Does Central Valley runoff control sediment supply to South San Francisco Bay?

David Schoellhamer
Greg Shellenbarger
Scott Wright

USGS California Water Science Center

USGS

Study Motivation

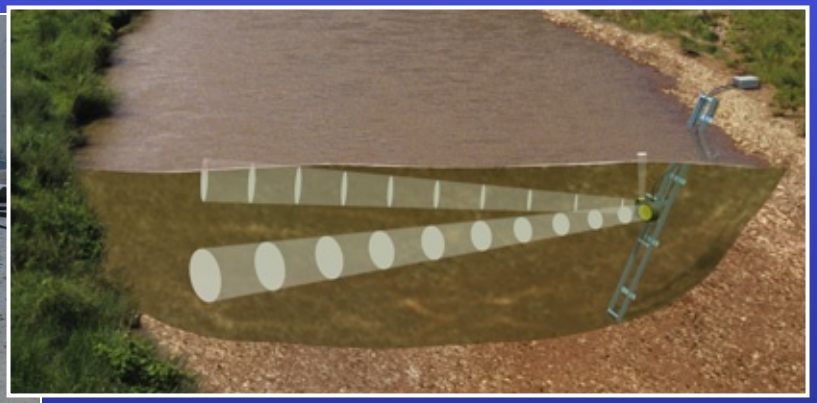
- South Bay Salt Pond Restoration Project
  - Key goal is salt marsh habitat development
  - Subsided areas require sediment
- Understand regional-scale sediment fluxes

