

Salinity and flow variability in Suisun Bay during FLaSH*

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* Fall Low (a) Salinity Habitat (Experiment)

“It was the best of times, it was the worst of times” Tale of Two Cities – C. Dickens

Case 1:09-cv-00407-OWW -DLB Document 1013 Filed 08/31/11 Page 1 of 140	
1	UNITED STATES DISTRICT COURT
2	FOR THE EASTERN DISTRICT OF CALIFORNIA
3	
4	
5	
6	The Consolidated Delta Smelt Cases
7	1:09-cv-00407-OWW-DLB
8	1:09-cv-00480-OWW-GSA
9	1:09-cv-00422-OWW-GSA
10	1:09-cv-00631-OWW-DLB
11	1:09-cv-00892-OWW-DLB
12	FINDINGS OF FACT AND
13	CONCLUSIONS OF LAW RE
14	PLAINTIFFS' REQUEST FOR
15	INJUNCTIVE RELIEF AGAINST
16	IMPLEMENTATION OF RPA
17	COMPONENT 3 (Action 4) (Doc.
18	900)
19	
20	I. INTRODUCTION
21	Plaintiffs State Water Contractors ("SWC"), Metropolitan Water
22	District of Southern California ("MWD" or "Metropolitan"), Kern
23	County Water Agency ("KCWA") and Coalition for a Sustainable Delta
24	("Coalition"), San Luis & Delta Mendota Water Authority (the
25	"Authority") and Westlands Water District ("Westlands") (collectively
26	herein "Plaintiffs"), seek an injunction prohibiting the
27	implementation of Reasonable and Prudent Alternative ("RPA")
28	Component 3, Action 4 (the "Fall X2 Action") set forth in the United
	States Fish and Wildlife Service's ("FWS") December 15, 2008,
	biological opinion ("BiOp"), which addresses the impacts of the
	coordinated operations of the federal Central Valley Project ("CVP")
	and State Water Project ("SWP") on the threatened delta smelt
	(<i>Hypomesus transpacificus</i>). Doc. 900. The California Department of
	1

FLaSH

Set of field measurements carried out in response to court case involving water agencies and USFWS and BiOp regarding placement of X2 in the autumn in wet years.

2011 was a wet year.

Our measurements: Detailed hydrodynamics – flows and salinities throughout Suisun Bay Nov 15, 2011 to January 9, 2012



ADCPs and top-bottom CTDs at all stations except Grizzly Bay and Honker Bay shallows where we had ADVs and single CTDs

Full coverage including CDEC



Salinity Station Summary

Stanford/Cal	CDEC
Sac	RVB
Chipps	Emm/SDI/TMS
CM24	CLL
Port Chicago	PTS
RyerRoe	MAL
Suisun Cut	PCT
Honker	HUN
Grizzly (1)	GOD
Montezuma	FLT
Reserve Fleet	MRZ
Benecia	

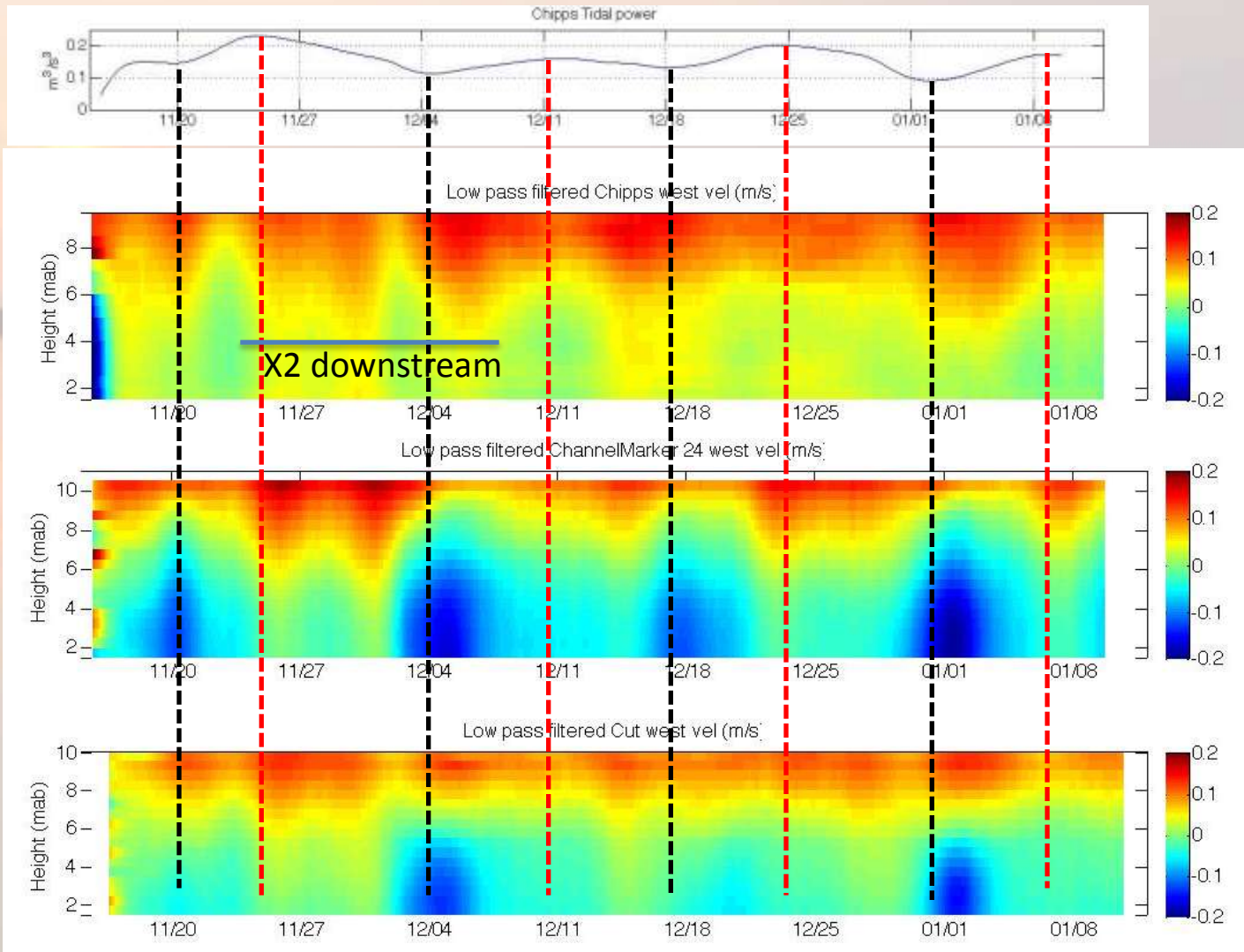
- Notes:
 - Top-bottom CTDs at all Stanford/Cal sites
 - Surface at Ryer Roe may have calibration error
 - Sacramento: lost surface, bottom bad after 12/25
 - Benecia: bottom salinity intermittently bad
 - Honker Bay: Salinity bad

