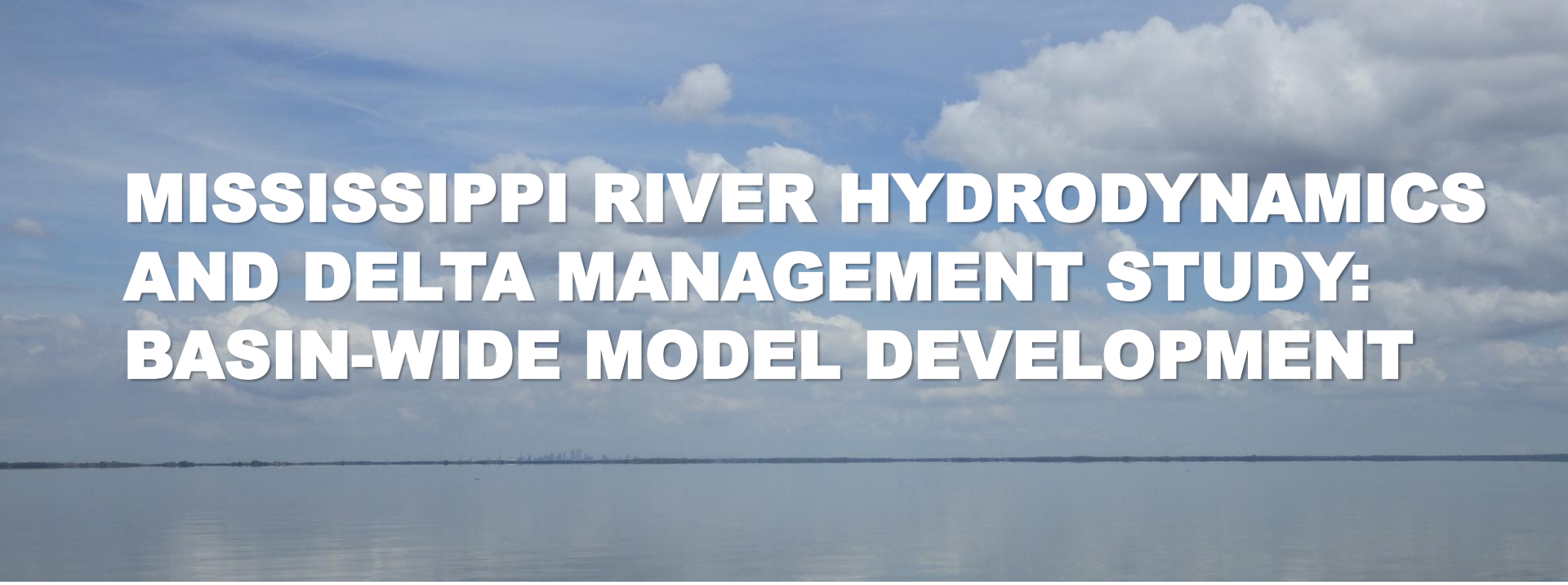


MISSISSIPPI RIVER HYDRODYNAMICS AND DELTA MANAGEMENT STUDY: BASIN-WIDE MODEL DEVELOPMENT

Delft3D Production Runs: 2020 – 2070

Fate of Nutrients

Melissa M. Baustian and Hoon Jung

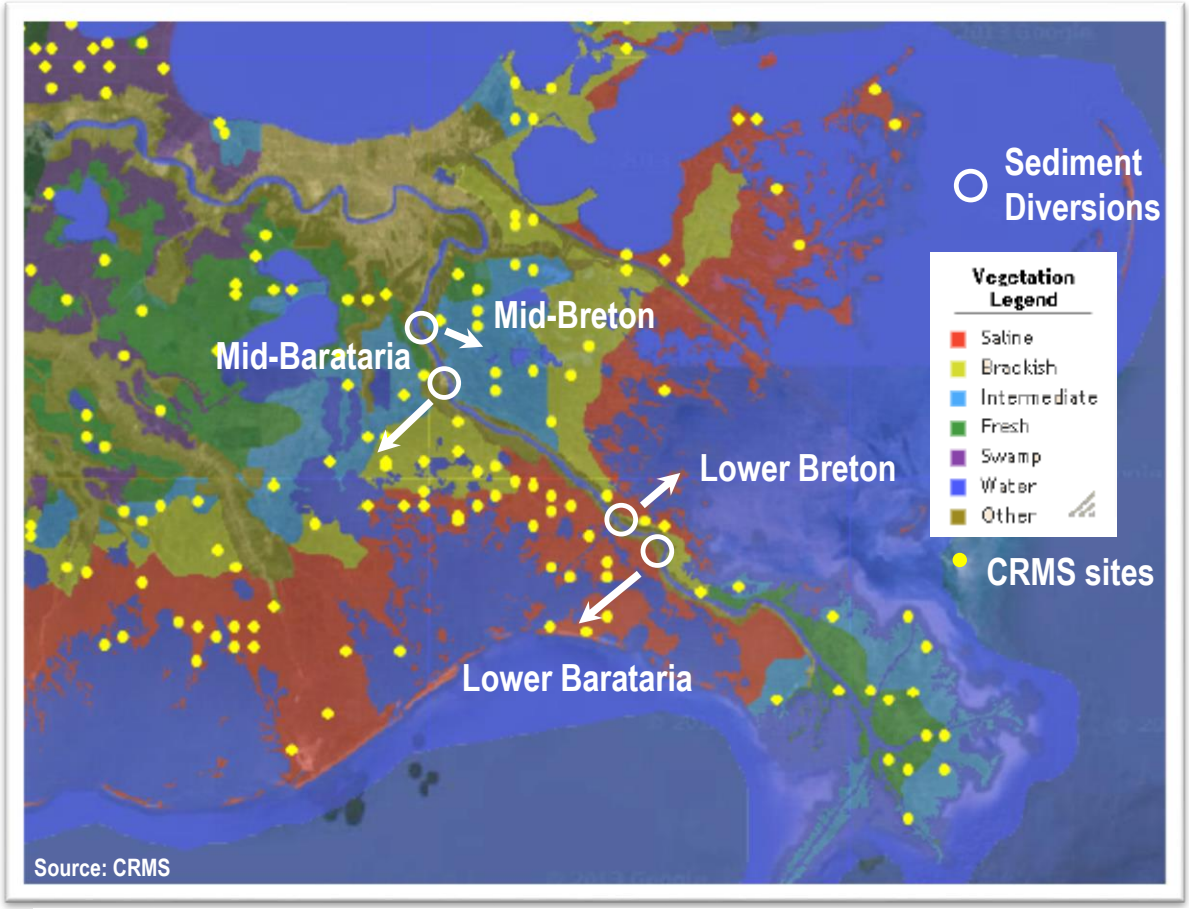
10/27/15

THE WATER INSTITUTE
OF THE GULF™

PROJECT GOAL

- Produce a calibrated and validated model capable of simulating:
  - Morphological evolution processes that occur during the creation of a new delta and wetland areas
  - **Nutrient effects to the wetland vegetation, soil, and the pelagic primary producers of Breton Sound and Barataria Bay estuaries**