USGS

Study Locations

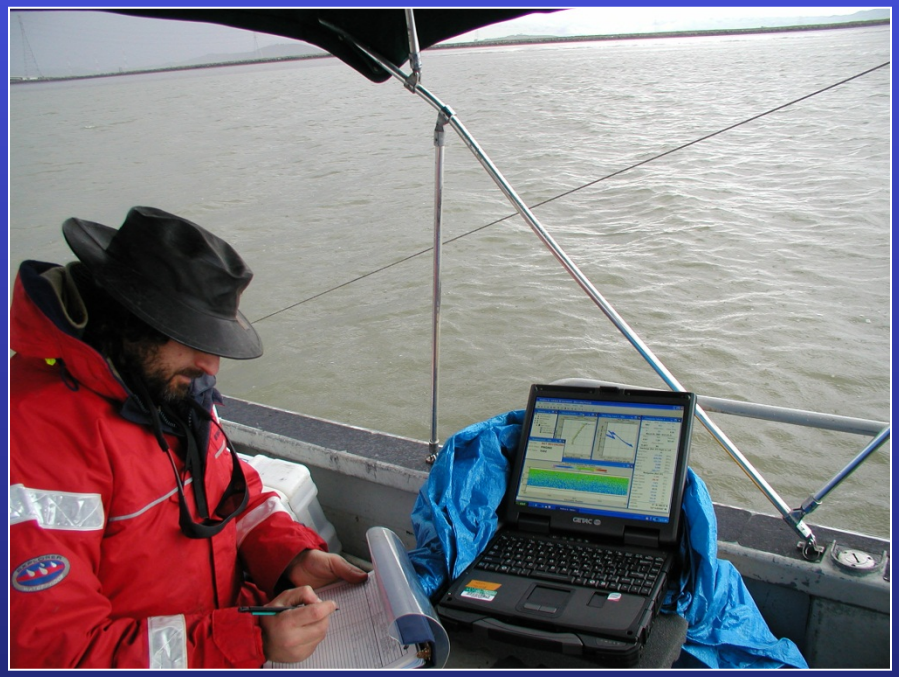
USGS

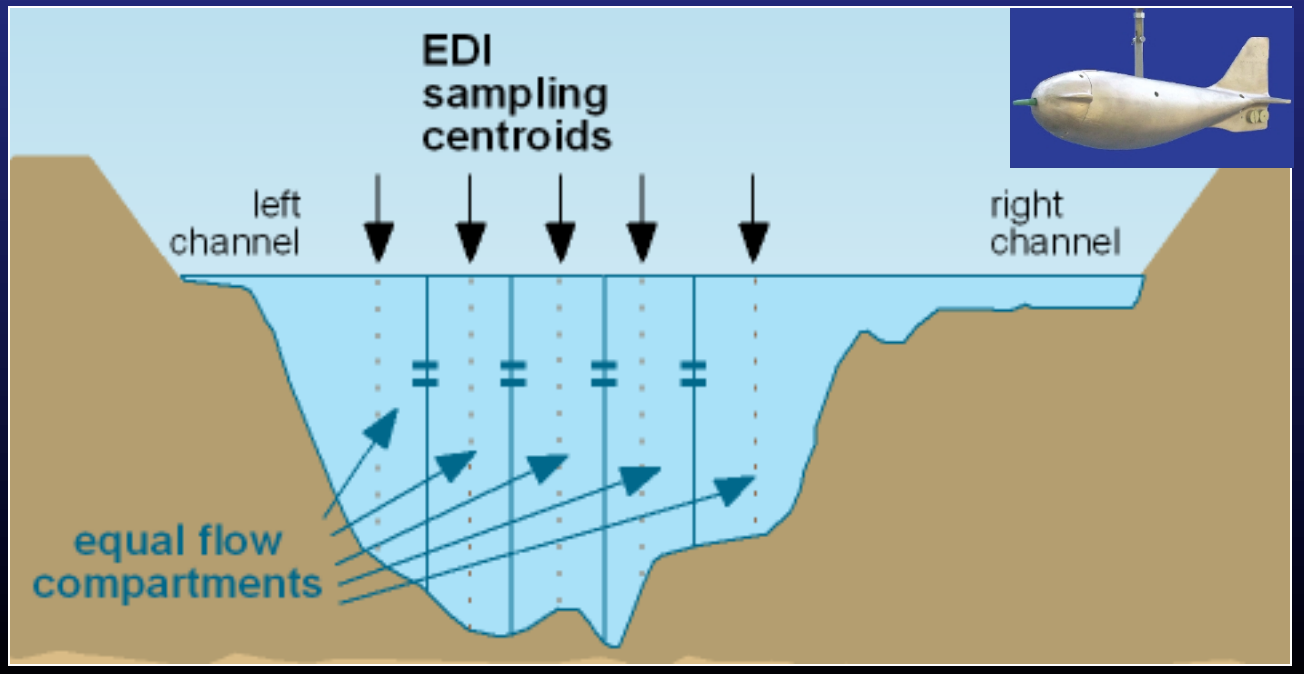
Aquadopp ADCP



YSI Turbidity Probe
with wiper

USGS




EDI
sampling
centroids
left
channel
right
channel
equal flow
compartments

USGS

Acknowledgements

