TOWARD UNDERSTANDING OF DROUGHT EVENTS IN THE LOWER MISSISSIPPI RIVER USING STATISTICAL ANALYSIS AND NUMERICAL MODELING

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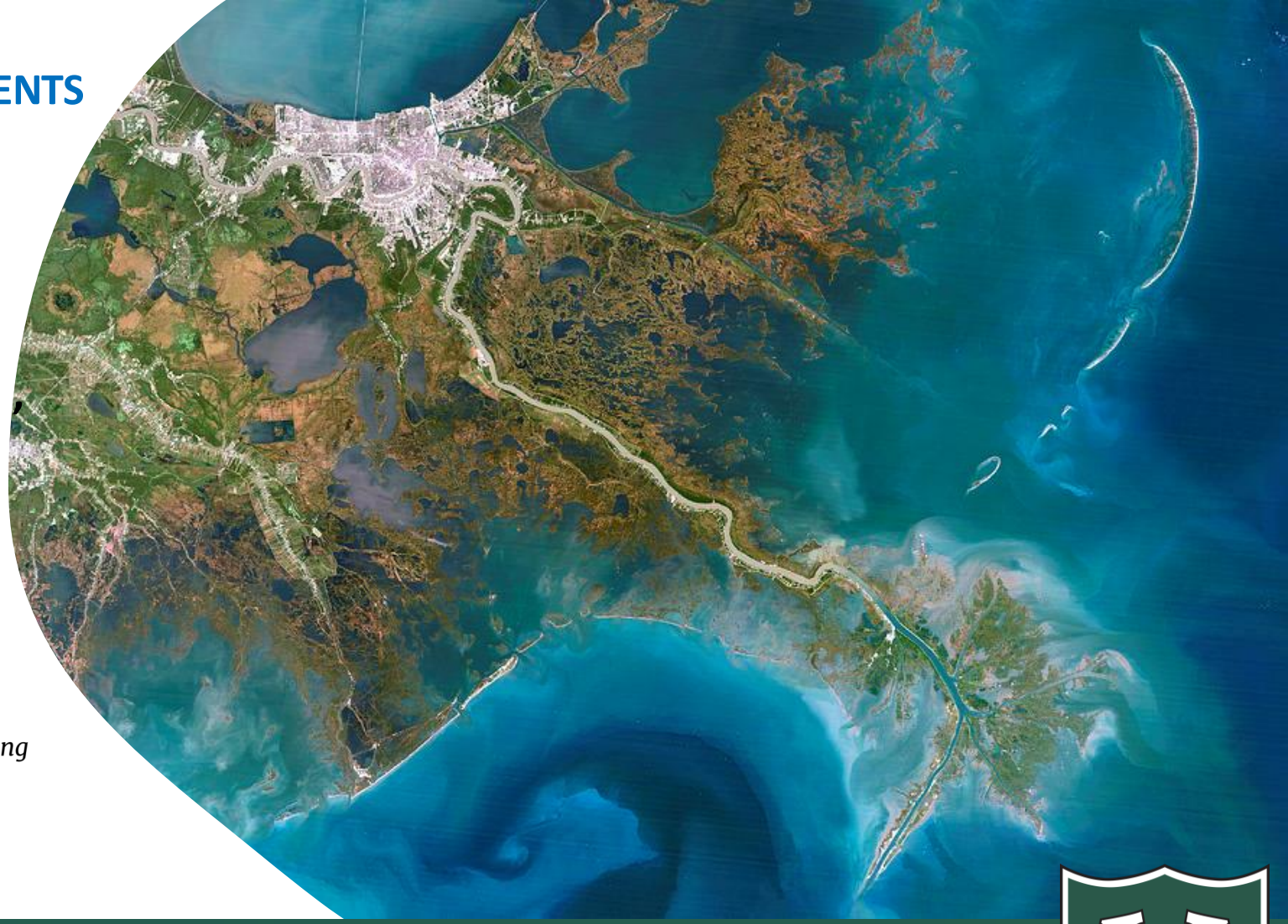

MISS DELTA
Mississippi River Delta Transition Initiative

NATIONAL ACADEMIES
Sciences
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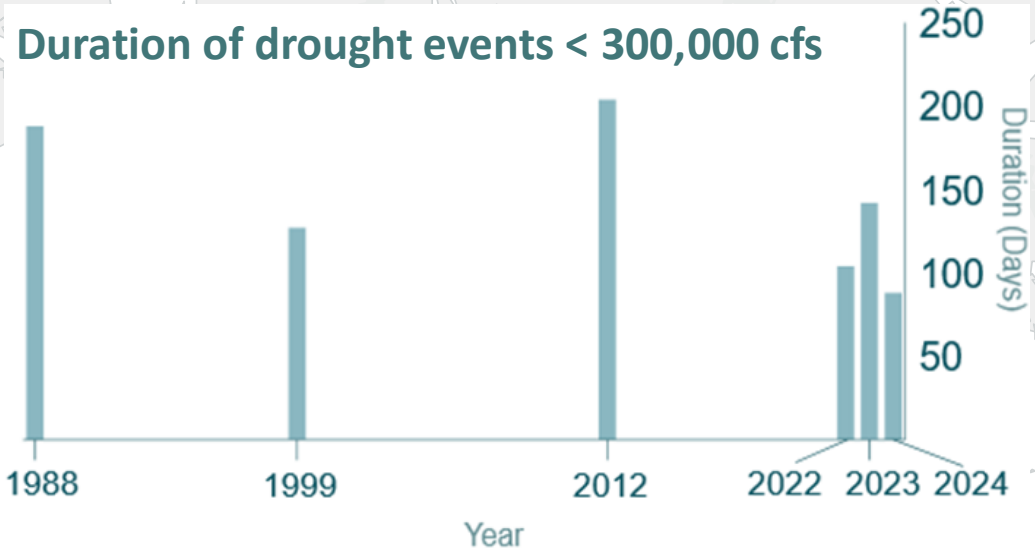
River-Coastal Science and Engineering Department
Tulane University