ADCP Station Summary

Station	dates
Sac	11/18/11 - 1/09/12 (with gap)
Chippis	11/18/11 - 1/11/12
CM24	11/18/11 - 1/11/12
Port Chicago	none
RyerRoe	11/18/11 - 12/17/11 (with gap)
Suisun Cut	11/18/11 - 1/11/12
Montezuma	11/18/11 - 12/27/11 (moved)
Reserve Fleet	11/18/11 - 12/27/11
Benecia	11/18/11 - 12/04/11

Gravitational circulation variability

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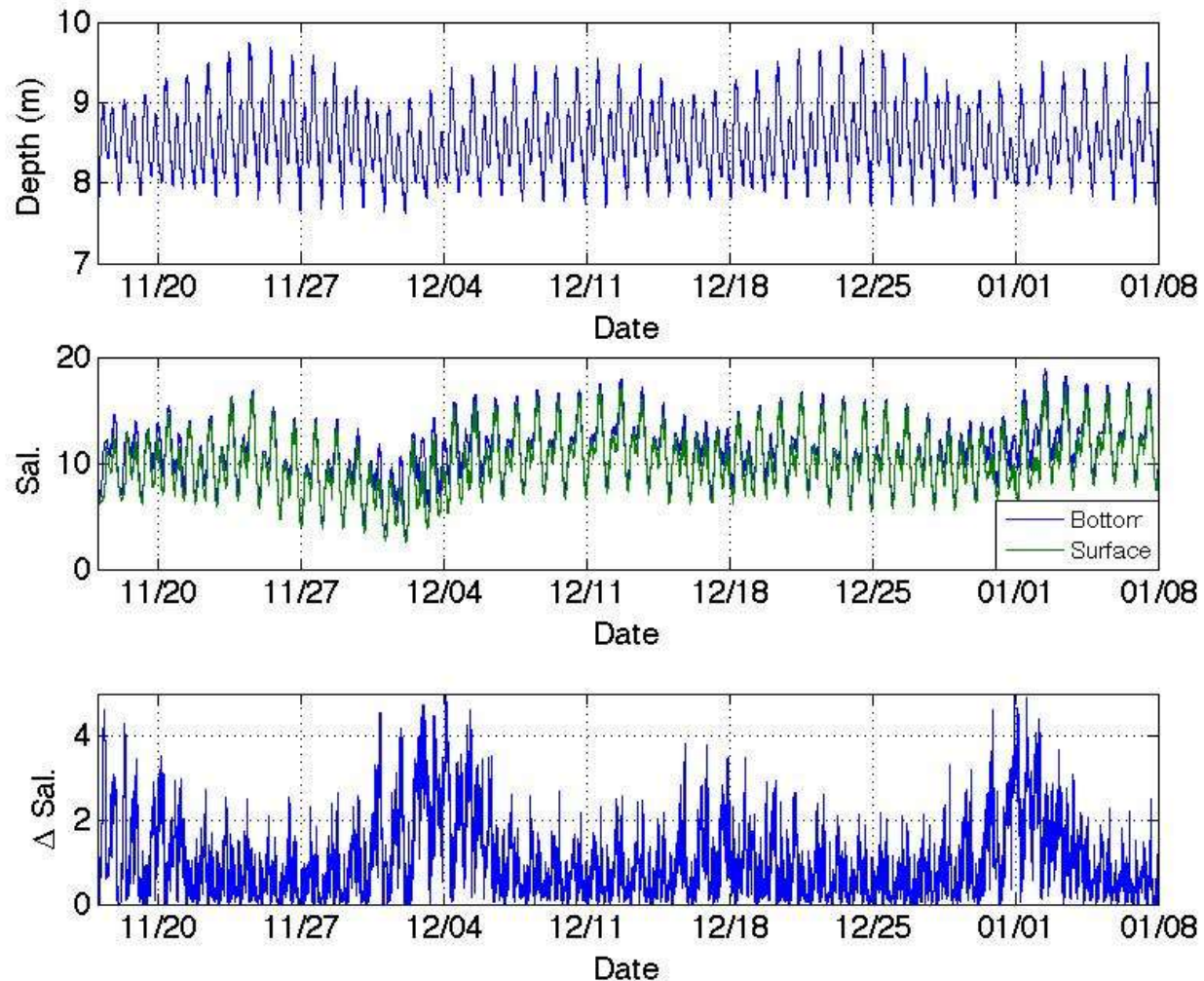


