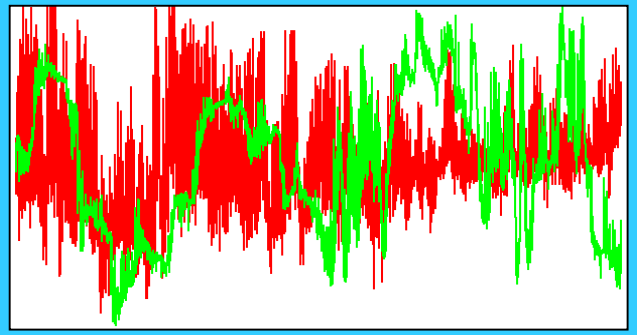
Influence of Flow from the C-44 Canal on the Water Quality of the South Fork of the St. Lucie Estuary, Florida



M. Dennis Hanisak, Kristen Davis, Bryan Botson

GEER 2019, April 25, 2019

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The Indian River Lagoon Observatory Network of Environmental Sensors (IRLON)

IRLON Overview

An estuarine observation and prediction network in the IRL providing real-time, high-accuracy and high-resolution water quality and weather data through a dedicated interactive website

High-resolution measurements for:

- Temperature
- Salinity
- Depth
- Current speed and direction
- Dissolved oxygen
- pH
- Turbidity
- CDOM (water color)
- Chlorophyll *a*
- Nitrate
- Phosphate

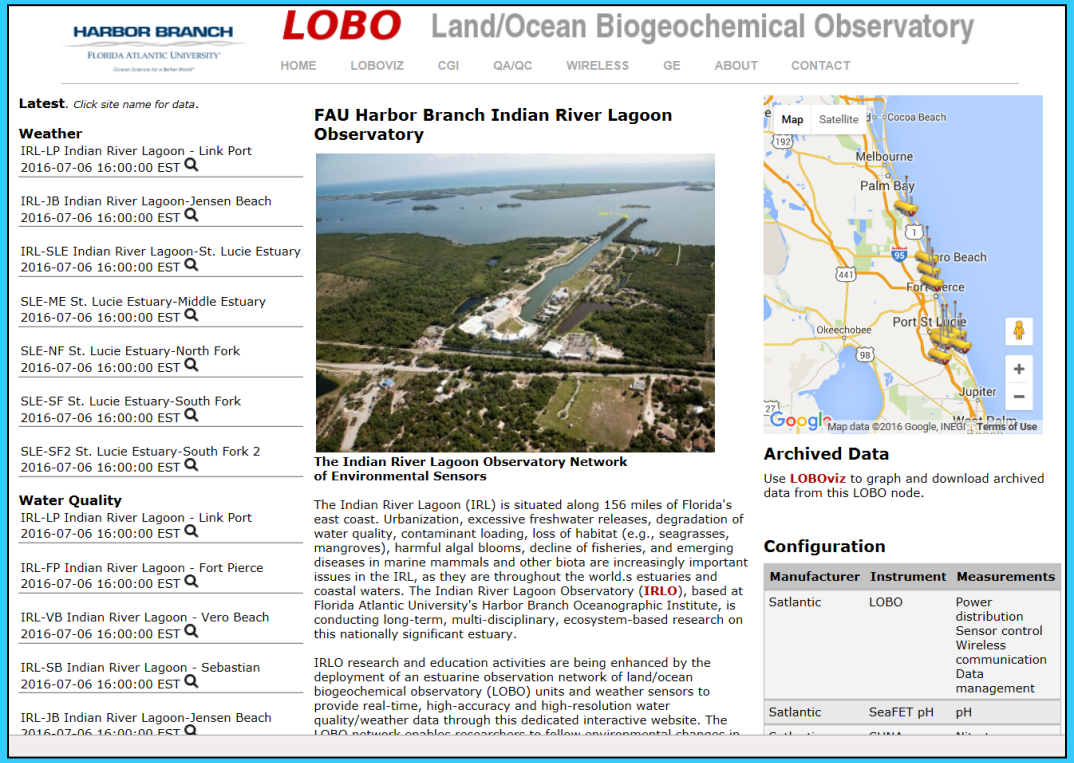
Weather station for:

- Air humidity
- Air temperature
- Barometric pressure
- PAR
- Pressure
- Rain
- Wind direction
- Wind gust
- Wind speed

Data Access

http://fau.loboviz.com/

Continuous real-time, high-accuracy and high-resolution observatory data available to all through a dedicated interactive website to better quantify and model relationships between environmental factors and biological processes in the IRL



Benefits to IRL & SLE

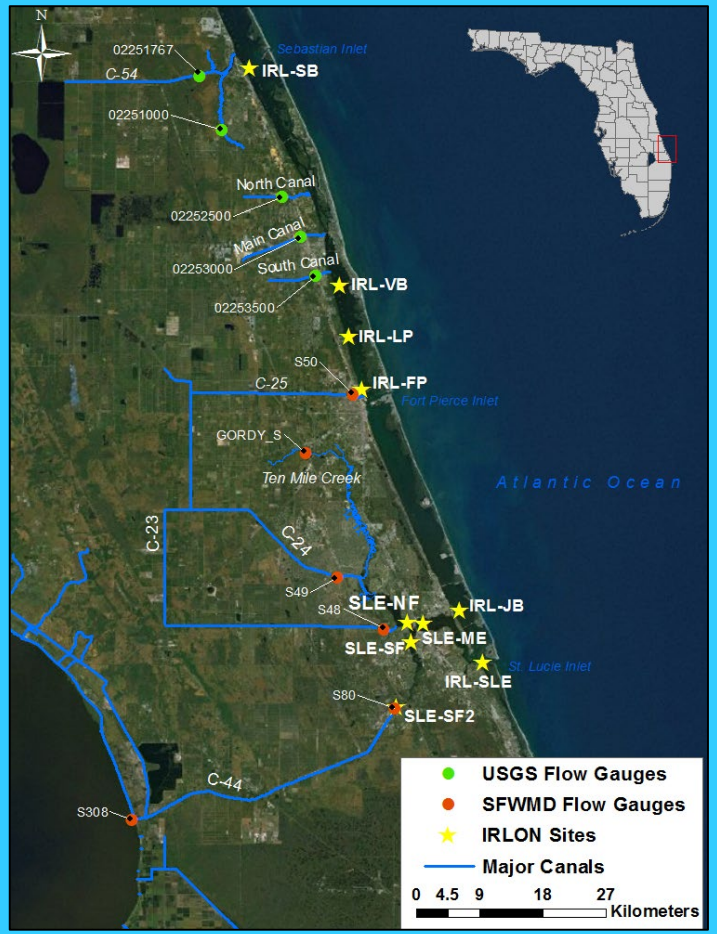
IRLON technology will provide researchers, governmental agencies, students, and the public unprecedented IRL & SLE environmental data

