Water Cost Tool and Bay-Delta SCHISM: Towards Fidelity in Planning Questions and Answers

CWEMF

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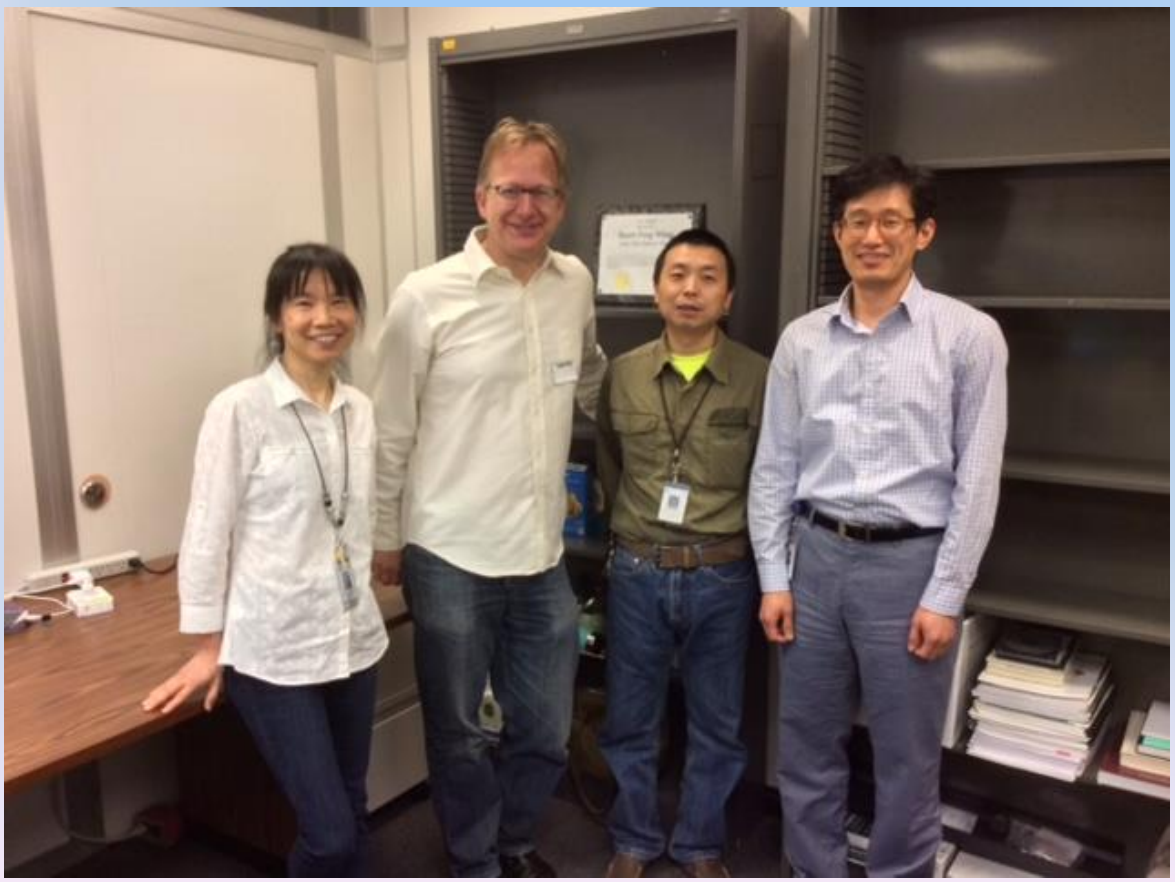
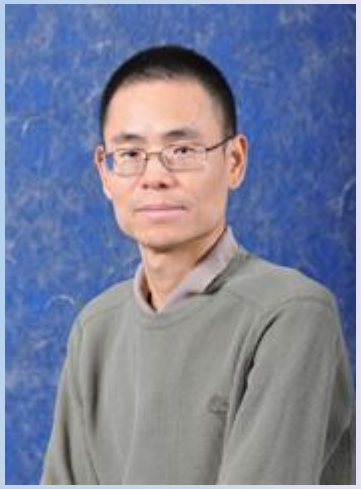
Thanks!

