

The Second Half of MOSSFA: Sedimentation and Flocculent Accumulation

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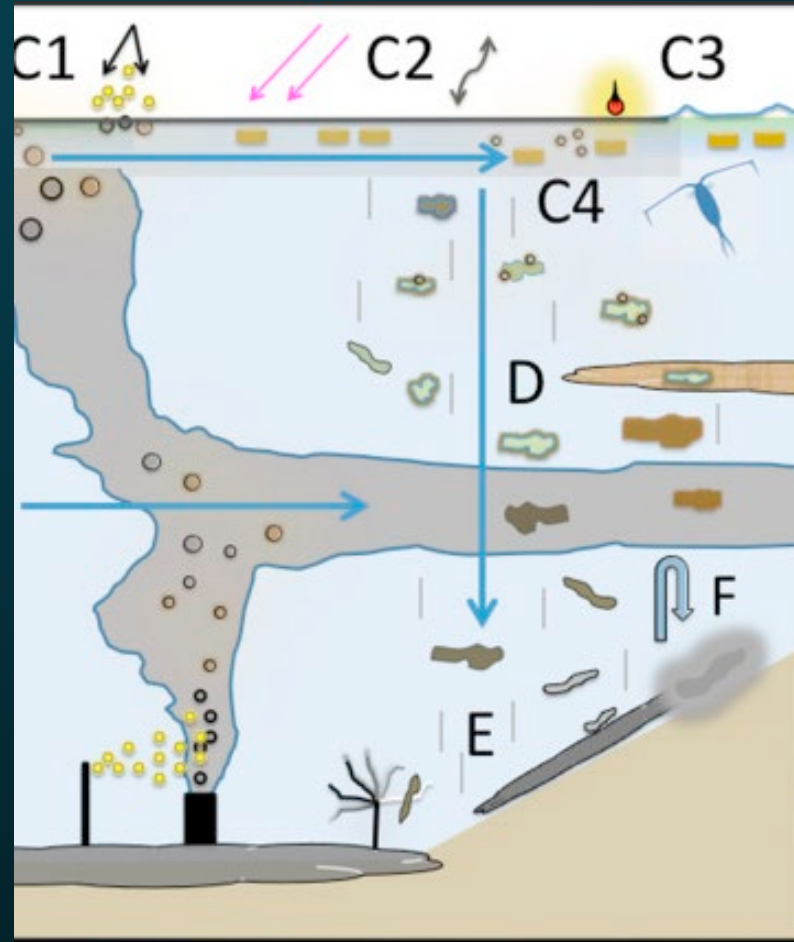
Short-term Sedimentation vs. Long-term Accumulation

Sedimentation:

- Settling of particles (sediment) to seafloor.
- May be re-mobilized, resuspended and transported and secondarily sedimented/deposited
- Does not always translate to accumulation.
- Is not always represented in the sedimentary record.
- Often short time-scales.

Accumulation:

- Settling of particles (sediment) to seafloor.
- Does not get re-mobilized.
- Stays at location of deposition and is subsequently buried.
- Composes the sedimentary record.
- Generally longer time-scales.



Detecting Events in the Sedimentary Record

Events - Deviations from natural / “normal”

Rates – Sedimentation, Accumulation

Sedimentology

Texture – clastic = energy of transport/deposition,
possibly source i.e. productivity forams...diatoms...

Composition - sediment source(s)

Terrigenous (Mississippi River) vs Carbonate (West-FL)

Organic and Inorganic Indicators

Biological Indicators

Appropriate time-scale to determine non-event patterns to
directly compare to identify changes associated with an event.

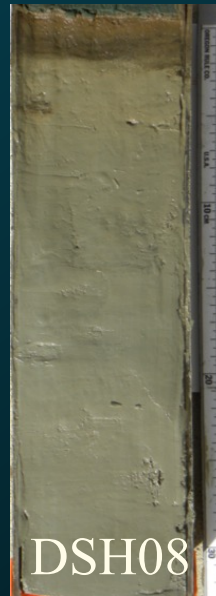
Evolution of sedimentation following DwH:

2010-2016 time-series – 4 sites

Multicoring

2mm to 5mm resolution
= high temporal resolution

- Signature; Texture and Composition
- Rates and timing; Short-lived Radioisotopes



Sedimentation Rates



Monthly resolution (~4 months)

Accumulation Rates



Annual resolution (~100 years)

$^{234}\text{Th}_{\text{xs}}$ – Monthly Scale Sedimentation

MARs (g/cm²/yr)

