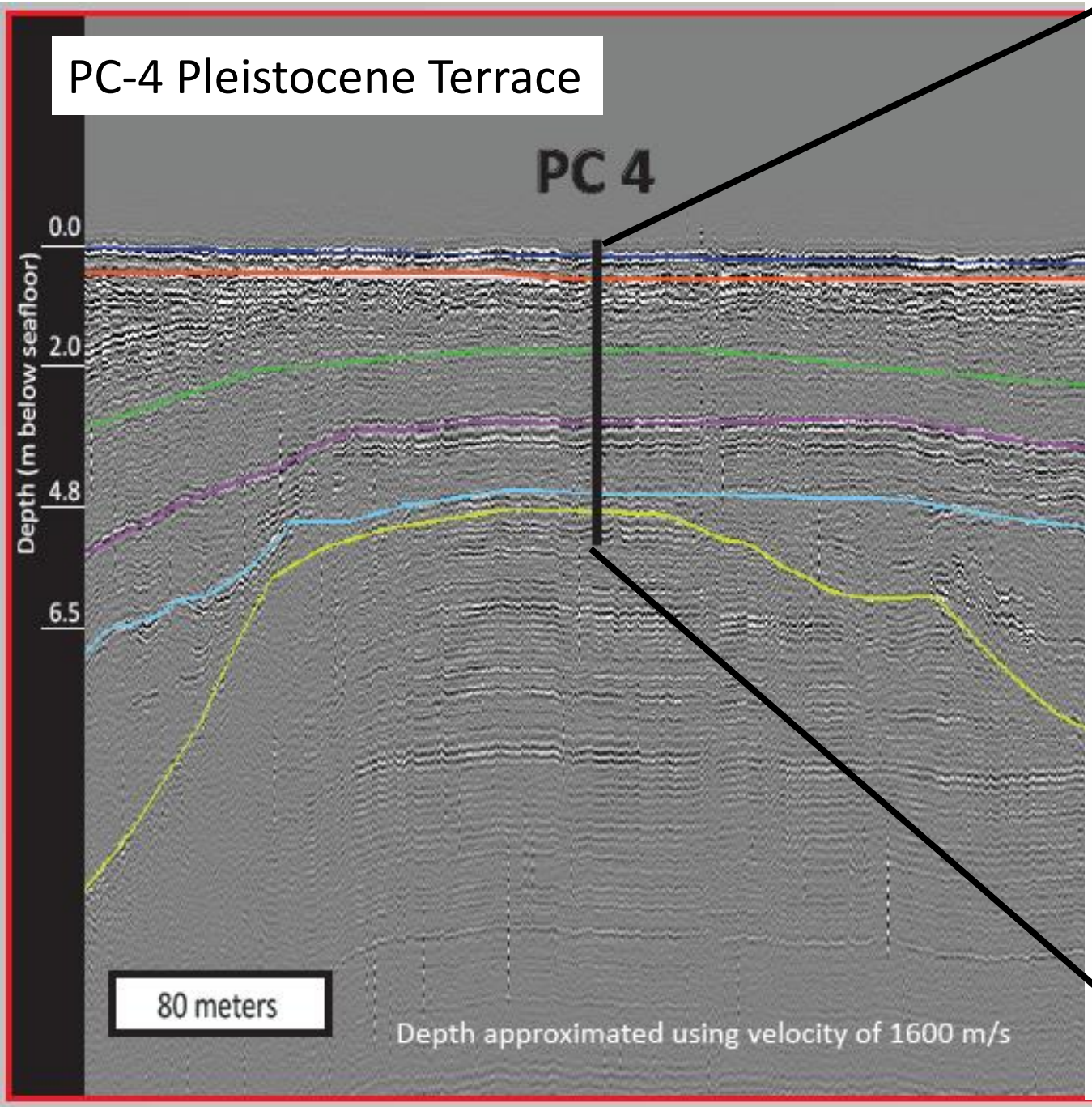


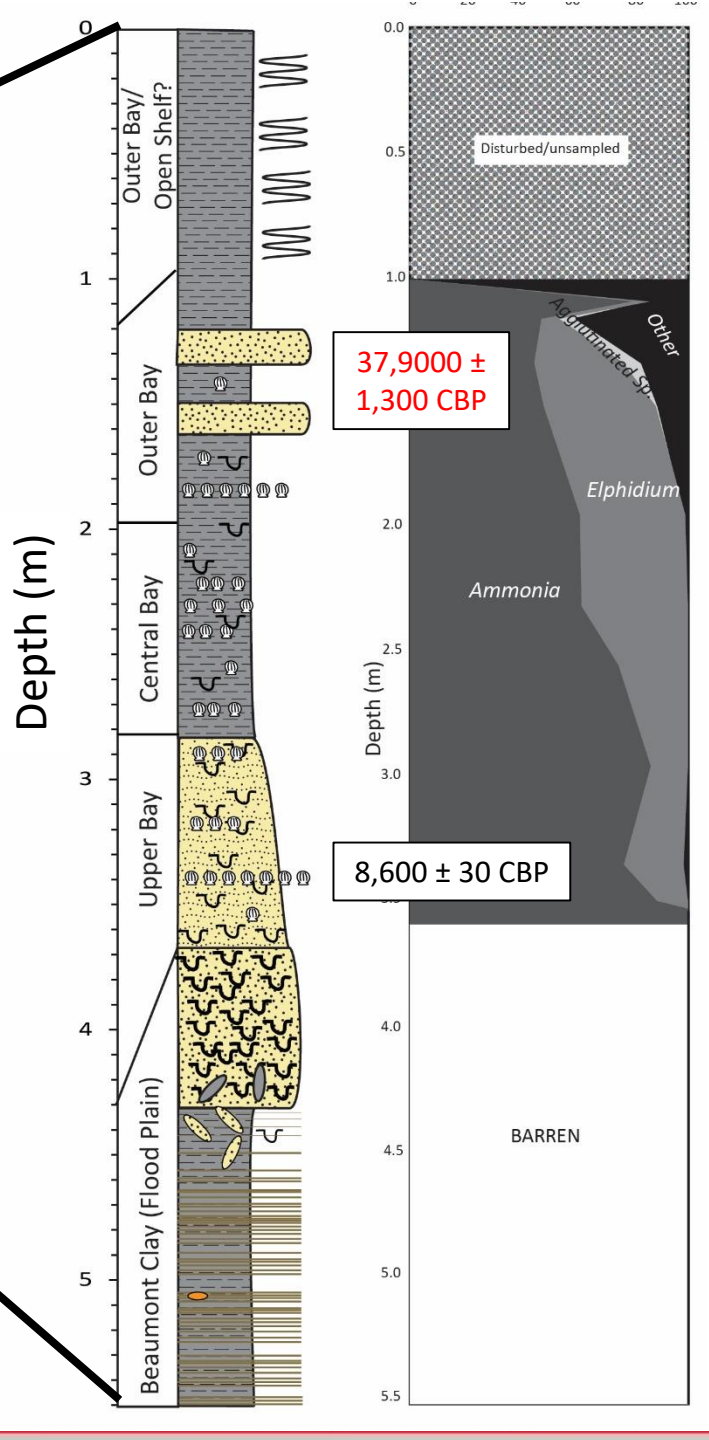

TRIPP lines
Chirp Lines
2019 Cores
2018 Cores
LEGACY CORES
Shallow
Long Cores
3D Seismic
N
0 2.25 4.5
9 Kilometers