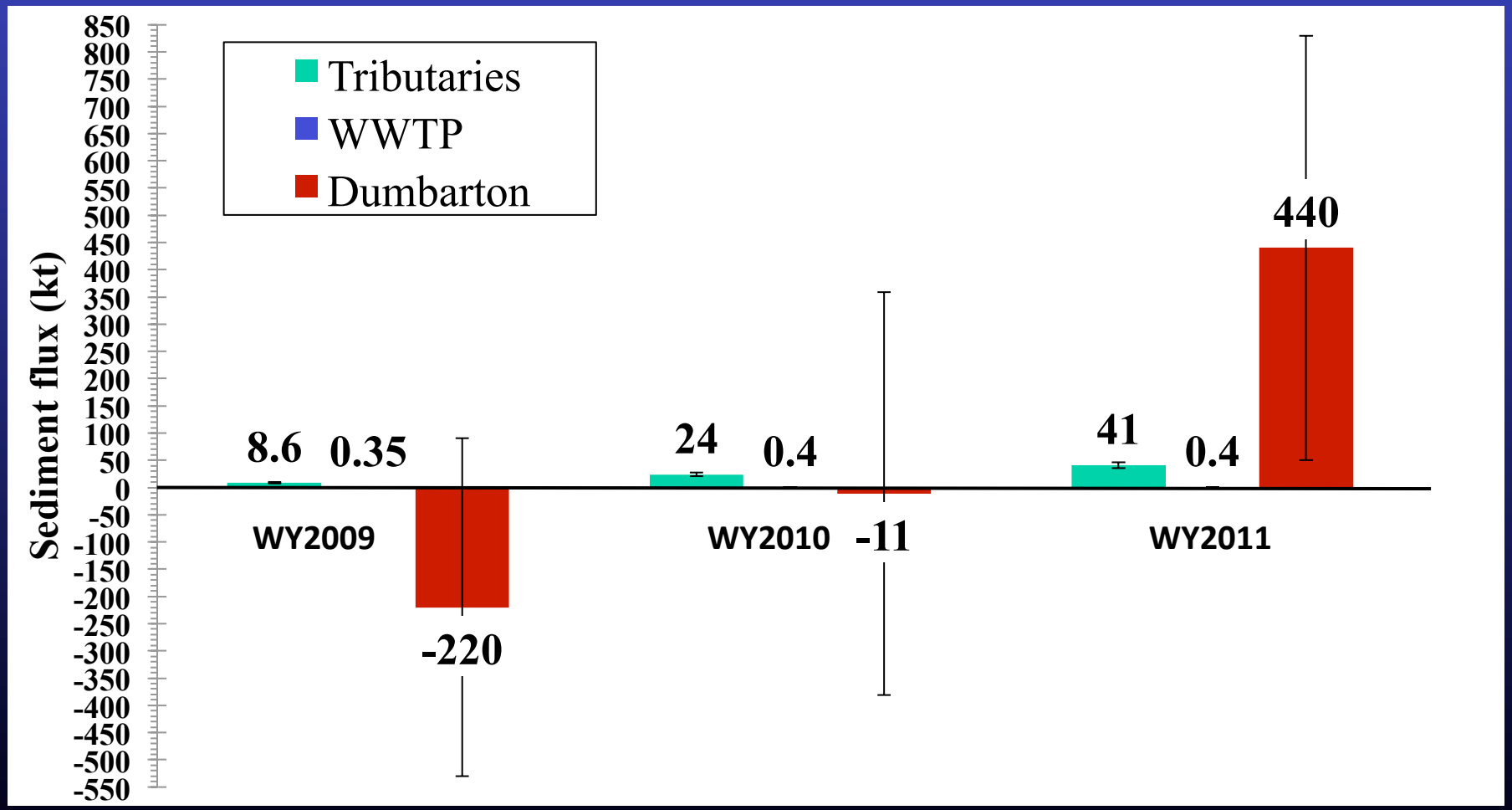
- Paul Buchanan, Maureen Downing-Kunz, Mike Farber, Amber Forest, Larry Freeman, Jeff Gartner, Bruce Jaffe, Tara Morgan-King, Amber Powell, Chris Silva, Laura Valoppi, Travis von Dessoneck, Kurt Weidich, Brooks Weisser, Daniel Whealdon-Haught, and Rob Wilson