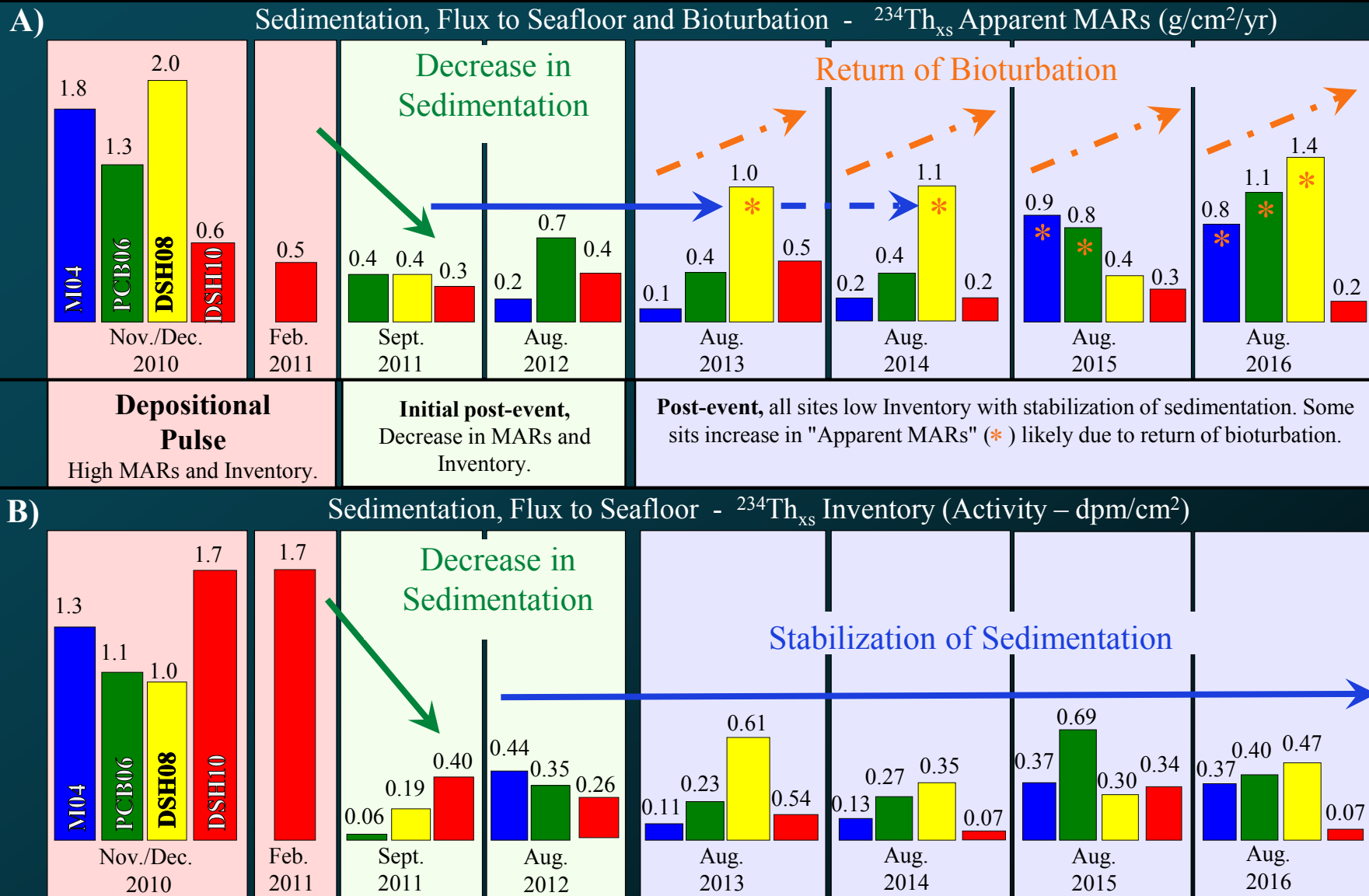
- Mass Accumulation Rate – $\text{MAR} = \text{LAR} \times \text{Bulk Density}$
 - Corrects for differential compaction in cores
 - Indicator of sedimentation, ~ 4 month period
 - May be influenced by mixing/bioturbation
-

Inventory (activity – dpm/cm²)