Tara Smith

Francis Chung

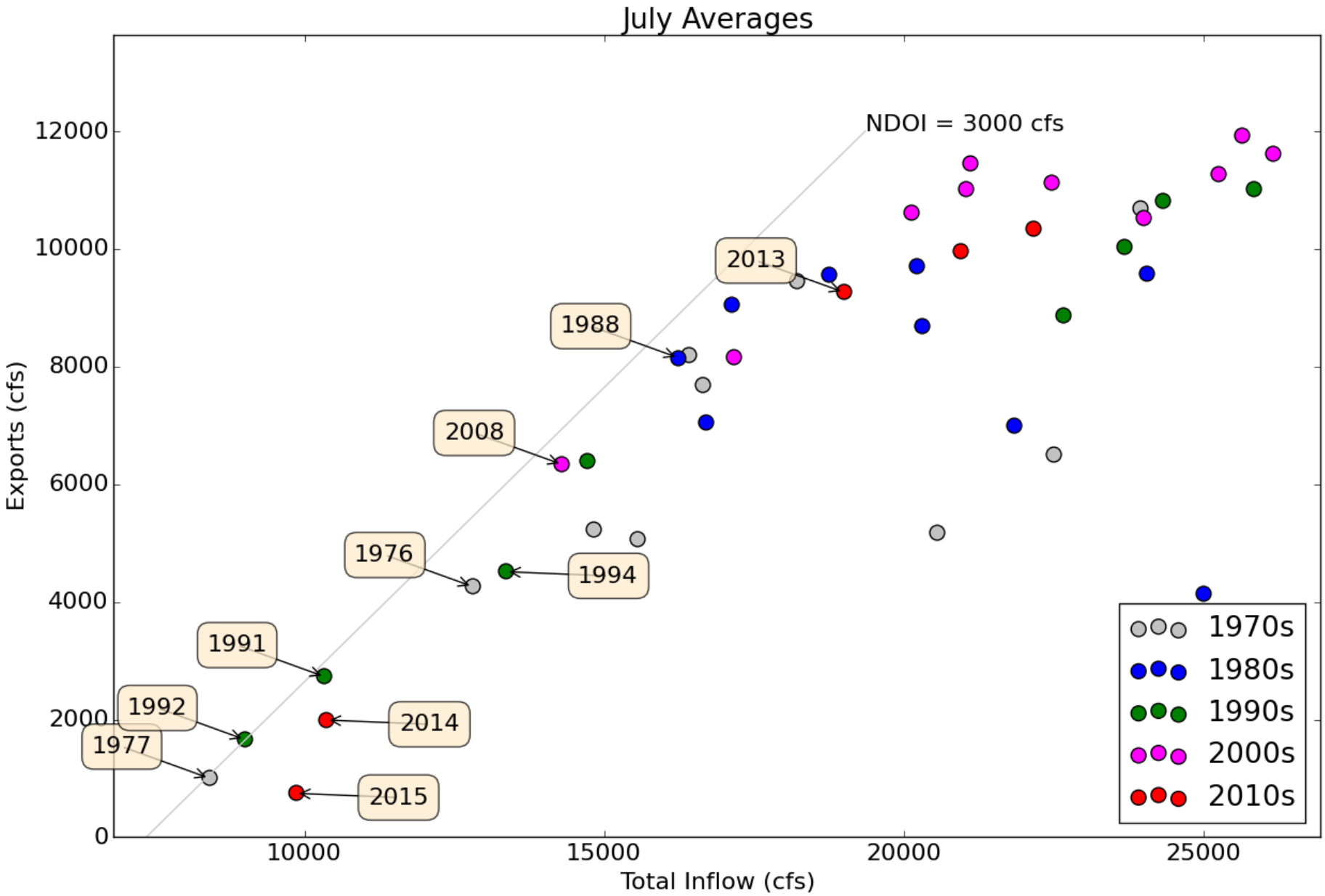


Rueen-fang Wang, Eli Ateljevich, Qiang Shu, Kijin Nam

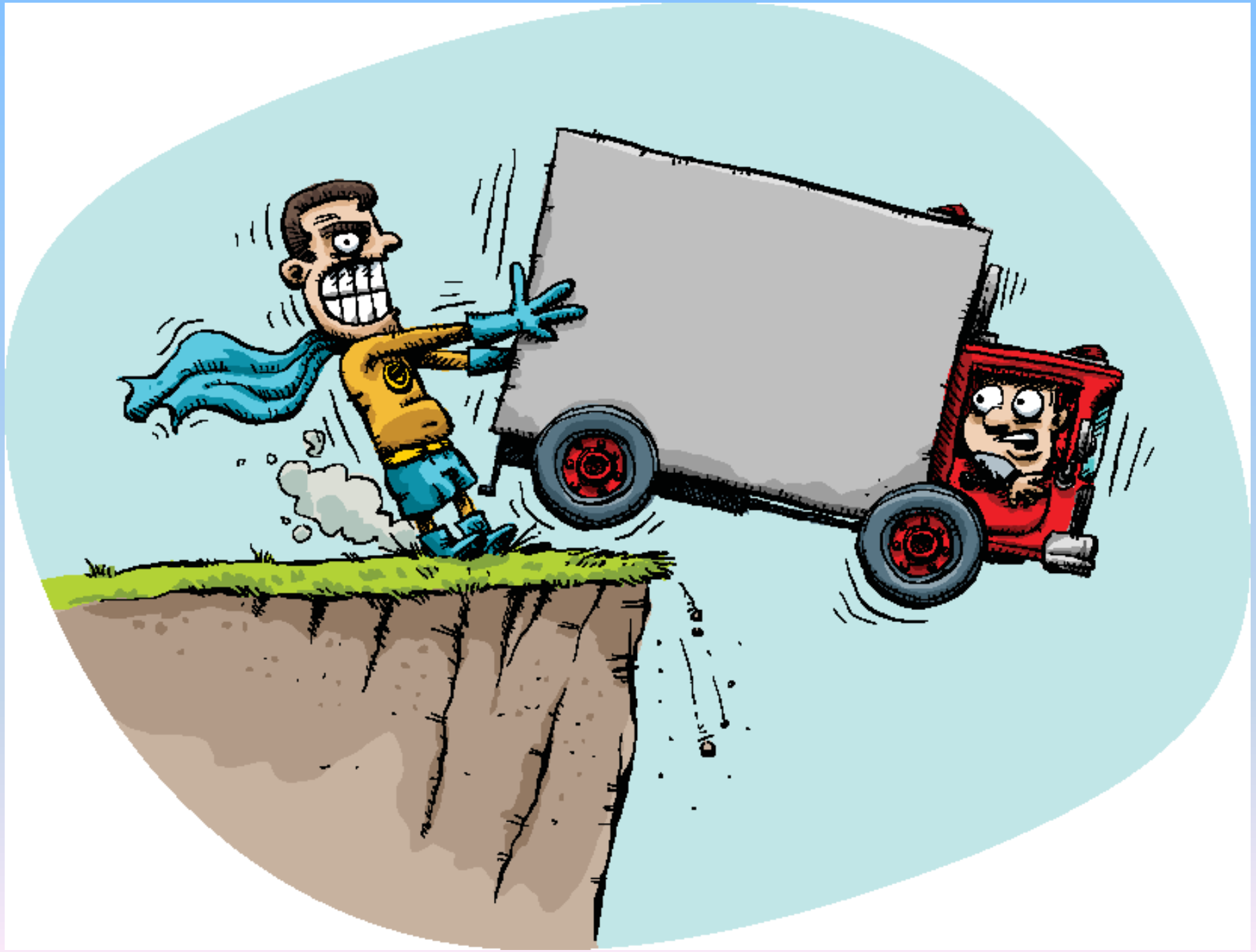


Joseph Zhang, VIMS

Setting the Stage … Drought Barrier



Note: high flow years1983, 1995, 1998, 2011 outside plot bounds



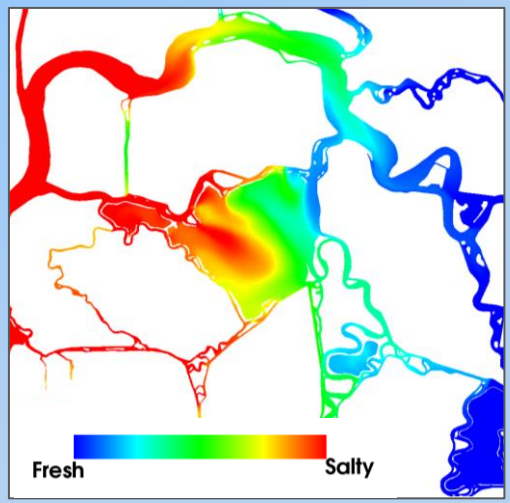