Chipps

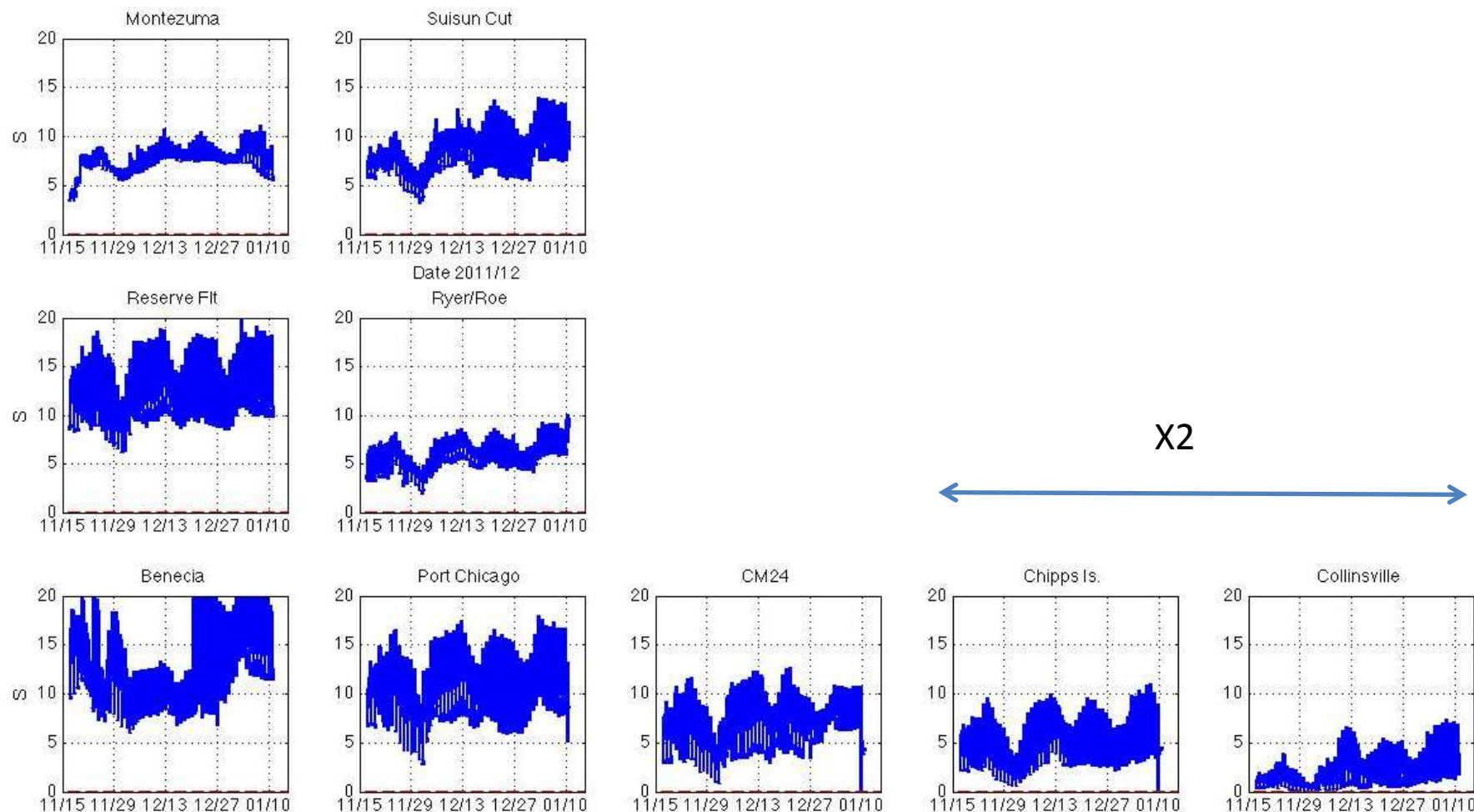
CM24

Cutoff

Typical (best) salinity data: Port Chicago



Salinity variations in Suisun Bay



58

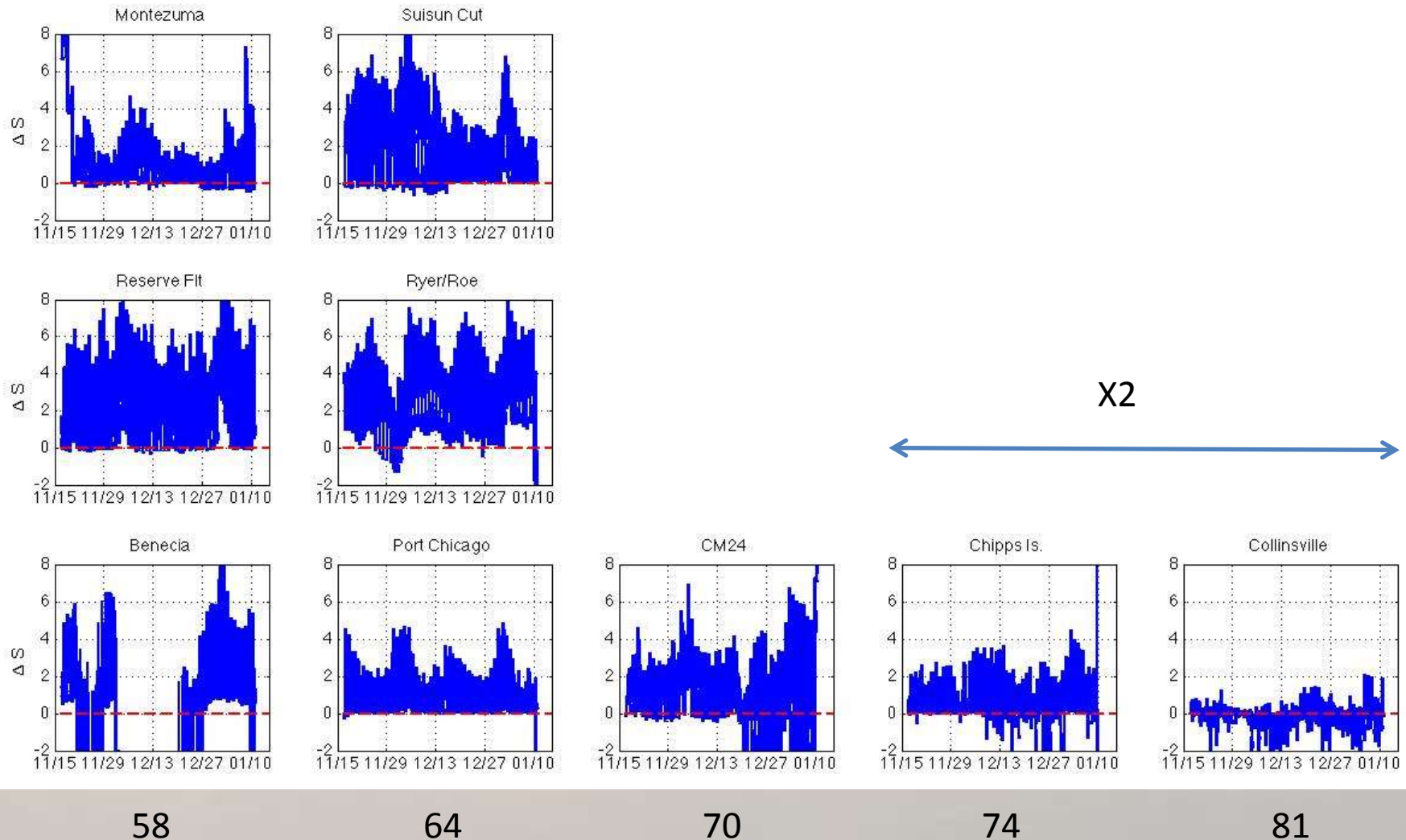