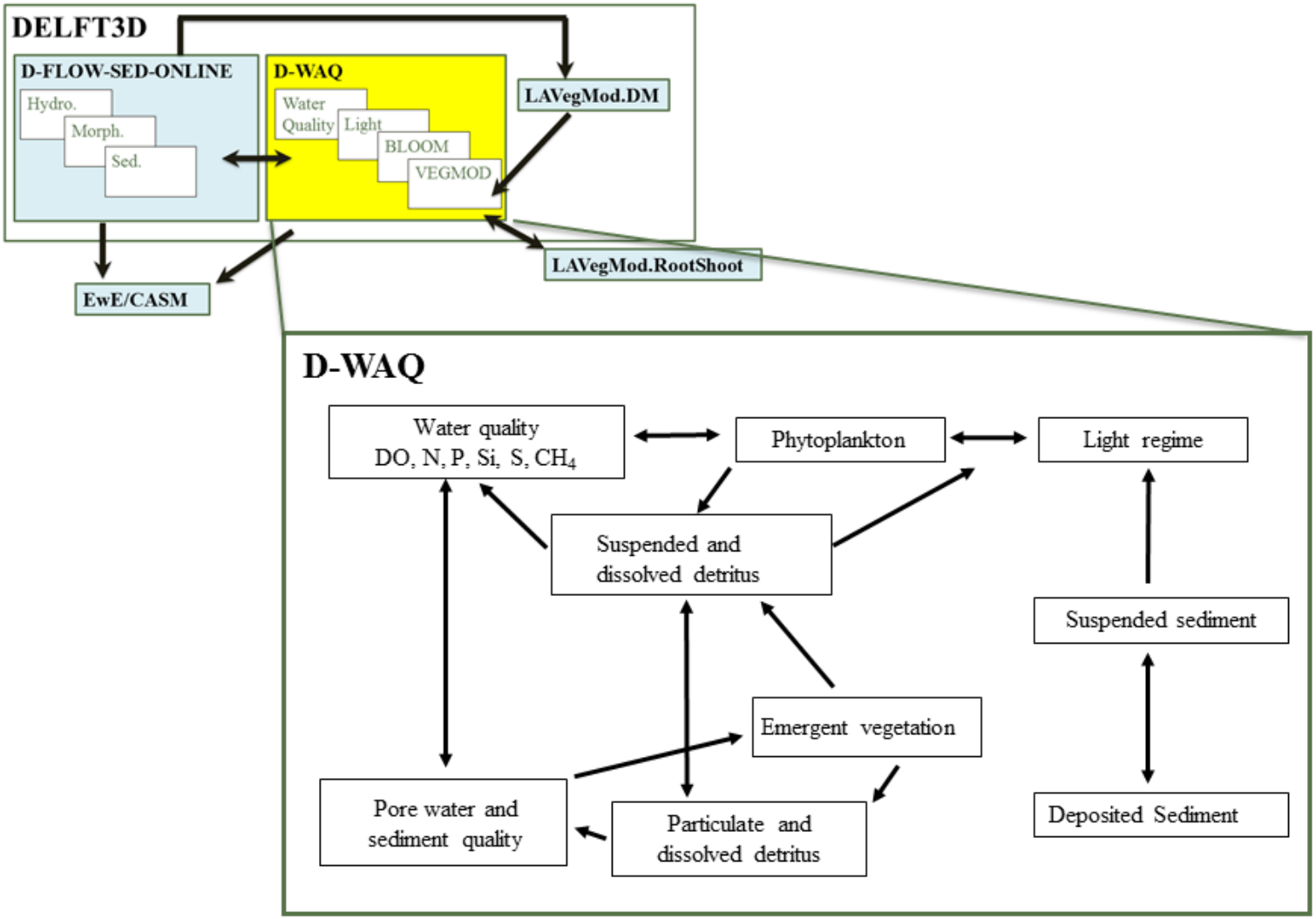
POTENTIAL SEDIMENT DIVERSION LOCATIONS



Likely flow conditions of four sediment diversions:

- ~35-75,000 CFS (~ 1,000-2,100 CMS)

D-WAQ: WATER QUALITY



D-WAQ MODEL SETUP SUBSTANCES

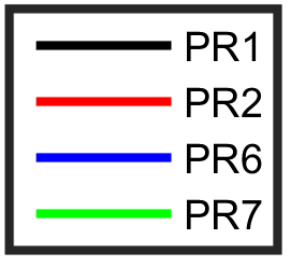
8 Phytoplankton Groups:

- Freshwater Diatoms, Freshwater Flagellates, Green Algae, *Microcystis*, *Anabaena*
- Marine Diatoms, Marine Flagellates, Dinoflagellates

Water Quality Variables:

- TOC, POC, DOC,
- TN, PON, DON, NH4, **NO3**
- TP, POP, DOP, **PO4**
- Si, Silt, Clay, **TSS**
- DO, **Chl a**

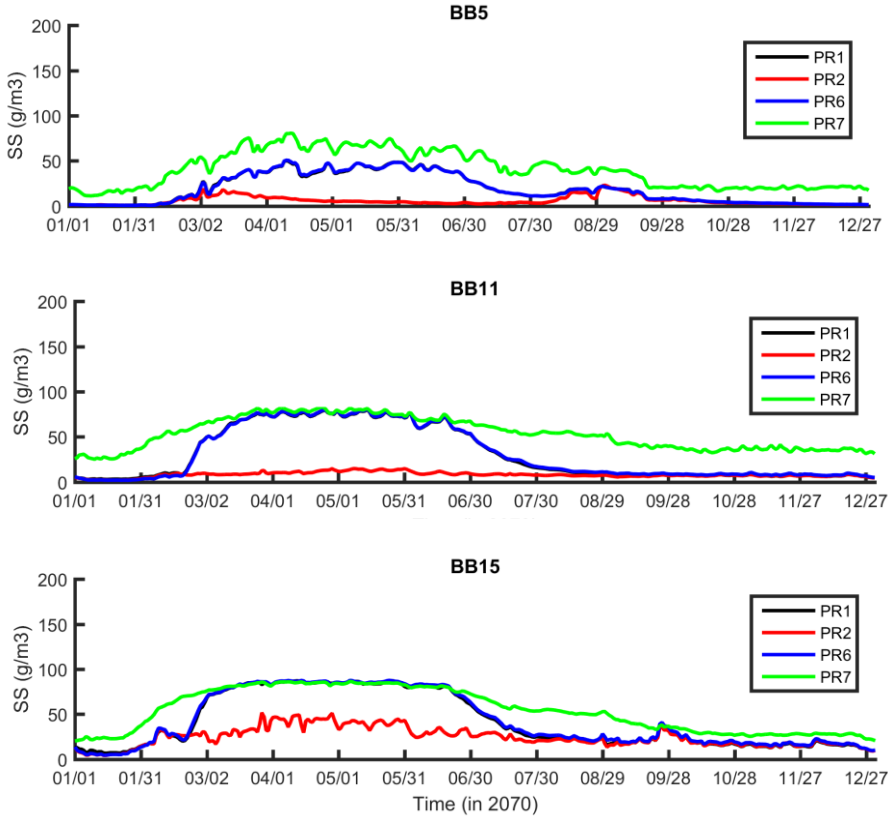
SEDIMENT DIVERSION PRODUCTION RUNS (PR)

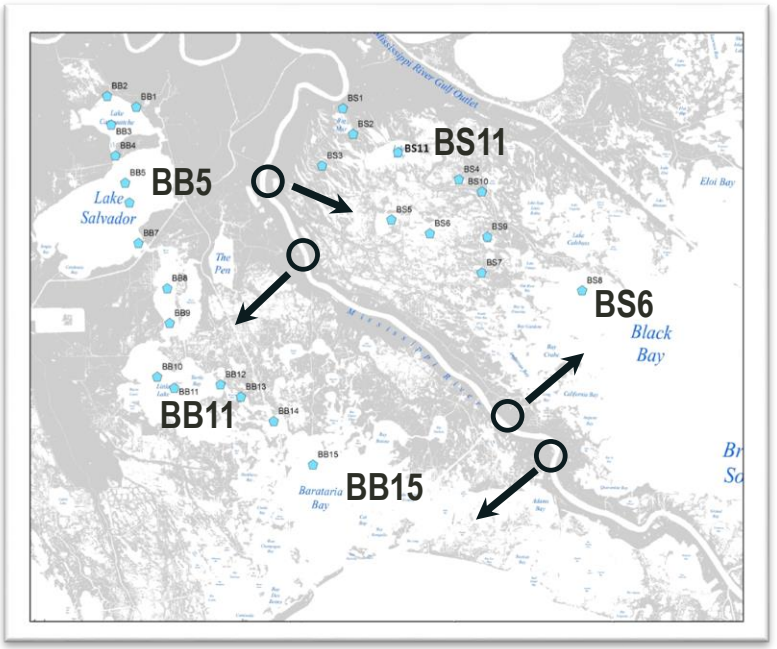


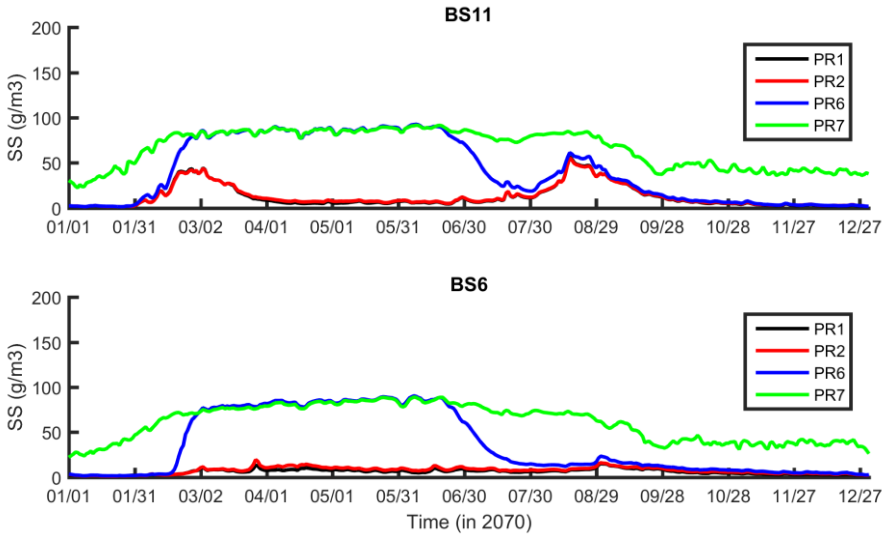
PR ID	Description	Operating Plan	Design Discharge (cfs)	Sea Level Rise	Subsidence Rate
PR1	Mid-Barataria	Less Aggressive	75K	Intermediate	20% into range
FWOP/PR2	Future Without Project	N/A (No Diversions)	N/A (No Diversions)	Intermediate	20% into range
PR6	All Four Diversions	Less Aggressive	35K,50K,50K,75K	Intermediate	20% into range
PR7	All Four Diversions	Aggressive	35K,50K,50K,75K	Intermediate	20% into range

Less Aggressive = operation for 5 months (Feb – July)
Aggressive = operation all year