False River Emergency Barrier 2015

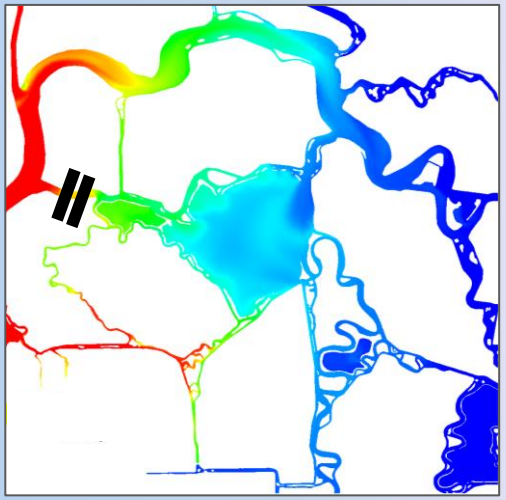
Tidal Pumping

No Barrier

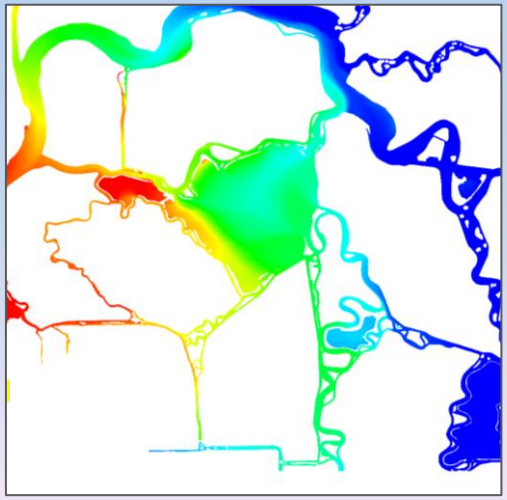
Barrier

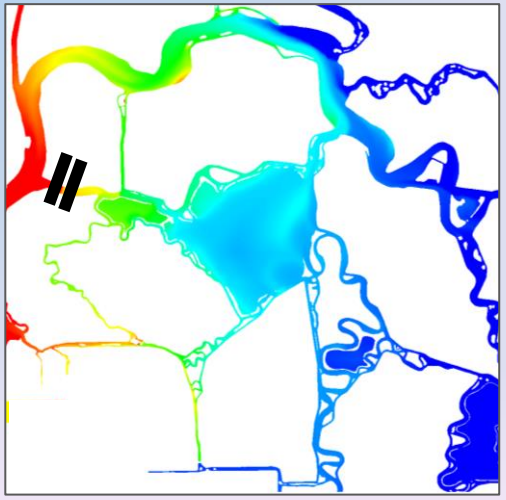
Flood





Ebb



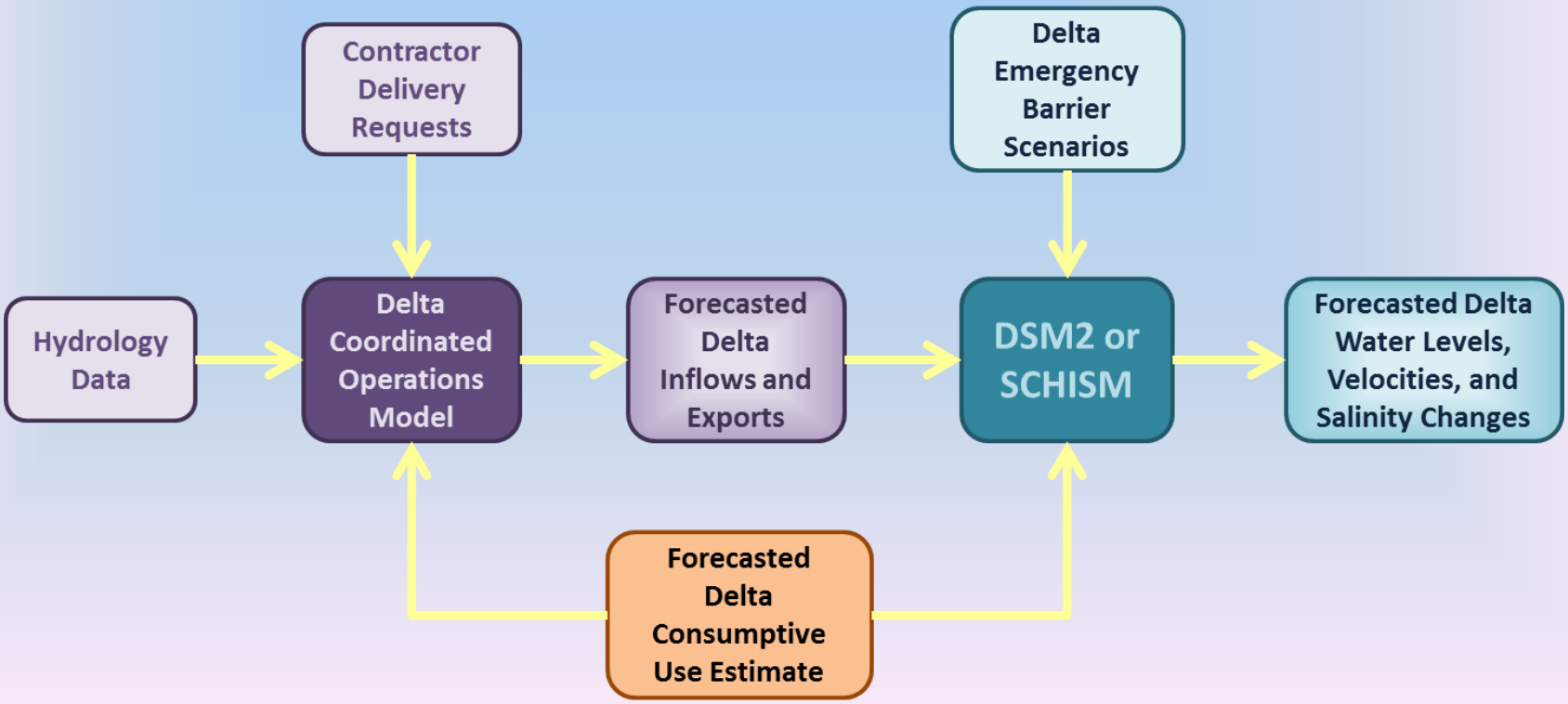


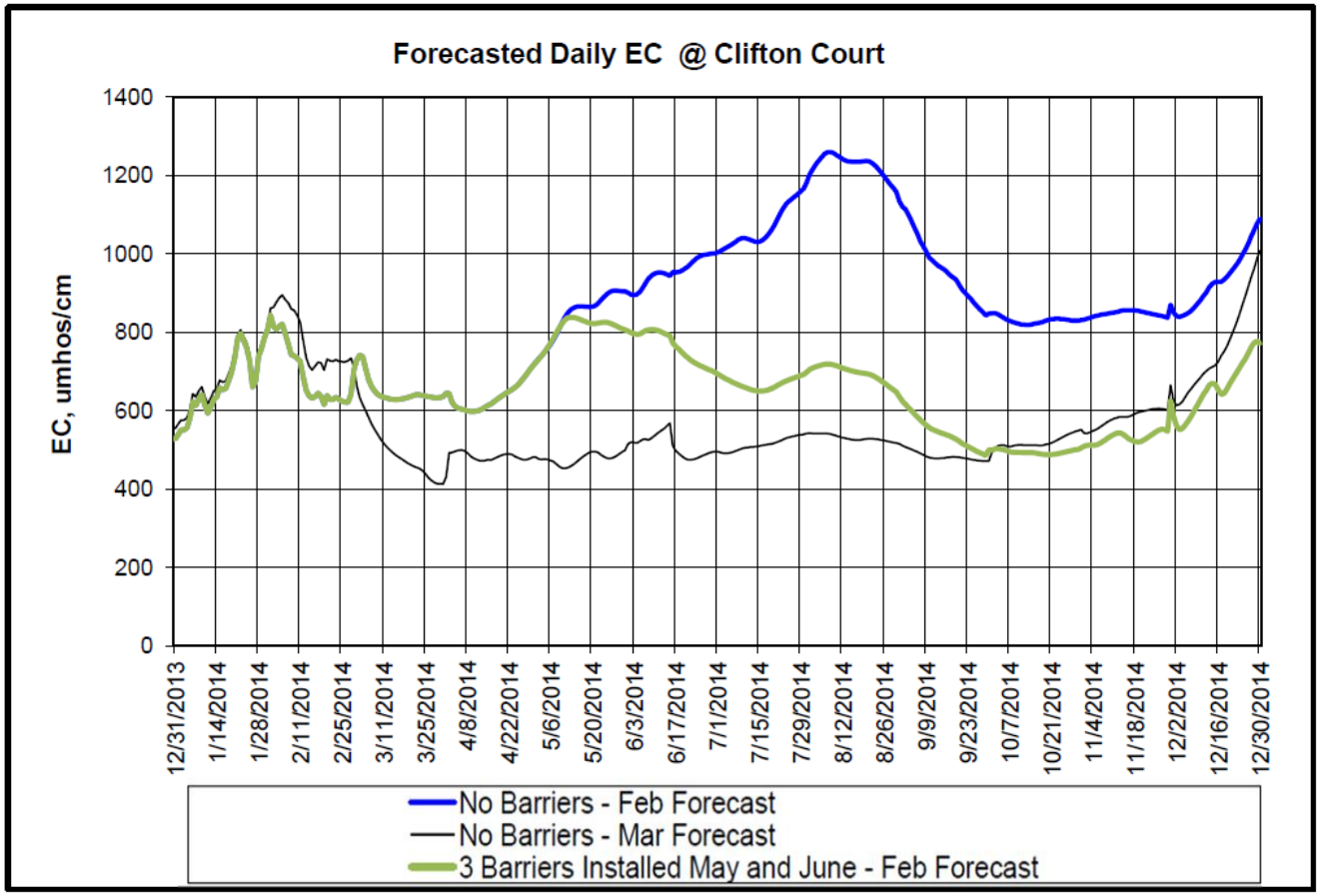
Bay-Delta SCHISM Model, Low NDOI Forecast of salinity