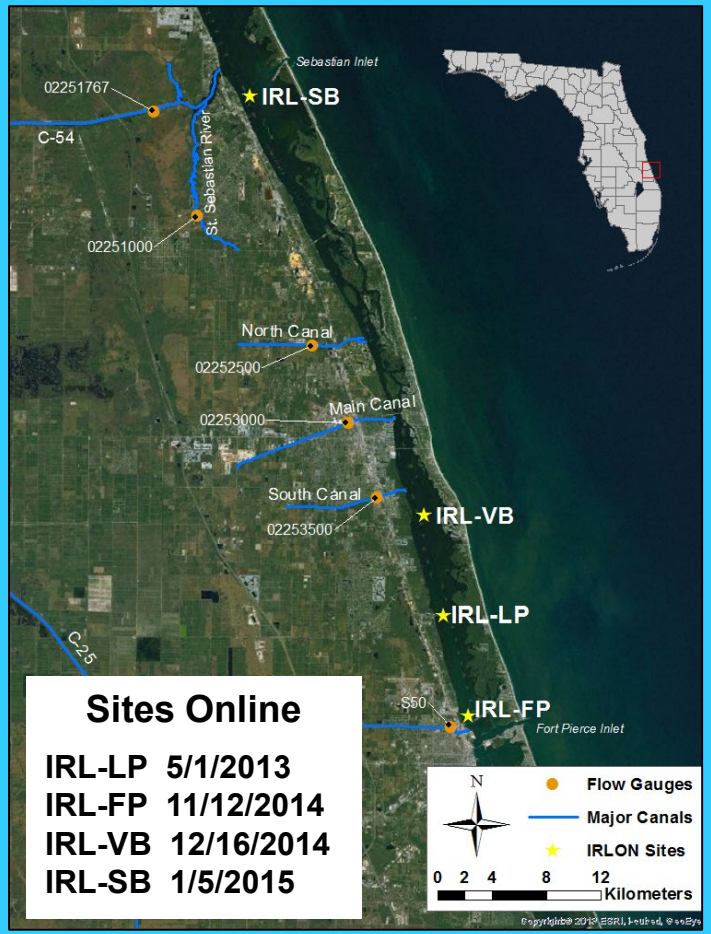
- **Provide real-time environmental data via a publicly accessible website**
- **Enable researchers to follow environmental changes in these estuaries and create the ability to do comparative studies on the east and west coasts of Florida**
- **Assist resource and planning managers to make informed decisions for the good of the IRL & SLE**
- **Model and correlate environmental data to biological, chemical, and physical phenomena of the IRL & SLE**
- **Create a platform for education and outreach activities**

Questions to Address with IRLO Network

- How do freshwater discharges and watershed runoff impact water quality in the Indian River Lagoon and St. Lucie Estuary?
  - What is the nutrient (nitrate, phosphate) load?
  - What is the impact on light attenuators (impact on seagrass)?
  - What is the relationship to algal blooms?
- How does water from these freshwater discharges interact with oceanic water flowing through the inlets?