# PC-4 Pleistocene Terrace



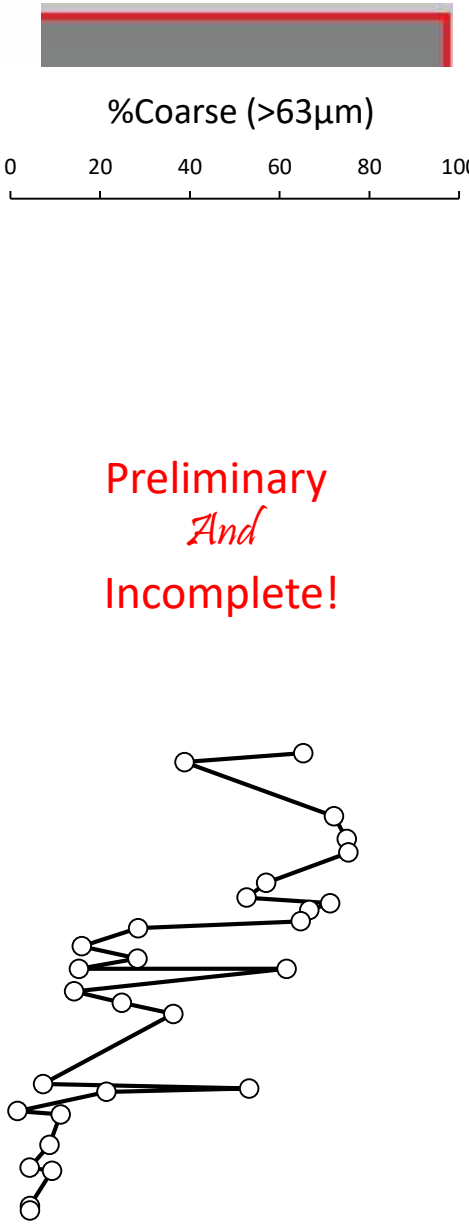
# PC-4 Pleistocene Terrace



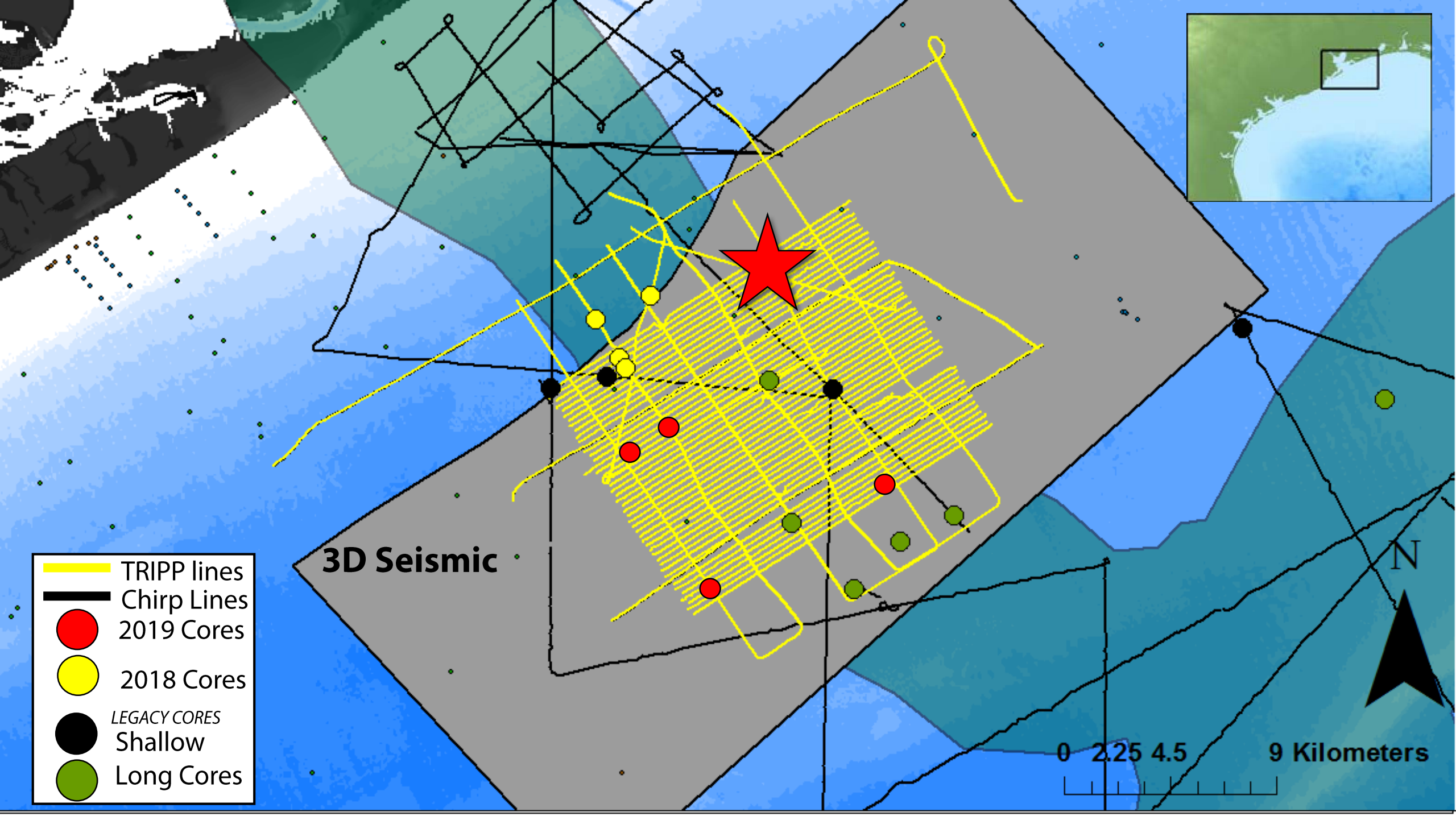



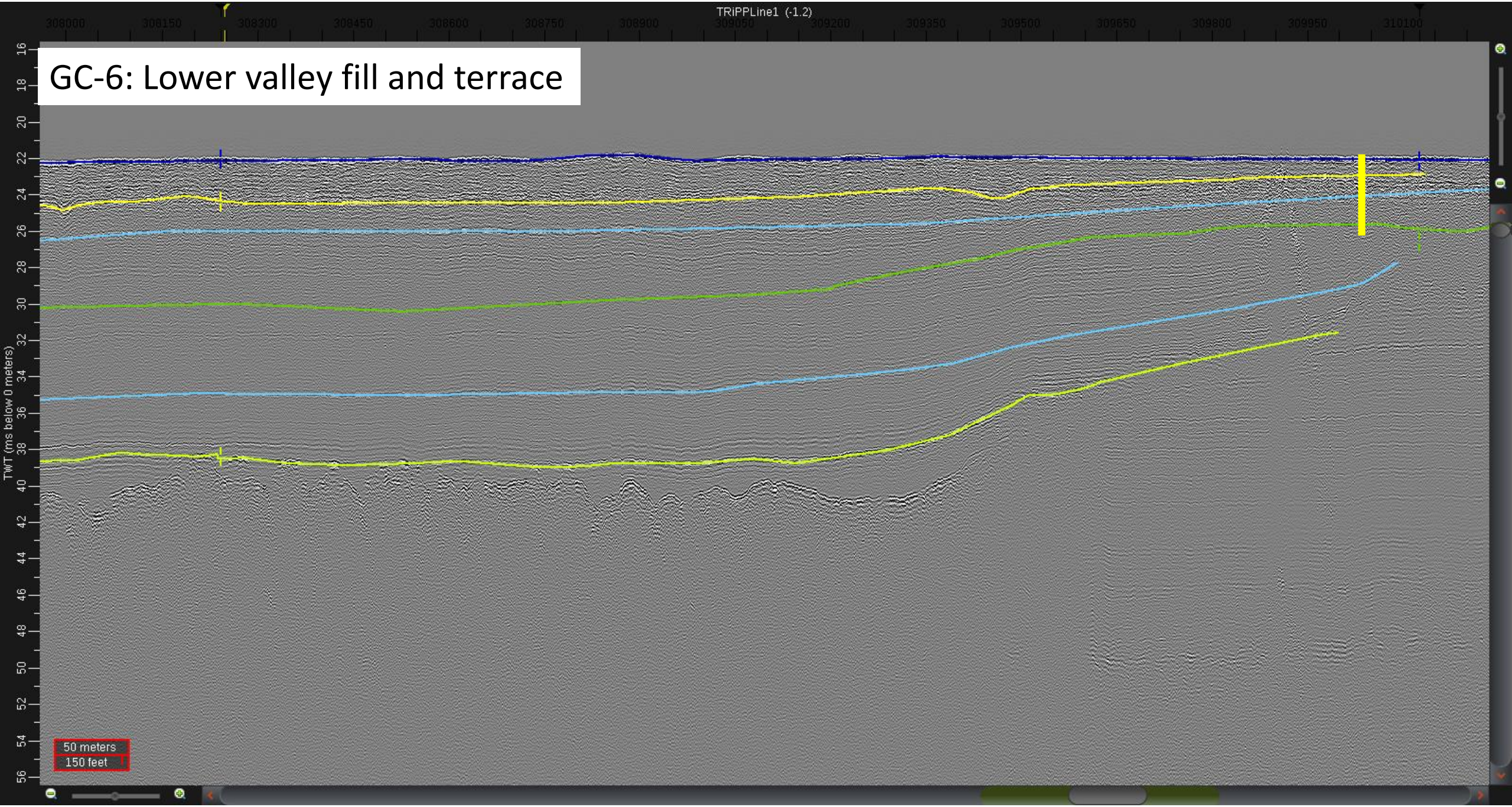




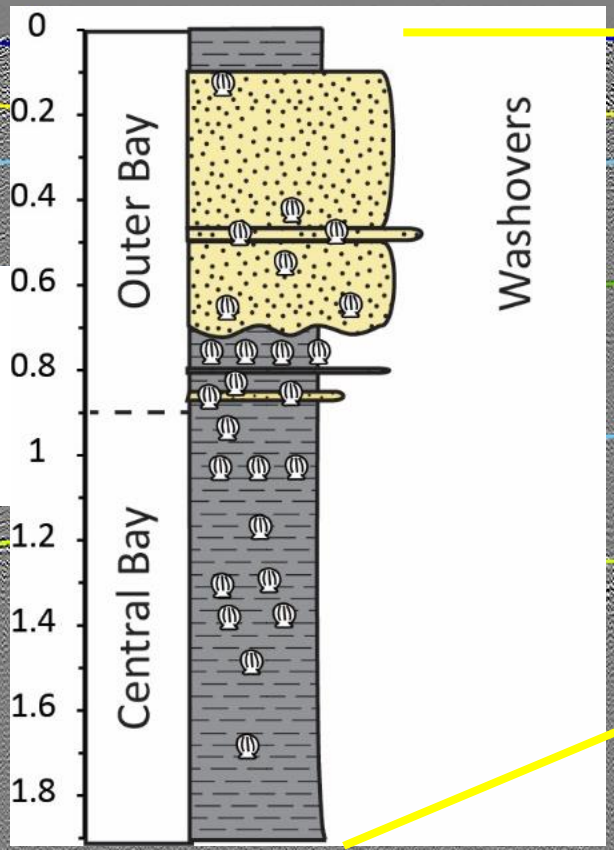