Realistic Questions: Water Cost Analysis

Tradition

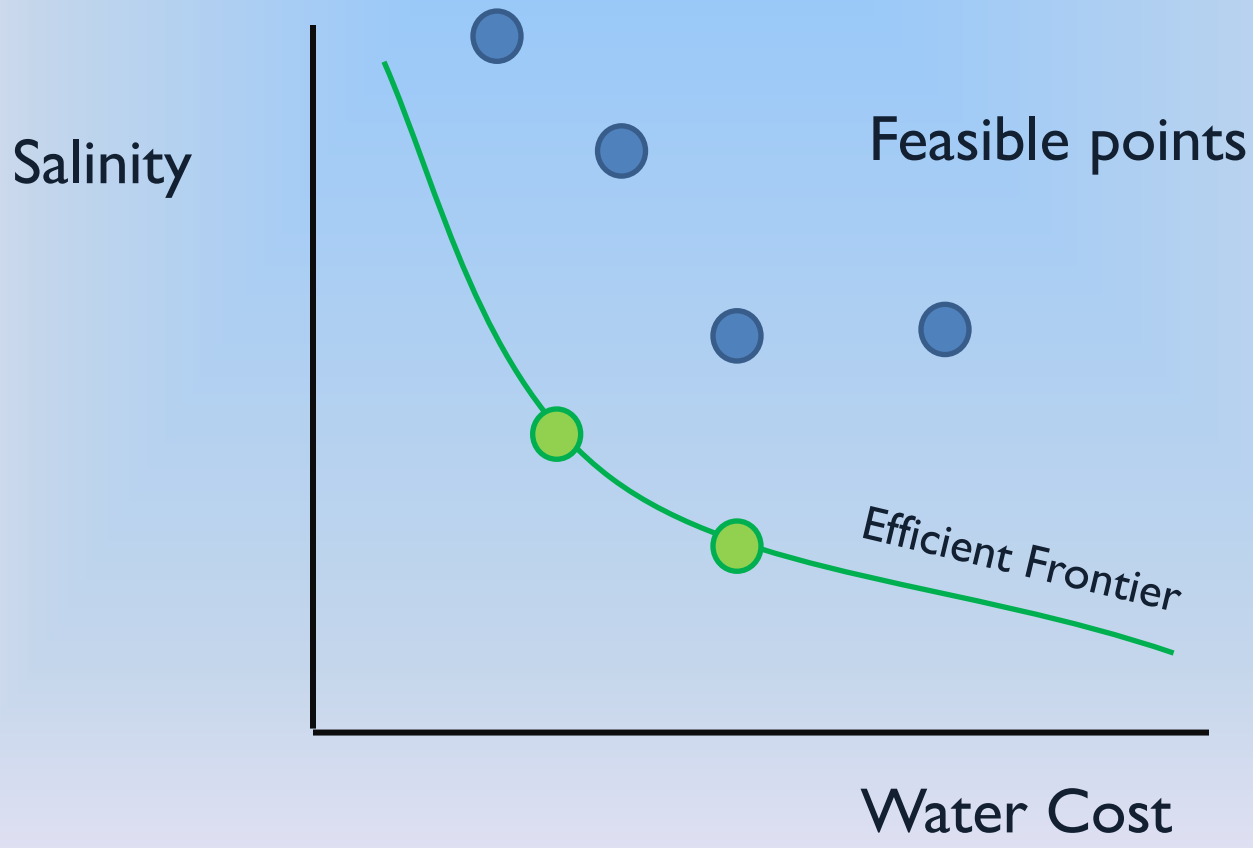
- Simulate *barrier* and *no barrier*, same inputs
- Sensitivity ⇨ defense, appendix

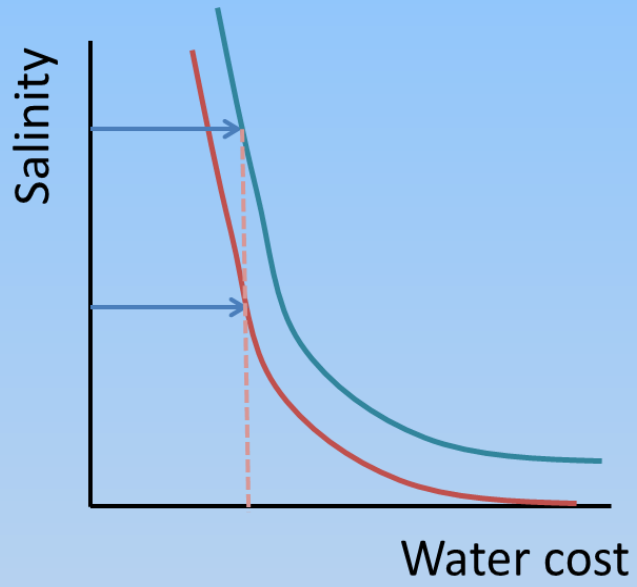



Forecasted Daily EC @ Clifton Court
EC, umhos/cm
1400
1200
1000
800
600
400
200
0
12/31/2013
1/14/2014
1/28/2014
2/11/2014
2/25/2014
3/11/2014
3/25/2014
4/8/2014
4/22/2014
5/6/2014
5/20/2014
6/3/2014
6/17/2014
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
No Barriers - Feb Forecast
No Barriers - Mar Forecast
3 Barriers Installed May and June - Feb Forecast