IRLON Sites

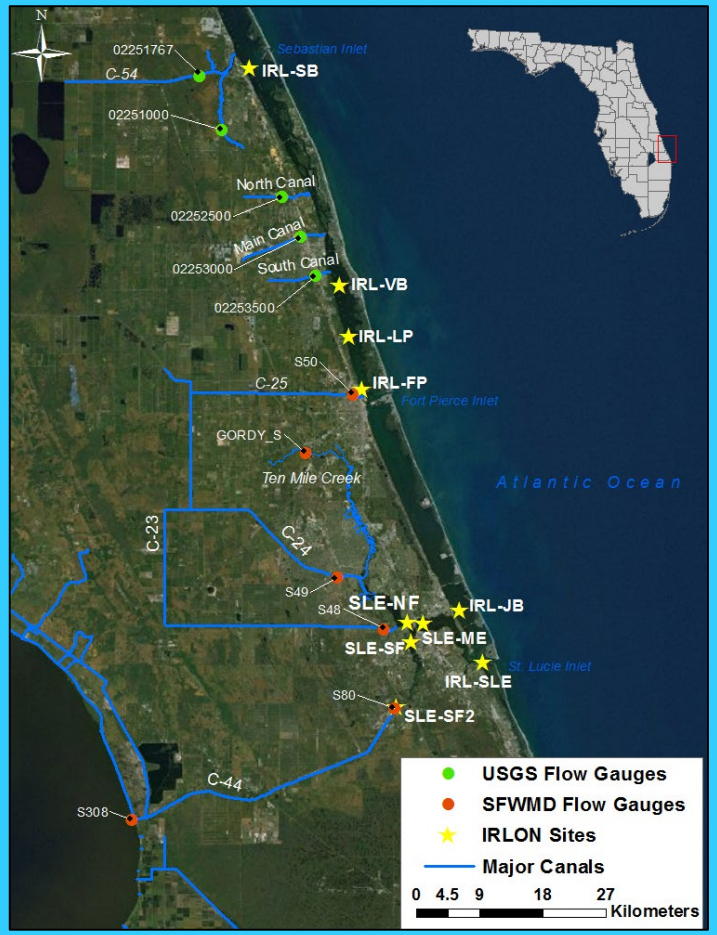


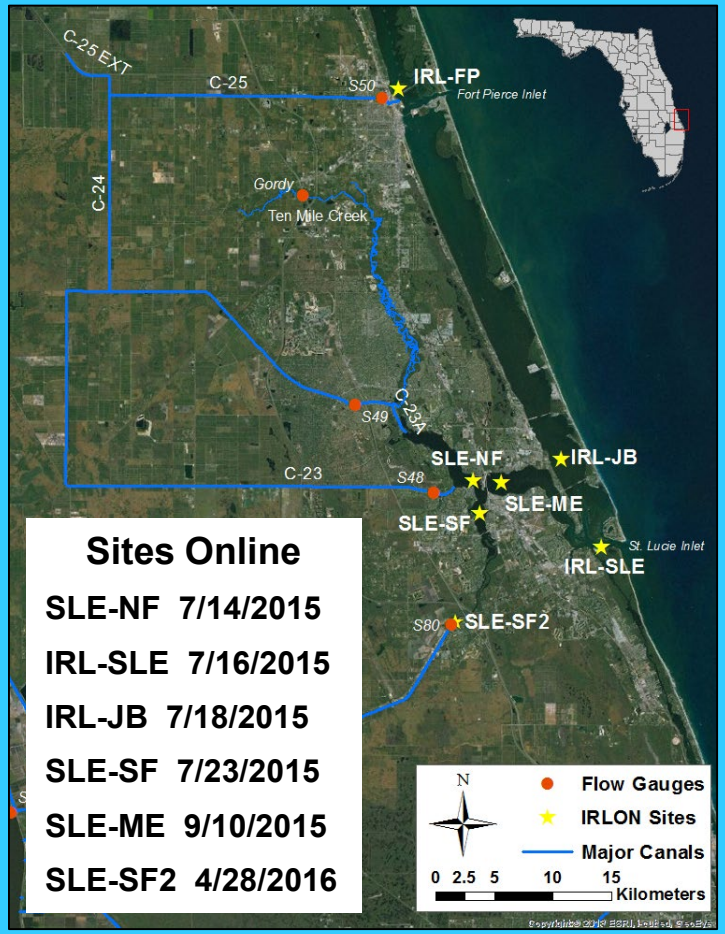


Sites Online

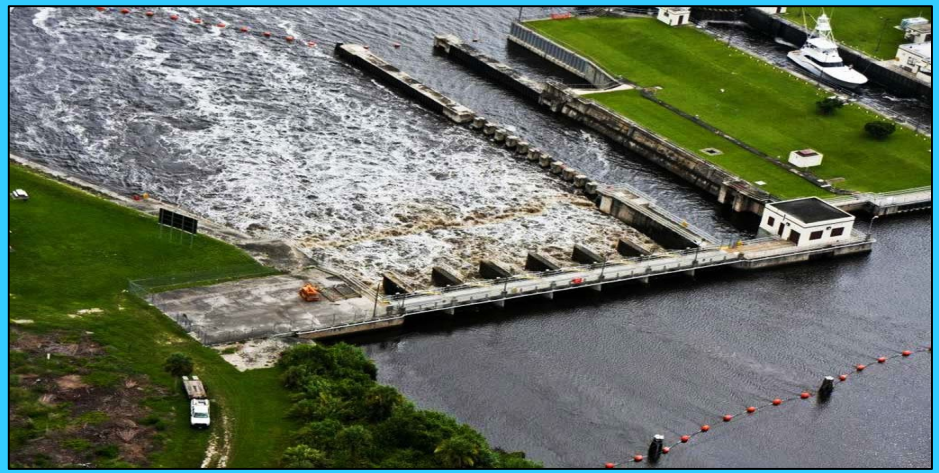
IRL-LP 5/1/2013
IRL-FP 11/12/2014
IRL-VB 12/16/2014
IRL-SB 1/5/2015

IRLON Sites

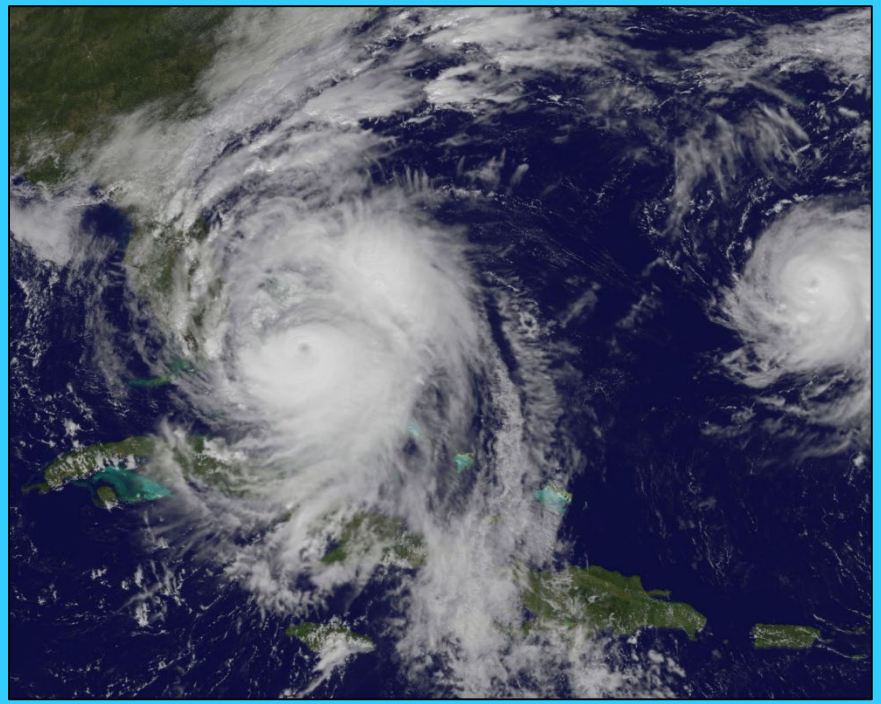

N
02251767
C-54
Sebastian Inlet
IRL-SB
02251000
North Canal
02252500
Main Canal
02253000
South Canal
IRL-VB
02253500
IRL-LP
S50
C-25
IRL-FP
Fort Pierce Inlet
GORDY_S
Ten Mile Creek
Atlantic Ocean
C-23
C-24
S49
S48
SLE-NF
IRL-JB
SLE-ME
SLE-SF
St. Lucie Inlet
IRL-SLE
S80
SLE-SF2
C-44
S308
USGS Flow Gauges
SFWMD Flow Gauges
IRLON Sites
Major Canals
0 4.5 9 18 27
Kilometers


C-25 EXT
C-25
S50
IRL-FP
Fort Pierce Inlet
C-24
Gordy
Ten Mile Creek
S49
C-23A
C-23
S48
SLE-NF
IRL-JB
SLE-ME
SLE-SF
St. Lucie Inlet
IRL-SLE
S80
SLE-SF2
Sites Online
SLE-NF 7/14/2015
IRL-SLE 7/16/2015
IRL-JB 7/18/2015
SLE-SF 7/23/2015
SLE-ME 9/10/2015
SLE-SF2 4/28/2016
N
Flow Gauges
IRLON Sites
Major Canals
0 2.5 5 10 15
Kilometers

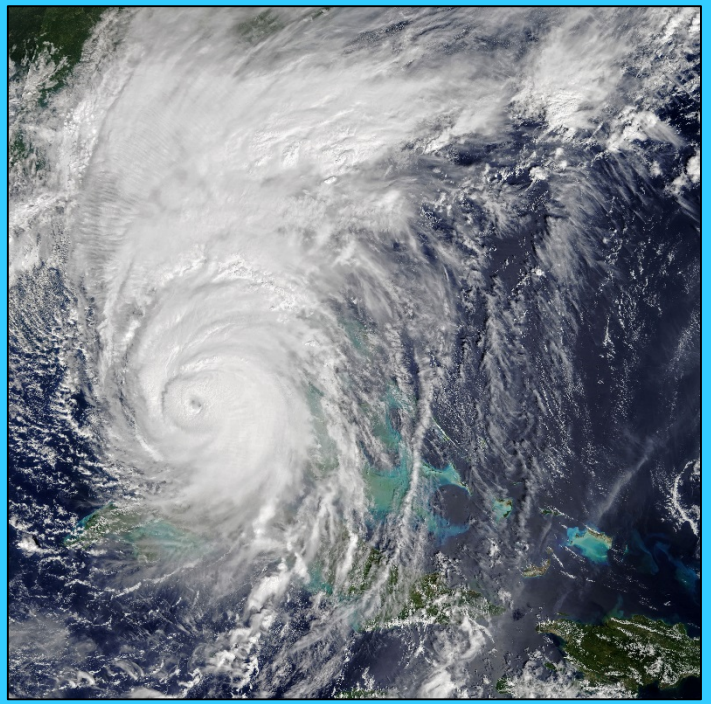
Impacts of Lake Okeechobee Discharges (2016)



