

# Analysis of seawater physicochemical variables after BP oil spill accident in 2010

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Driven to Discover<sup>SM</sup>

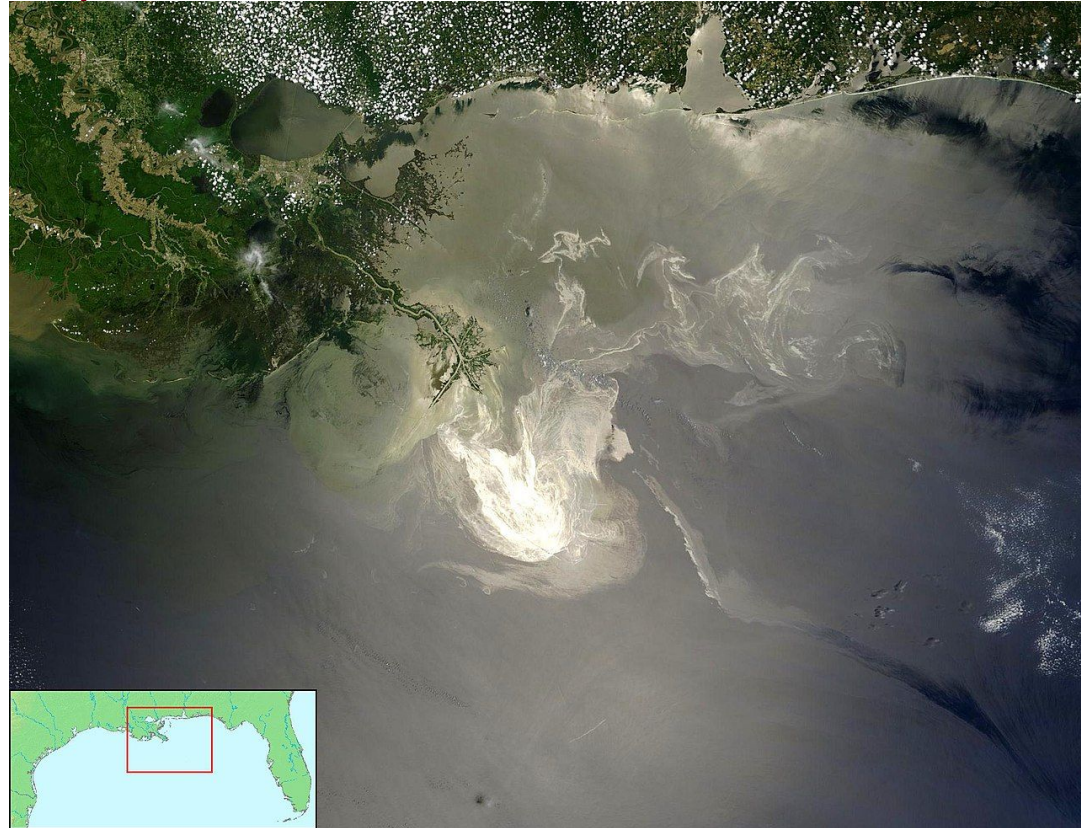
# Agenda

- Background: accident overview and data collection
- Data cleaning and processing
- Interpolators selected
- Preliminary results
- Discussion
- Conclusion



# Deepwater Horizon oil spill

- April 20, 2010 in Gulf of Mexico
- Discharge of 210 M US gal (780k m<sup>3</sup>)
- Well sealed on Sep 19, 2010,  
with reports of leaks in 2012
- 11 people died



NASA's Terra Satellites Sees Spill on May 24 Sunlight illuminated the [lingering oil slick](#) off the Mississippi Delta on May 24, 2010

# Problem statement

Hypothesis: seawater physicochemical variables, such as dissolved oxygen and conductivity, changed dramatically after the accident.