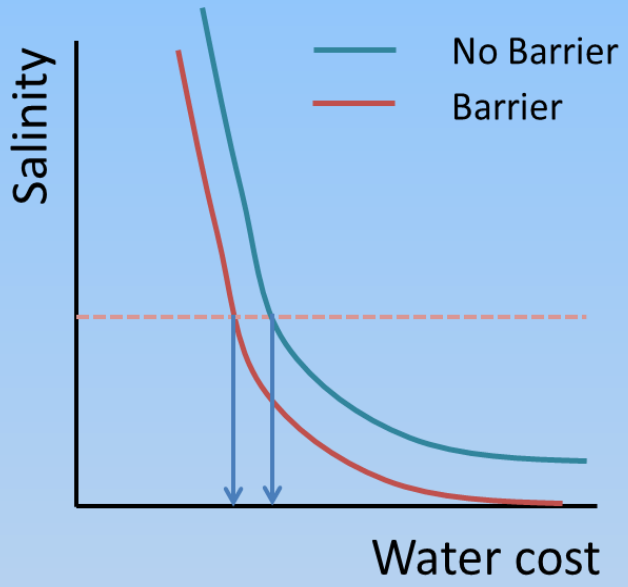
Water Cost Analysis

The Quality-Quantity Frontier





Large salinity change for fixed flow pattern



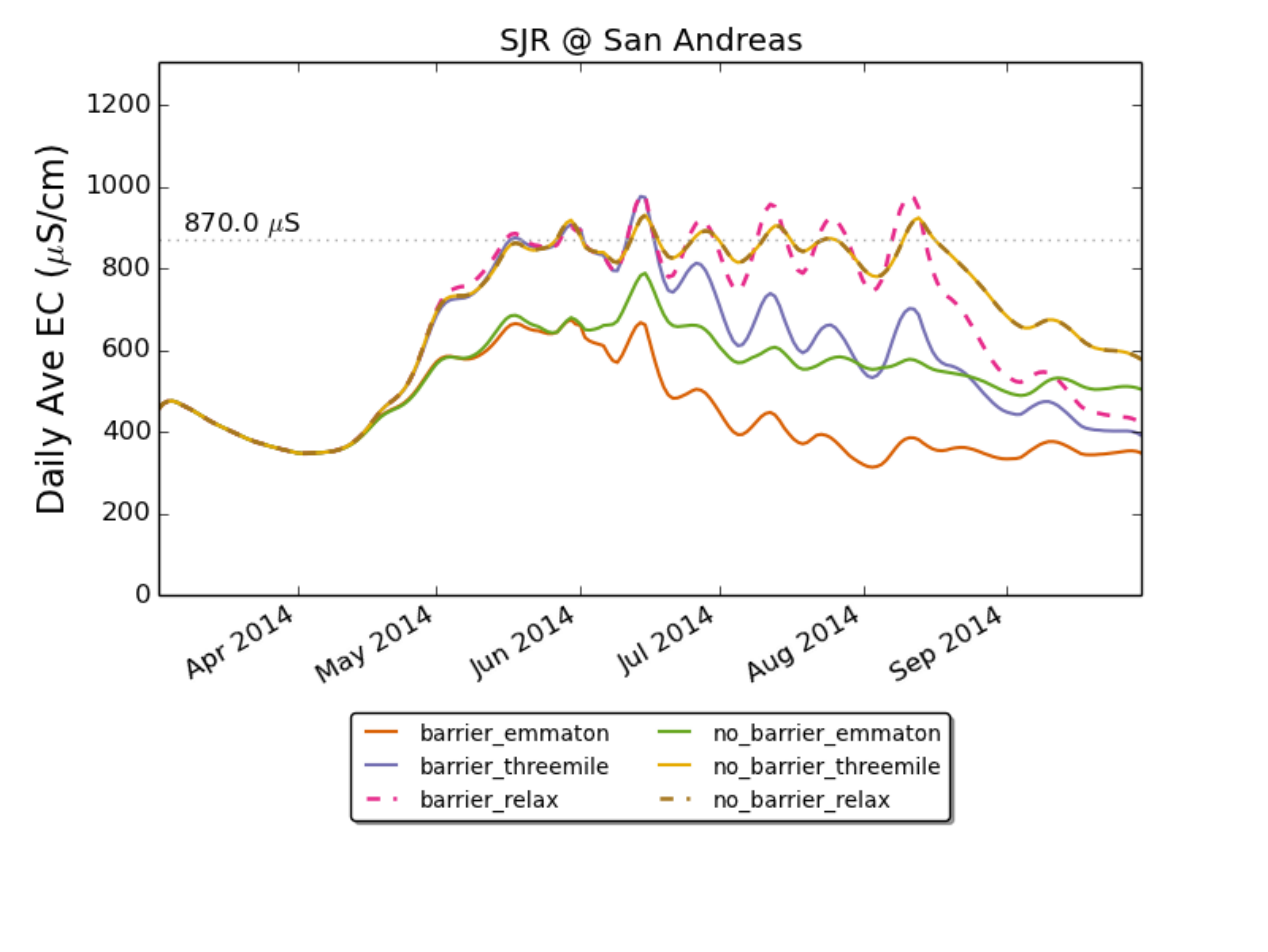
Small water cost savings for fixed salinity constraint

Water cost is a more robust metric.

Water Cost is an Inverse Problem

- Minimize sum of outflow that …
- Meets D-1641 EC (or anything you want)
- Constrained Optimization By Linear Approximation (COBYLA)
- Regularization to get rid of whacky results
- (Most) solutions are “in the calibration zone”

Binding Standards



The Main Result

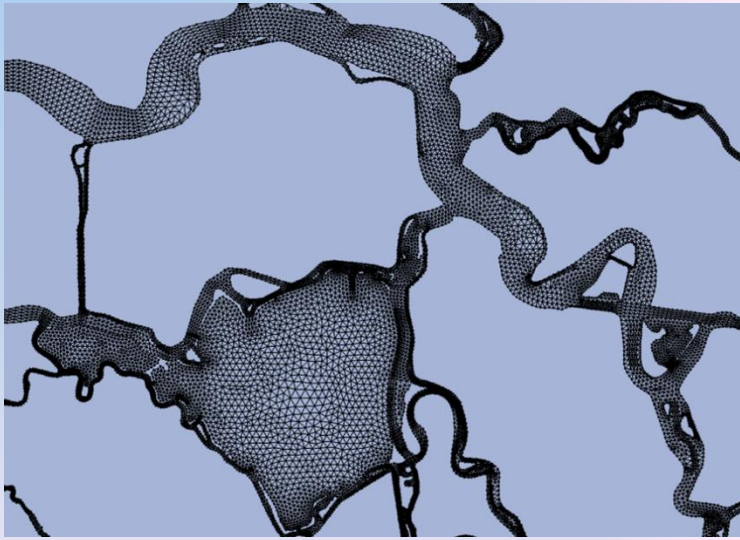
Objective	Emergency Barriers	Without Barriers
Emmaton	3893 cfs	3657 cfs
Three Mile	3050 cfs	3045 cfs
Relaxed	2769 cfs	3045 cfs