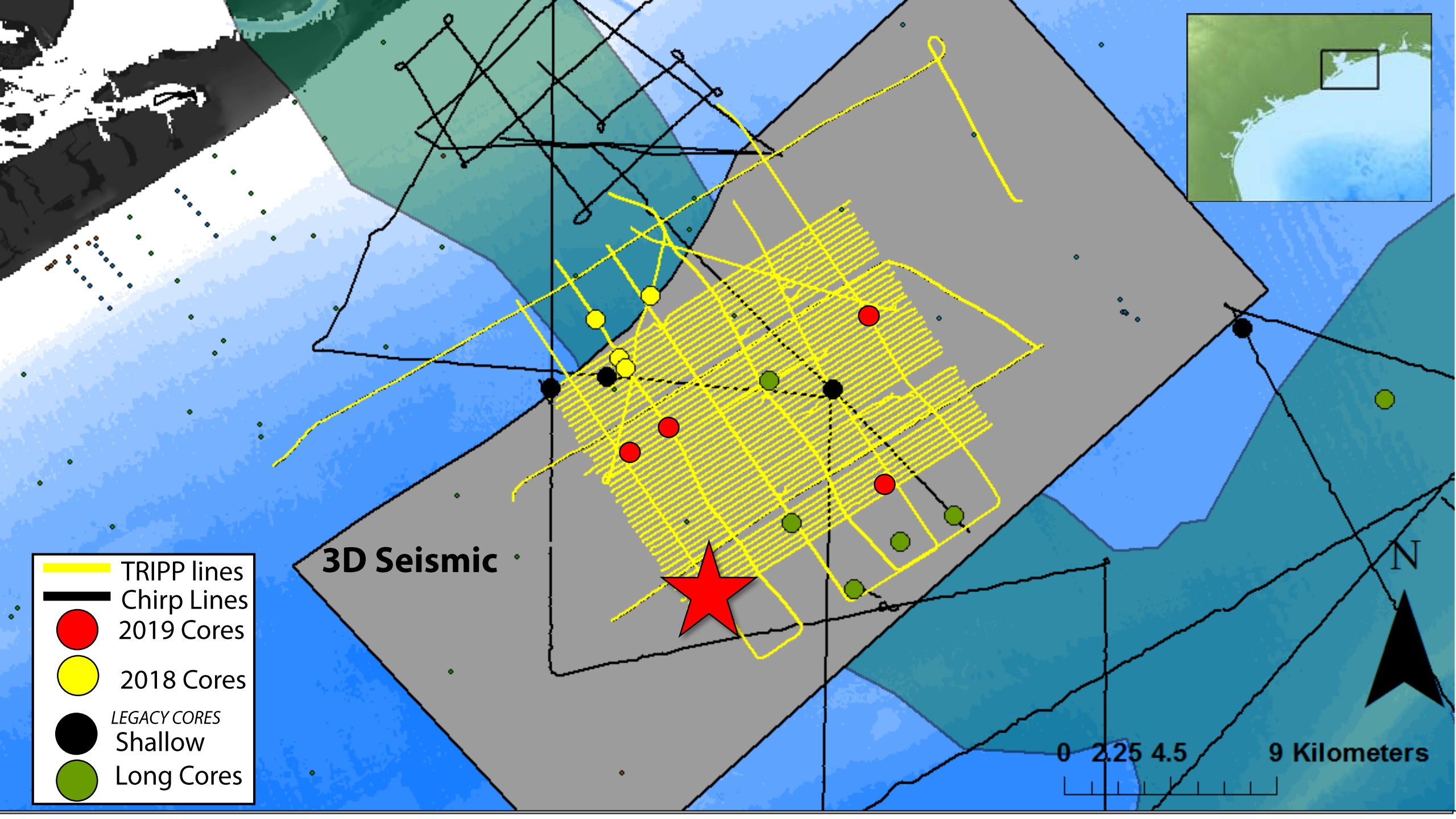

Preliminary
*And*
Incomplete!

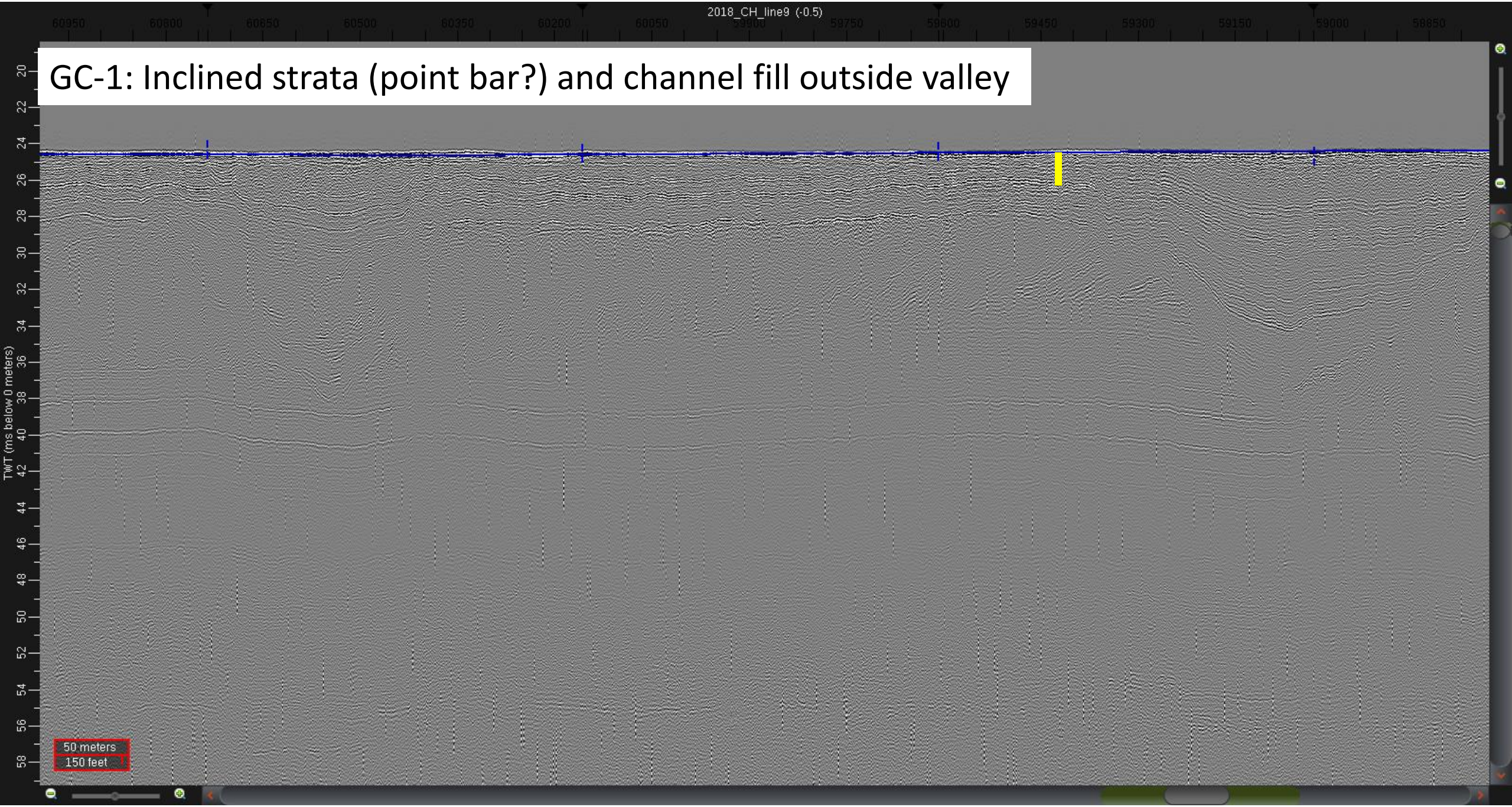

TRIPP lines
Chirp Lines
2019 Cores
2018 Cores
LEGACY CORES
Shallow
Long Cores
3D Seismic
N
0 2.25 4.5
9 Kilometers