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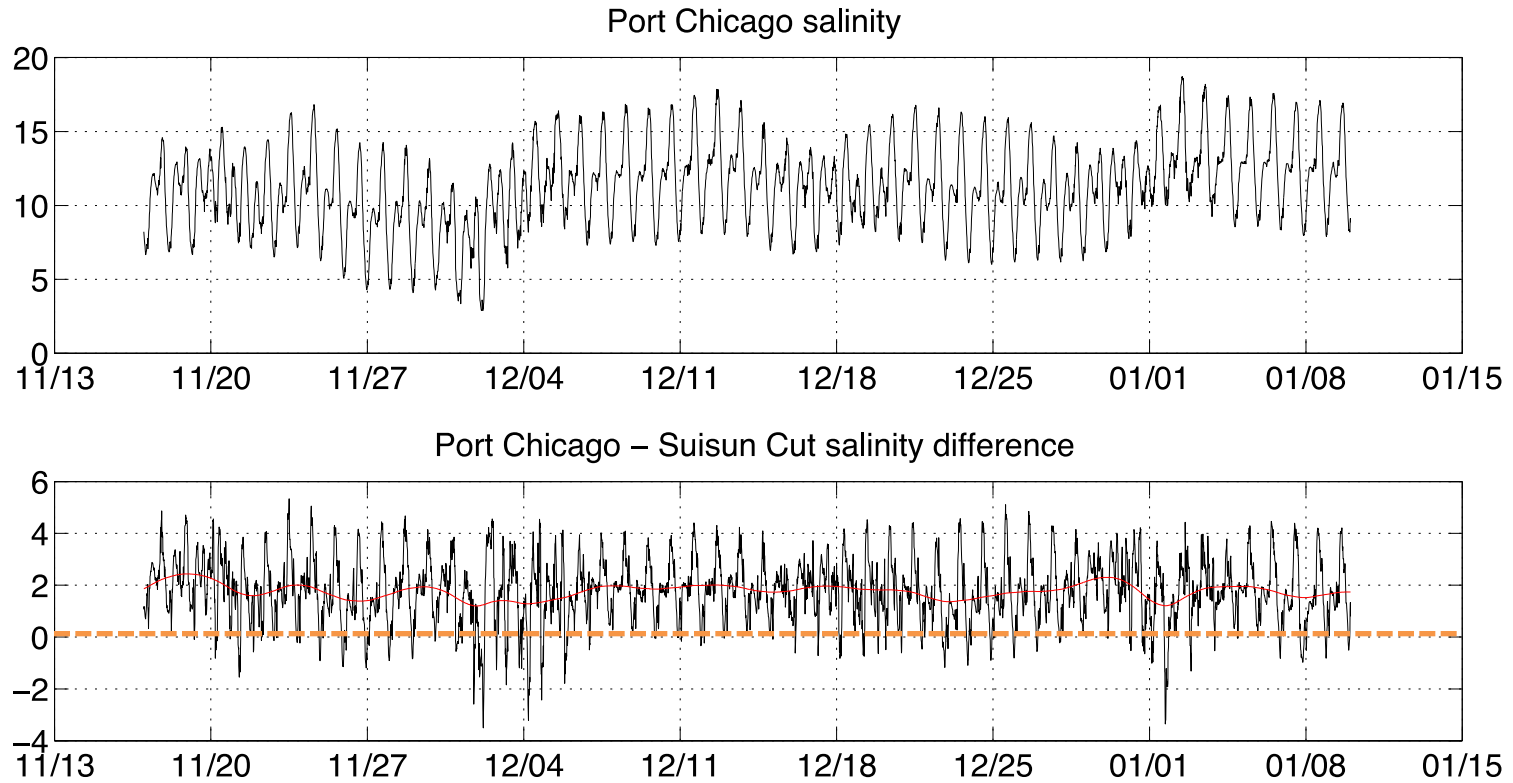
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81