1. Compliance point relaxation saves water
2. Barriers yield no further water cost reduction if ag standards on Sac/SJR are limiting
3. Barriers reduce interior salinity and make it possible to safely make use of the relaxed compliance point

Realistic Answers: Bay-Delta SCHISM

Bay-Delta SCHISM

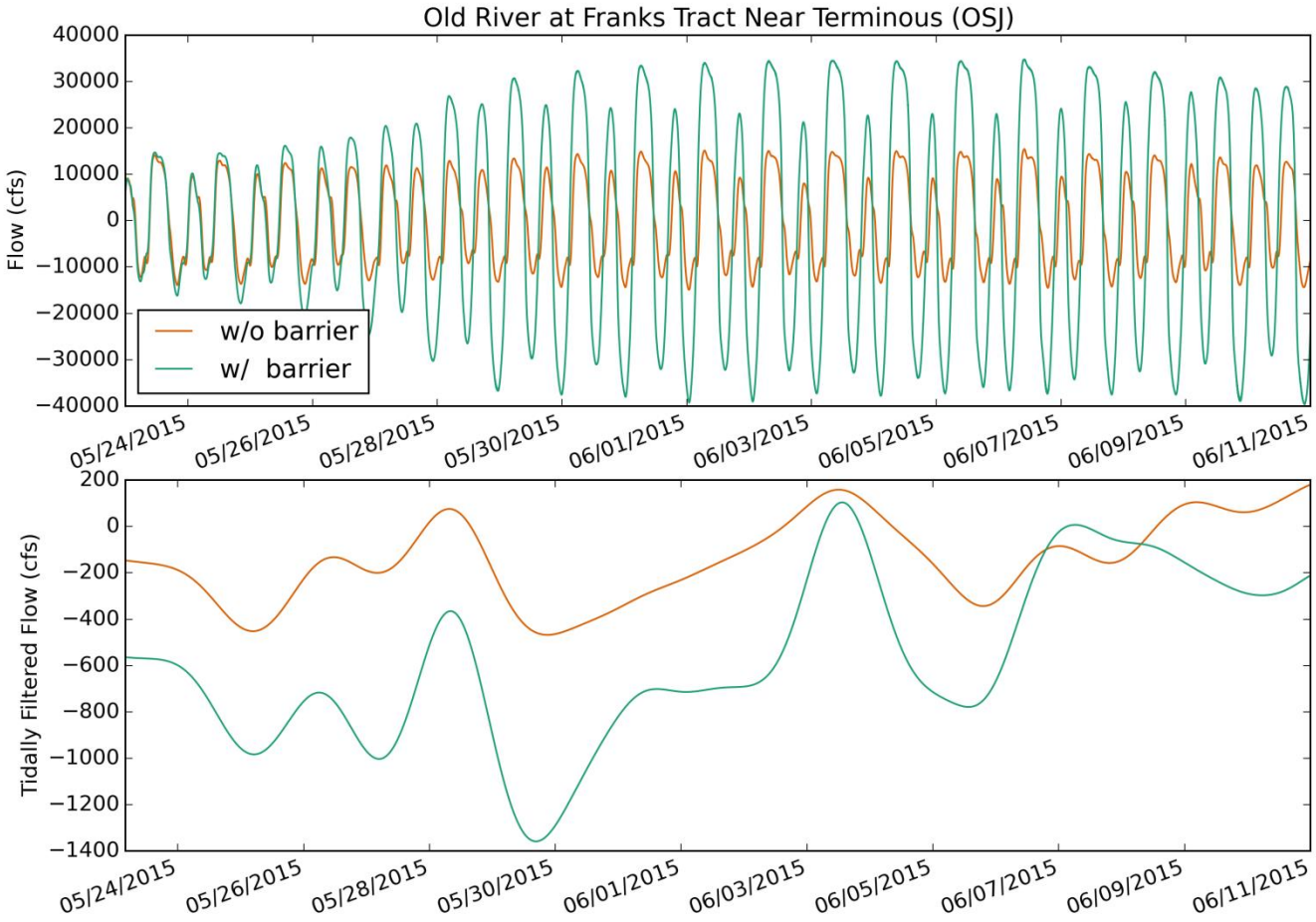
- Under development since 2011
- Collaboration with Virginia Institute of Marine Science (VIMS)
- Public: first workshops in 2015
- Infrastructural intent/scope
- 3D circulation and dynamics
- Resolves primary currents
- Drought was our Big Break



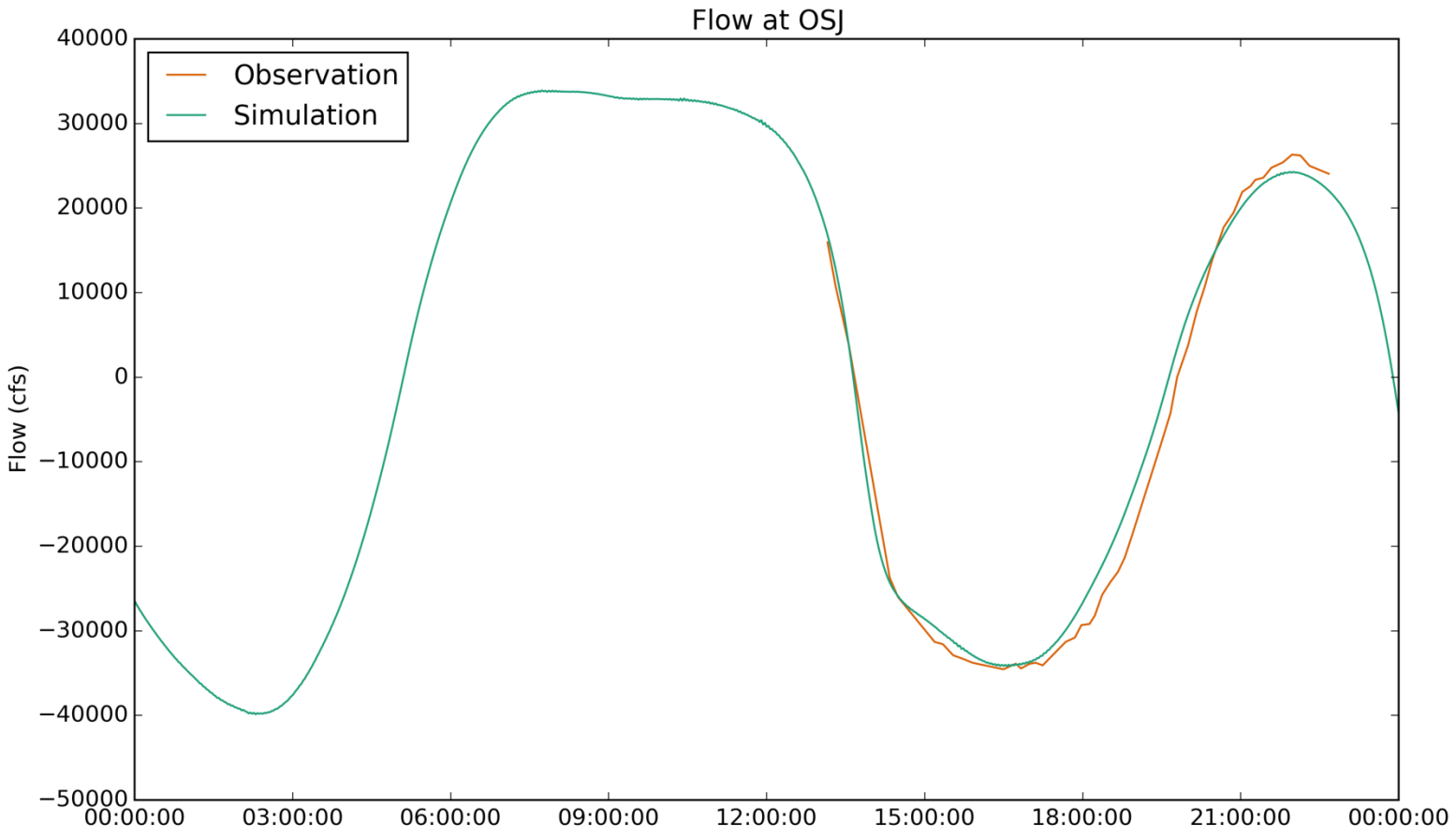
http://baydeltaoffice.water.ca.gov/modeling/deltamodeling/models/bay_delta_schism/