Interannual Variability: Hurricane Season

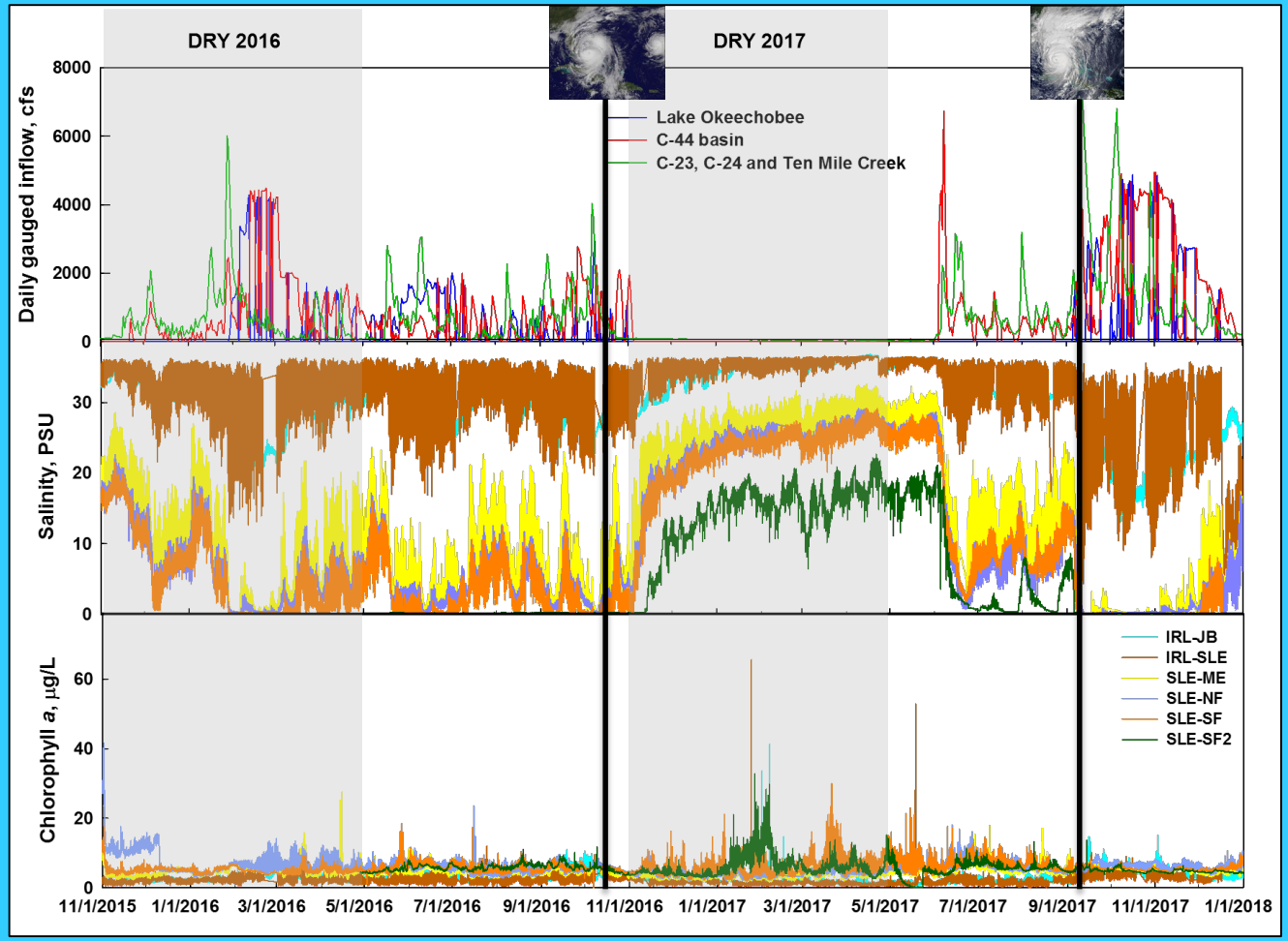


Hurricane Matthew
October 2016

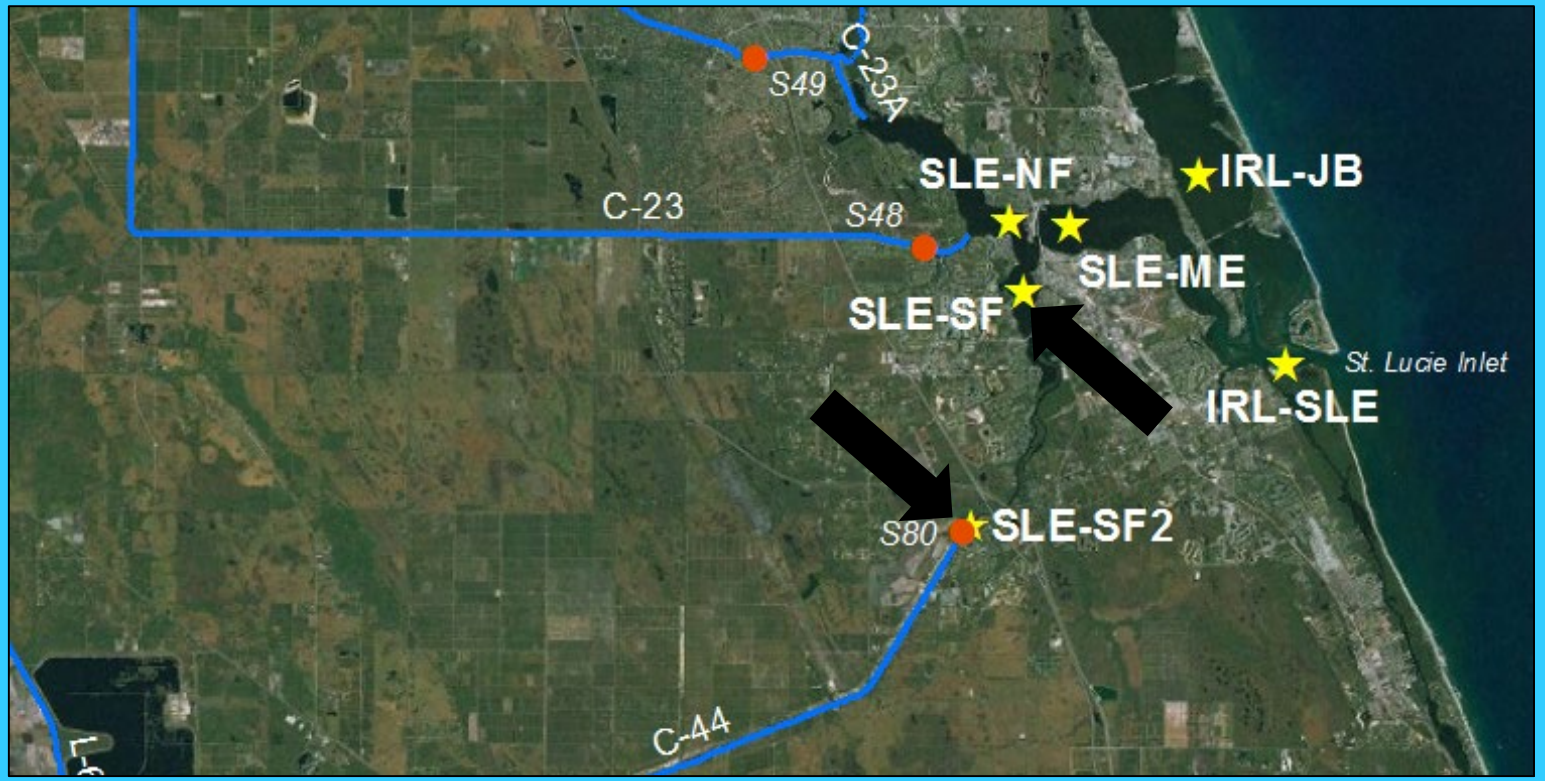


Hurricane Irma
September 2017

IRLON – Southern Network (11/2015 – 12/2017)