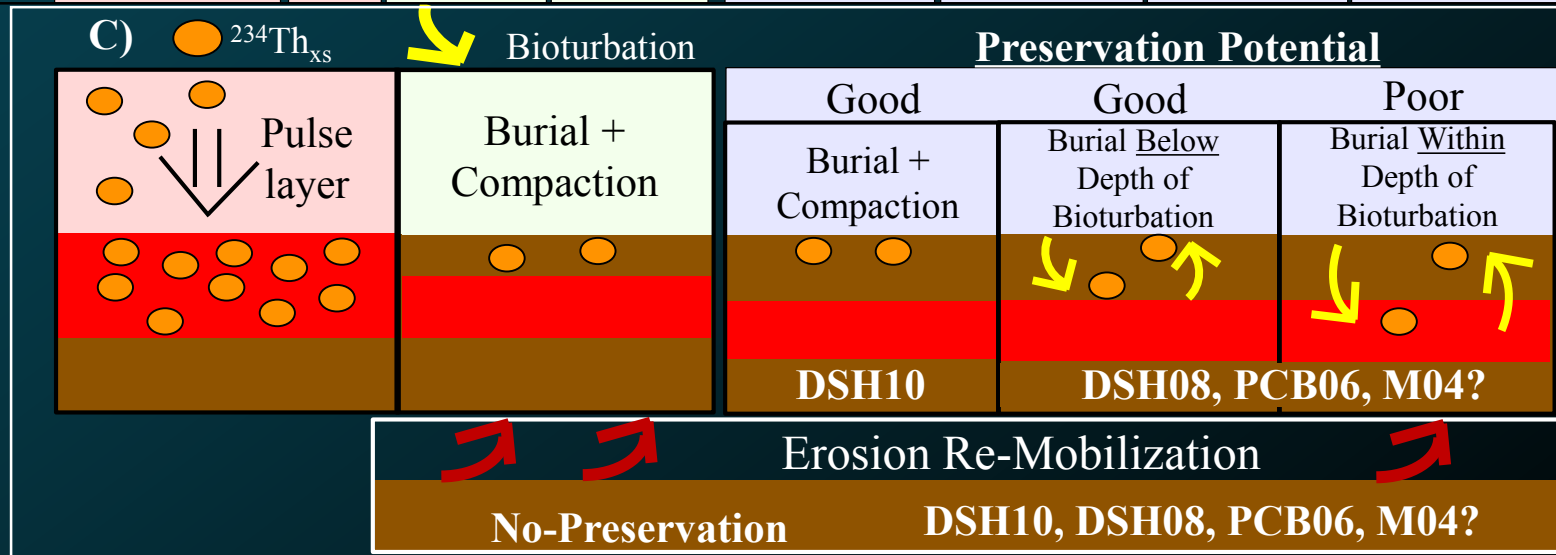
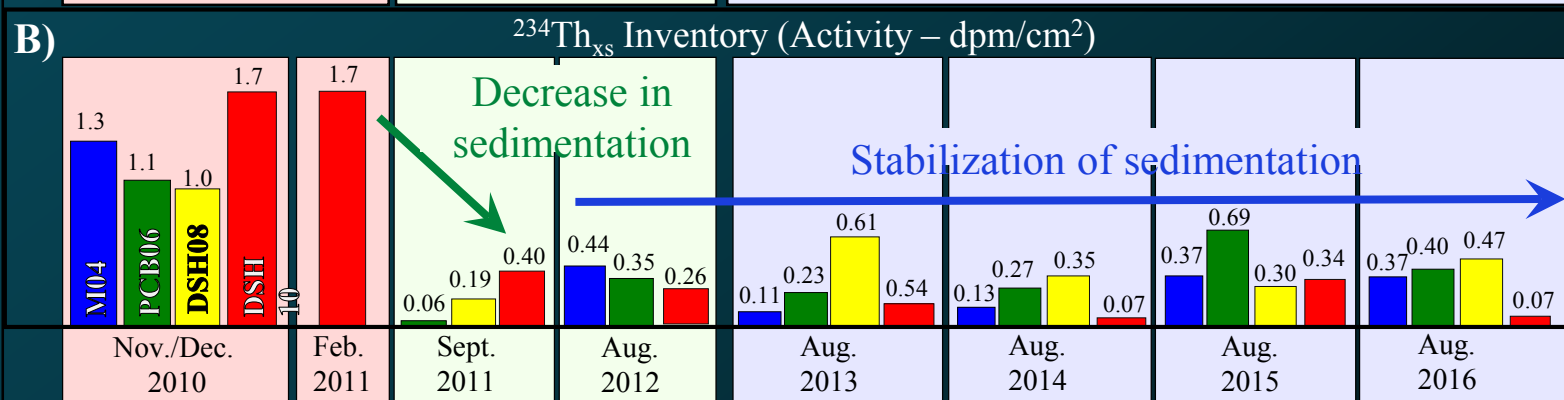
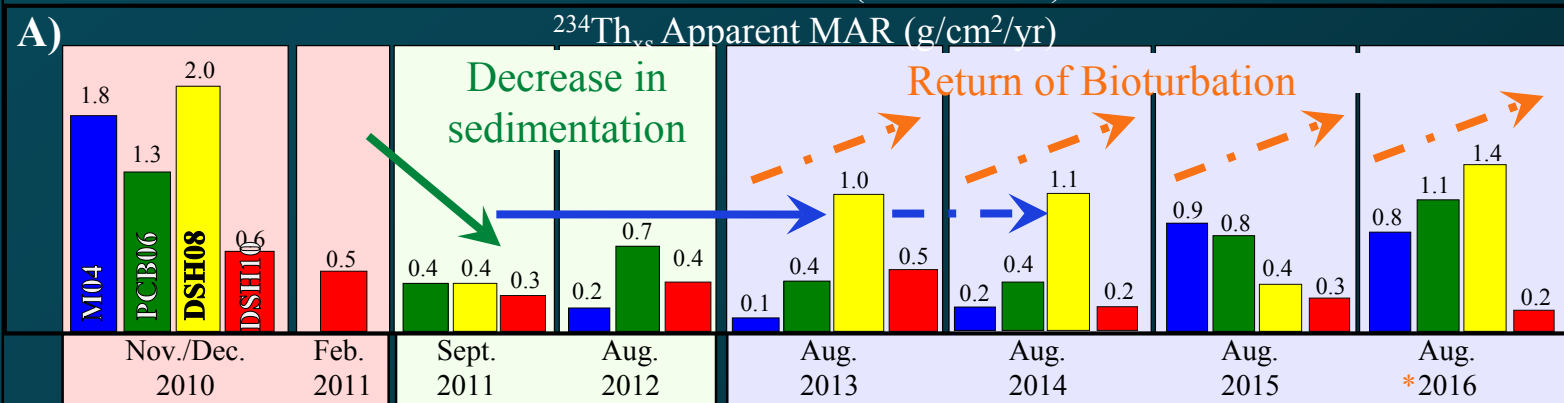
- Sum of the Activities in core
- Indicator of flux to sea floor associated with sedimentation
- Independent of mixing/bioturbation

Evolution of Sedimentation Following DwH - 2010-2016 Time-Series

Time Series Sites (2010-2016)



Time Series Sites (2010-2016)