WATER QUALITY – TSS: 2070







WATER QUALITY – TSS: 2070

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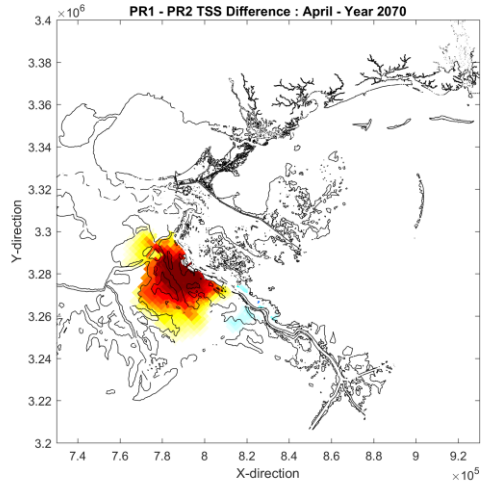
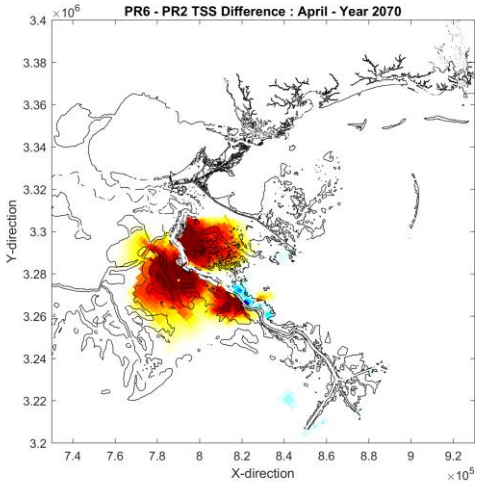
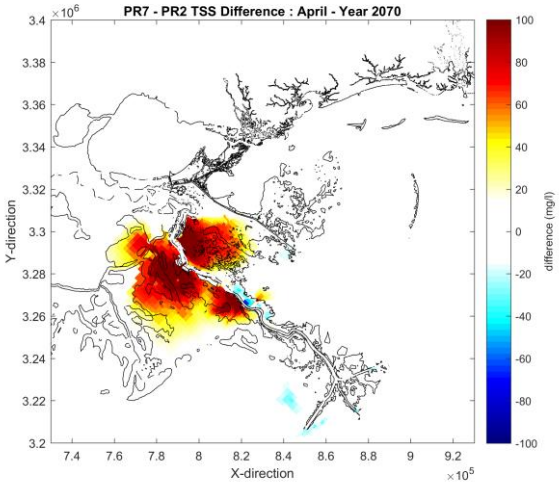
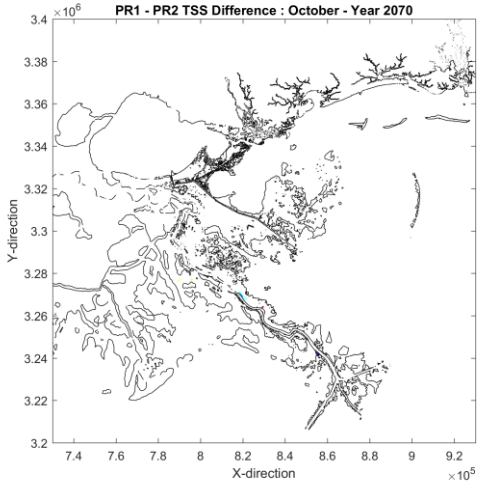
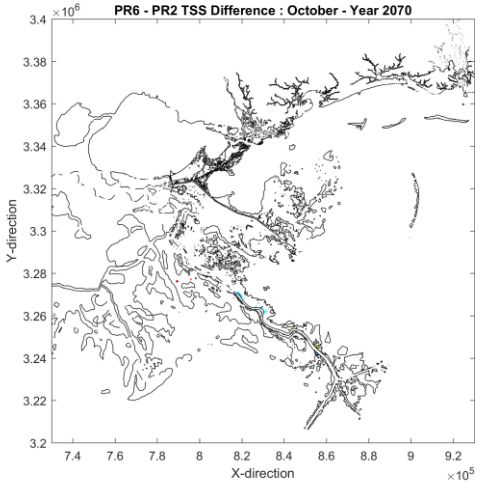
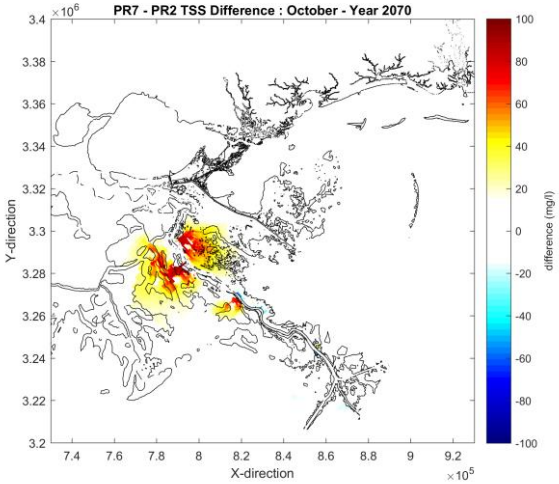
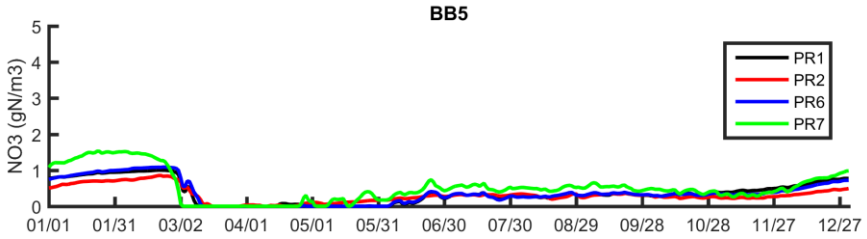
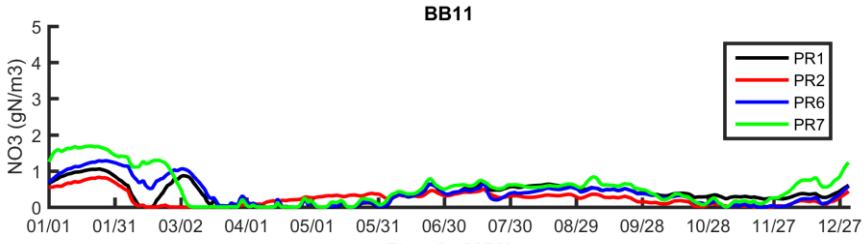
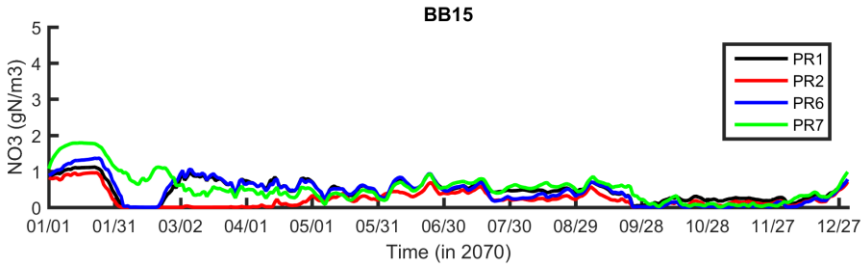
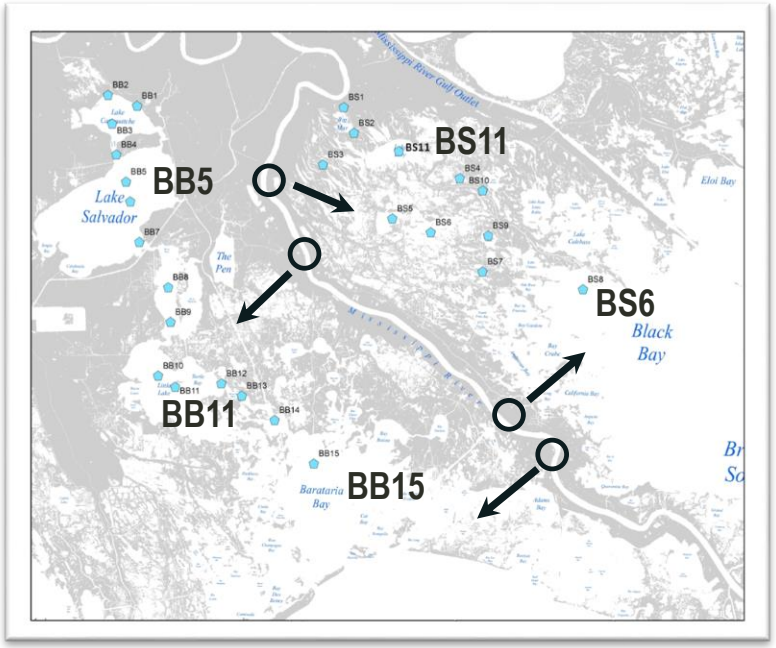
April			
October			