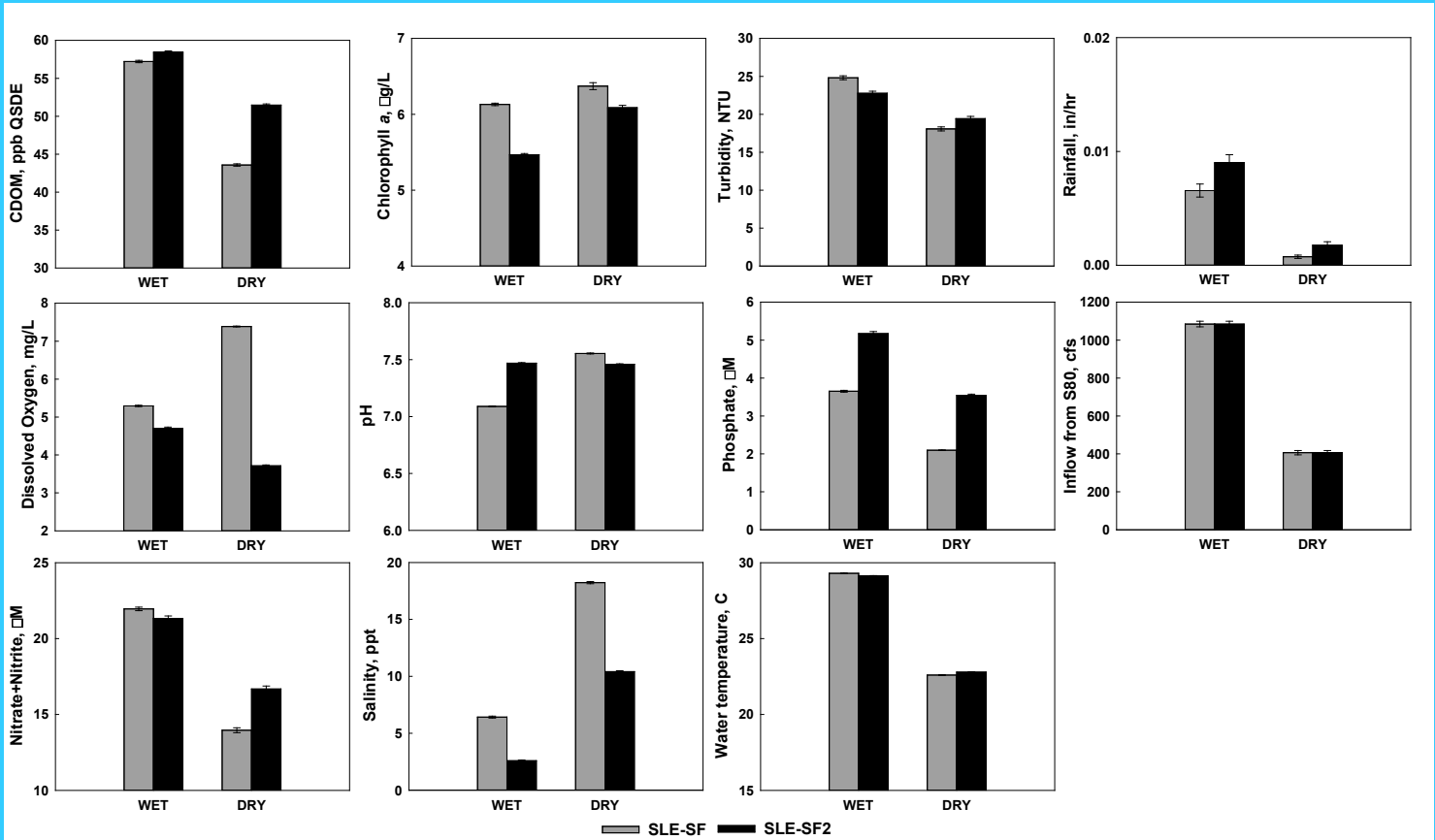


IRLON Southern Network

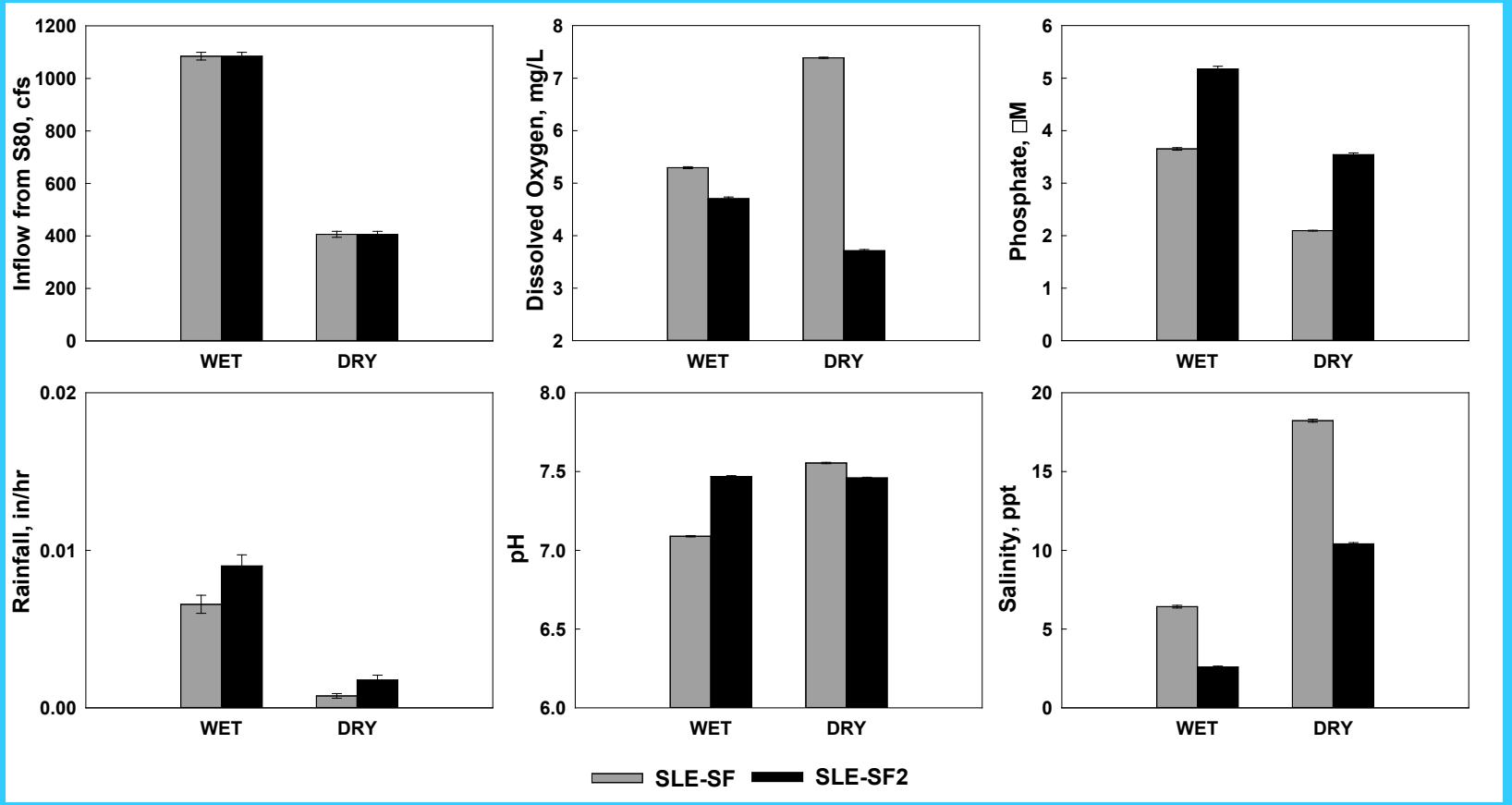


How does flow from Lake O, or lack of, influence water quality in the South Fork of the St. Lucie Estuary?