TRiPPLine1 (-1.2)
GC-6: Lower valley fill and terrace
TWT (ms below 0 meters)
50 meters
150 feet

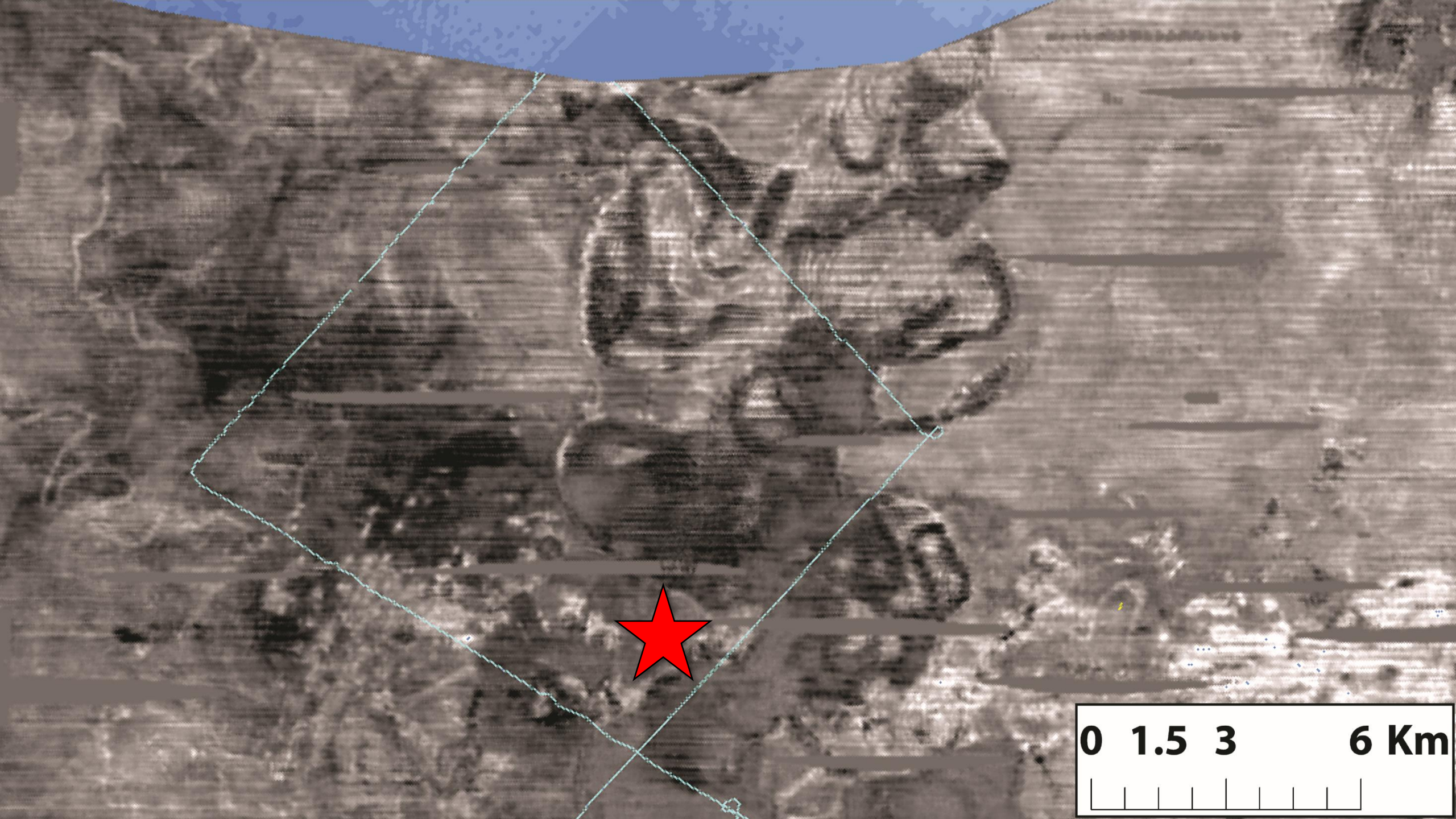
# GC-6: Lower valley fill and terrace



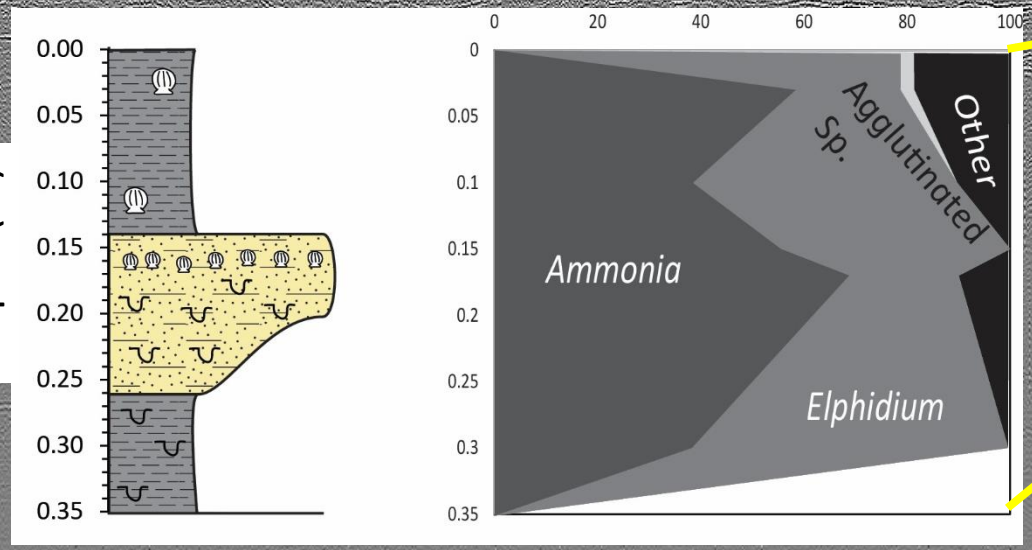

TRIPP lines
Chirp Lines
2019 Cores
2018 Cores
LEGACY CORES
Shallow
Long Cores
3D Seismic
N
0 2.25 4.5
9 Kilometers