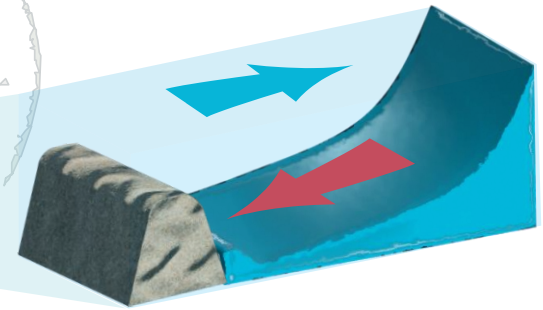
5/21/2025

Tarbert Landing

Background

Since the first sill was constructed in 1988, the USACE has typically built a sill every 10–12 years. However, recently a shift occurred with sills constructed in three consecutive years: **2022, 2023, and 2024**





Head of Passes

0 5 10 20 Miles

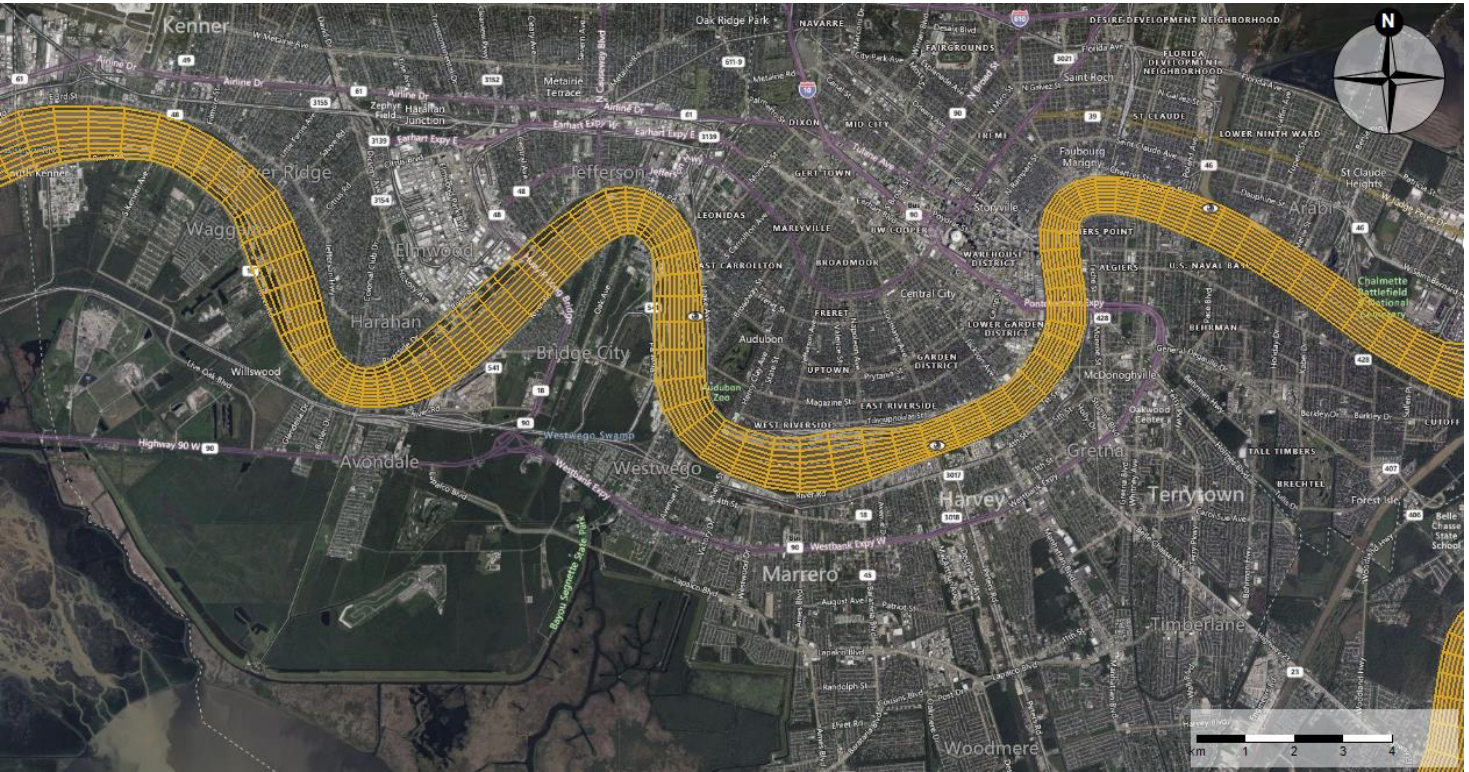
N

City of New Orleans, CONANP, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS

Model Domain

Grid Resolution

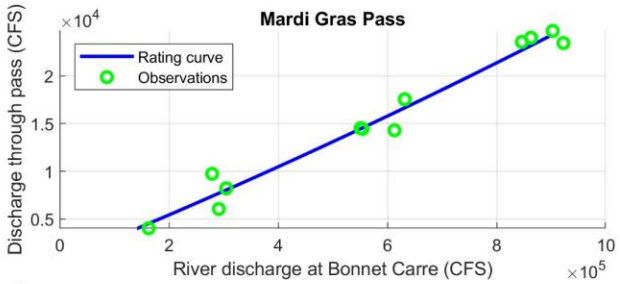
- MR channel is resolved with 11 curvilinear grid points
- 3,590 elements
- 30 Z vertical layers
- 2021 bathymetry USACE survey