- US Army Corps of Engineers
- San Francisco Bay Regional Monitoring Program
- California Coastal Conservancy
- US Geological Survey Priority Ecosystem Science Program, Office of Water Quality, and San Francisco Bay Pilot Study for the National Water Quality Monitoring Network for U.S. Coastal Waters and their Tributaries
- Santa Clara Valley Water District
- City of San Jose Environmental Services Department

USGS

Comparison of Sediment Fluxes

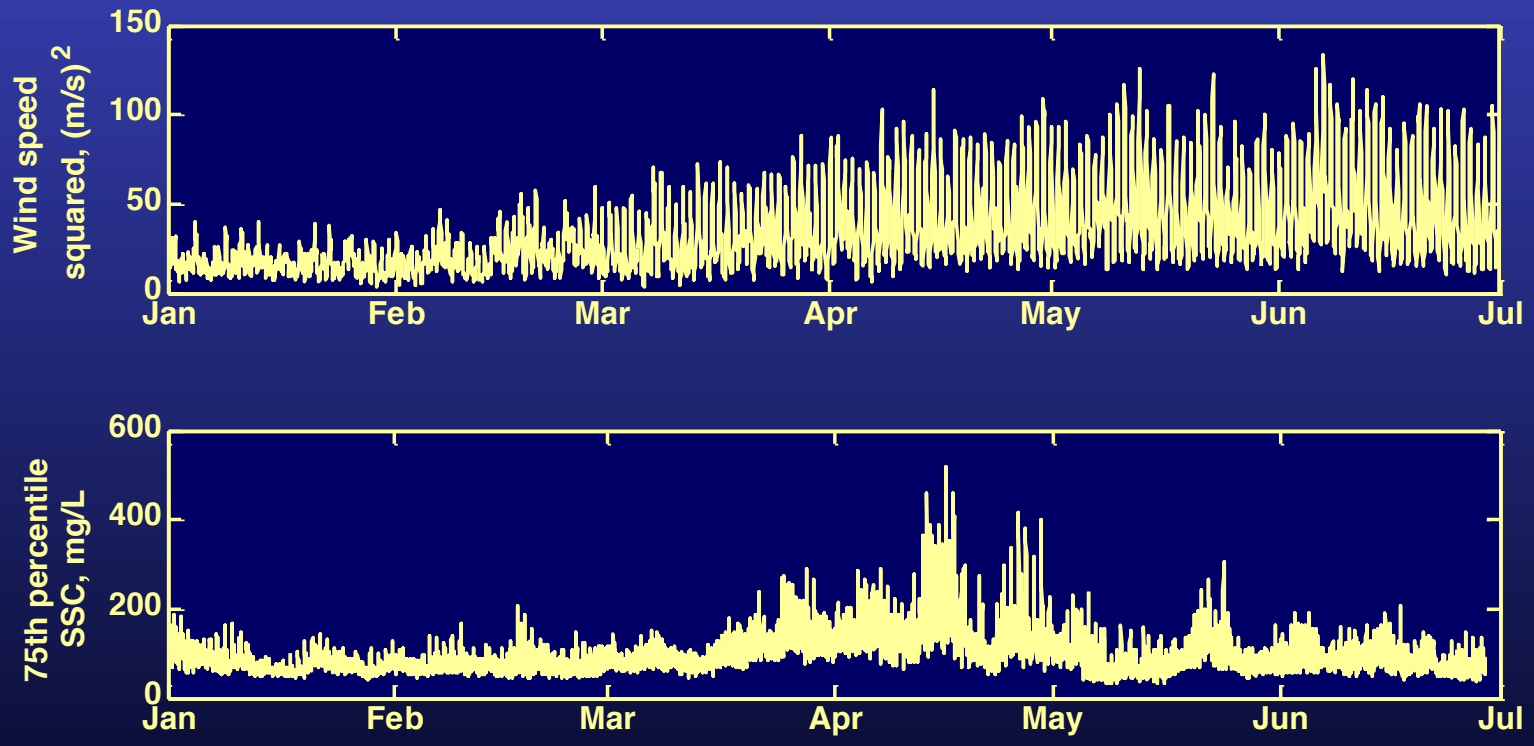
Positive values are seaward



USGS

Springtime: wind and suspended sediment

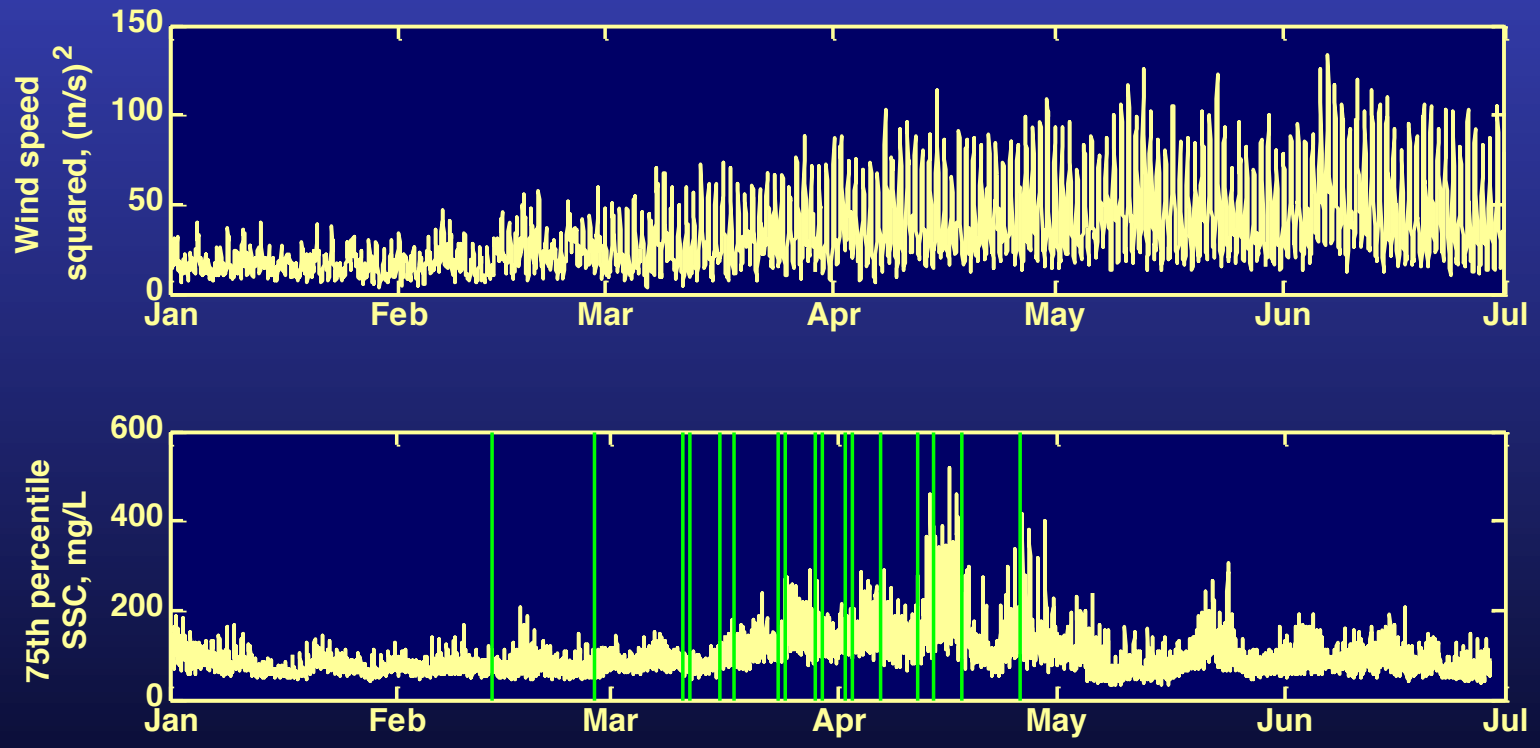
Dumbarton Bridge 1992-2011



USGS

Springtime: wind and suspended sediment and phytoplankton bloom