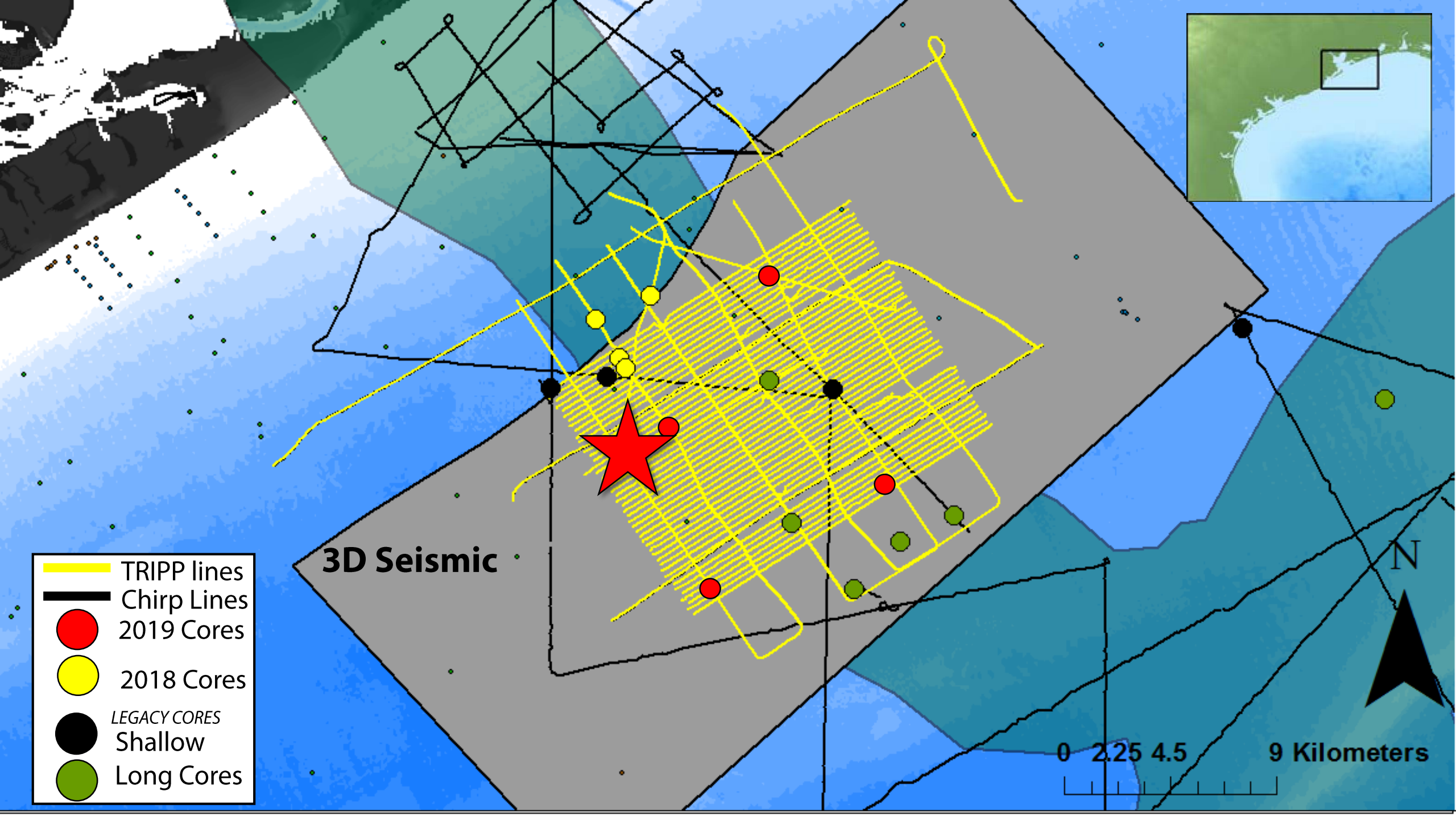



# GC-1: Inclined strata (point bar?) and channel fill outside valley


0 1.5 3 6 Km

# GC-1: Inclined strata (point bar?) and channel fill outside valley

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Chirp Lines
2019 Cores
2018 Cores
LEGACY CORES
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Long Cores
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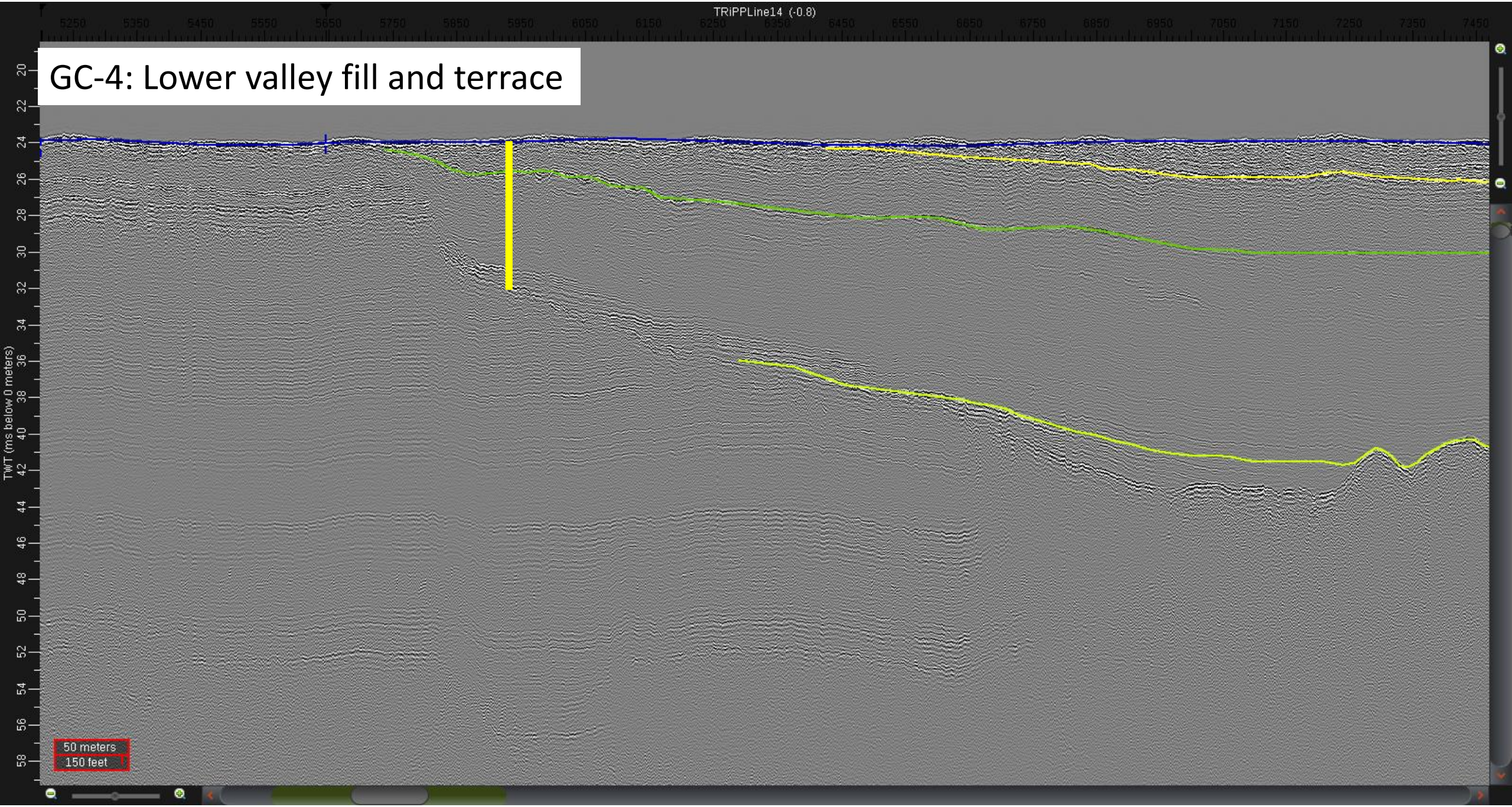
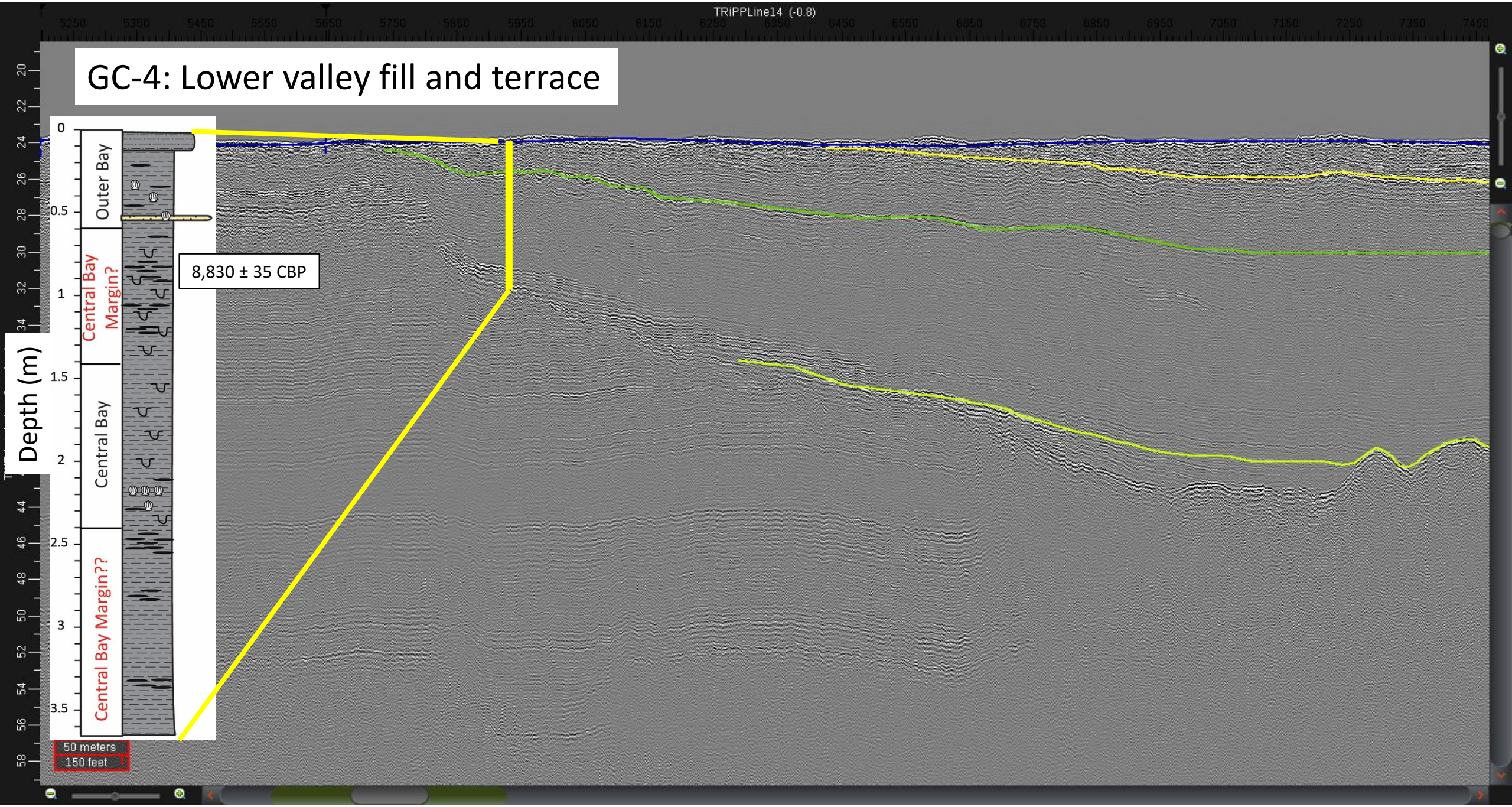
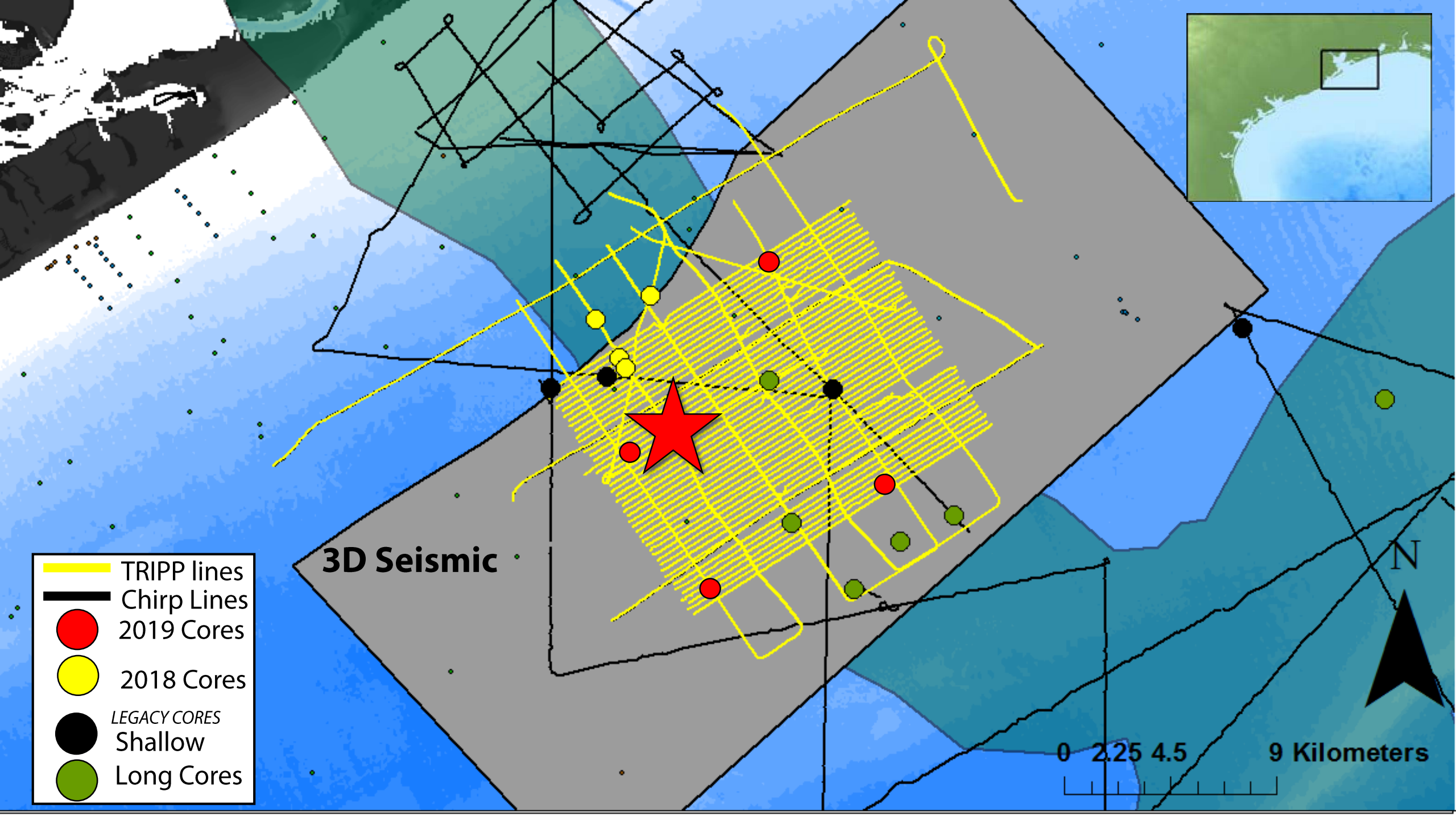
N
0 2.25 4.5
9 Kilometers