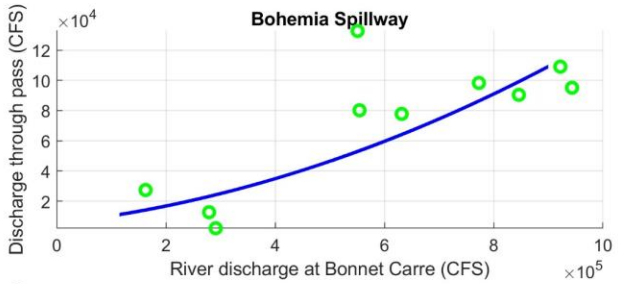


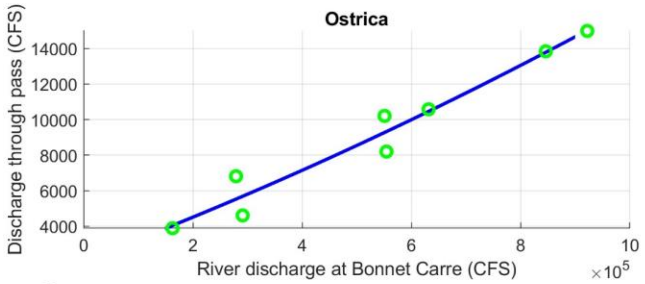
Run Time

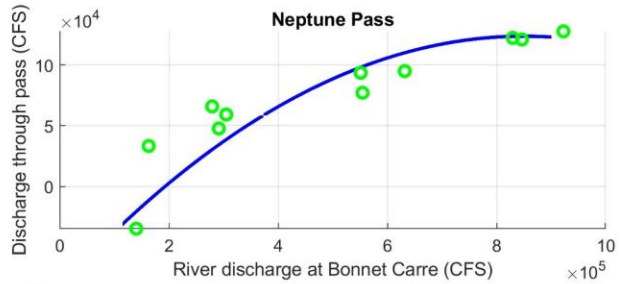
- One year in ~ 6 hours
- One day in a minute
- It uses 6 cores on a common PC