Dumbarton Bridge 1992-2011



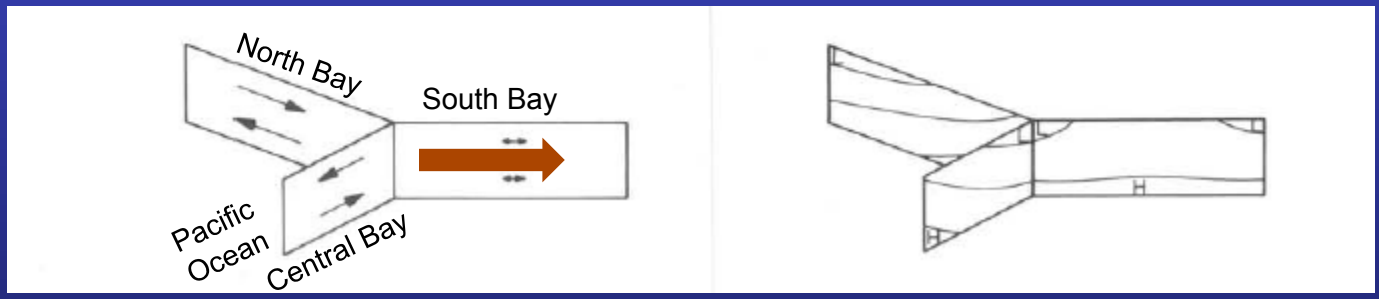
USGS

Springtime flushing of South Bay

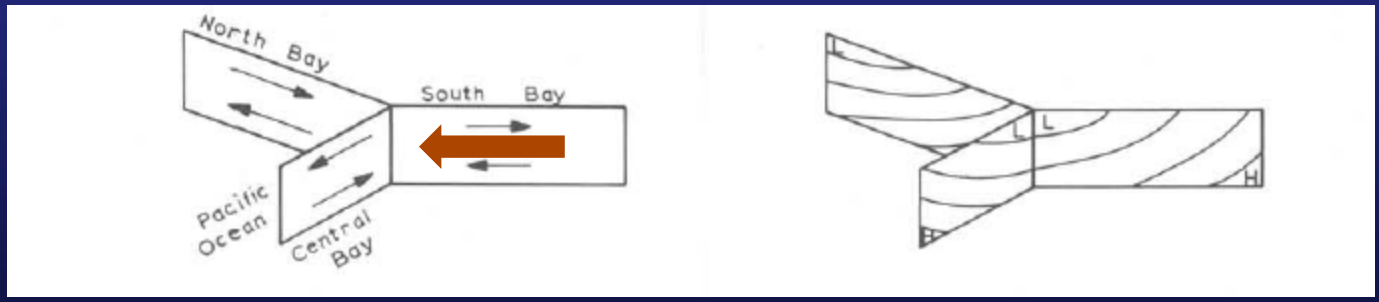
Surface and bottom currents

Salinity gradient

Dry spring 2009



Wet spring 2011

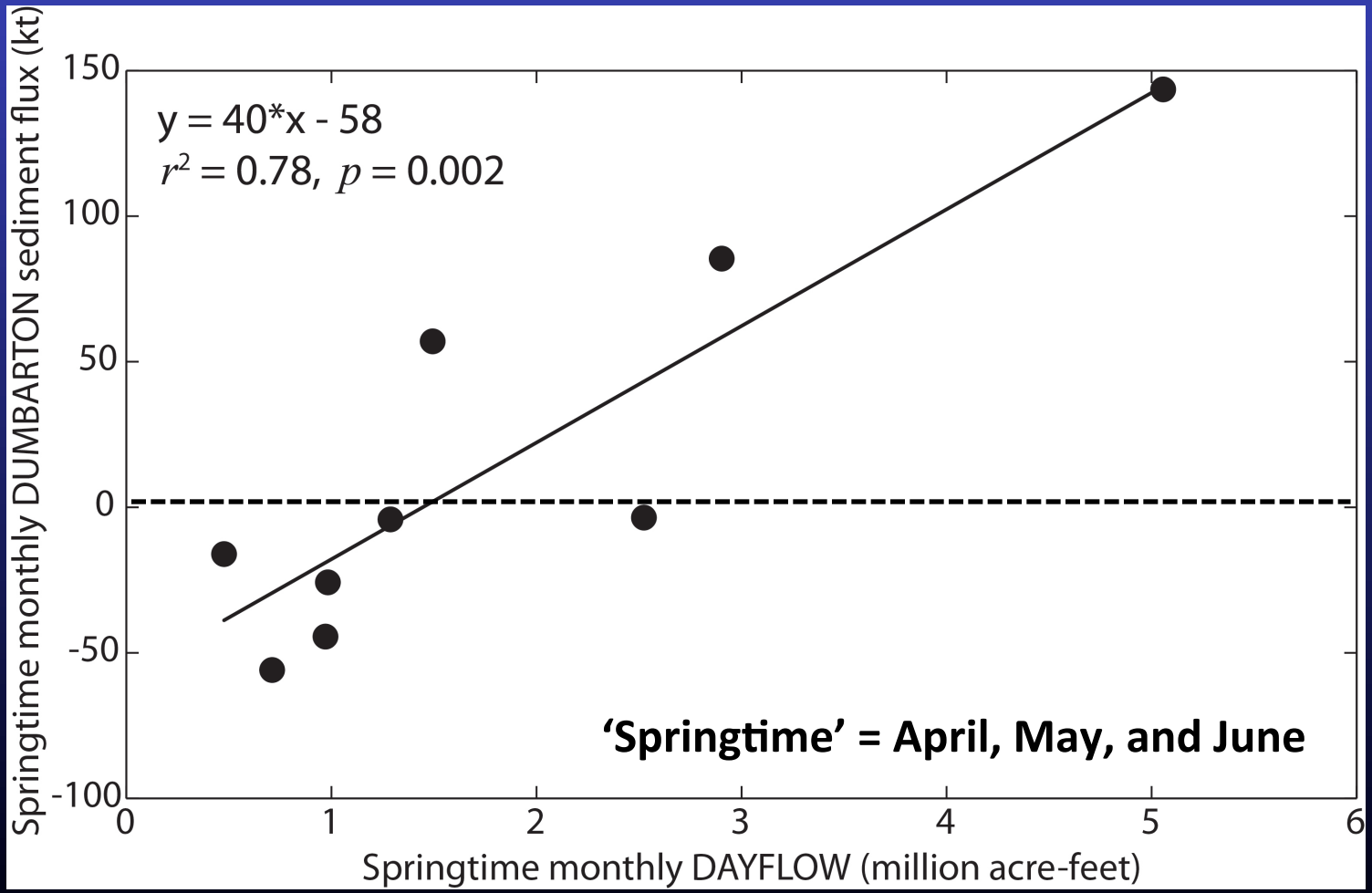


McCulloch et al. 1970

USGS

Flux - Flow Relationship (WY09-WY11)