Salinity stratification variations in Suisun Bay

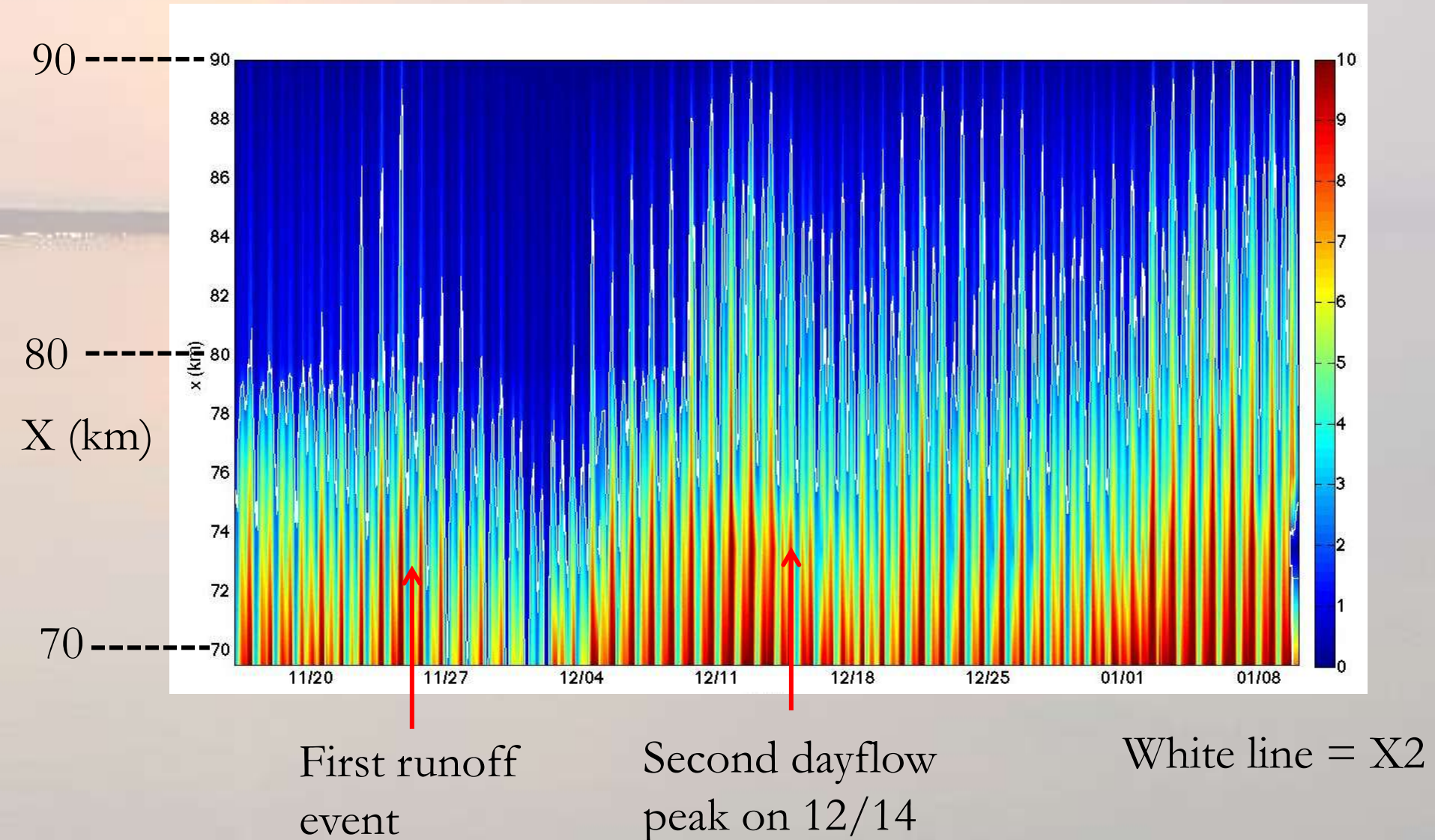


North-South Salinity Gradient

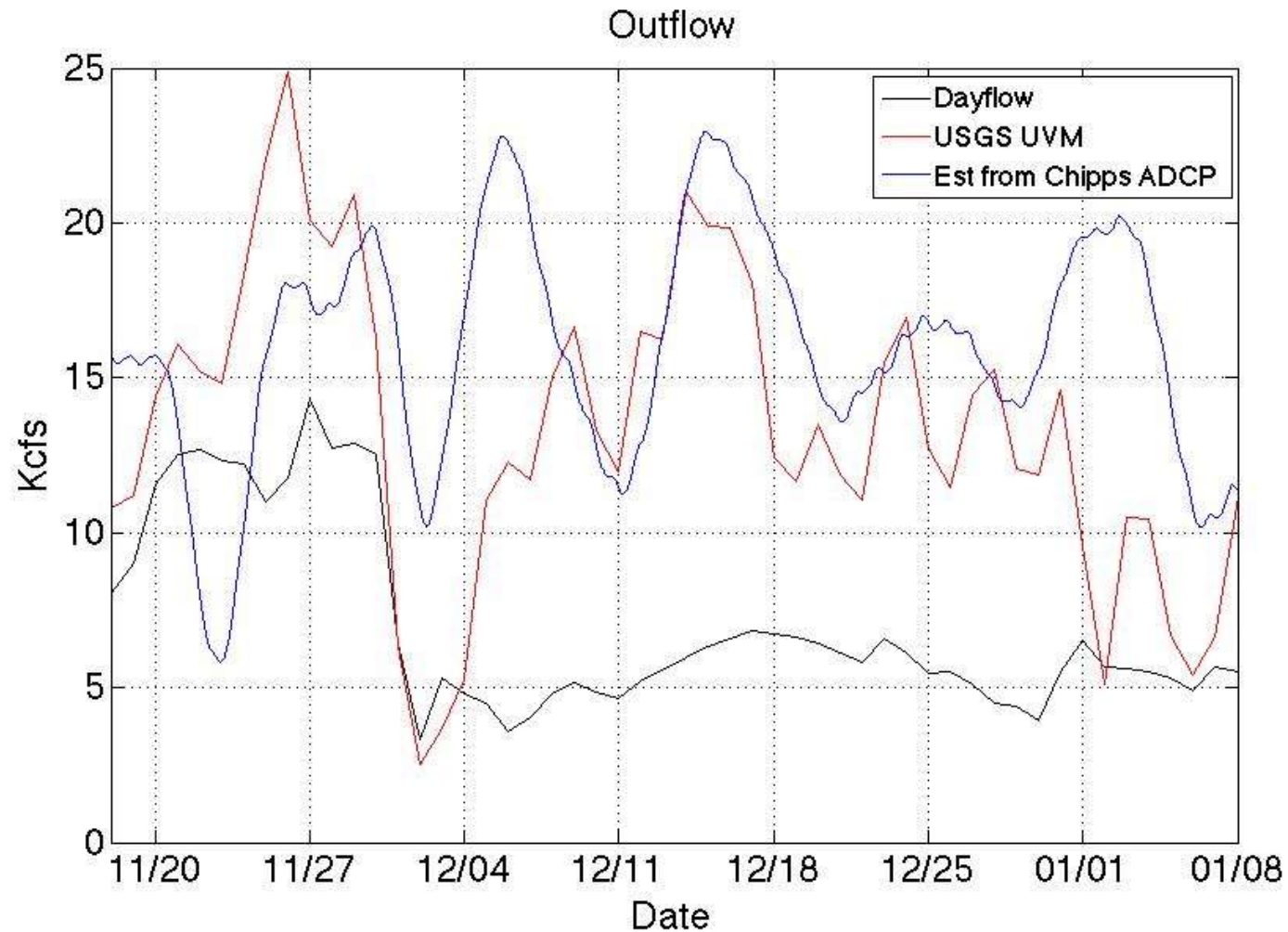


- Large tidal salinity differences between Port Chicago and Suisun Cut consistent with a weaker dS/dx for northern channel.
- Smaller salinity difference for subtidal variations