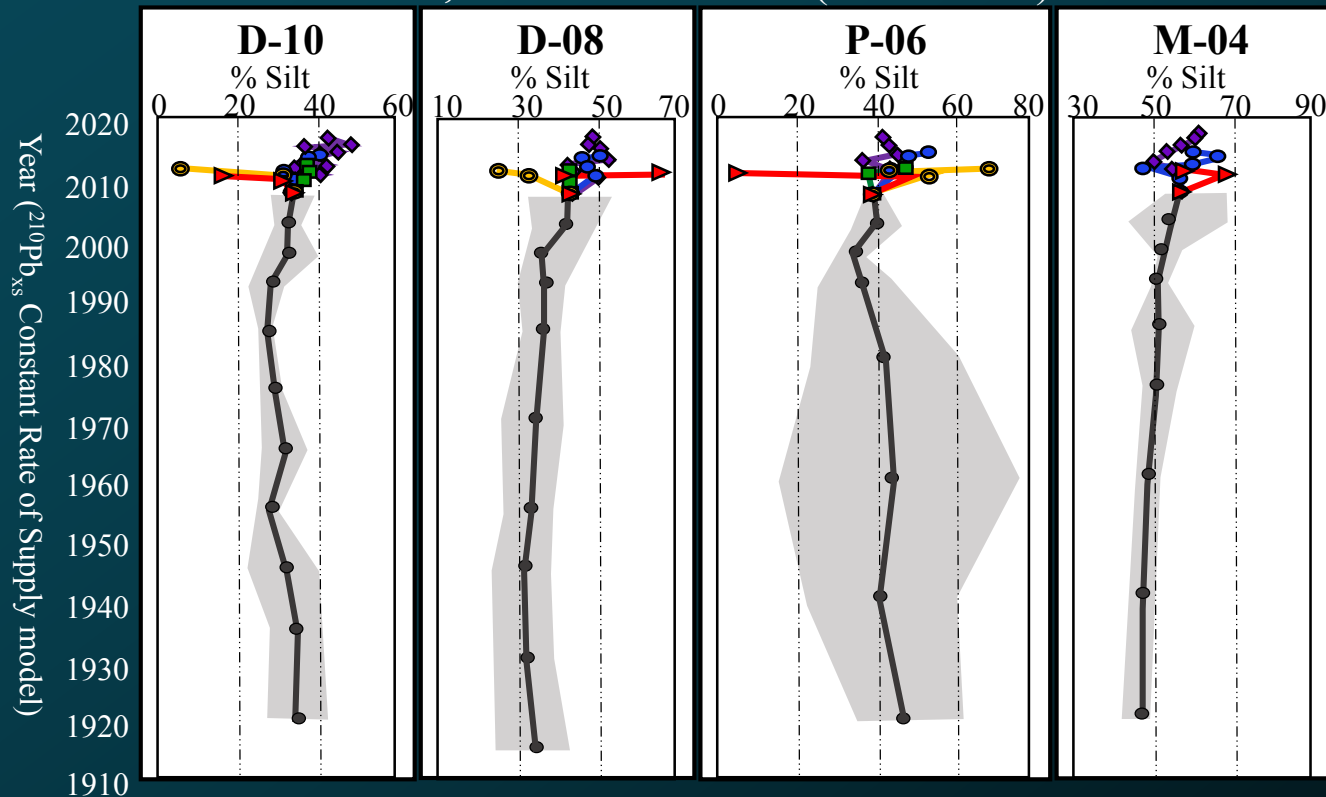
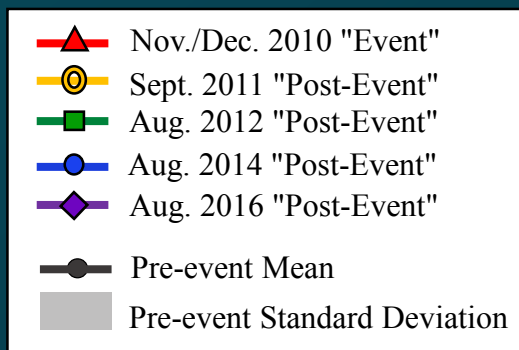


Preservation potential from the sedimentary perspective; burial, bioturbation, re-mobilization

Sedimentary signature of DwH

- Detected in 2010-2011.
- Becomes undetectable 2012-2016.

%Silt, Time Series Sites (2010-2016)