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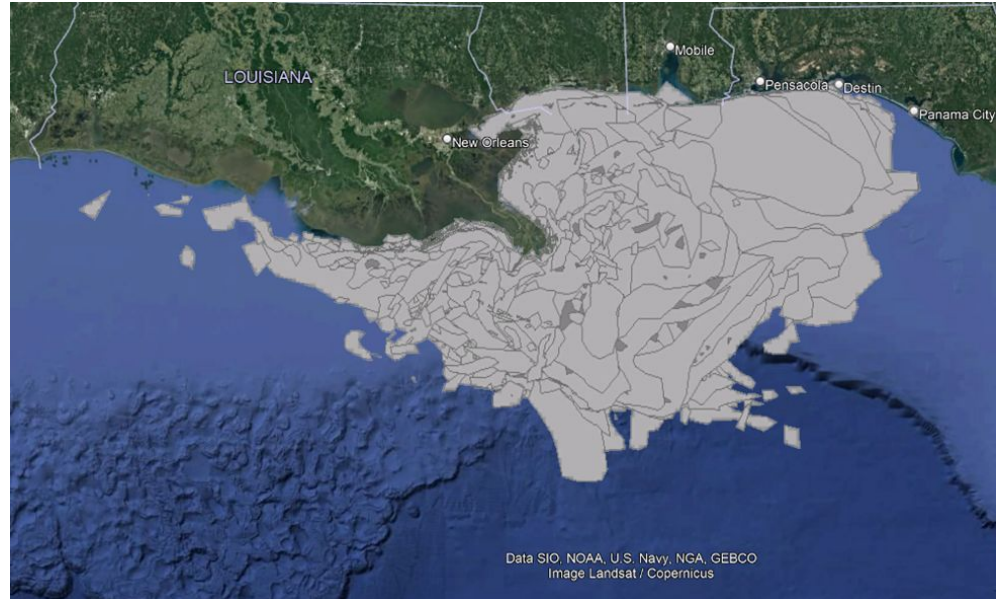
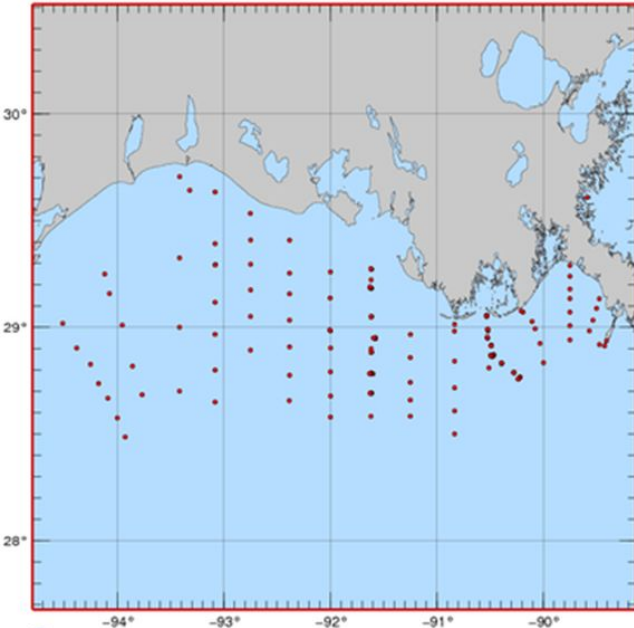
Why?

- O<sub>2</sub> supports marine life → electron acceptor
- Cond.: reduced as oil does not break down into ions

# Data

- NOAA stations (intended for hypoxia analysis): 5/17 - 10/28 (NOAA, 2021)
- NOAA daily plume projection: 5/2 - 8/5 (ESRI, n.d.)

Accession 0117436 Stations



# Methods

- MS Access (failed)

- txt files cleaning

ID	Station ID	Station	Date	depth	Inorganic SPM	Organic SPM	Total SPM
1	42	C5	05/17/10	0.00	2.20	4.40	6.60
2	40	C6C	05/17/10	0.00	5.00	3.80	8.80
3	40	C6C	05/17/10	3.20	4.00	2.00	6.00

- Minimum depth chosen < 1 m (3 ft)

- Joining station coordinates w/ variables

- Problem: i) temporal variability, ii) spatiotemporal intersection only on one day