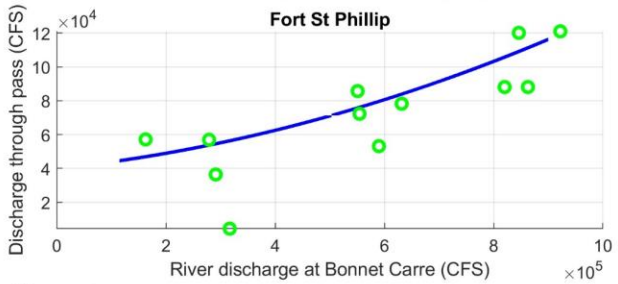
Outlets Rating Curves

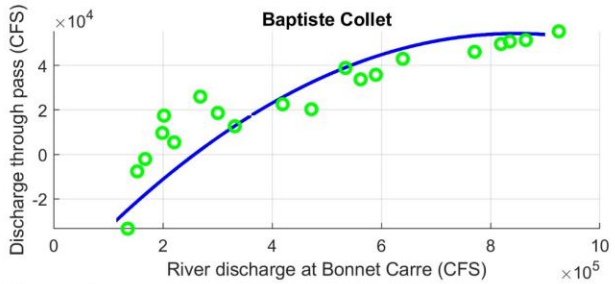


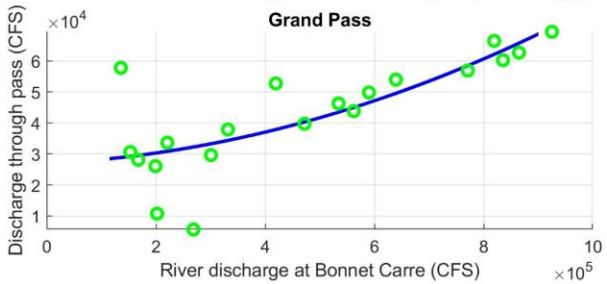


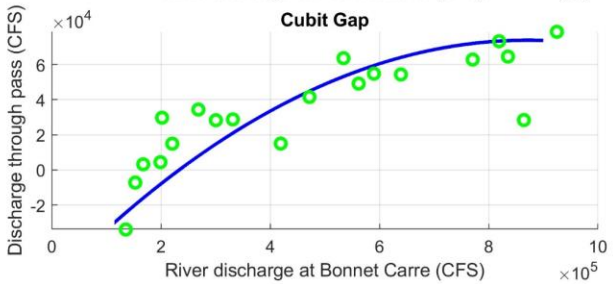


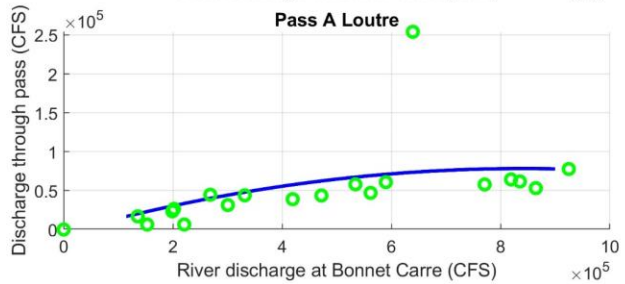


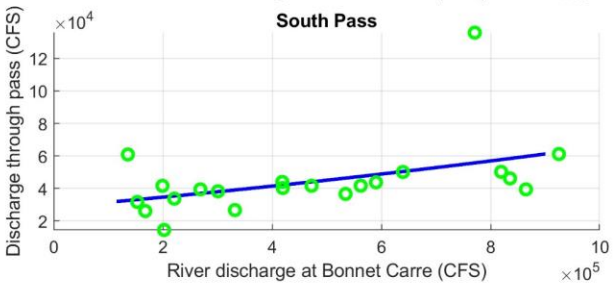


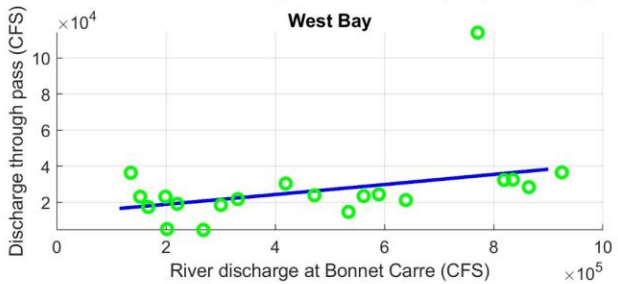


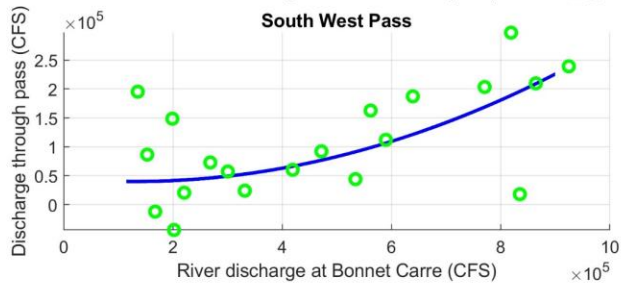






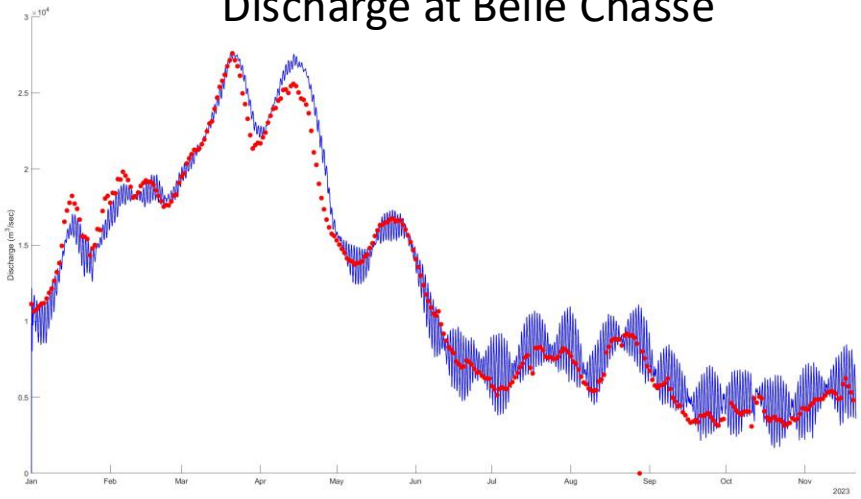


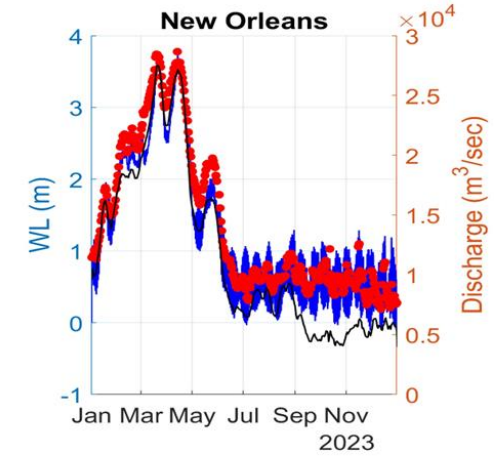