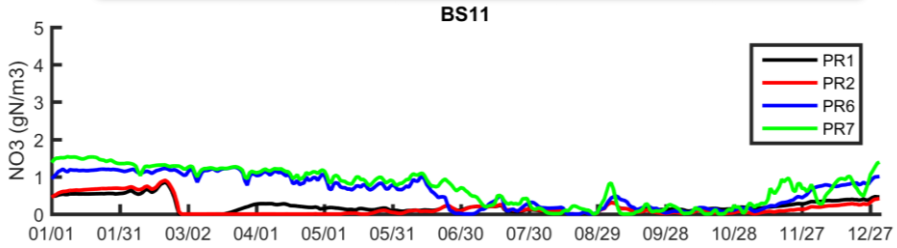
WATER QUALITY – NO3: 2070

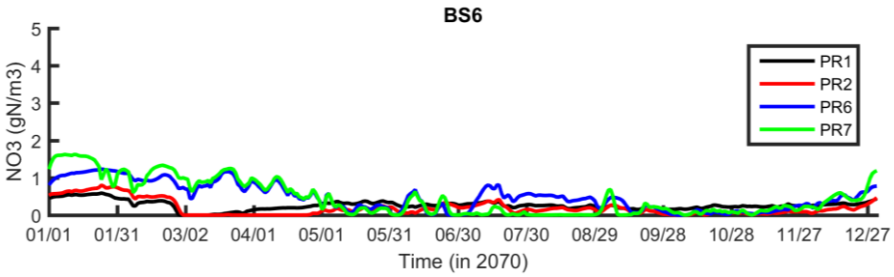




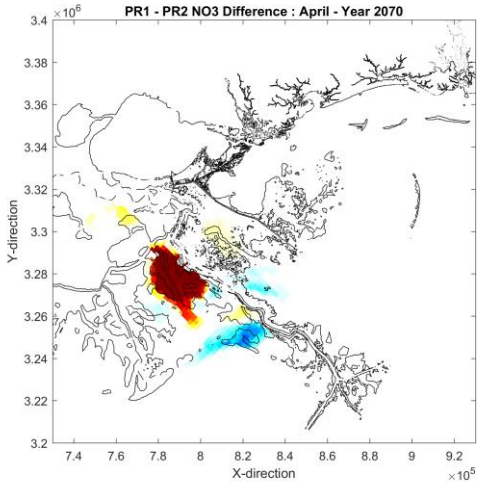
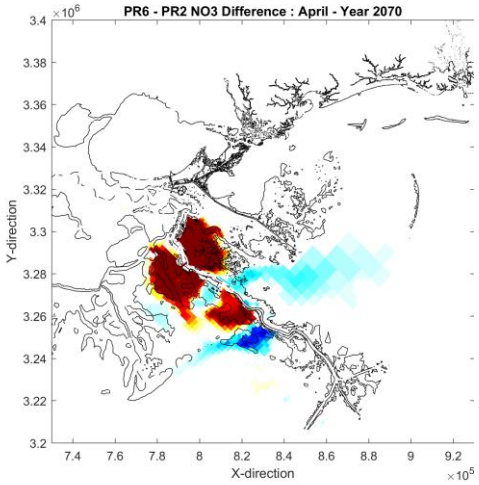
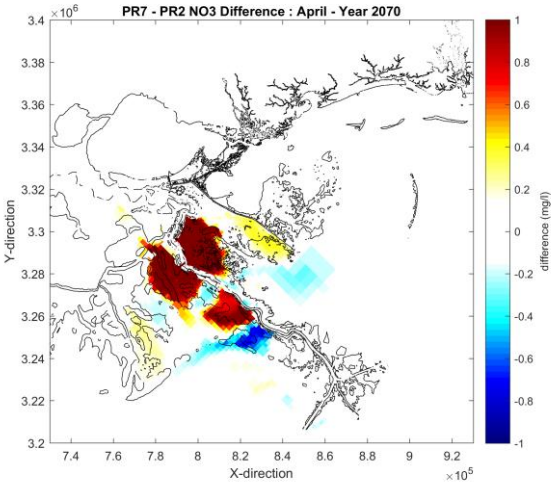
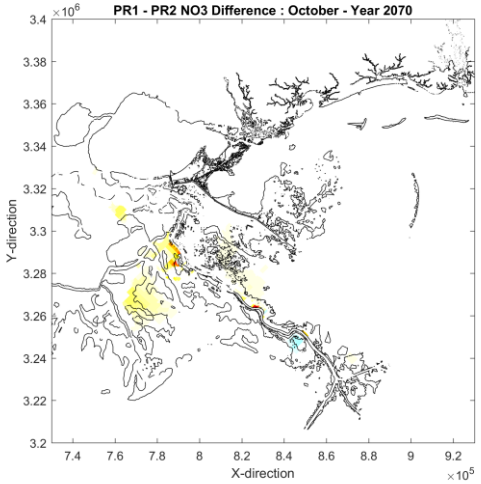
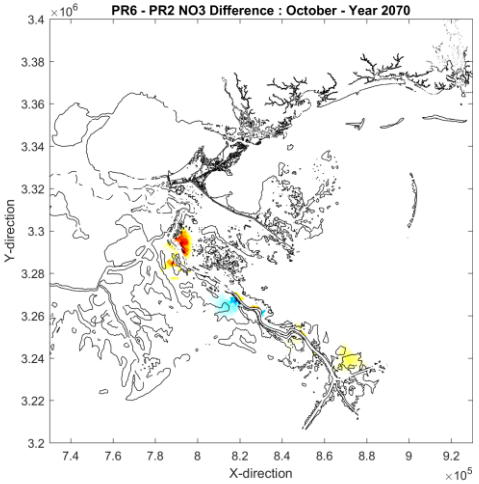
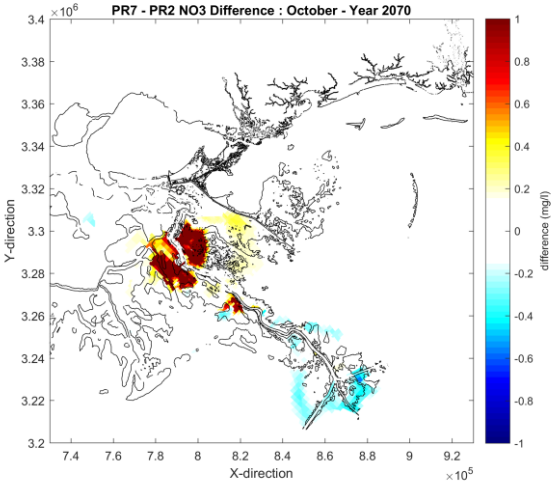




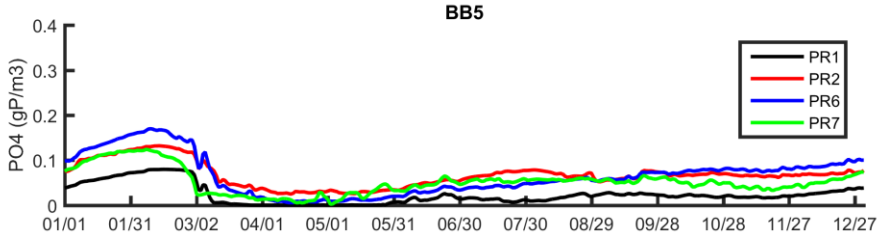


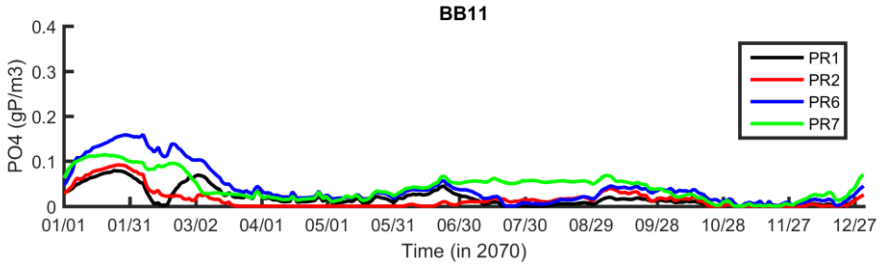


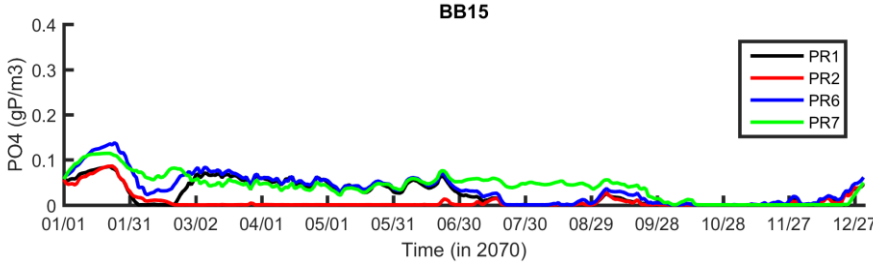
WATER QUALITY – NO3: 2070

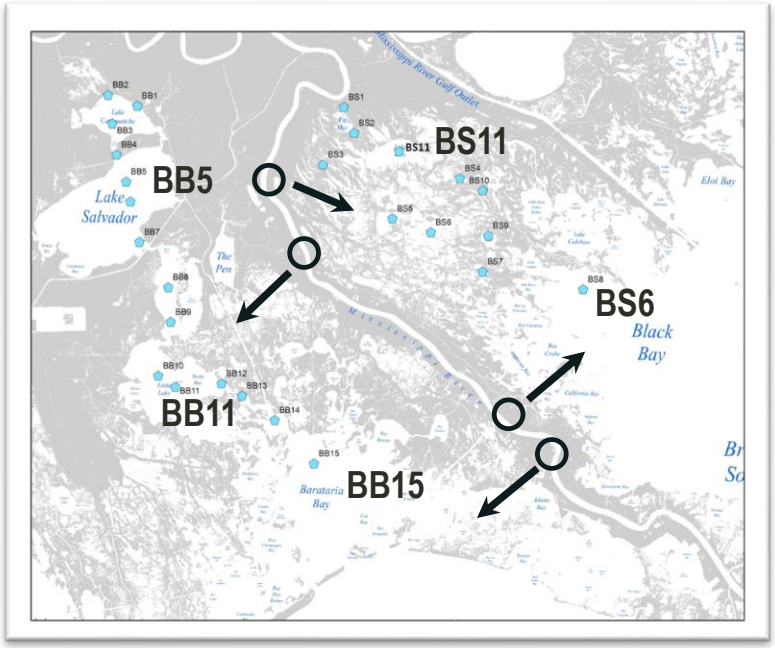
	PR1 –PR2	PR6 –PR2	PR7 –PR2
April			
October			