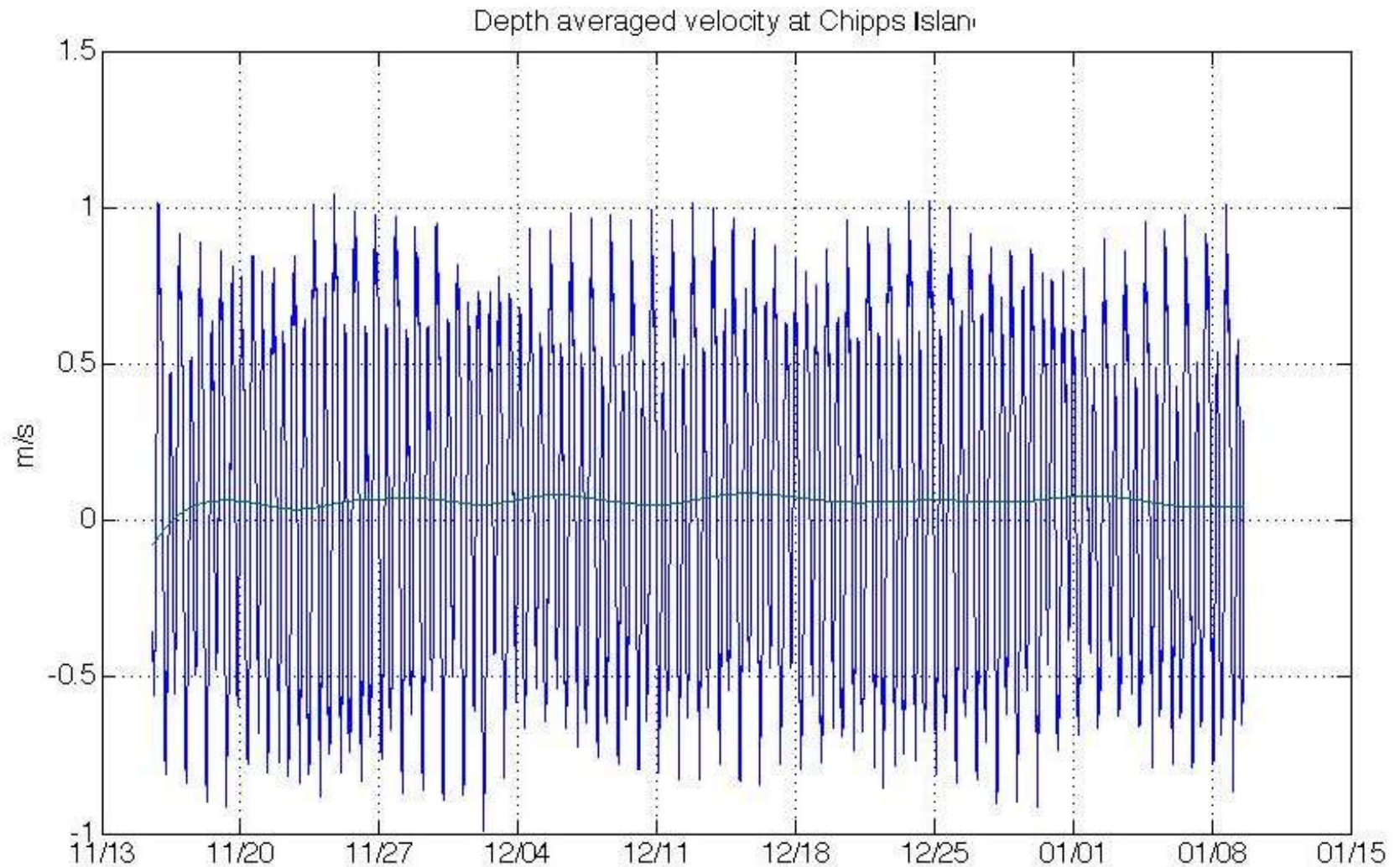
Summary of longitudinal salinity variability