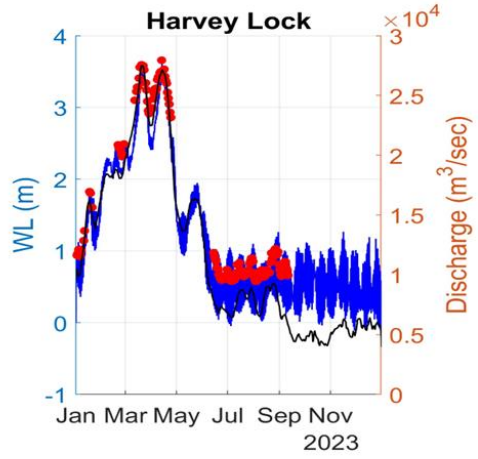


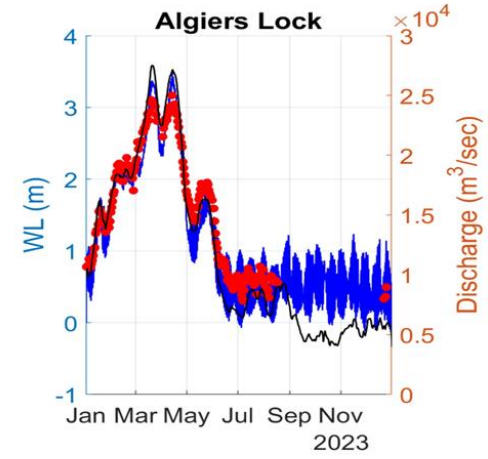
Hydrodynamic Calibration

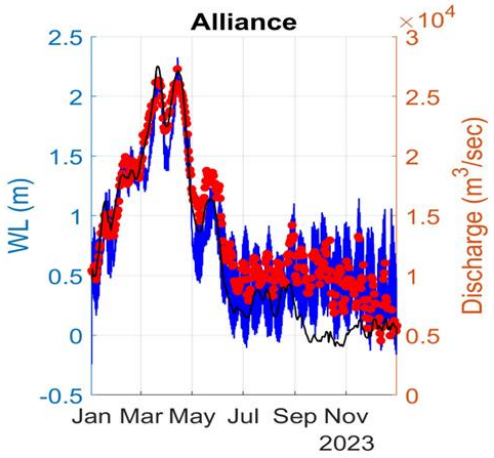
Discharge at Belle Chasse

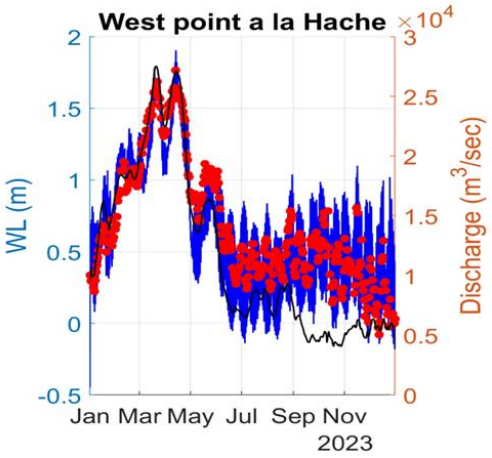


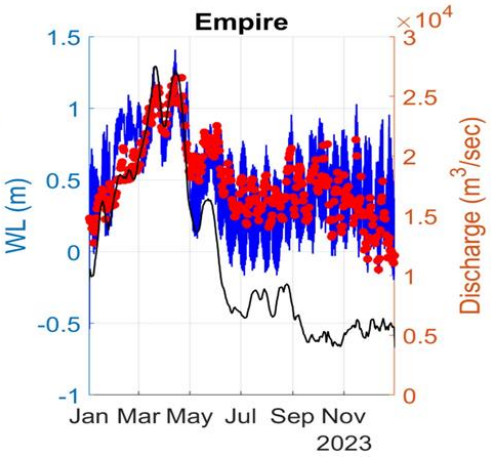












Model Output

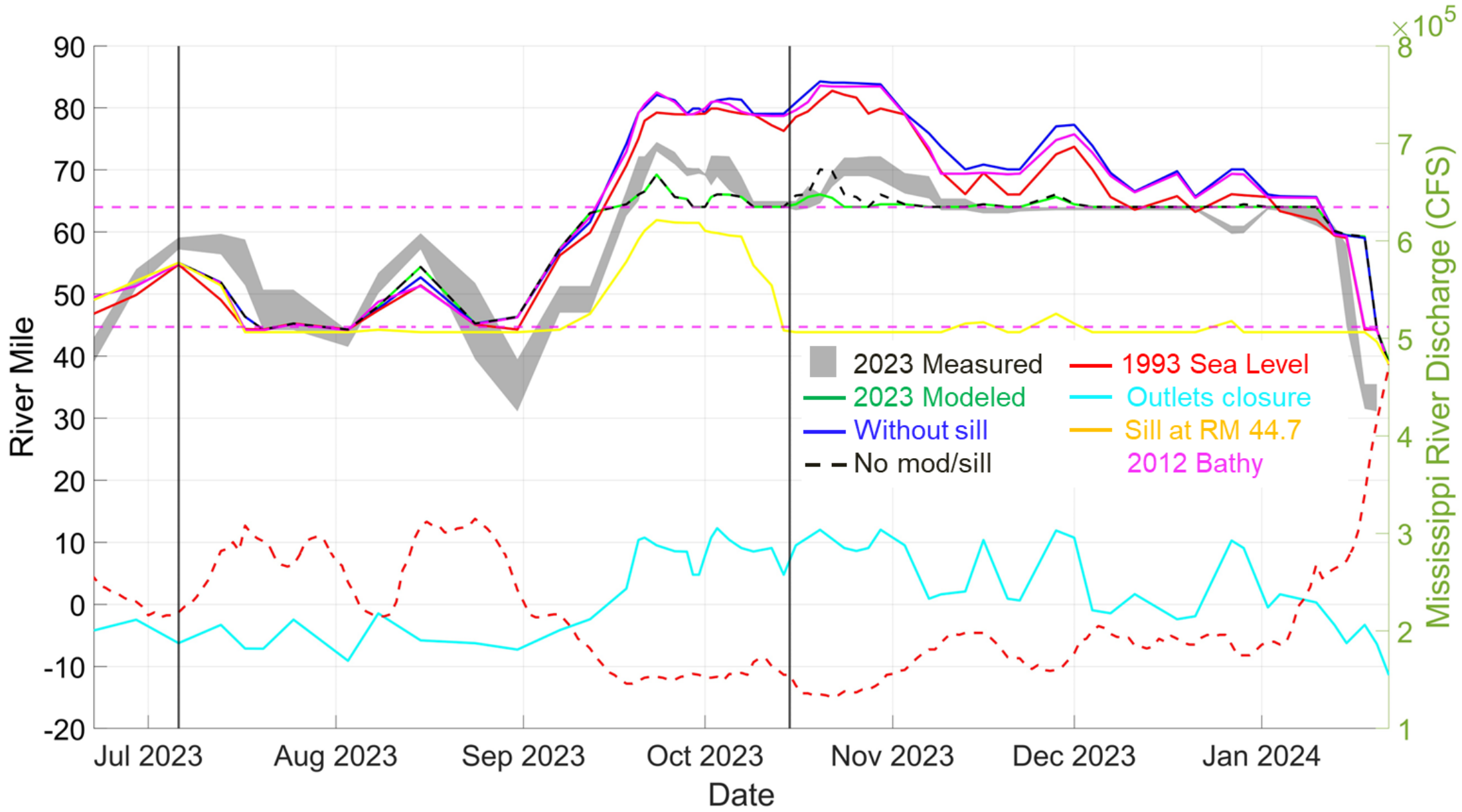
Observations

Discharge

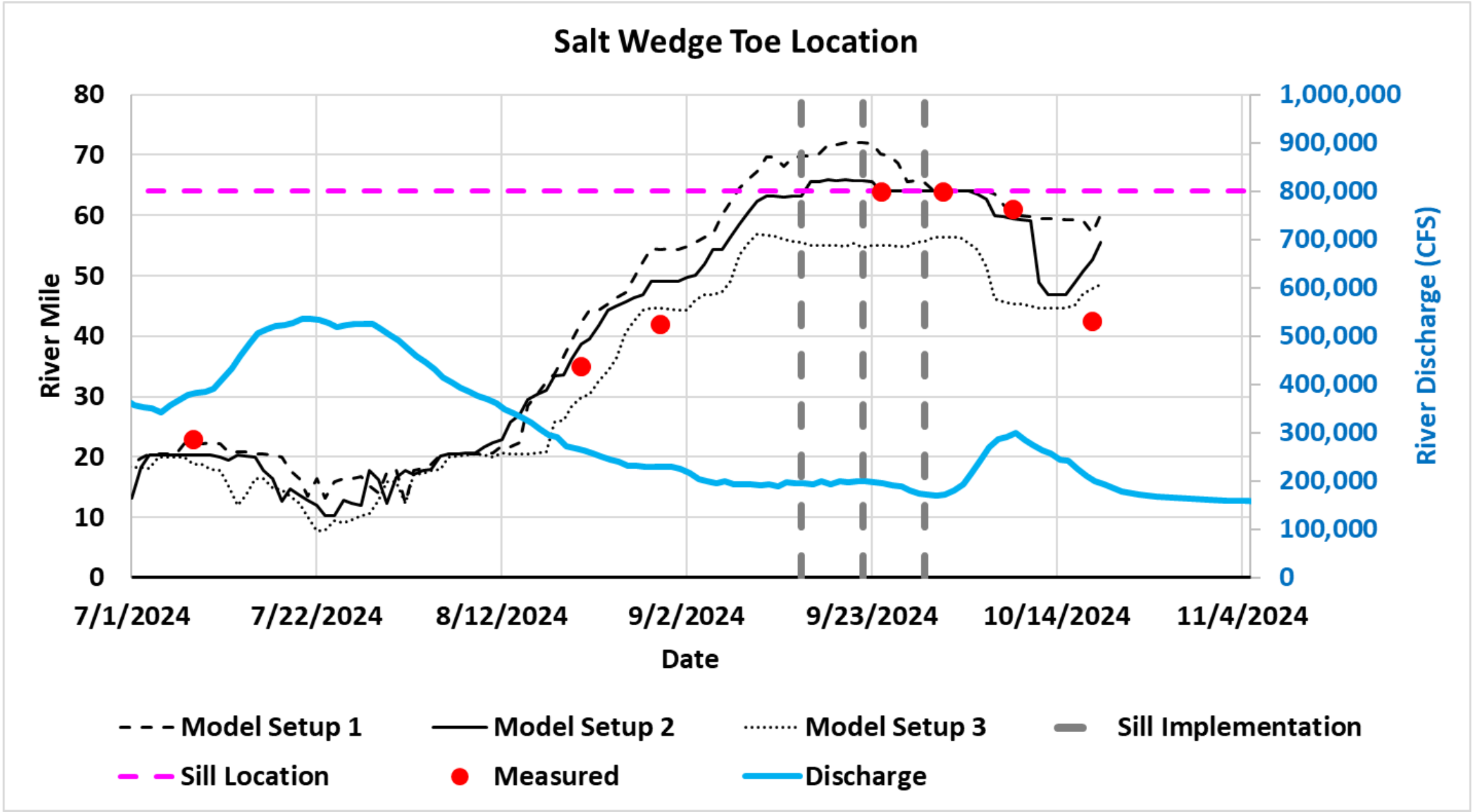
Impact of Drivers on Location of the Wedge Toe

- Scenario #0 (calibration): 2023 event with sill and modification
- Scenario #1: 2023 event without sill
- Scenario #2: lowered tidal signal to reflect SL in 1993 (12.5 cm)
- Scenario #3: Full closure of all outlets starting with MGP to Fort St Phillip during drought event
- Scenario #4: 2023 event with sill and no modification
- Scenario #5: 2023 event with sill at RM44.7 with modification
- Scenario #6: 2023 event with sill at RM44.7 and no modification