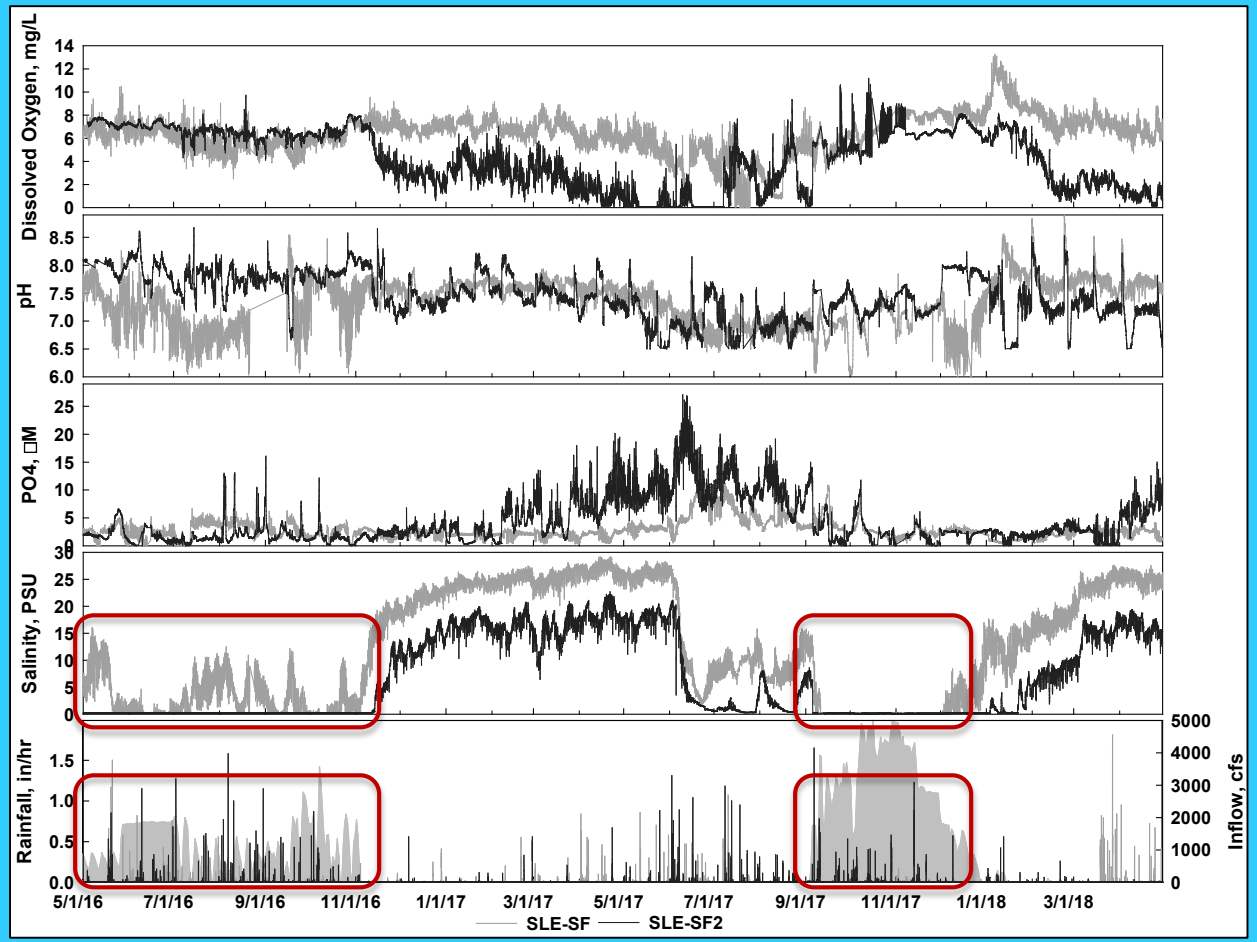
SLE-SF vs. SLE-SF2 (Wet vs. Dry Season)
May 2016 – April 2018