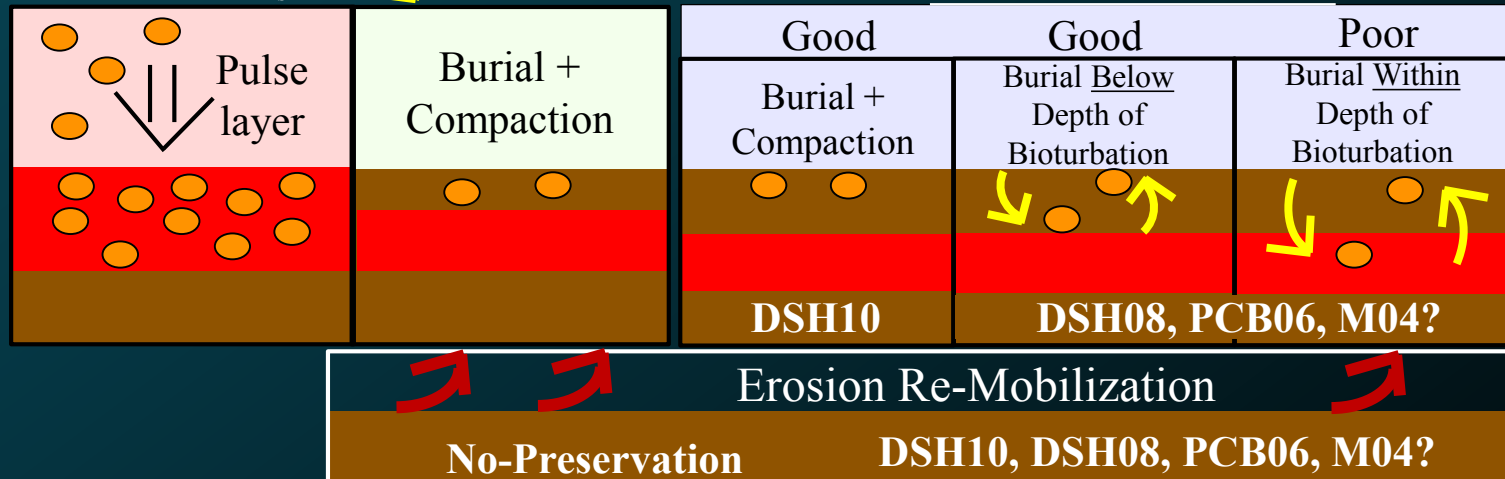
2010

2011-2012

2013-2016

C) $^{234}\text{Th}_{\text{xs}}$

Bioturbation



Re-Mobilization

Potential re-introduction of MOSSFA to ecosystem

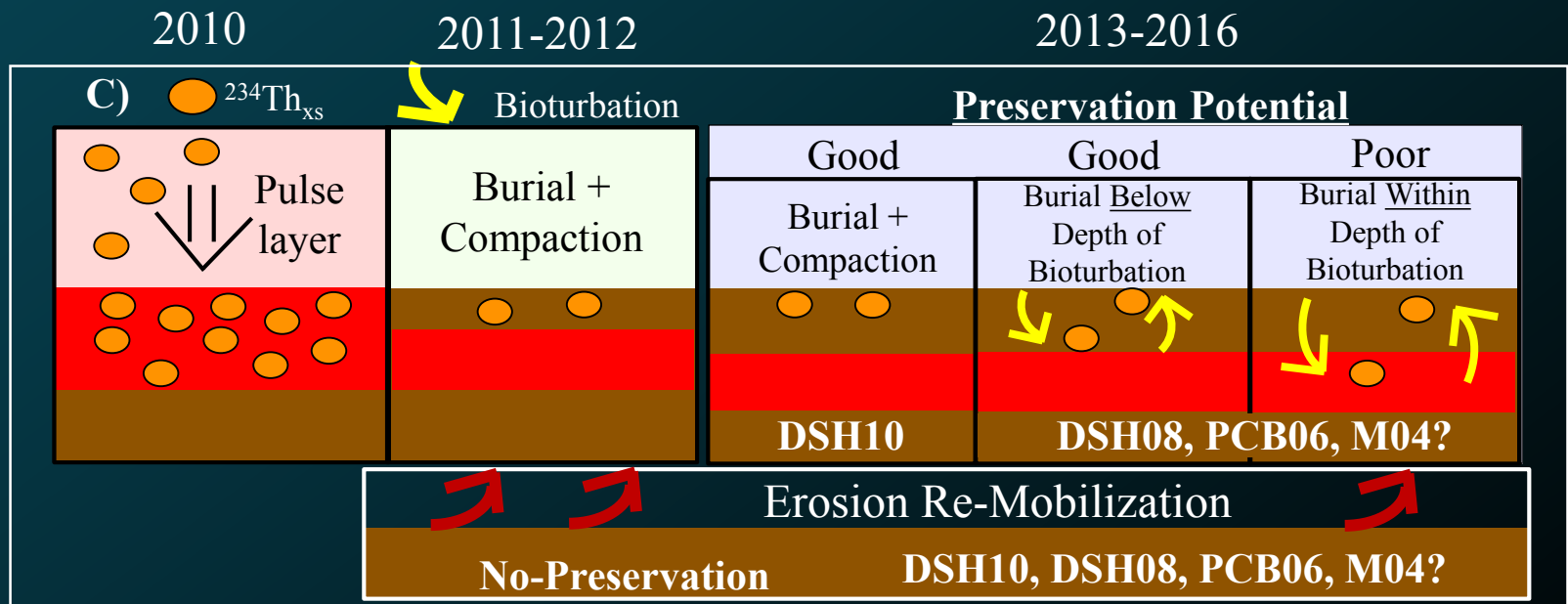
– Renewed exposure and biological impacts?

Increased PAHs in Fish between 2012/2013 and 2014 (Pulster et al., In Press)

Resuspension of oil-residues not new oil, Tropical Cyclones 2012/2013?

Where MOSSFA Accumulates?

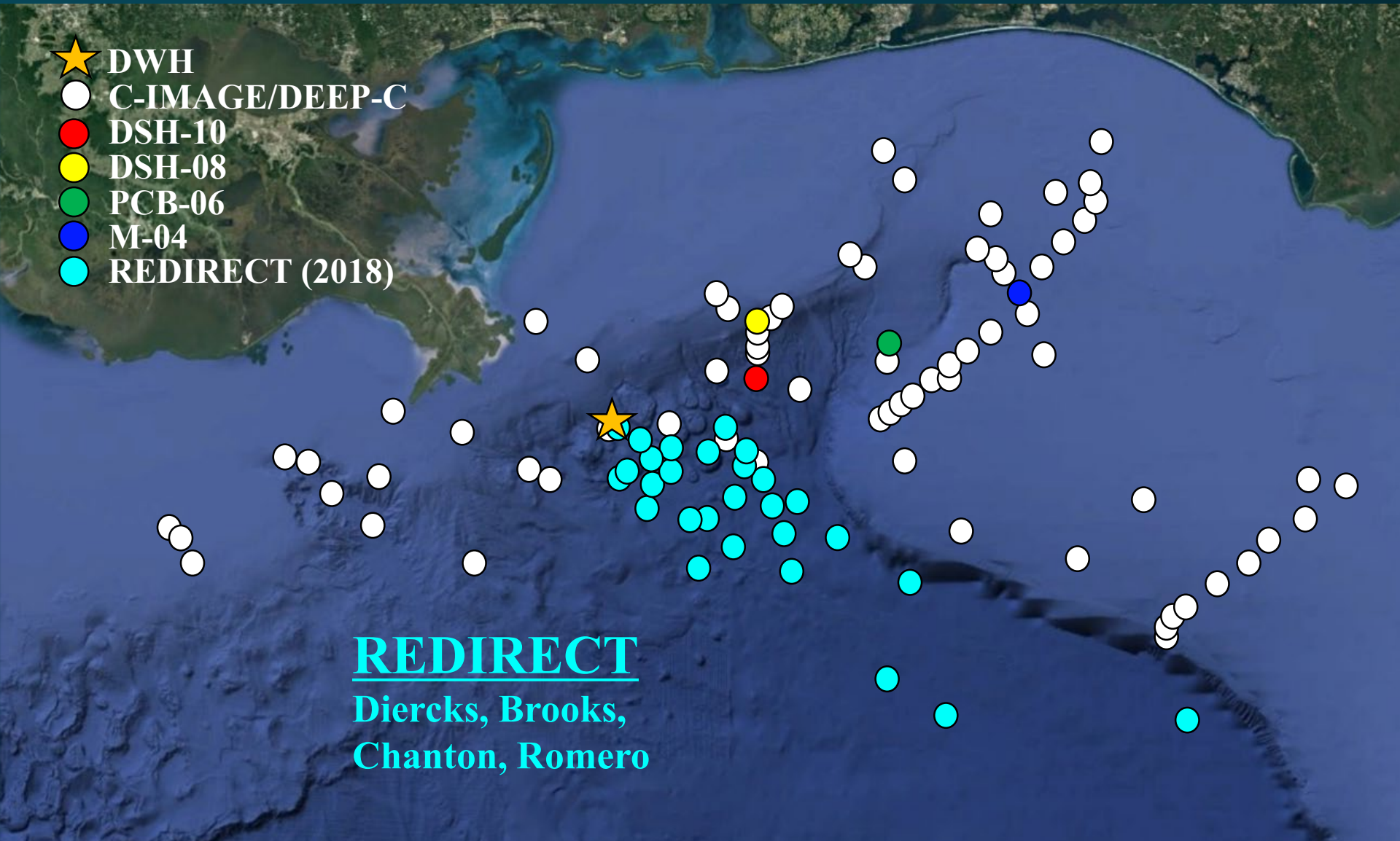
- Ultimate fate and sequestration (i.e. buried and out of the benthic ecosystem).
- Detection of MOSSFA in Sedimentary Record
 - Areas of initial deposition?
 - Areas of secondary deposition?