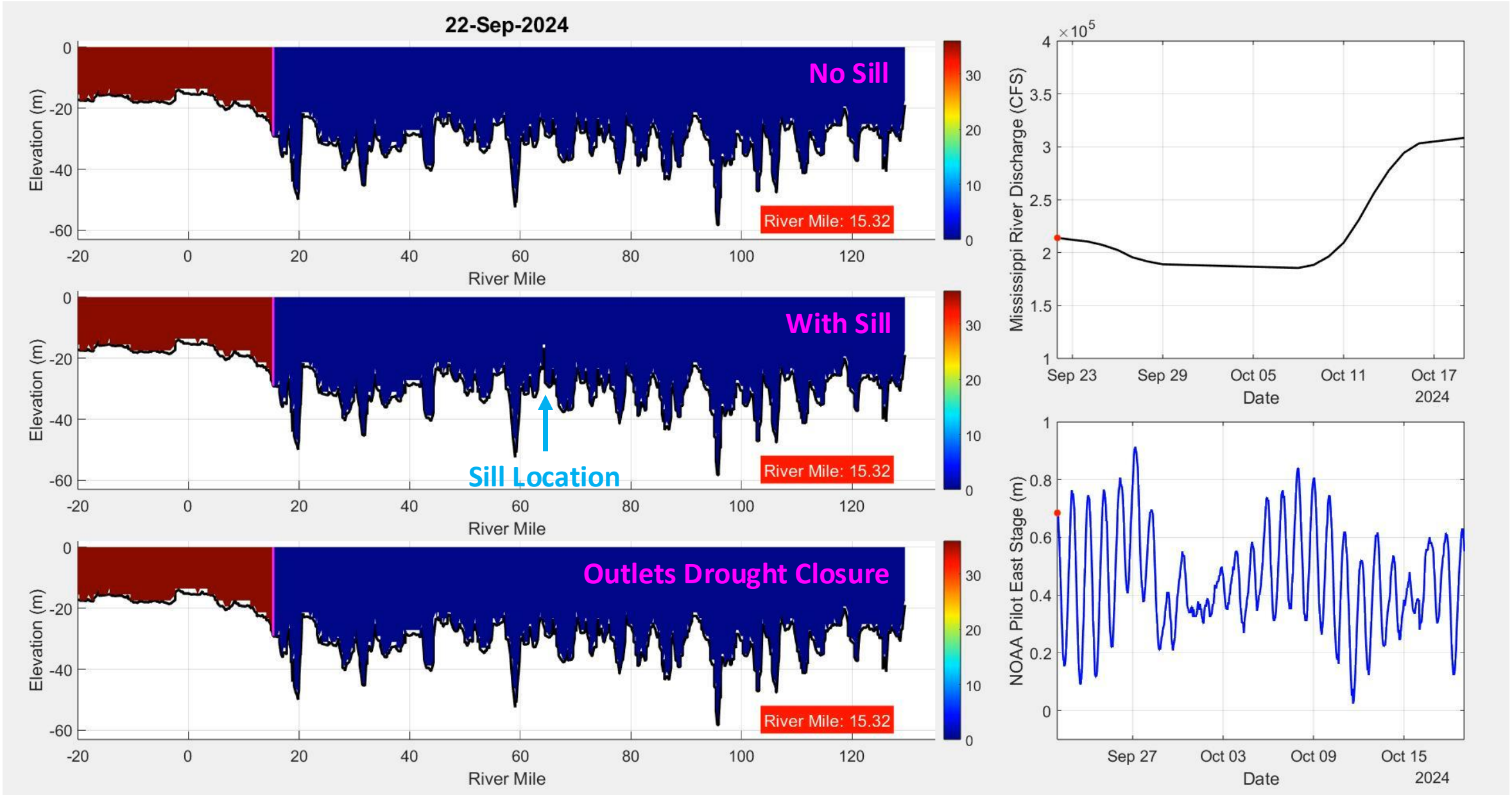
Model and CTD Toe Tracking (Calibration) and Scenarios



Forecasting Tool (Validation)



Coproduction and Outreaching Tool



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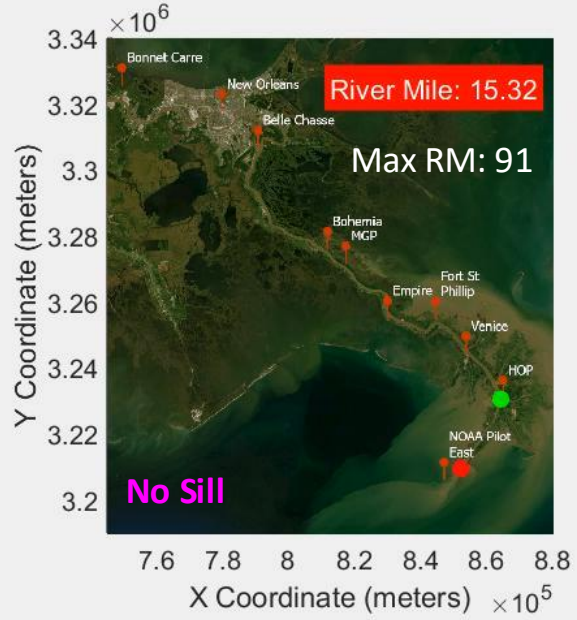