# GC-4: Lower valley fill and terrace


TRiPPLine14 (-0.8)
GC-4: Lower valley fill and terrace
Depth (m)
0
0.5
1
1.5
2
2.5
3
3.5
Outer Bay
Central Bay Margin?
Central Bay
Central Bay Margin??
8,830 ± 35 CBP
50 meters
150 feet


TRIPP lines
Chirp Lines
2019 Cores
2018 Cores
LEGACY CORES
Shallow
Long Cores
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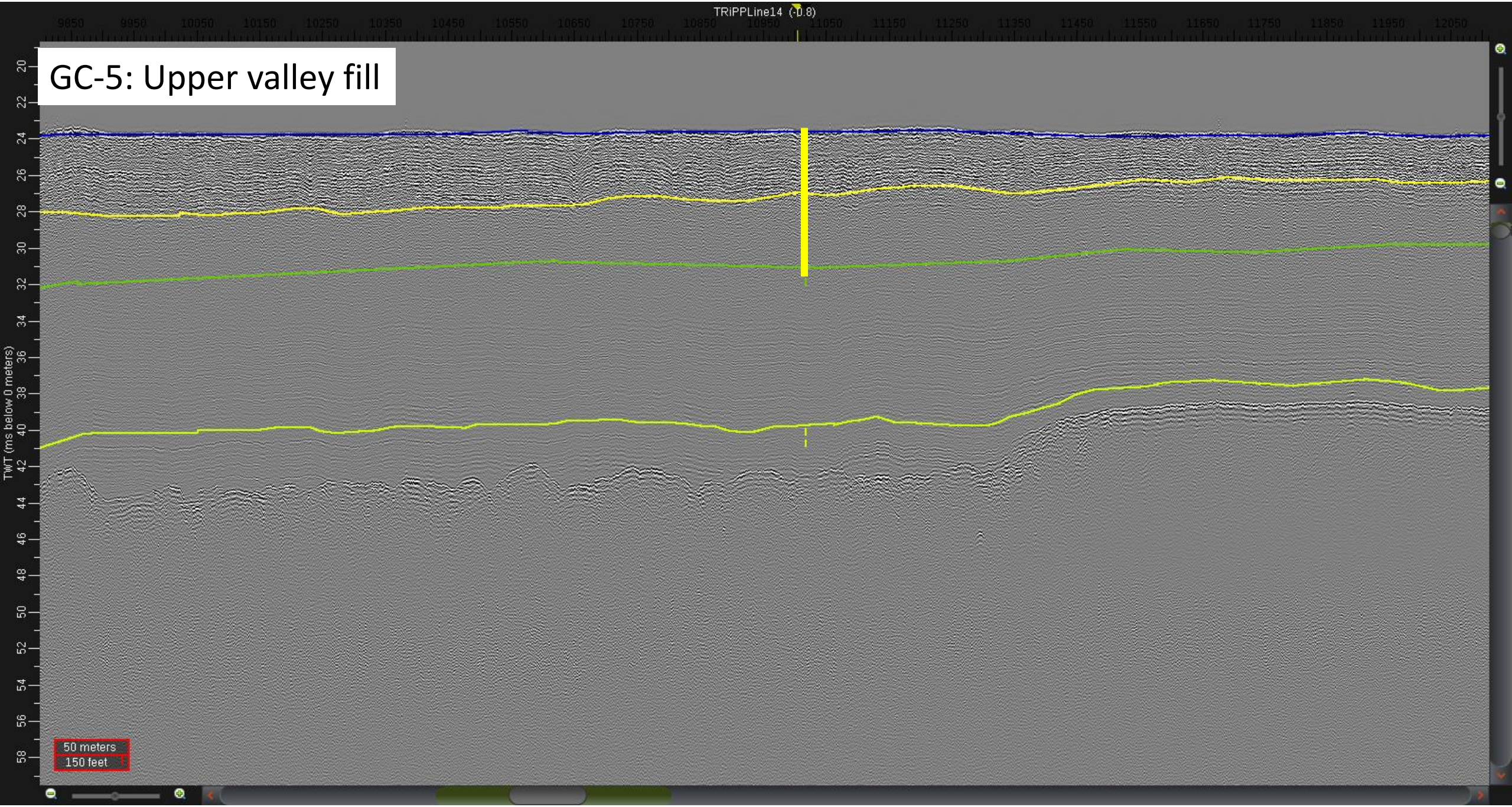
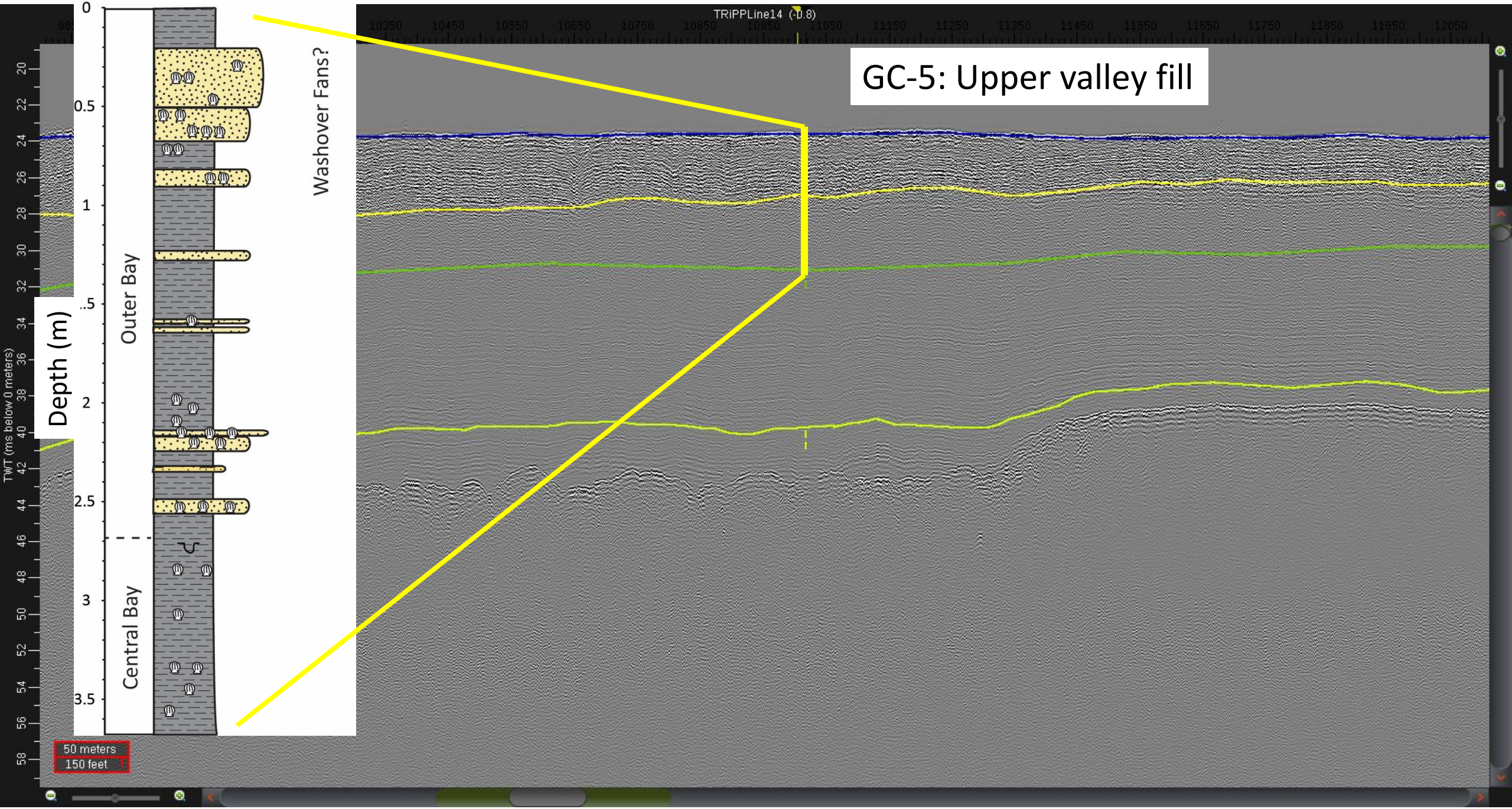
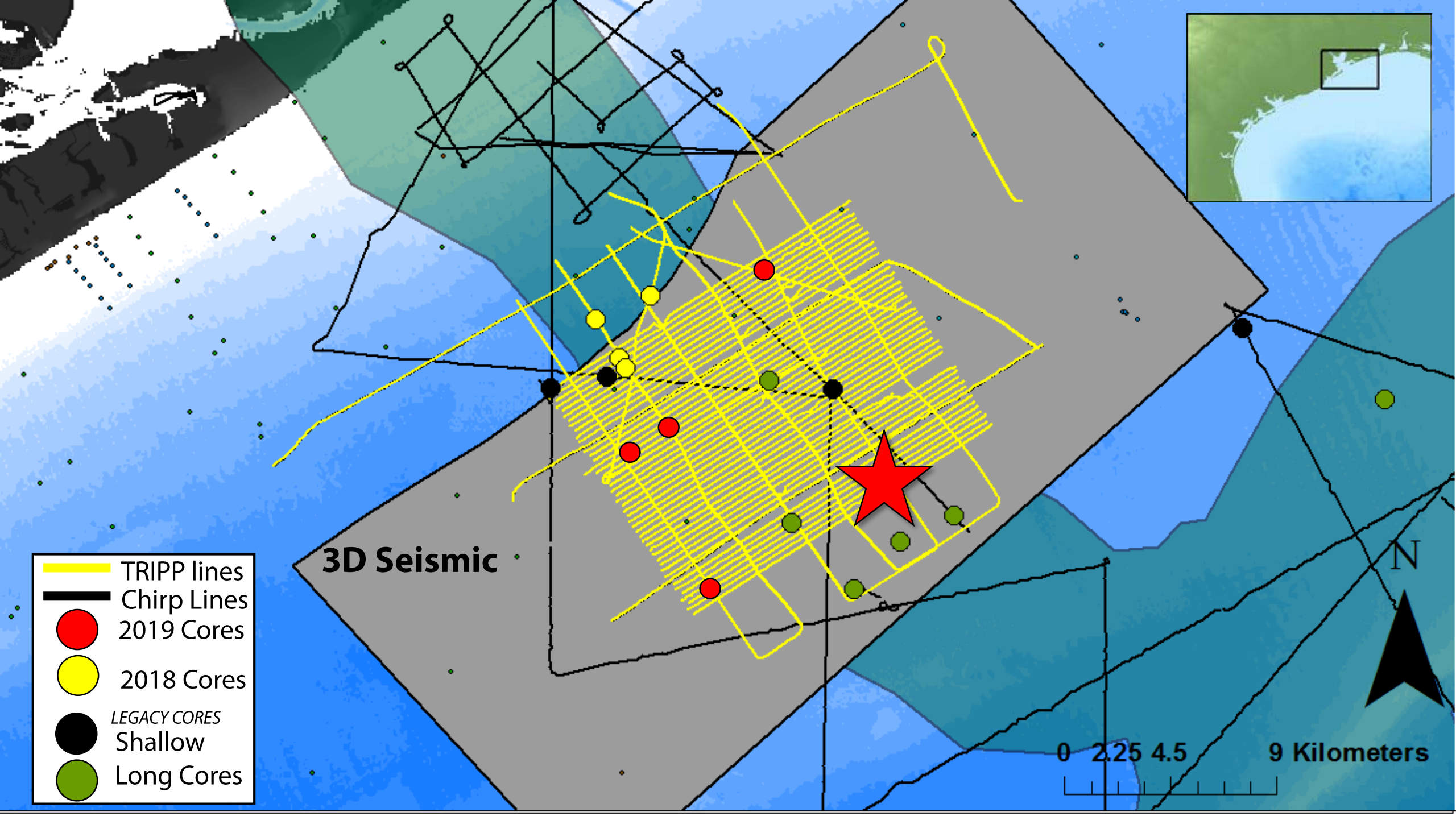
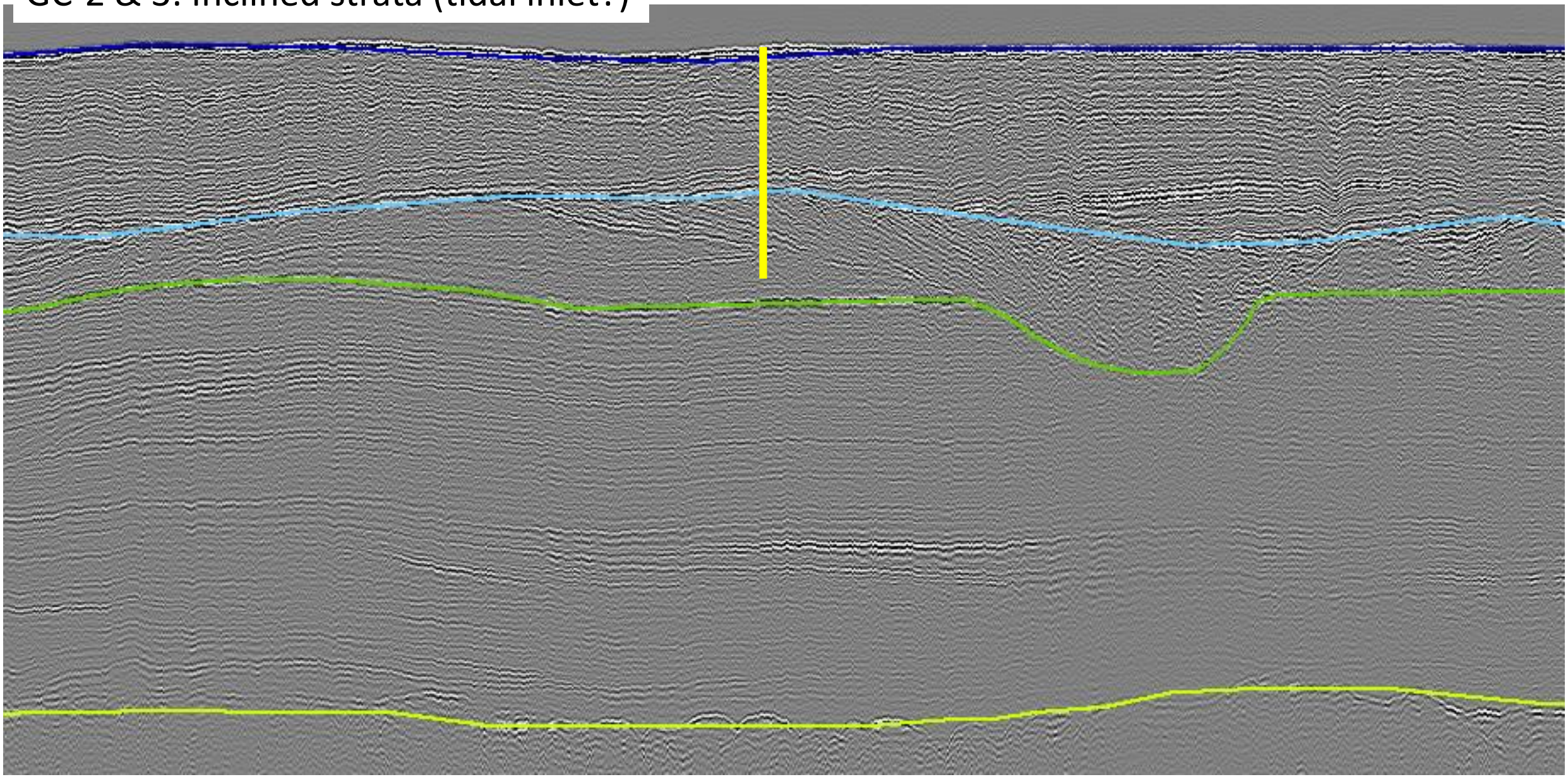
N
0 2.25 4.5
9 Kilometers