Re-Mobilization

– downslope transport

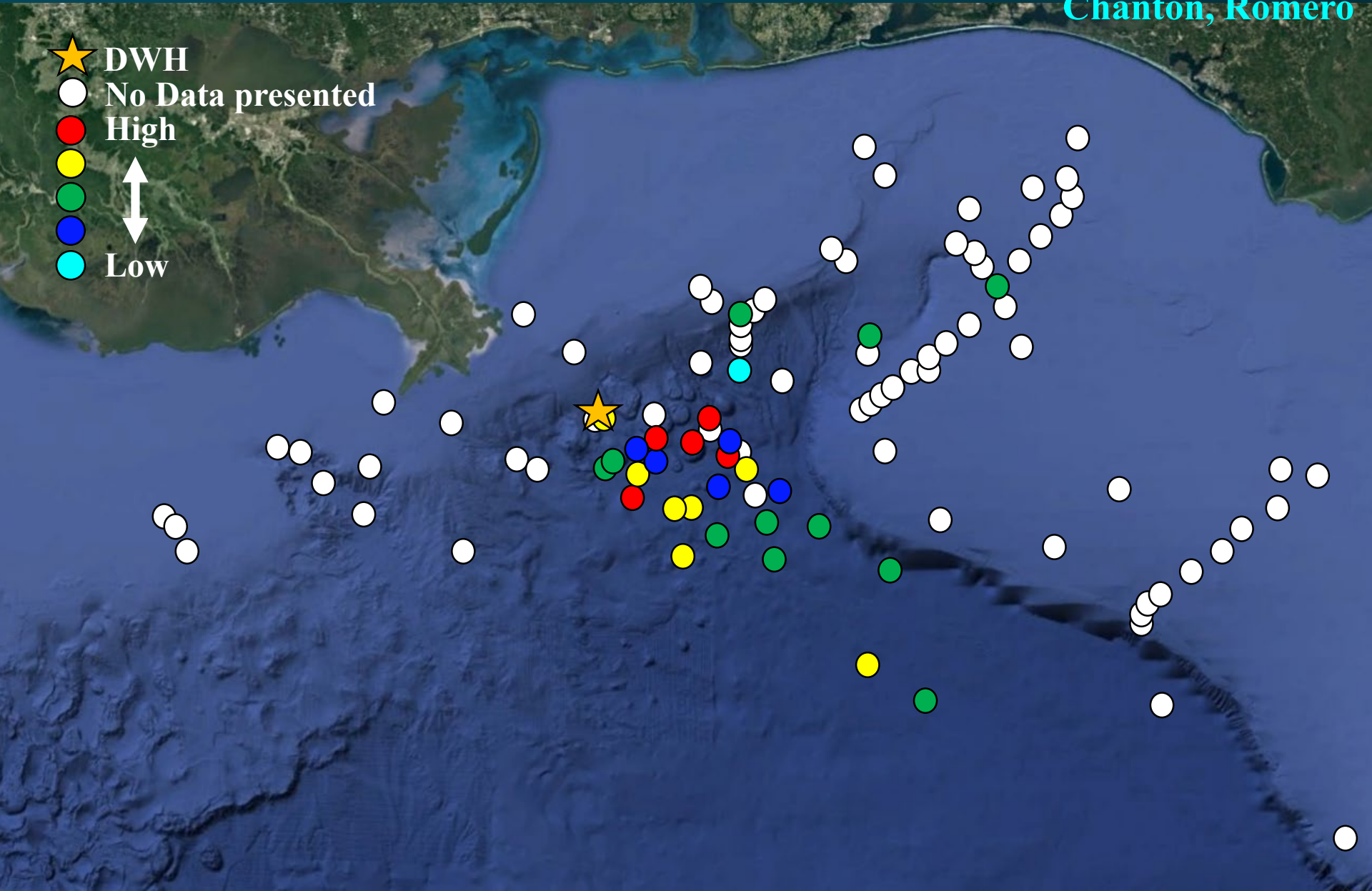
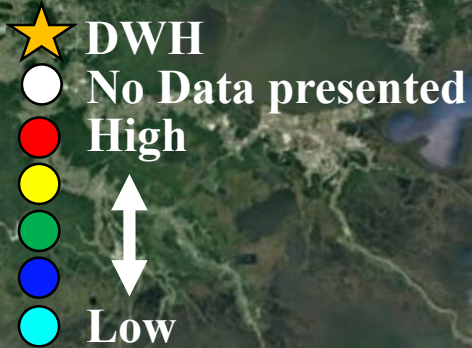
- ★ DWH
- C-IMAGE/DEEP-C
- DSH-10
- DSH-08
- PCB-06
- M-04
- REDIRECT (2018)