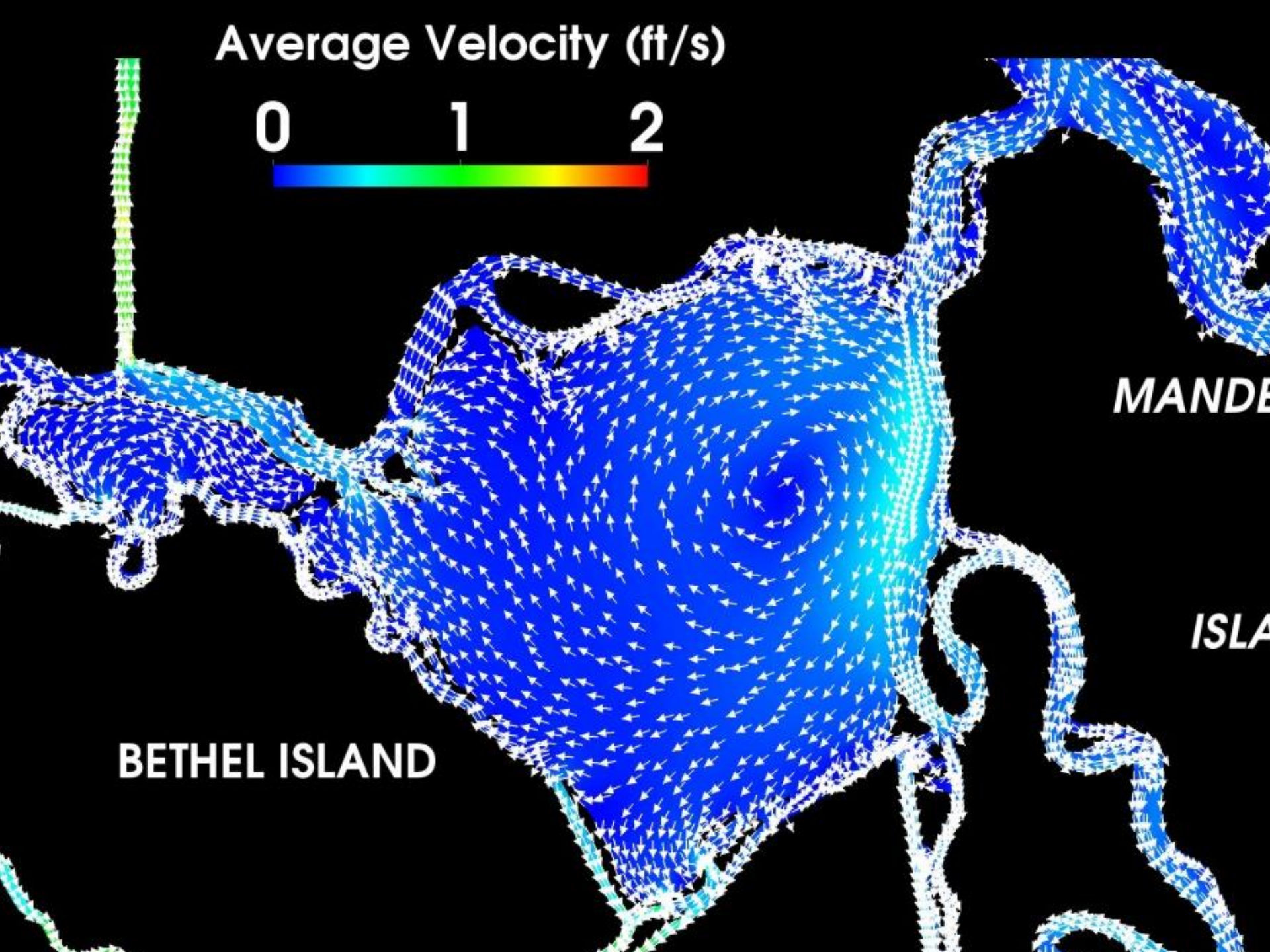
… or just google “Bay-Delta SCHISM”