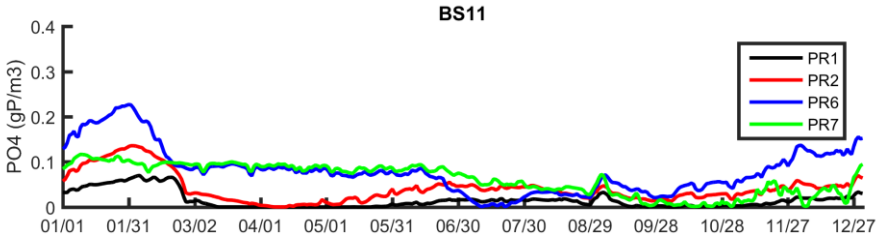
WATER QUALITY – PO4: 2070

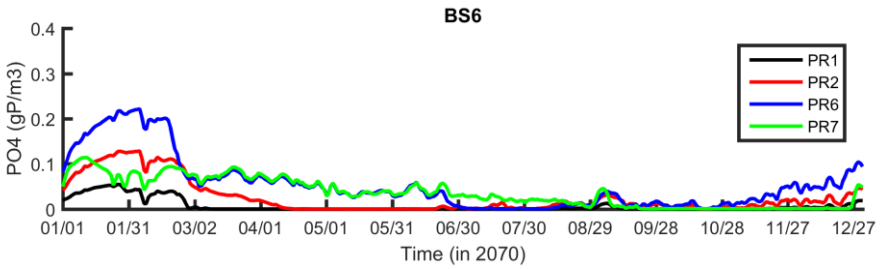




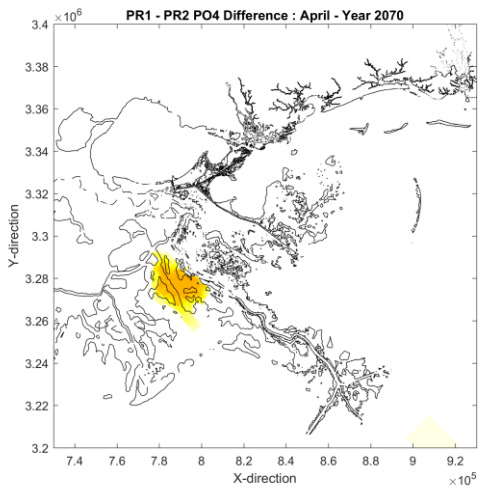
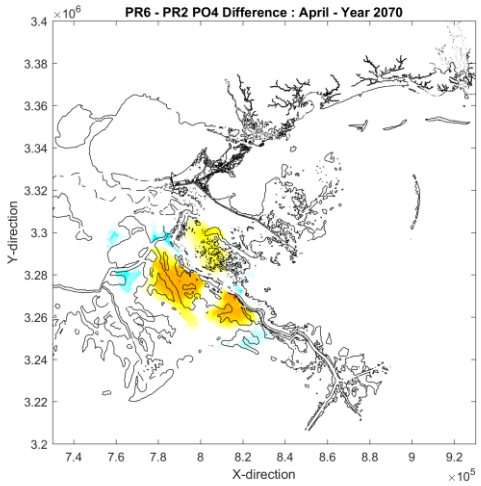
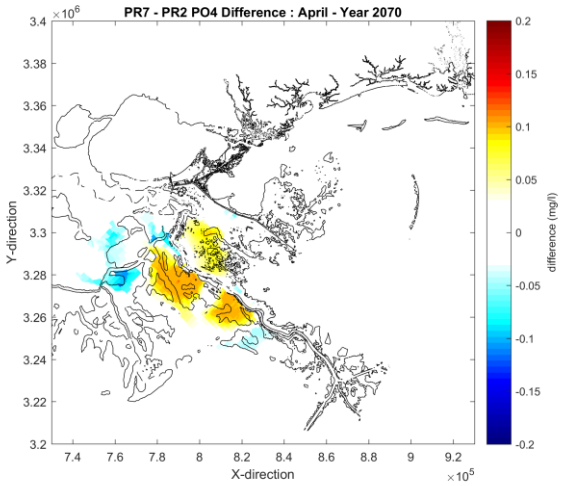
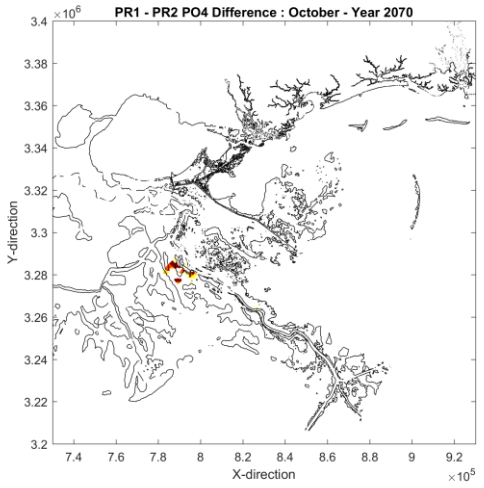
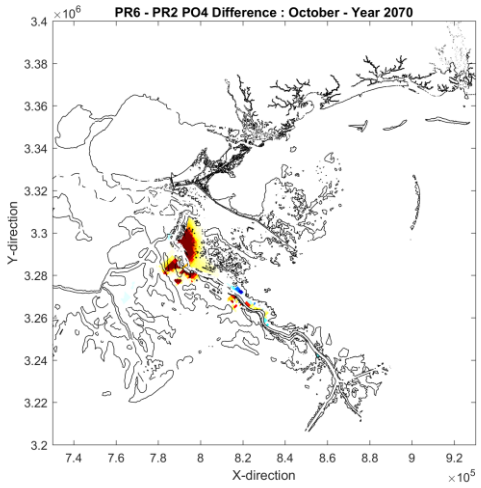
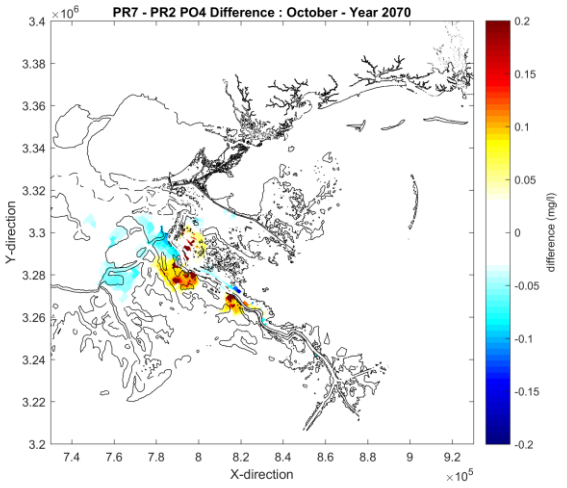