Positive values are seaward



USGS

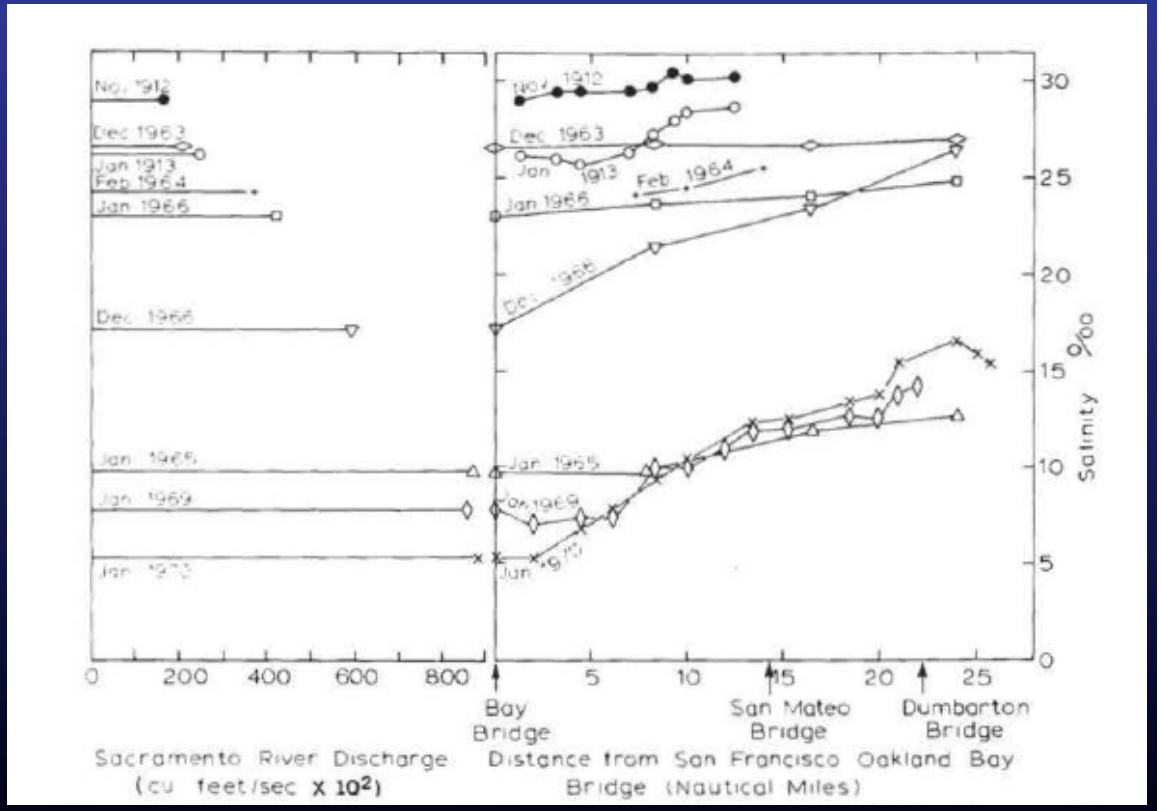
1970: *RV Polaris* longitudinal transects

A PRELIMINARY STUDY OF THE EFFECTS OF WATER CIRCULATION IN THE SAN FRANCISCO BAY ESTUARY

Some Effects of Fresh-water Inflow on the Flushing of South San Francisco Bay: A Preliminary Report

By D. S. McCulloch, D. H. Peterson, P. R. Carlson, and T. J. Conomos

"The indicated relation between the Sacramento River discharge and flushing, suggests that soluble waste materials are removed from south bay largely during periods of high river discharge."



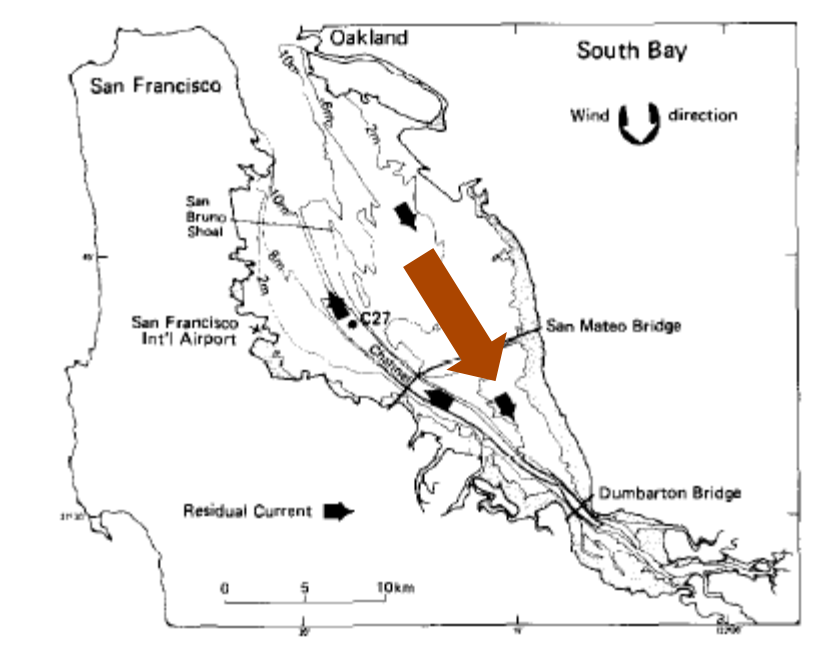
USGS

1985: in situ current meters

Time scales of circulation and mixing processes of San Francisco Bay waters

R. A. Walters[1], R. T. Cheng[2] & T. J. Conomos[2]

"South Bay exhibits a balance between wind-driven circulation and tidally driven residual circulation for most of the year. During winter, however, there can be sufficient density variations to drive multilayer (2 to 3) flows in the channel"