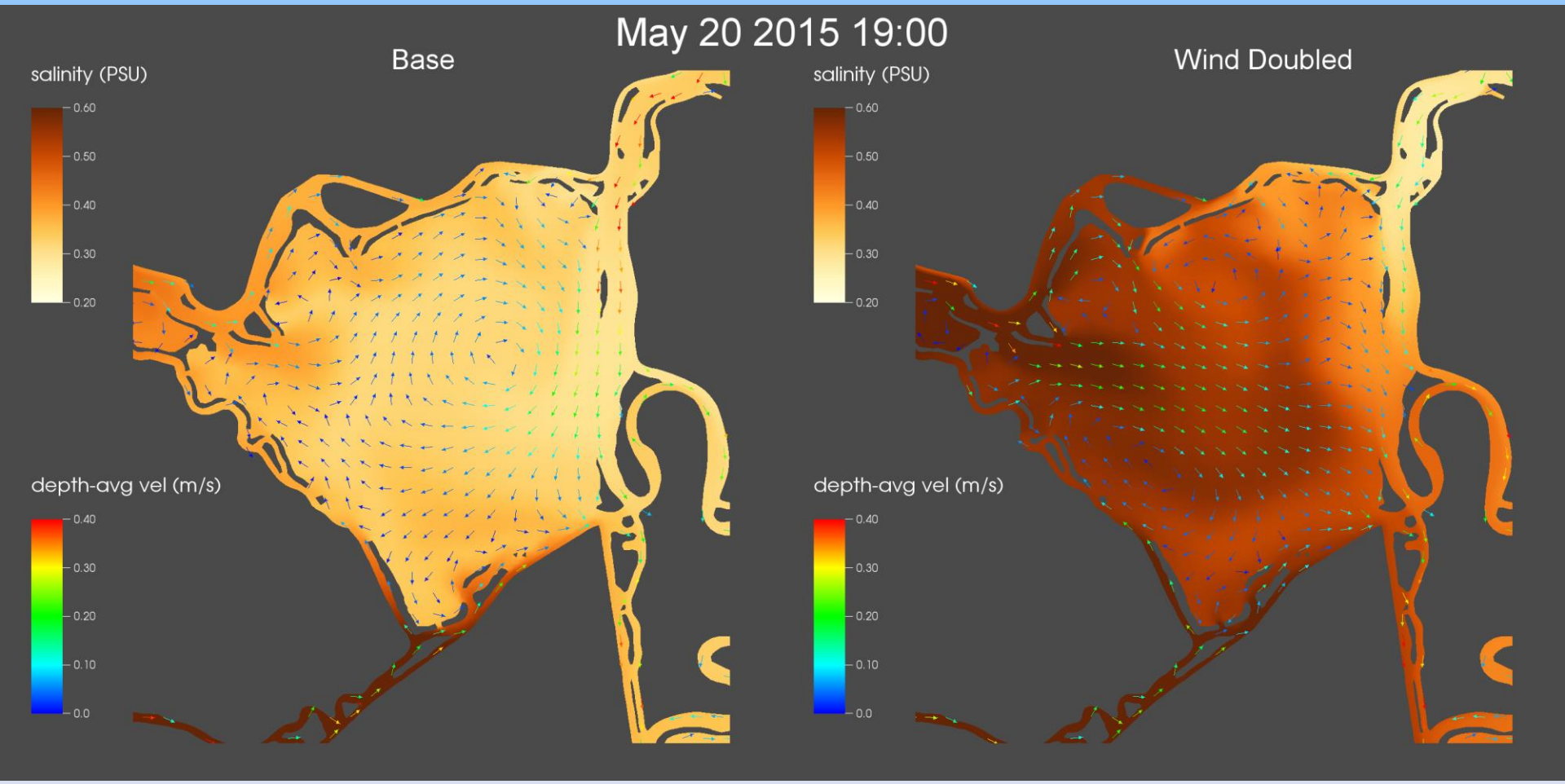
Lots of Plumbing Changes!!

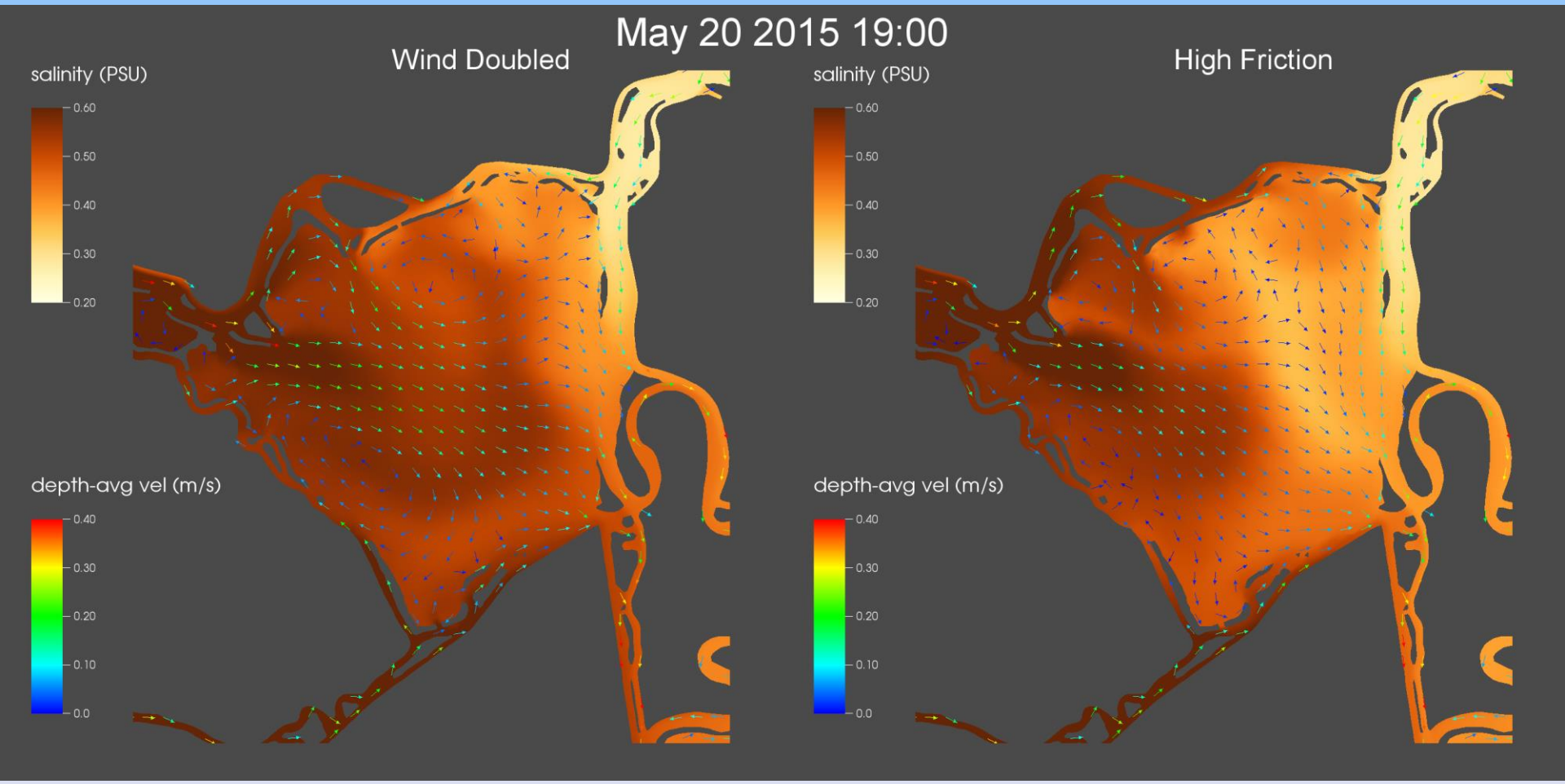


Flow Measurement




Average Velocity (ft/s)
0
1
2
BETHEL ISLAND
MANDE
ISLA


May 20 2015 19:00
Base
Wind Doubled
salinity (PSU)
0.60
0.50
0.40
0.30
0.20
depth-avg vel (m/s)
0.40
0.30
0.20
0.10
0.0


May 20 2015 19:00
Wind Doubled
High Friction
salinity (PSU)
0.60
0.50
0.40
0.30
0.20
depth-avg vel (m/s)
0.40
0.30
0.20
0.10
0.0

Bay-Delta SCHISM Marches On

- Climate Change basis for WSIP
- Nutrients and vegetation on Franks Tract
- Two flavors of Yolo
- Flooded Islands
- Multifidelity algorithms for combining DSM2/SCHISM/surrogates

Parting Thought

- Sometimes the Devil is in the Details

…sometimes he is in the primary flow field

Modeling and Data Analysis