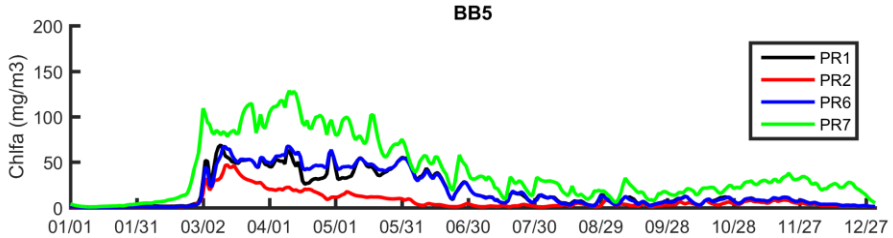


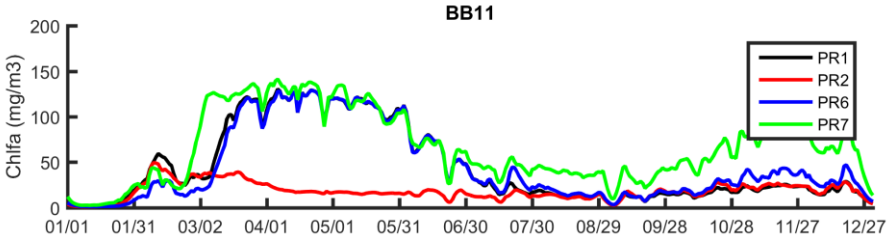


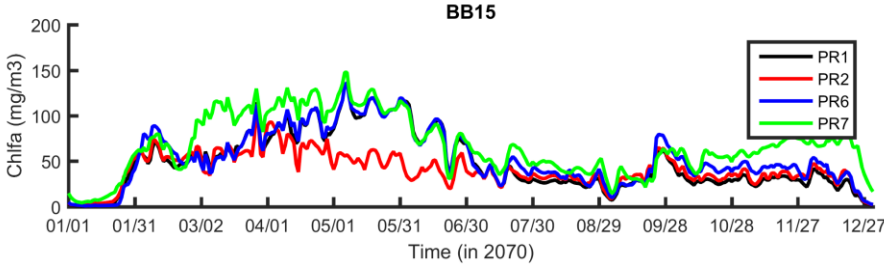
WATER QUALITY – PO4: 2070

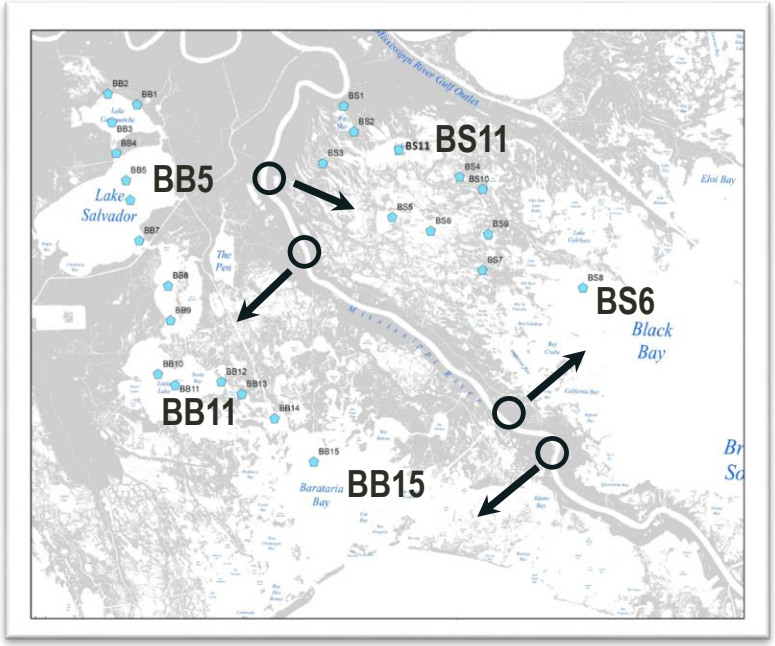
	PR1 –PR2	PR6 –PR2	PR7 –PR2
April			
October			

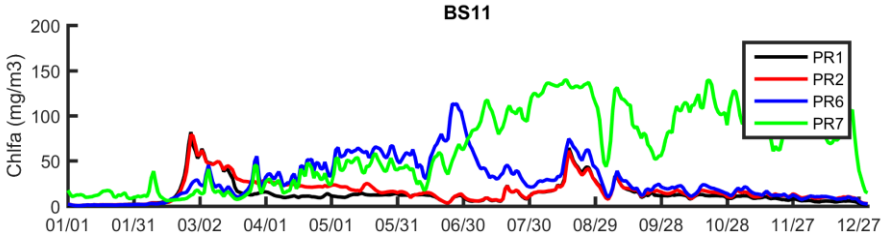
WATER QUALITY – Chl a: 2070

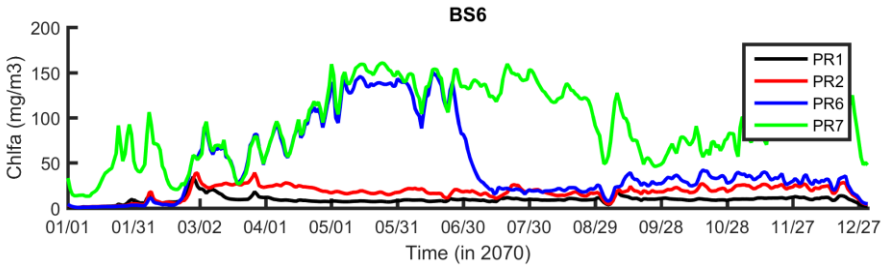




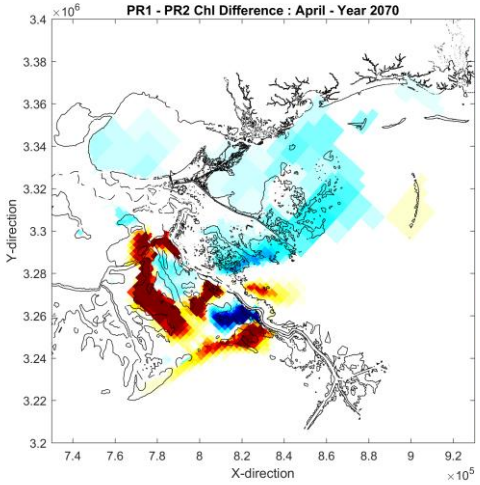
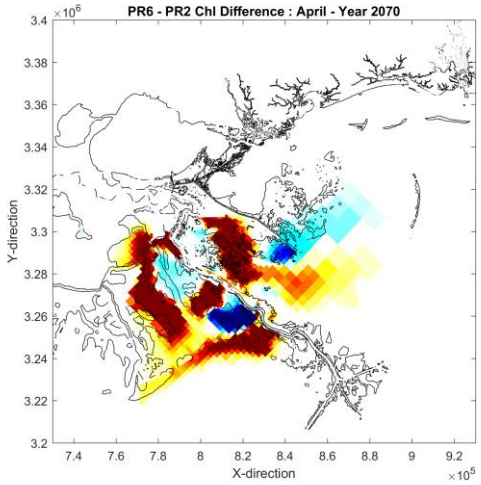
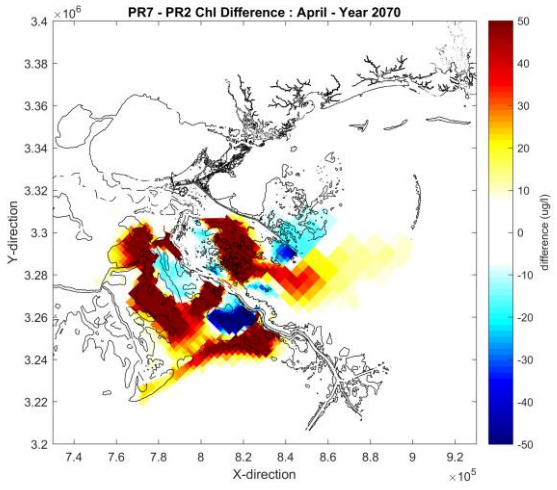
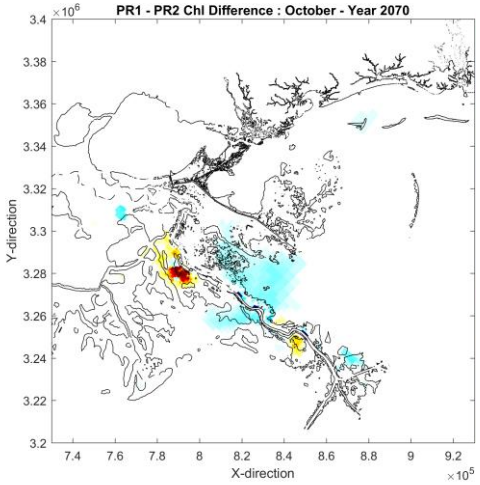
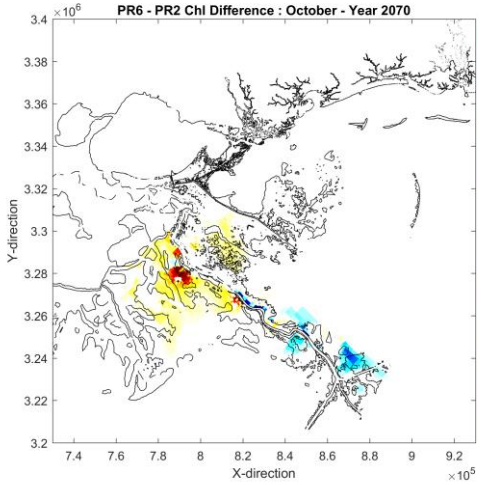
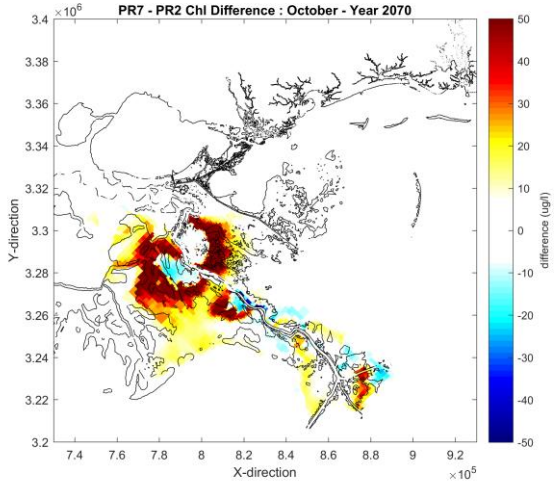