# Interpolators

Purpose: compare head to head

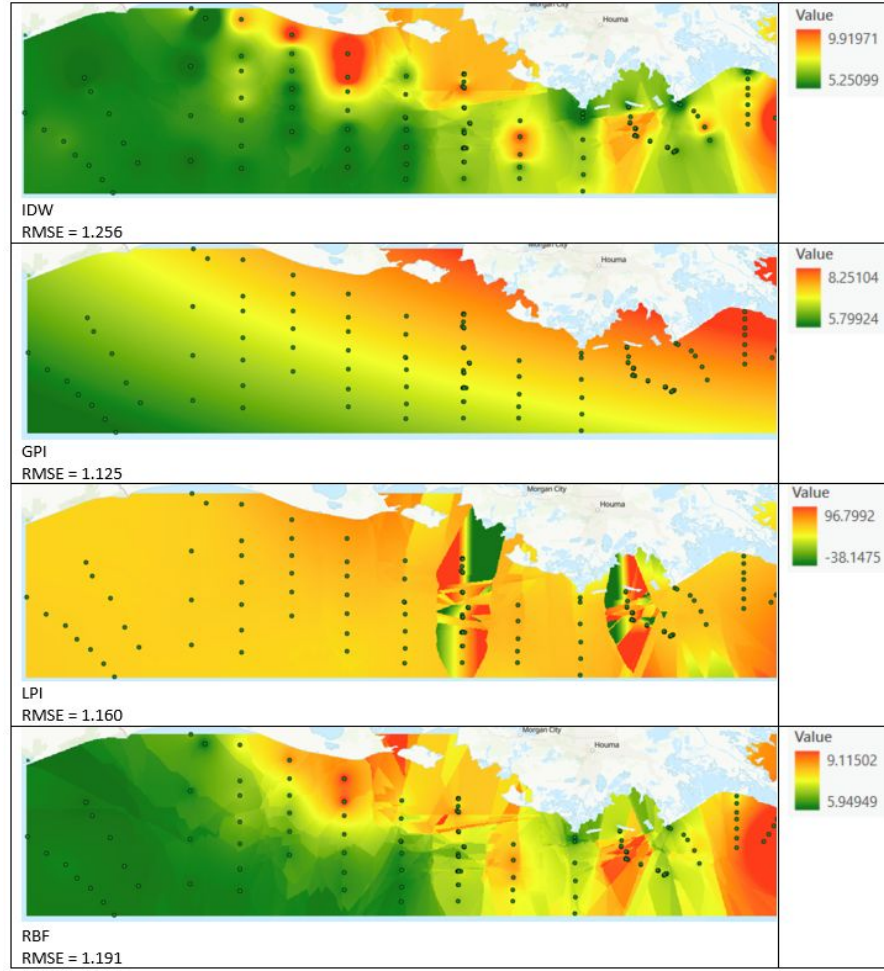
Exact:

- IDW:  $\alpha = 2$ , # neighbors = 10-15
- RBF: search neighborhood = standard, RBF = completely regularized spline

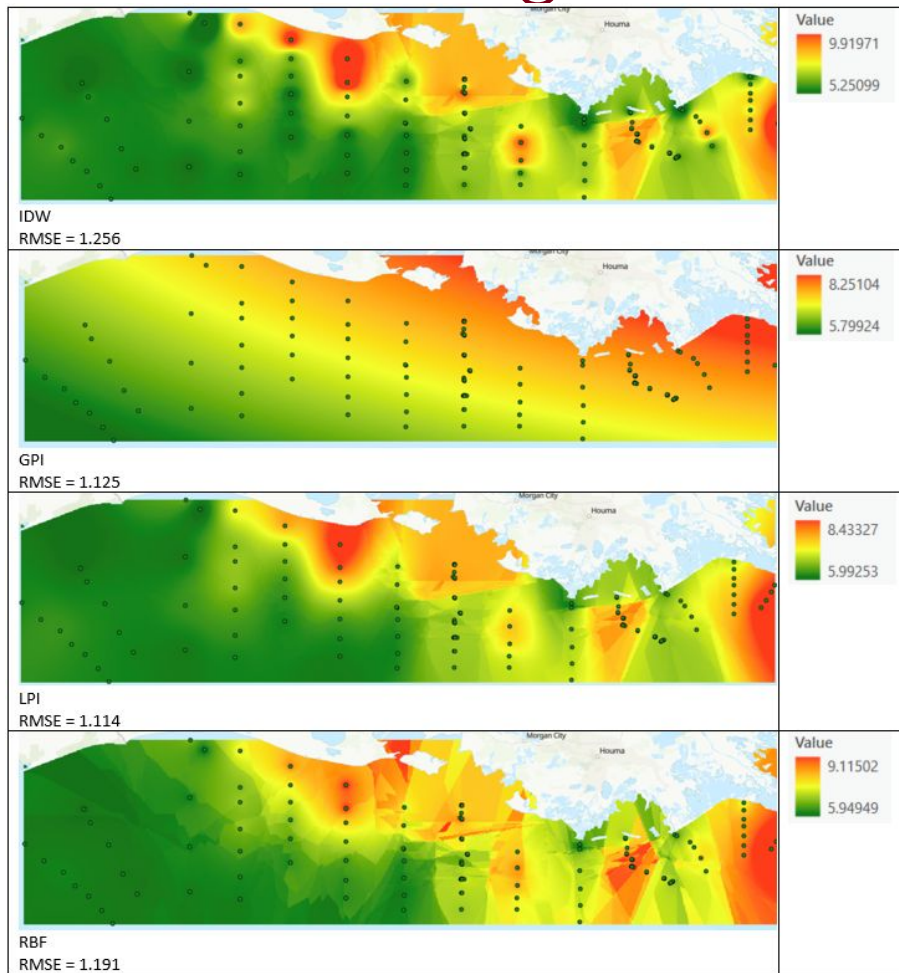
Inexact:

- GPI: order = 2
- LPI: order = 1 and 0

# Results (O<sub>2</sub> [mg/L])

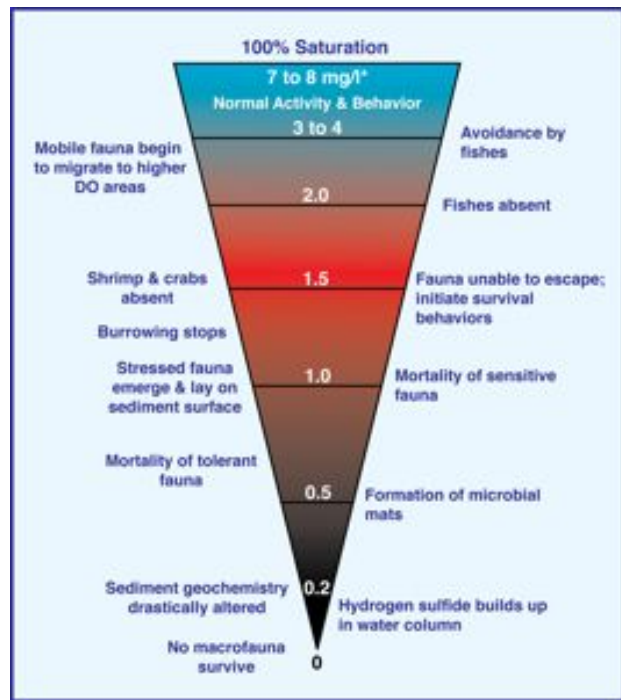
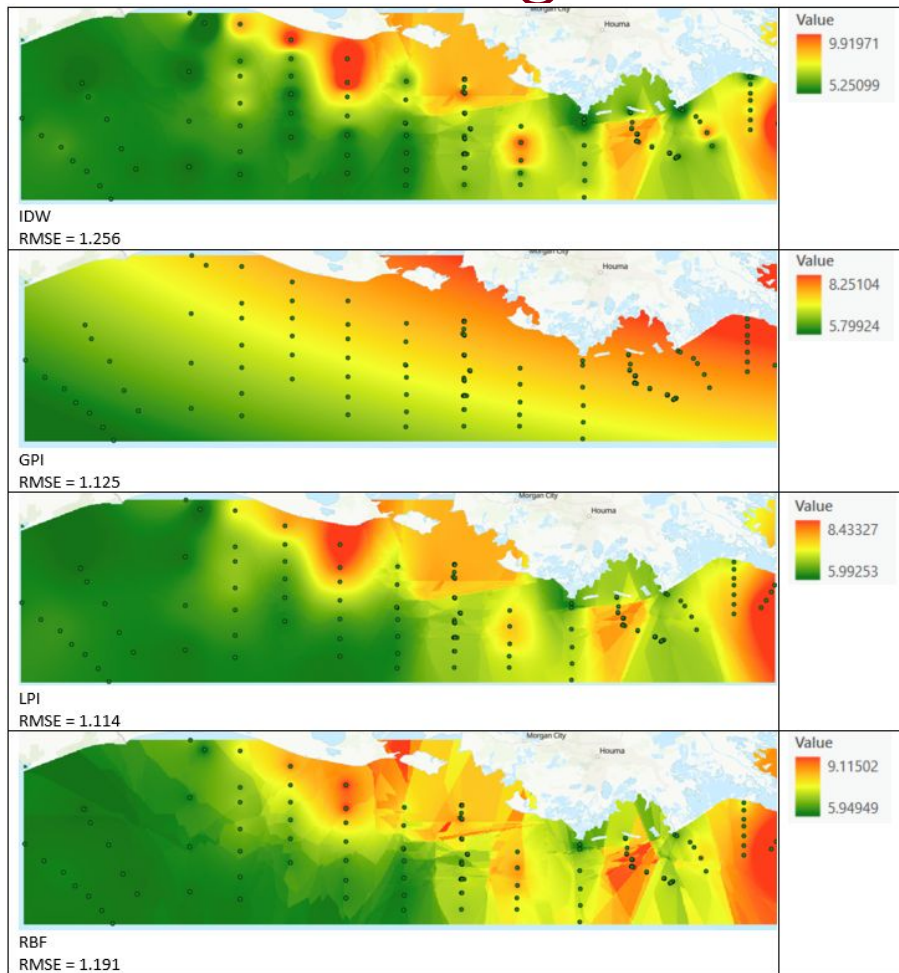