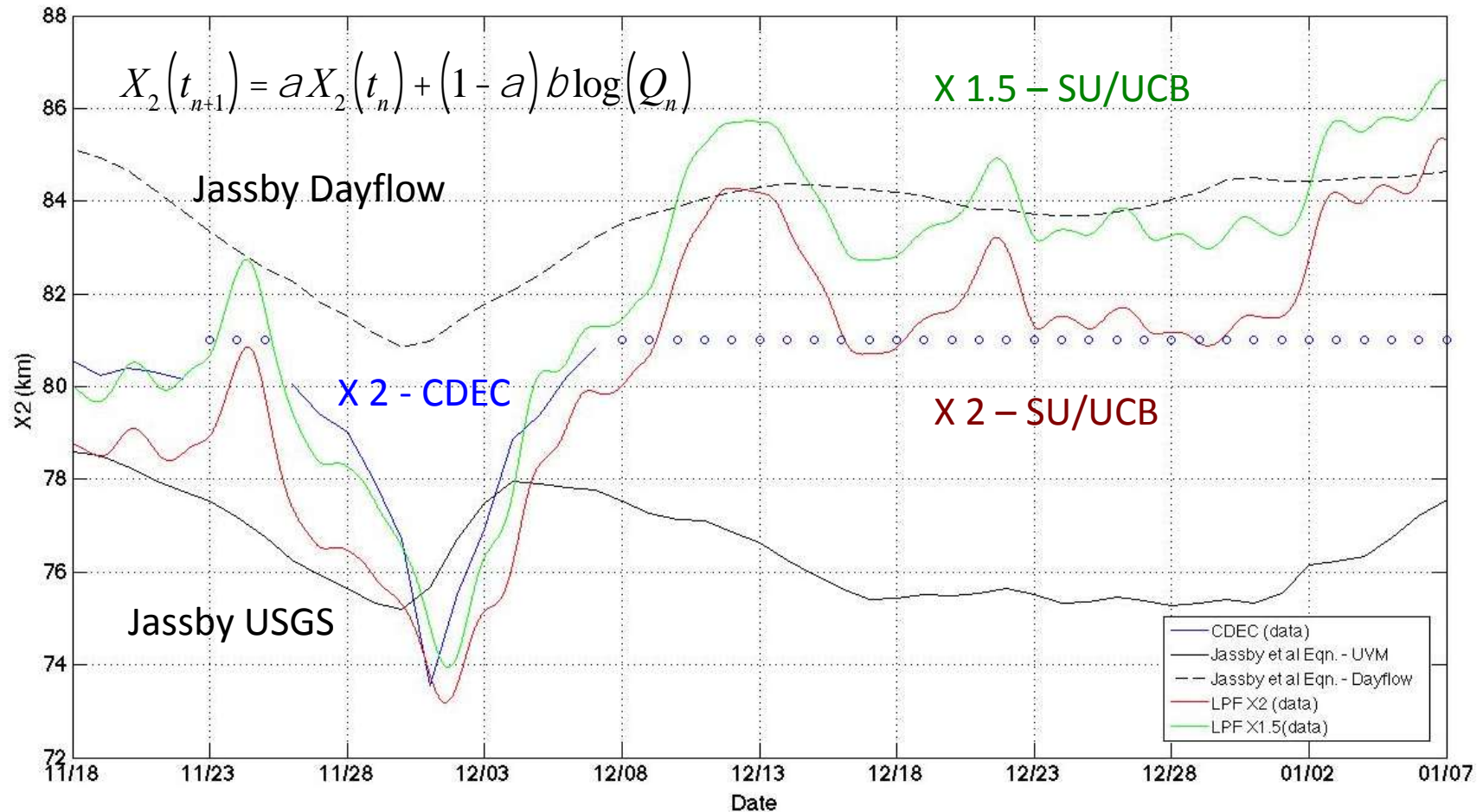
Outflow? 3 estimates



A reminder of the problem: Depth averaged flows at Chipps Island

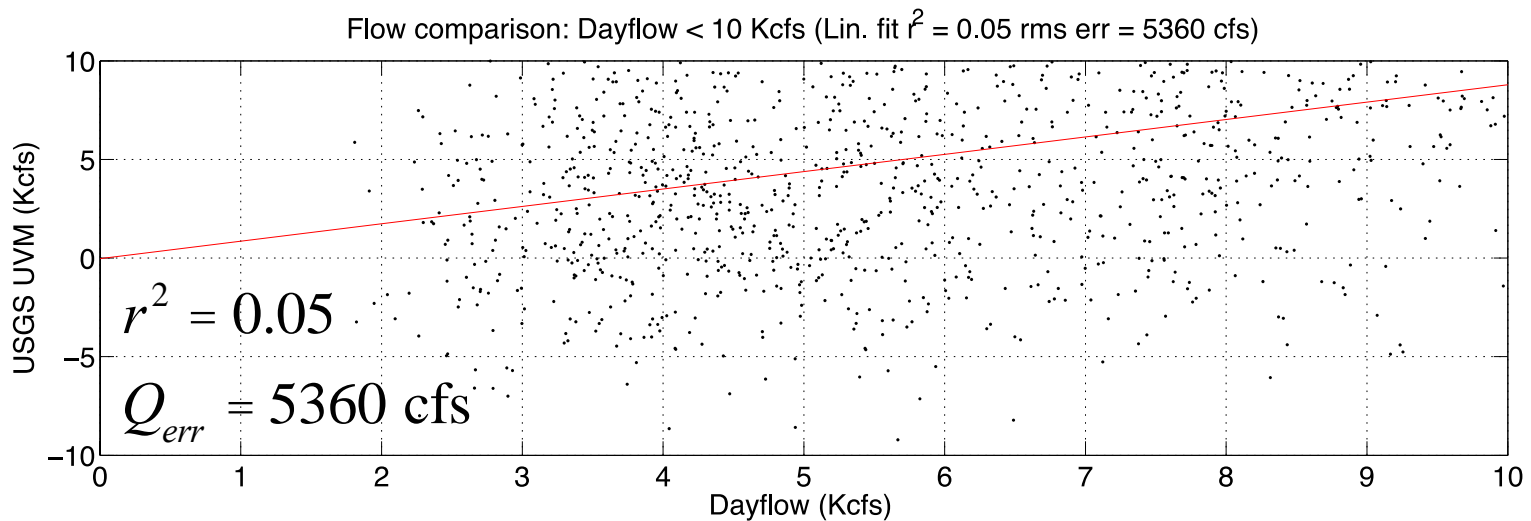
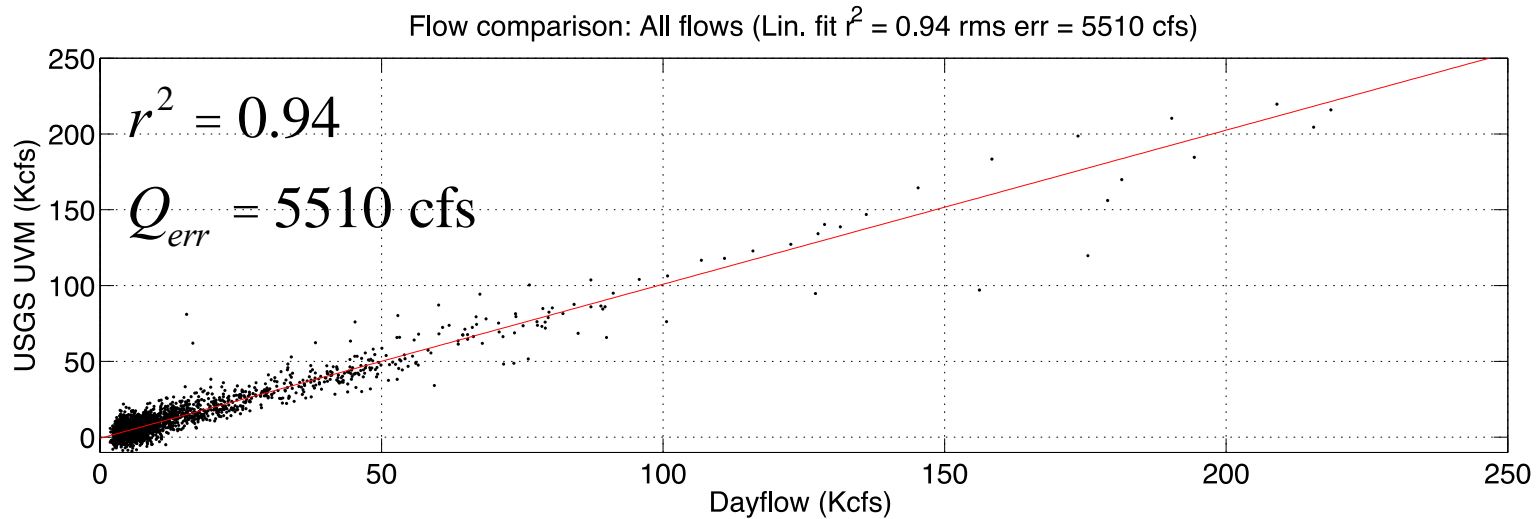