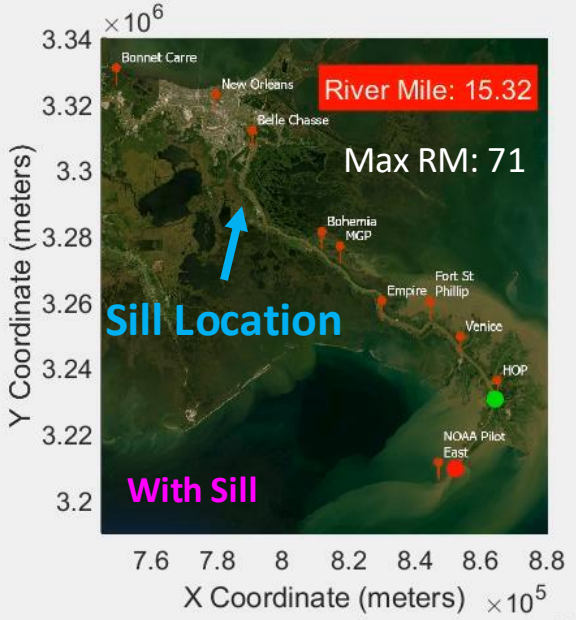

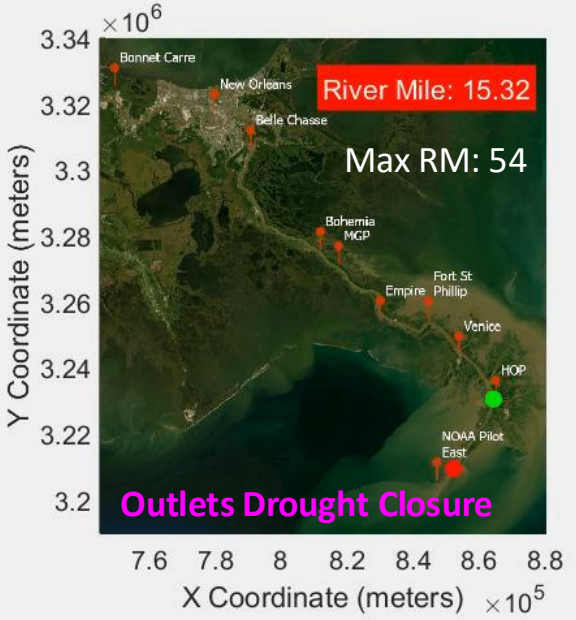

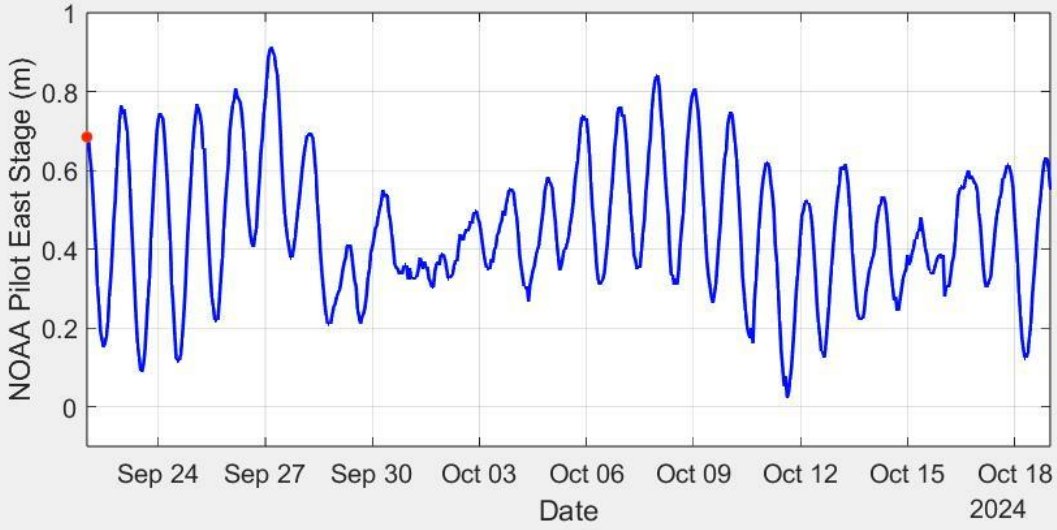

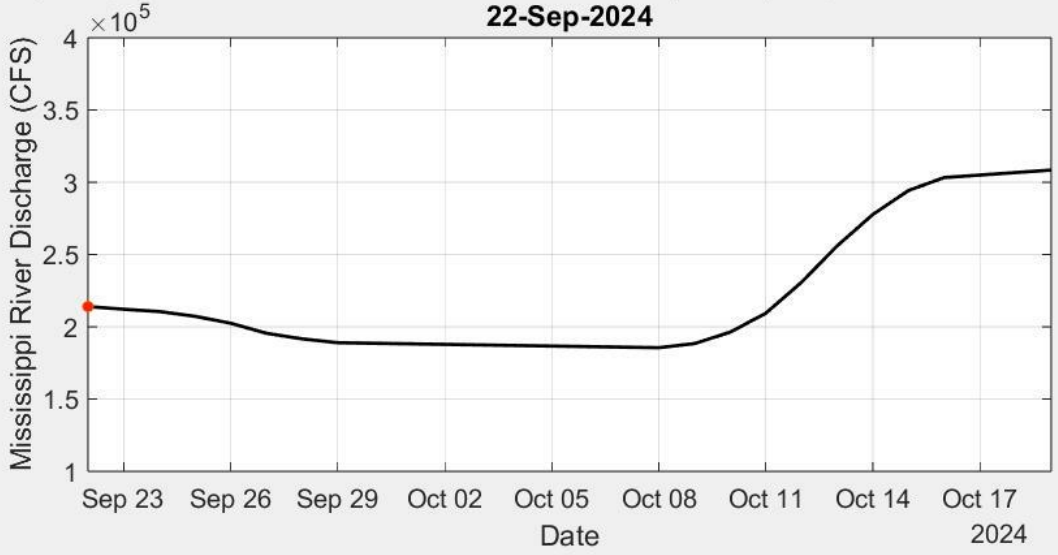

Closing Remarks

- Sill is quite effective in impeding the wedge propagation (20 RM reduction) but may not be in the optimal location.
- RM 44 performs better – further analysis is needed to confirm.
- Continue to refine the Delft model to improve the performance and run historical events: 2012 and 1988 if we have the data.
- Continue the collaboration with the USACE to support their efforts addressing drought events.
- Continue incorporating feedback from coproduction representatives into the model scenarios and output.

Acknowledgments

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- Brendan Yuill
- Gary Brown

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THANK YOU

Questions?!

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