SLE-SF vs. SLE-SF2 (Wet vs. Dry Season)
May 2016 – April 2018

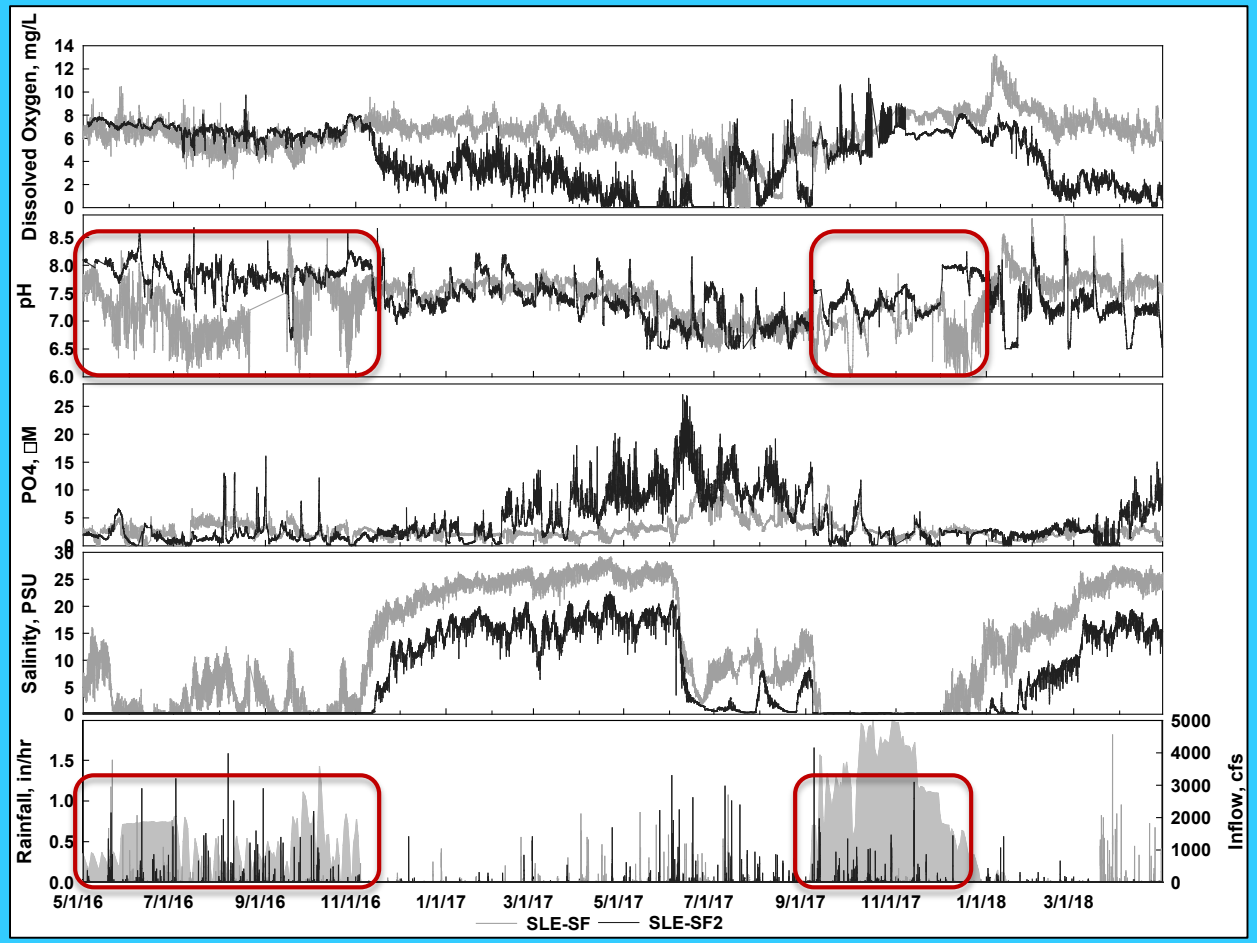


SLE-SF vs. SLE-SF2 (May 2016 – April 2018)



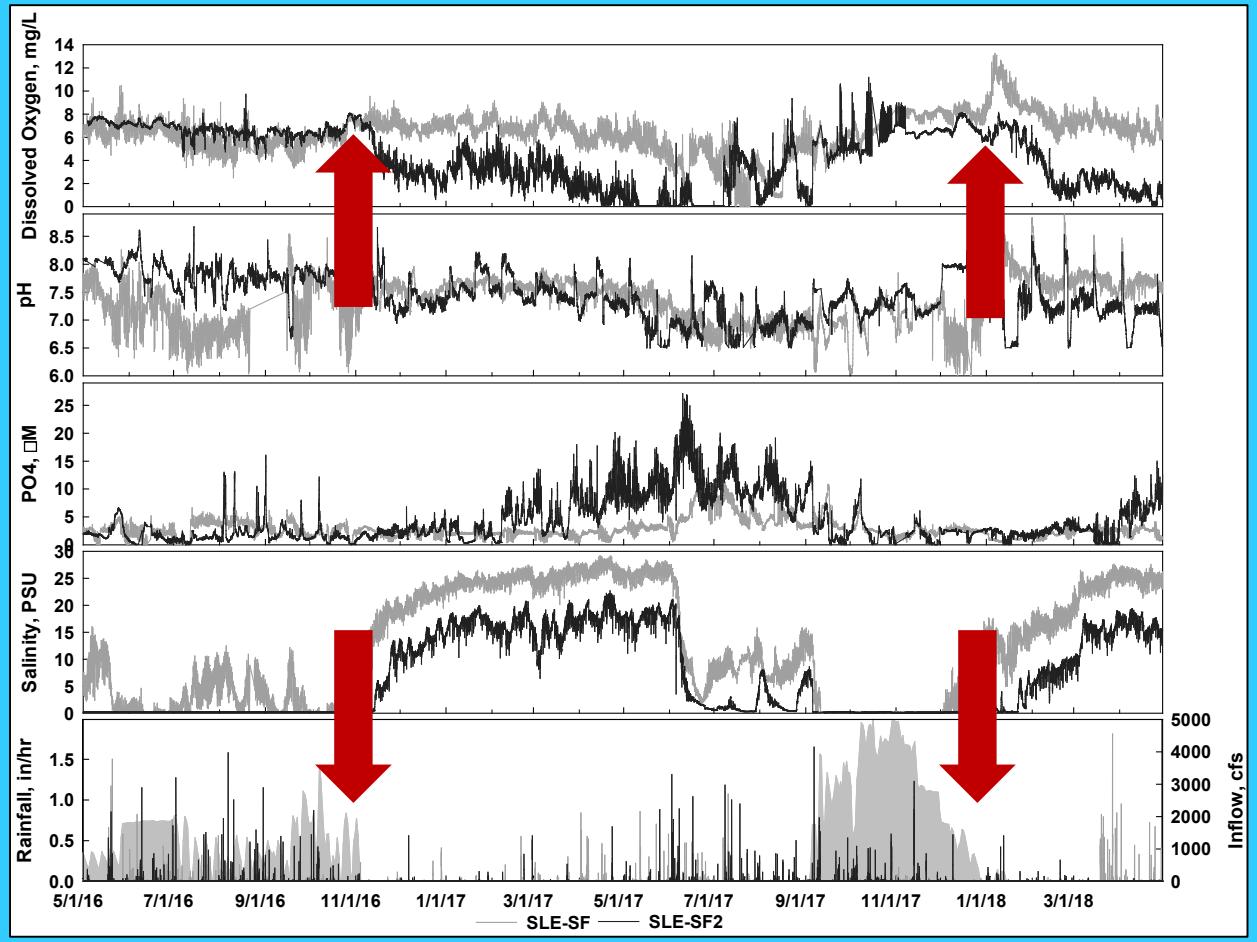
When Lake O flows are strong, SF2 is completely a freshwater system (as is SF at times)

SLE-SF vs. SLE-SF2 (May 2016 – April 2018)



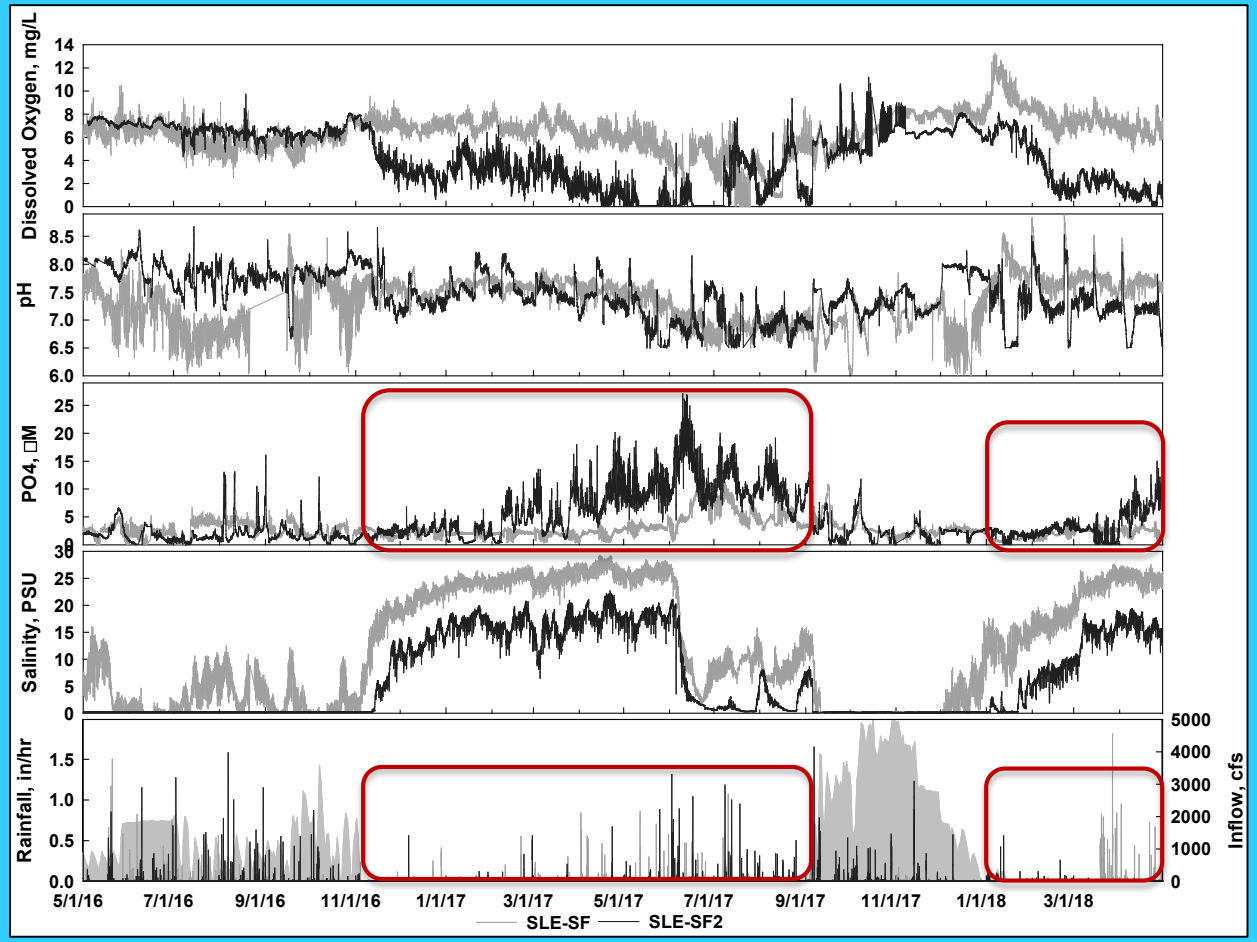
When Lake O flows are strong, pH is depressed downstream at SF2