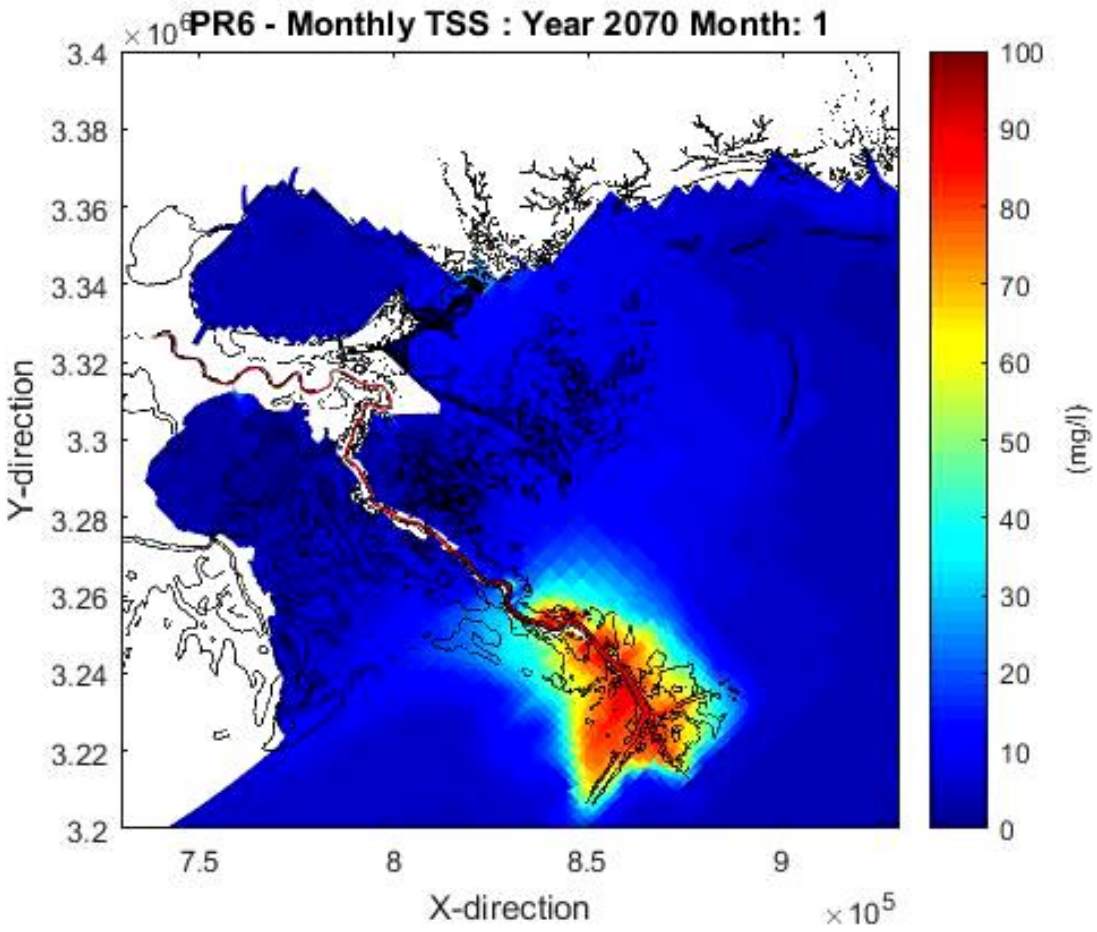




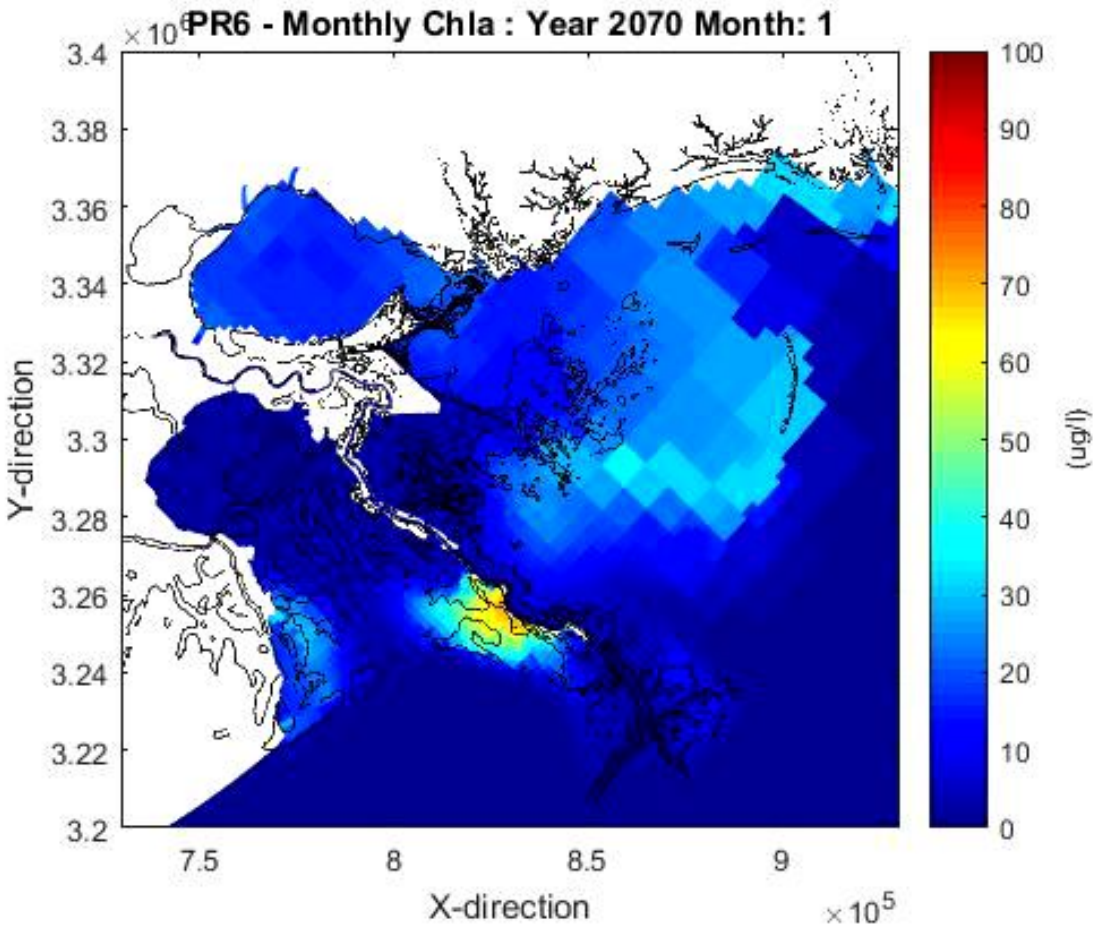
WATER QUALITY – Chl a: 2070

	PR1 –PR2	PR6 –PR2	PR7 –PR2
April			
October			

PR6 ANIMATION: TSS



PR6 ANIMATION: Chl a



WATER QUALITY CONCLUSIONS

- Operating sediment diversions could result in high concentrations of TSS, NO3, PO4, and Chl a in the open water of estuaries

- TSS
  - Responds to diversion operation (declines when not operating)
  - High concentrations near outfall area

- NO3 and PO4
  - Elevated concentrations at some sites and periods of time
  - High concentrations near outfall area

- Chl a
  - Responds to diversion operation
  - Tends to be consistently higher than FWOP
  - Implications to food webs and fisheries

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THANK YOU

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(225) 448-2813
WWW.THEWATERINSTITUTE.ORG

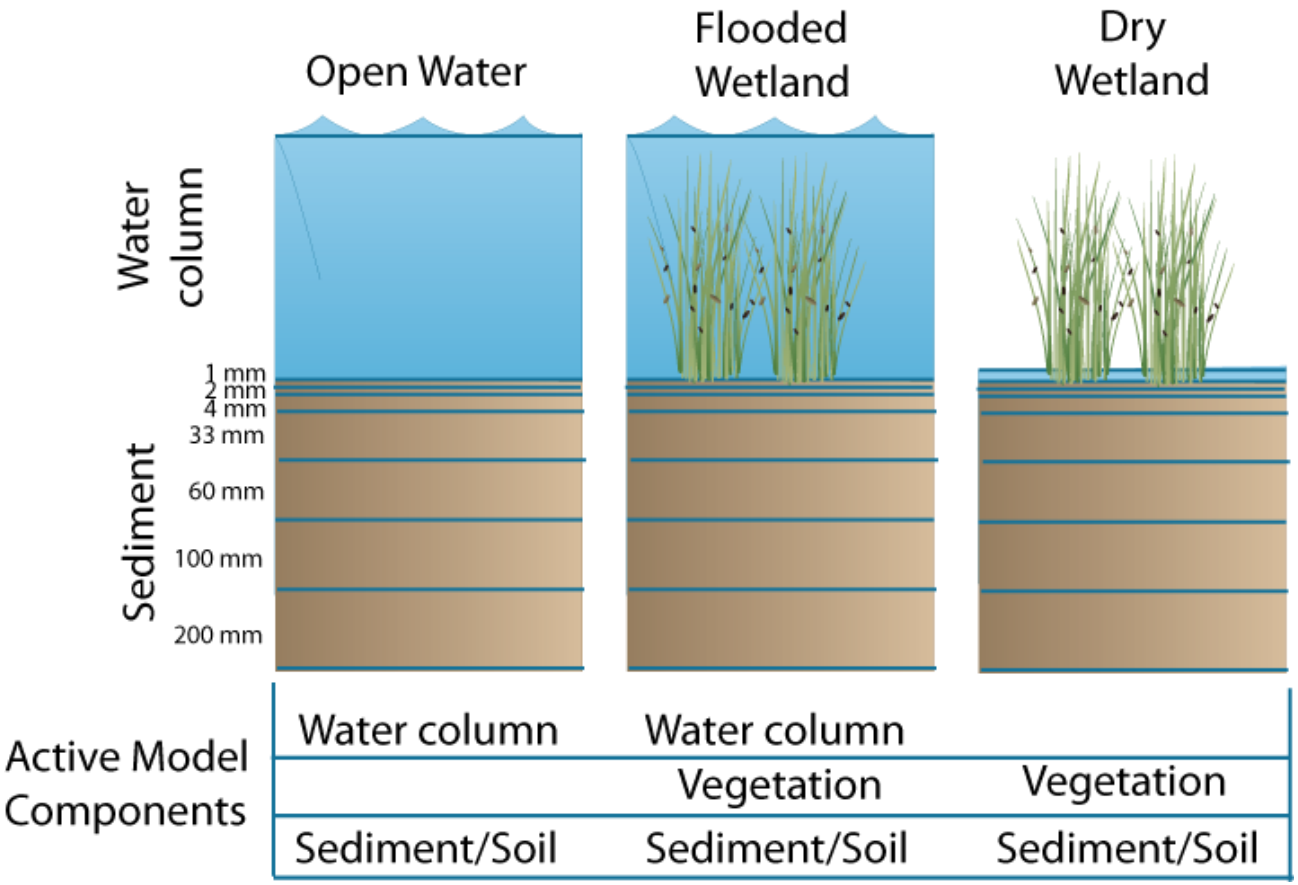
EXTRA SLIDES

SEDIMENT DIVERSION PRODUCTION RUNS (PR)