TRiPPLine14 (-0.8)
GC-5: Upper valley fill
TWT (ms below 0 meters)
50 meters
150 feet

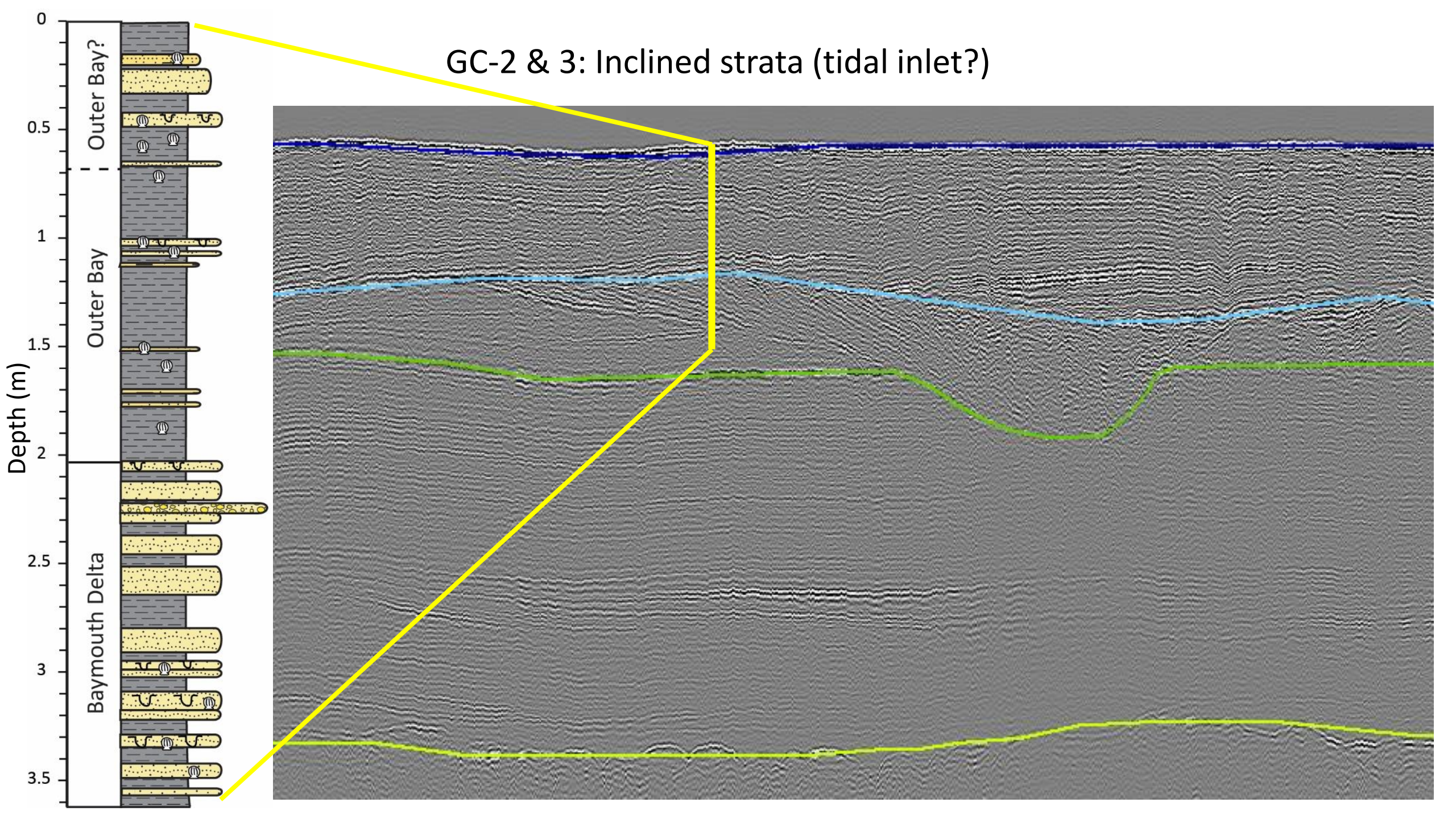

GC-5: Upper valley fill
Depth (m)
Outer Bay
Central Bay
Washover Fans?
0
0.5
1
1.5
2
2.5
3
3.5
50 meters
150 feet
TRiPPLine14 (-0.8)
TWT (ms below 0 meters)


TRIPP lines
Chirp Lines
2019 Cores
2018 Cores
LEGACY CORES
Shallow
Long Cores
3D Seismic
N
0 2.25 4.5
9 Kilometers

# GC-2 & 3: Inclined strata (tidal inlet?)



# GC-2 & 3: Inclined strata (tidal inlet?)



# Radiocarbon Ages Still Pending

NOSAMS | NATIONAL OCEAN SCIENCES ACCELERATOR MASS SPECTROMETRY

**View My Current Sample Status:**

| Receipt # | Sample ID | Process | Status Date | Status |
|---|---|---|---|---|
| 162402 | PC-2-S2 69.5-71 | (TP) Target Press | 11/25/2019 5:31:32 PM | In Process |
| 162403 | PC-2-S2 100.5-102 | (TP) Target Press | 11/25/2019 5:31:33 PM | In Process |
| 162404 | PC-2-S3 82-83.5 | (TP) Target Press | 11/25/2019 5:31:33 PM | In Process |
| 162405 | PC-4-S2 94-95 | (TP) Target Press | 11/25/2019 5:31:33 PM | In Process |
| 162406 | PC-4-S3 59 | (TP) Target Press | 11/25/2019 5:31:33 PM | In Process |
| 162407 | GC-1-S1 5-6 | Received | 10/24/2019 12:00:00 AM | Logged In |
| 162408 | GC-1-S1 28.5-30 | Received | 10/24/2019 12:00:00 AM | Logged In |
| 162409 | GC-2-S3-6-10 | Received | 10/24/2019 12:00:00 AM | Logged In |
| 162410 | GC-2-S2 144-145 | Received | 10/24/2019 12:00:00 AM | Logged In |
| 162411 | GC-4-S2 13-13.5 | (TP) Target Press | 11/25/2019 5:31:33 PM | In Process |

# Conclusions

- **Extensive sand deposits exist in the shallow estuarine section of the drowned Trinity river valley**
- Microfossils show that most estuarine sands are associated with an outer bay environment (tidal deltas and washover fans behind the barrier islands – *the latter may be particularly suitable for beach nourishment, since it's essentially beach sand*)
- It is not clear that there is a substantial bayhead delta in our study area
- High-contrast seismic facies in estuary appear related to interbedded sands, low-contrast seismic facies are more muddy – *important for future exploration*

# Future work

- *Finish foraminiferal analysis of cores*
- *more $^{14}C$ dating*
- *Quantitative grain size analysis*
- *Core-seismic integration, detailed mapping of estuarine facies*