# Results (O<sub>2</sub> [mg/L])



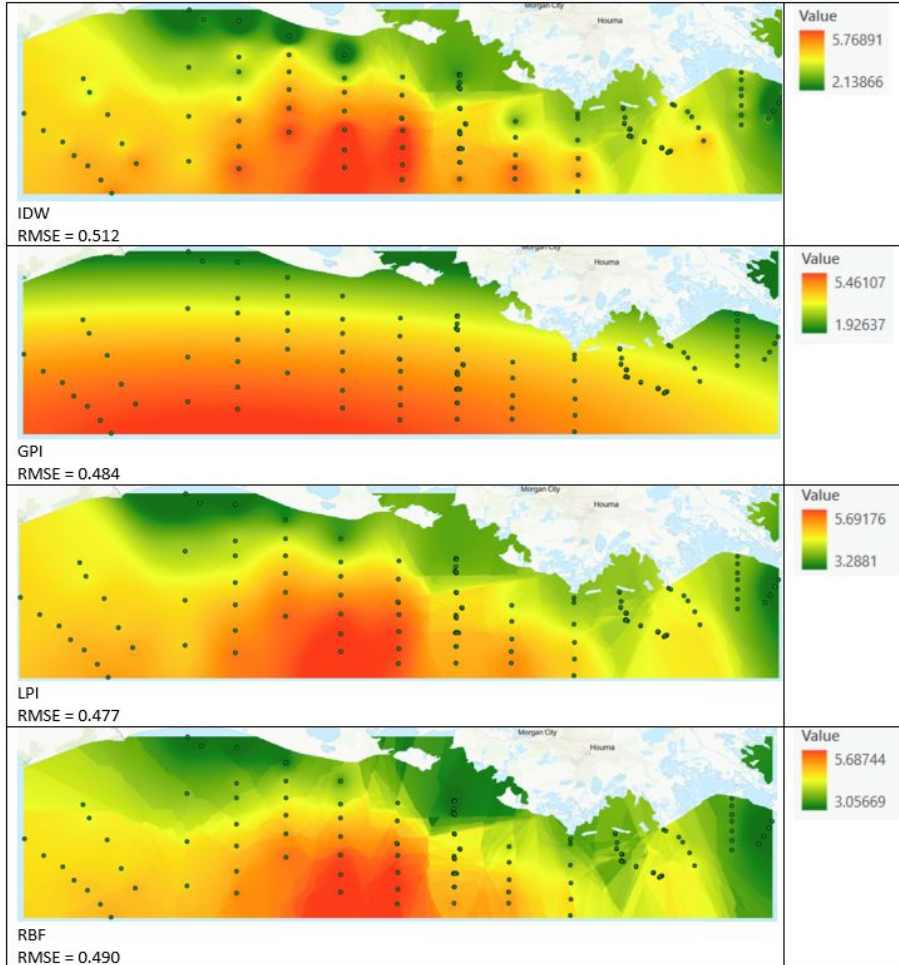


# Results (O<sub>2</sub> [mg/L])

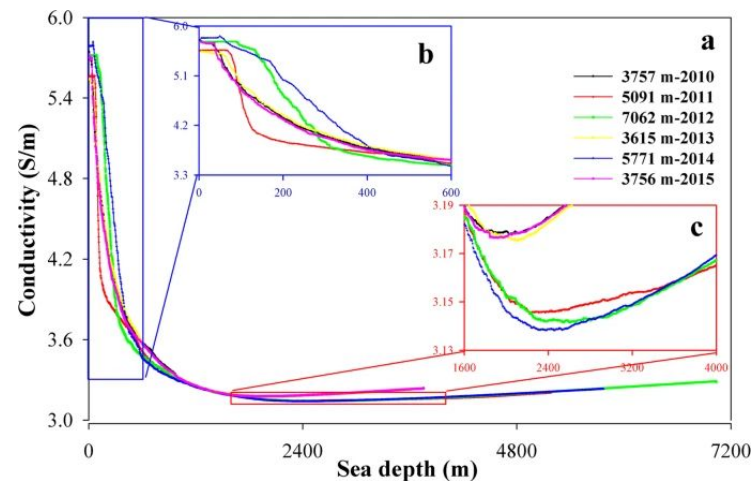
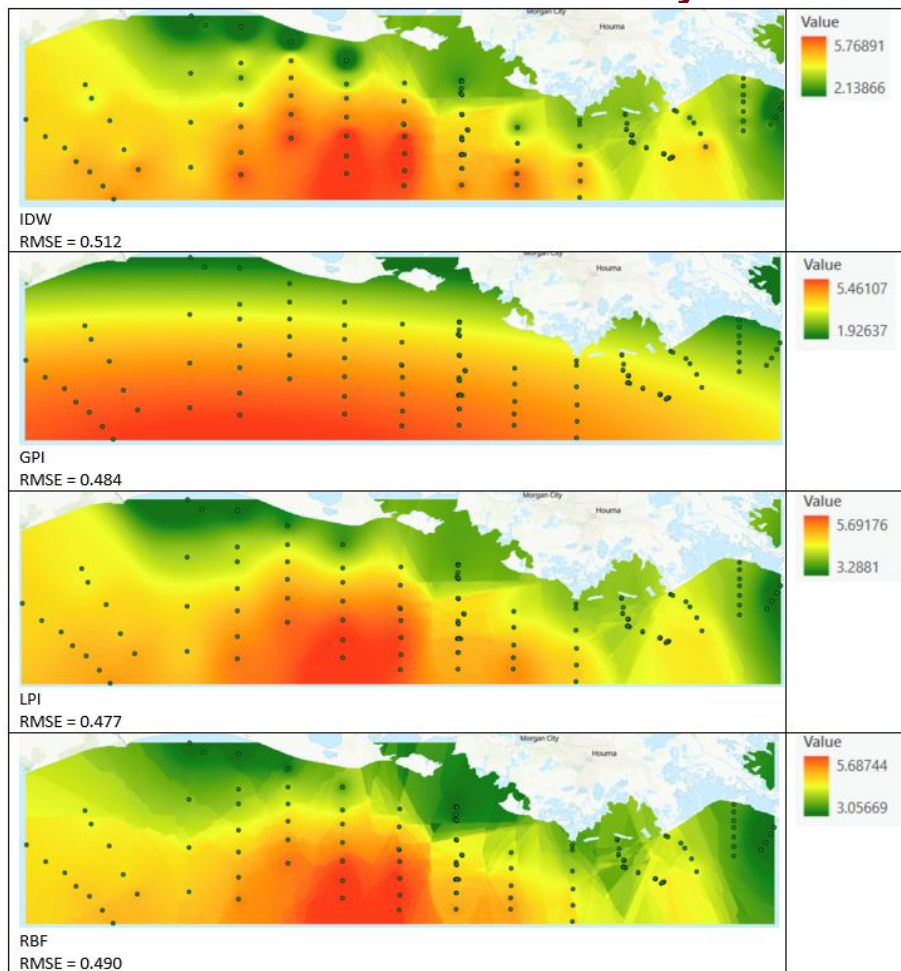


(VIMS, n.d.)

# Results (Conductivity [S/m])



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(Zheng et al., 2018)



# Discussion

- O<sub>2</sub> levels not affected
  - Large molecules → no decomposition
- Low conductivity close to well, but also the coast:
  - Freshwater input w/ low salt content
- Dataset chosen doesn't explain the impact of oil spill on seawater: temporal variability
- Analyze [**B**enzene, **T**oluene, **E**thylbenzene, **X**ylene]

# Wrap-up

- Deepwater Horizon is the worst oil spill disaster in history
- LPI, order = 0 performed the best. Lowest RSME
- Measures at different times affected the analysis
- More variables to analyze

# References

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Thank you!

Questions?