SLE-SF vs. SLE-SF2 (May 2016 – April 2018)



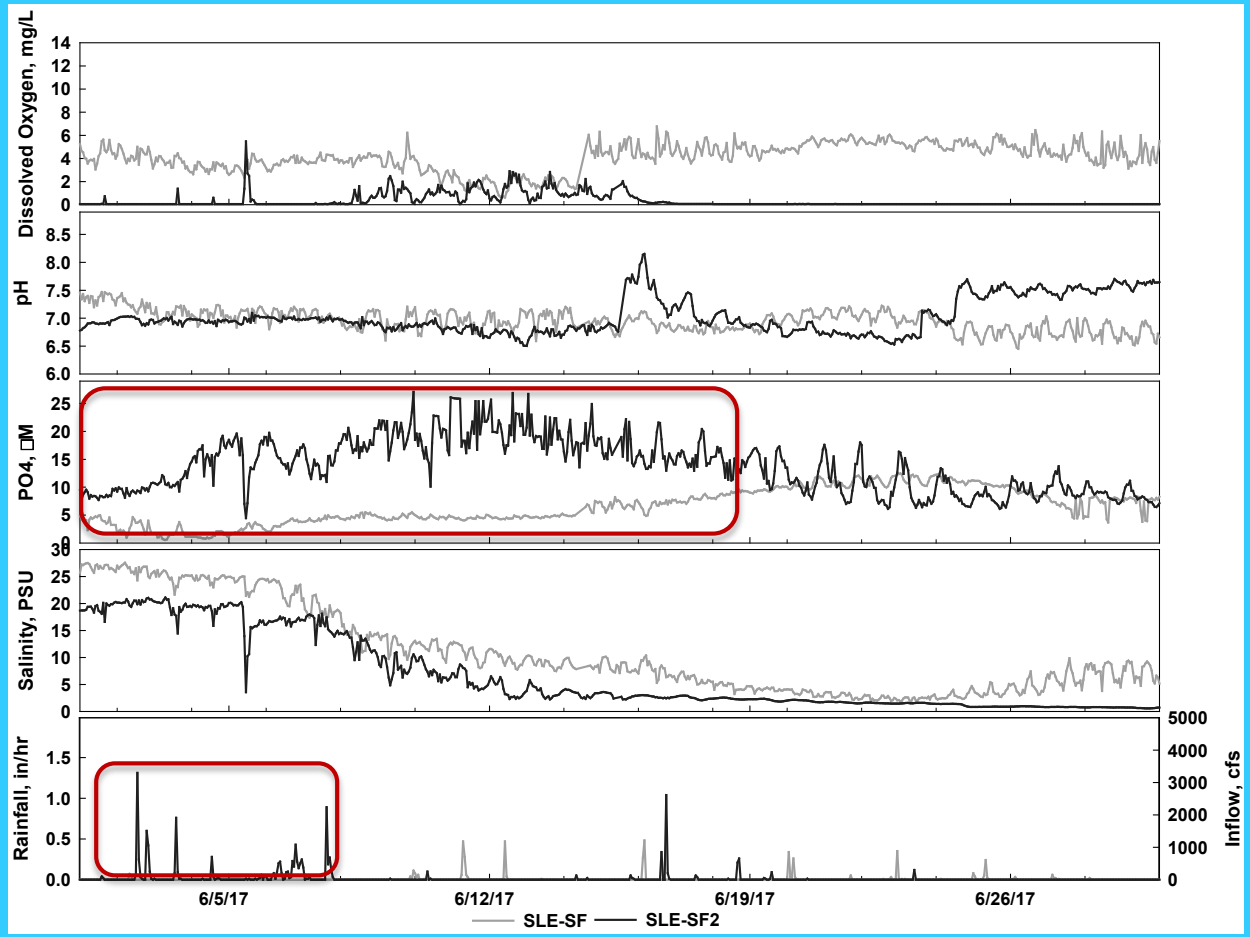
When Lake O flows drop, DO drops sharply at SF2

SLE-SF vs. SLE-SF2 (May 2016 – April 2018)



When Lake O flows stop,
PO_4 is elevated at SF2

SLE-SF vs. SLE-SF2 – First Flush (June 2017)



When Lake O is not flowing, and there is precipitation, SF2 is well positioned to capture the effects of local runoff

Concluding Remarks

- The location of IRLON's SLE-SF2 site is unique compared to other IRLON sites; conditions change rapidly based on the flow, or lack of flow, of freshwater from the C-44 canal
- The parameters most impacted in the SLE by that flow are salinity, pH, phosphate, and dissolved oxygen
- During periods of heavy discharge, salinity plummets and the site is in essence a flowing river of fresh water
- When there are prolonged periods without flow from the C-44, the site is essentially a stagnant brackish lake, with increasingly anoxic conditions as time since discharge increases
- When precipitation occurs, and when there is no flow from the C-44, this site is positioned to capture the effects of local runoff, such as the spike of phosphate levels during the first flush in June 2017

Concluding Remarks

- High-frequency, continuous observatory data are enabling better quantification and modeling of relationships between environmental factors and biological processes in an estuary with tremendous climate-related interannual variability
- Real-time data enable researchers to follow environmental changes in the SLE and IRL, assist resource and planning managers to make informed decisions, model and correlate environmental data to biological, chemical and physical phenomena, and contribute to education and public outreach on the lagoon.
- Use of continuous data such as those provided by IRLON enhances our ability to understand temporal and spatial variability in estuarine water quality, including major storms which seem to be increasingly frequent

The Indian River Lagoon Observatory Network of Environmental Sensors (IRLON)

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http://fau.loboviz.com/

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