REDIRECT
Diercks, Brooks,
Chanton, Romero

Preliminary $^{234}\text{Th}_{\text{xs}}$ Inventory – Sedimentation (2016, 2018)

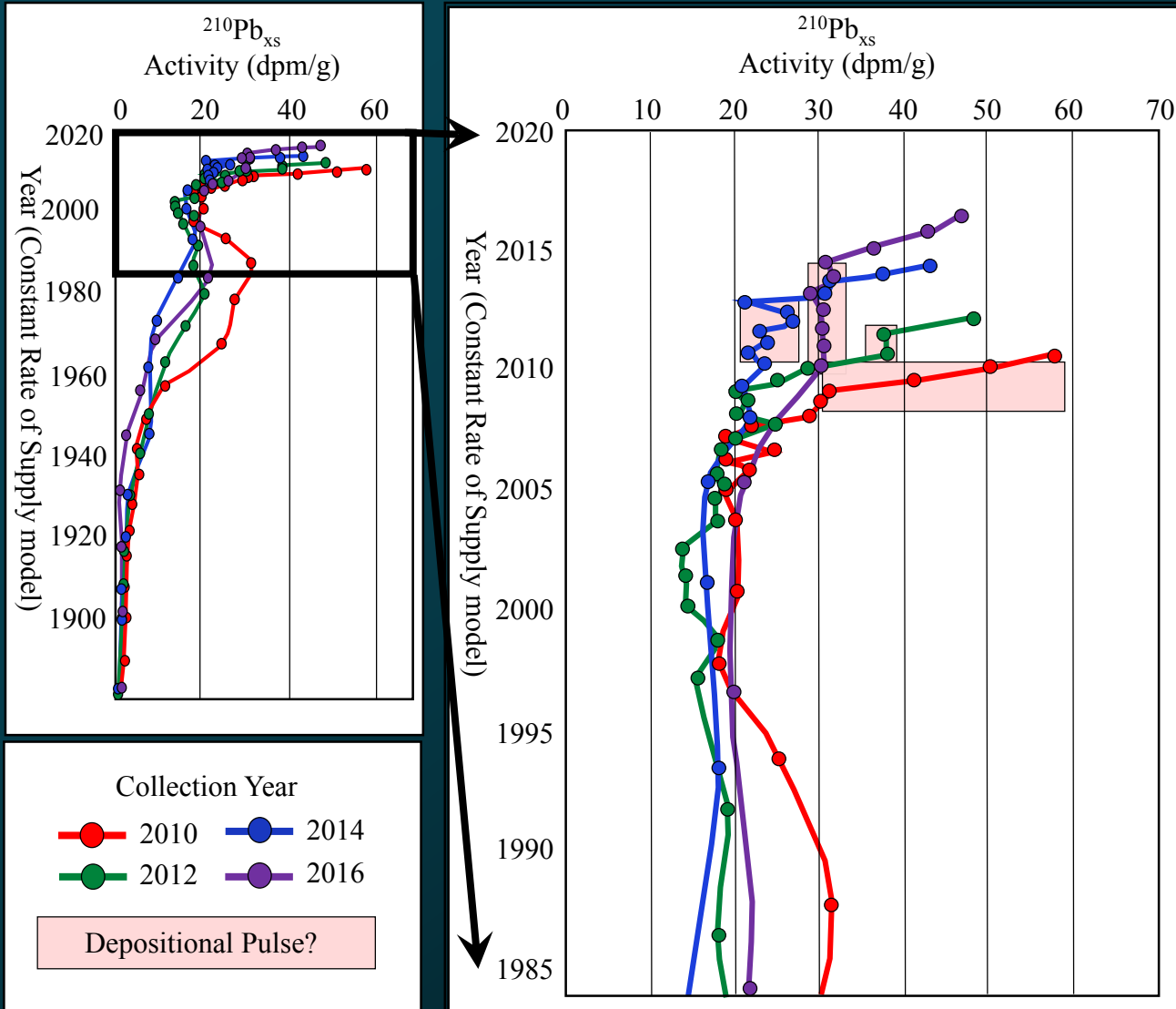
REDIRECT
Diercks, Brooks,
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Initial indications of MOSSFA from $^{210}\text{Pb}_{\text{xs}}$ profiles - Accumulation