X2: Tidally averaged

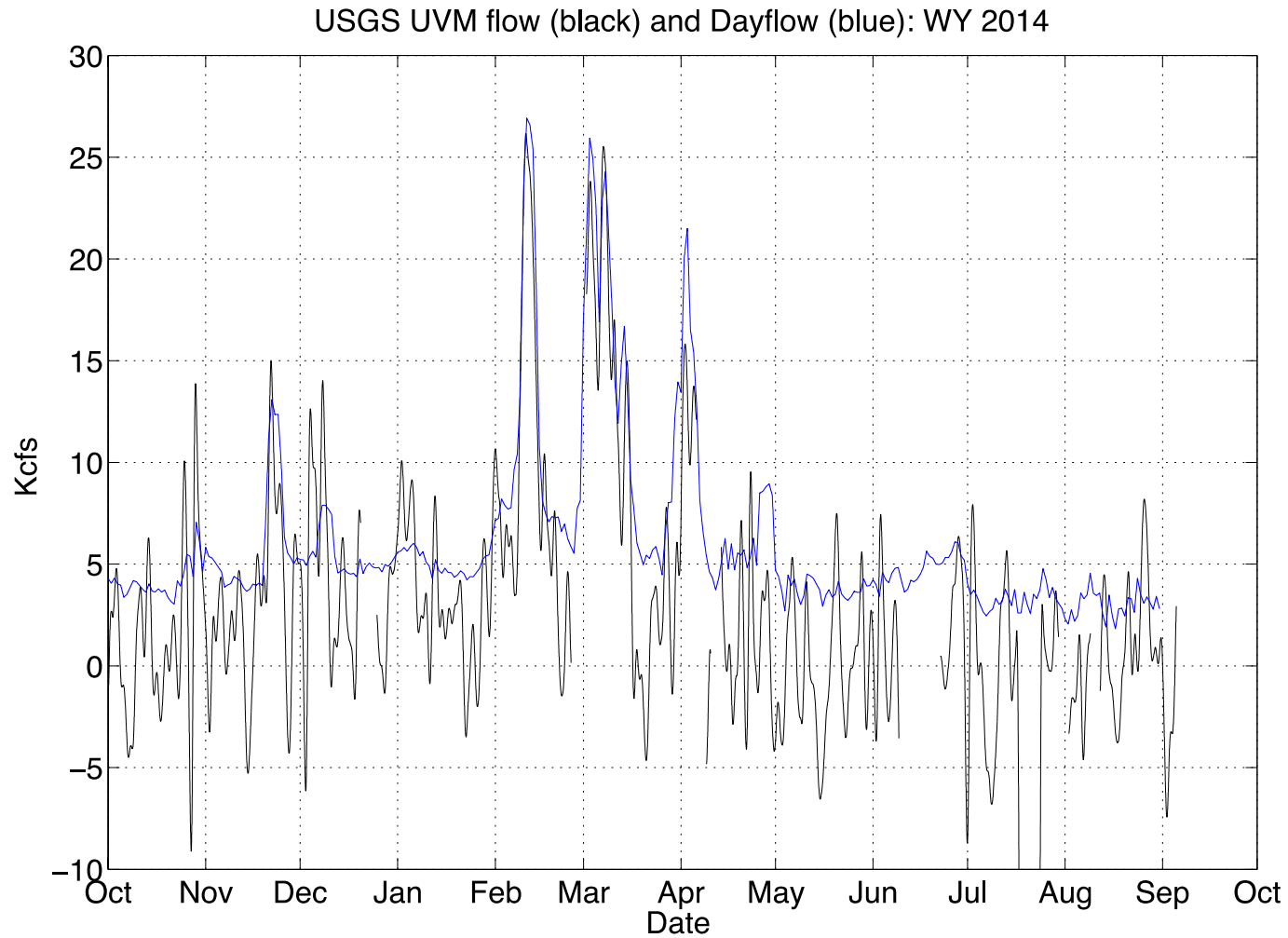


- Tidally-filtered X2 timeseries is different than X2 predicted using either estimate of flow
- Note: CDEC surface estimate agrees better with X1.5 than X2. CDEC station bottom salinity derived X2 is close to ours.

The problem with Dayflow and the UVMs



Example Dayflow and USGS flow in a dry year



Summary

- Large scale measurement program in Suisun Bay mostly successful – data available for use in evaluating numerical models. Includes one freshening event and subsequent relaxation.
- Gravitational circulation not in-phase throughout Suisun Bay and variations appears to lag spring-neap variations in tidal energy.
- Significant tidal north-south variations in salinity in Suisun Bay – work in preparation looking at role of multiple channels in longitudinal dispersion of salt in Suisun Bay.
- Observed X2 variation not predicted accurately by existing X2 relation – problem is what flow to use. Dayflow \neq USGS flow network derived outflow \neq (to a lesser extent) flow based on ADCP measured sub-tidal velocities
- Dayflow and USGS flows agree in general, but error for a single day is comparable to or larger than low flows of regulatory interest (< 10 Kcfs). We should make an attempt to more accurately measure low flows – esp. during drought!

Where we are in WY2015