PR ID	Description	Operating Plan	Design Discharge (cfs)	Sea Level Rise	Subsidence Rate
PR1	**Mid-Barataria**	**Less Aggressive**	**75K**	**Intermediate**	**20% into range**
FWOP/PR2	**Future Without Project**	**N/A (No Diversions)**	**N/A (No Diversions)**	**Intermediate**	**20% into range**
PR3	Mid-Breton	Less Aggressive	35K	Intermediate	20% into range
PR4	Lower-Breton	Less Aggressive	50K	Intermediate	20% into range
PR5	Lower-Barataria	Less Aggressive	50K	Intermediate	20% into range
PR6	**All Four Diversions**	**Less Aggressive**	**35K,50K,50K,75K**	**Intermediate**	**20% into range**
PR7	**All Four Diversions**	**Aggressive**	**35K,50K,50K,75K**	**Intermediate**	**20% into range**
PR8	Marsh Creation/Dredge Only	N/A (No Diversions)	N/A (No Diversions)	Intermediate	20% into range
PR9	No Vegetation (20 yrs)	Less Aggressive	35K,50K,50K,75K	Intermediate	20% into range

Less Aggressive = operation for 5 months
Aggressive = operation all year
PR8 = PR6 diversion footprints with sediment from 11 river bars

D-WAQ: SEDIMENT/SOIL LAYERS

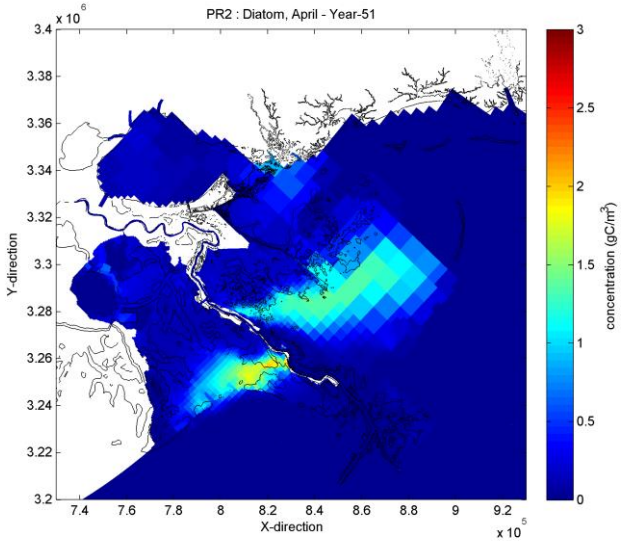


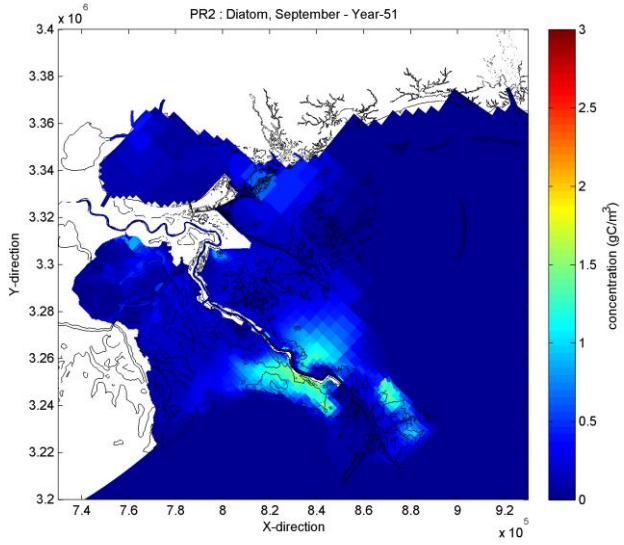
PHYTOPLANKTON– PR2: 2070

April

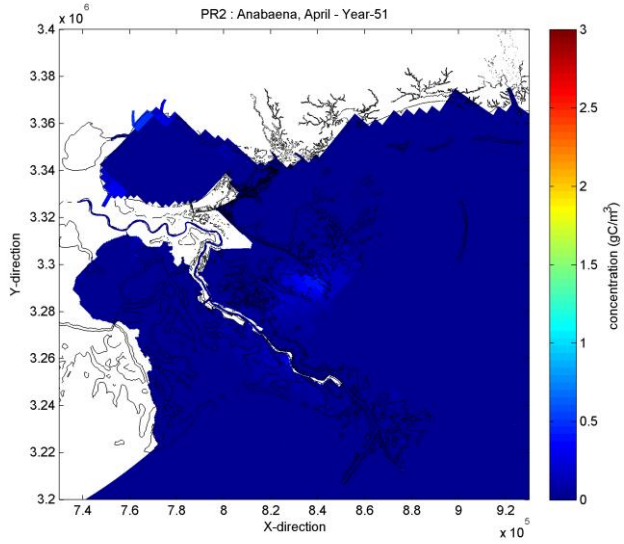
September

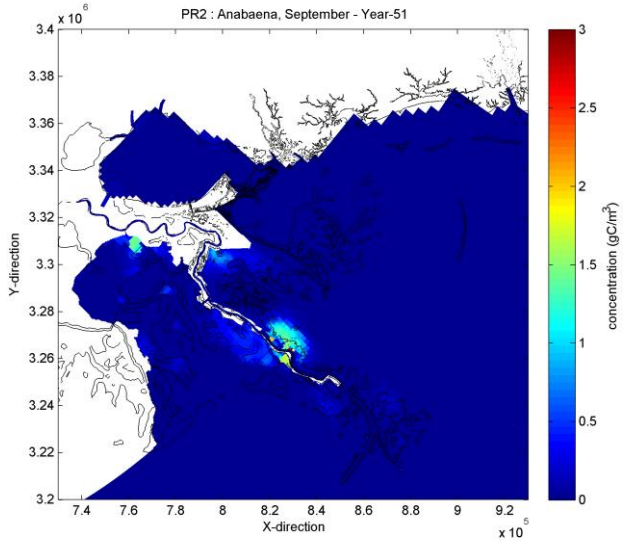
Diatoms





Anabaena



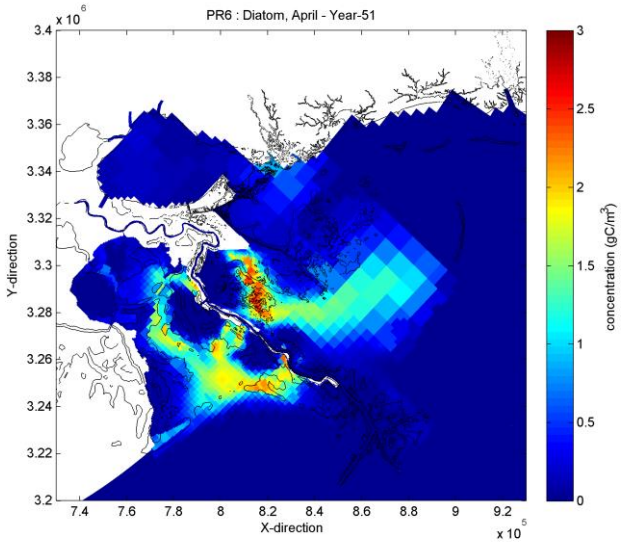


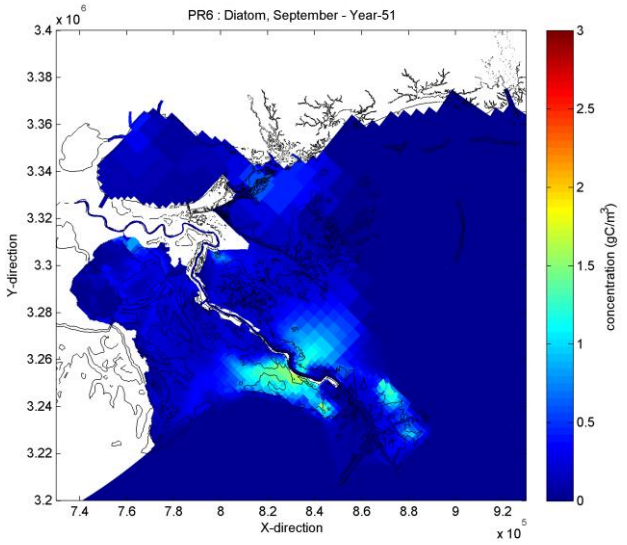
PHYTOPLANKTON– PR6: 2070

April

September

Diatoms





Anabaena