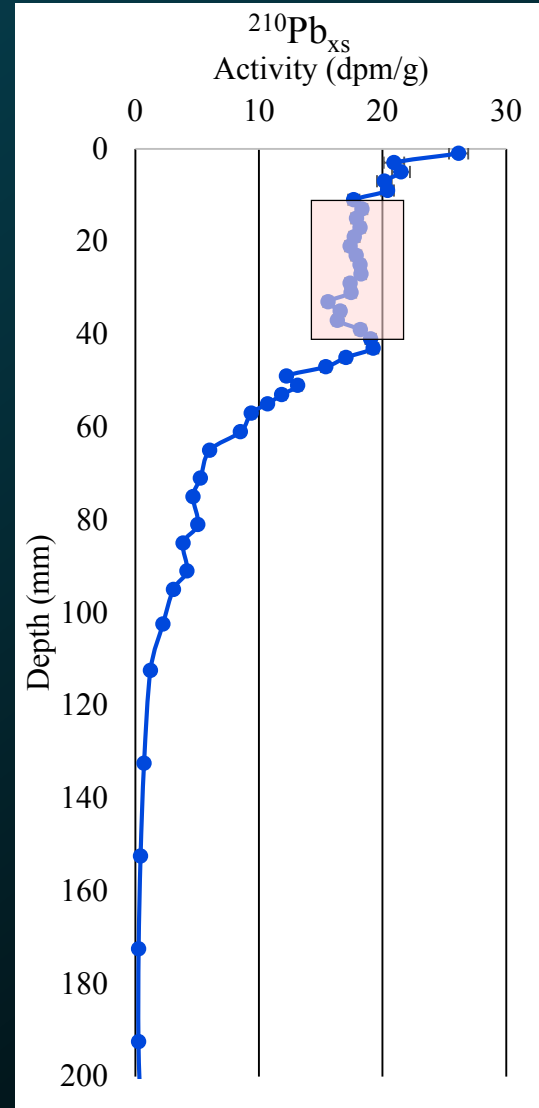
DWH

Site D-10 $^{210}\text{Pb}_{\text{xs}}$ Activity, Time Series (2010-2016)



IXTOX-1

IXW-250



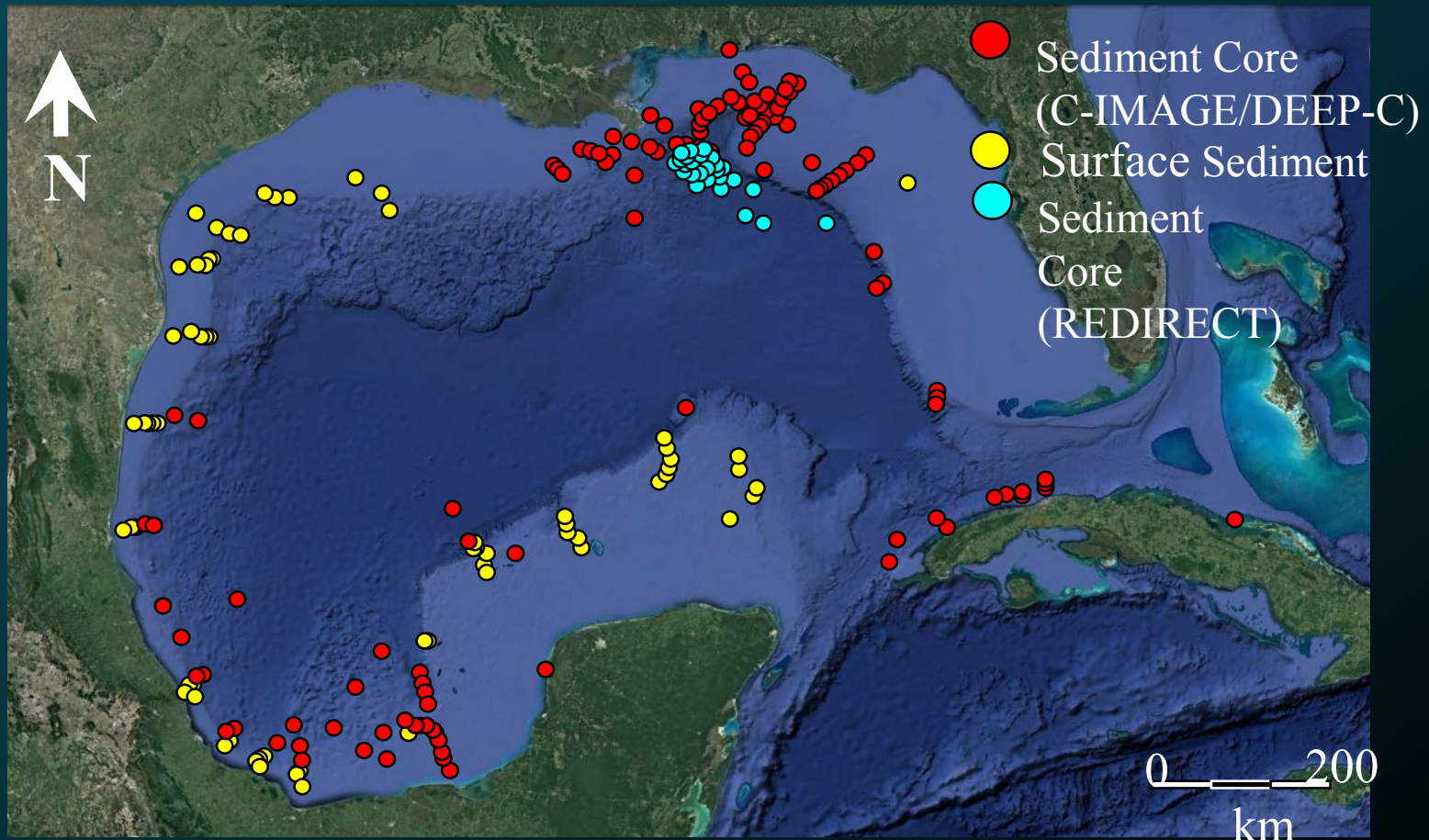
Gaps and Next Questions?

Baselines: For Sedimentation $^{234}\text{Th}_{\text{xs}}$; define initial impact and spatial extent of MOSSFA

Baselines: For Accumulation $^{210}\text{Pb}_{\text{xs}}$; define long term fate and spatial extent of MOSSFA

Baselines: For Sedimentology; sedimentary signature of MOSSFA

Appropriate time-scale to determine non-event patterns for direct comparison to identify changes associated with an event.



Gaps and Next Questions?

Initial Depositional Pulse - MOSSFA

Long term (years to decades) impacts?

Re-mobilization

- Re-introduction to ecosystem
- Modification of distribution of MOSSFA

Ultimate fate and sequestration?

Removal of MOSSFA from ecosystem into sedimentary system.

When?

- Months
- Years

Where?

- Initial areas of depositional pulse
- Areas of secondary + deposition
 - Larger area
 - Focusing in depocenter(s)

QUESTIONS?