USGS

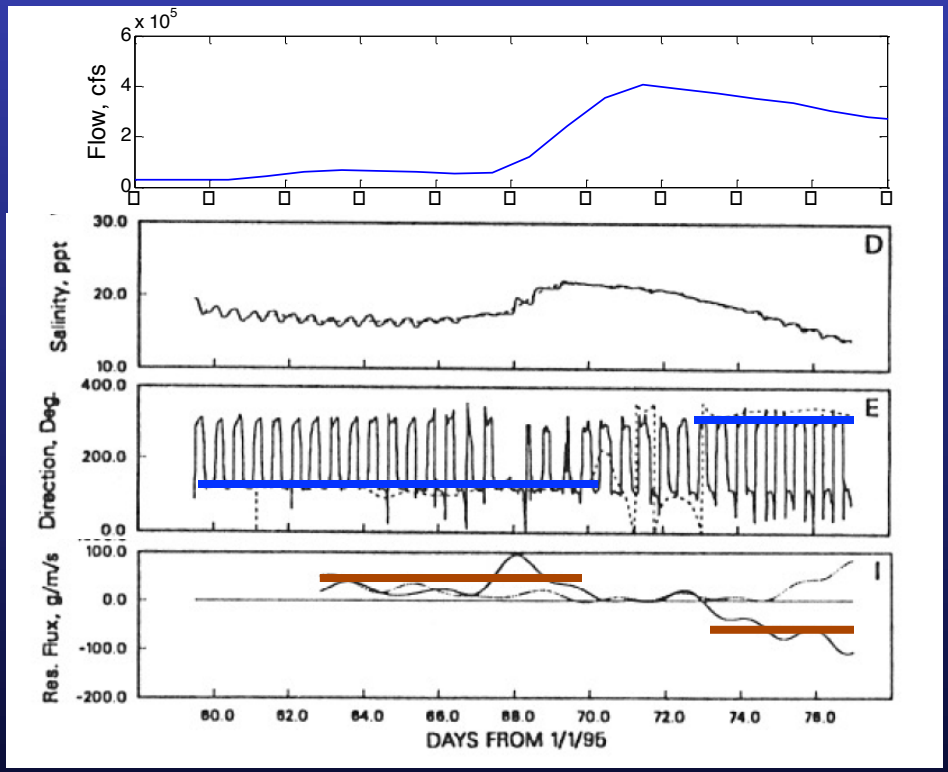
1997: acoustic current profilers

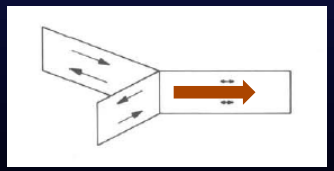
March 1995
Dumbarton Bridge channel
near -bottom

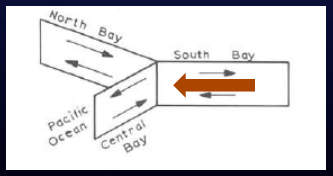
"During the first spring tide … residual flux of SSC is directed into South Bay (positive), whereas during the next spring tide … residual flux is directed out of South Bay (negative)."

NEAR BOTTOM VELOCITY AND SUSPENDED SOLIDS MEASUREMENTS IN SAN FRANCISCO BAY, CALIFORNIA

JEFFREY W. GARTNER, RALPH T. CHENG,
DAVID A. CACCHIONE, and GEORGE B. TATE







USGS

Conclusions

- Large freshwater inflow from the Central Valley in spring results in sediment export from the project area.
- The timing and magnitude of freshwater inflow from the Central Valley may control sediment supply to the South Bay Salt Pond Restoration Project.

USGS

Value of long-term research

- Need years of data: 3 years produce 3 different results.
- Improve certainty by building upon decades of research as technology improves and management questions change.

USGS

For more details:

ARTICLE IN PRESS

MARGO-04920; No of Pages 13

Marine Geology xxx (2013) xxx–xxx

Contents lists available at SciVerse ScienceDirect

Marine Geology

journal homepage: www.elsevier.com/locate/margeo

A sediment budget for the southern reach in San Francisco Bay, CA: Implications for habitat restoration

Gregory G. Shellenbarger *, Scott A. Wright, David H. Schoellhamer

Marine Geology Special Issue
on sediment transport and geomorphic evolution in San Francisco Bay

- 21 papers now available on line and to be published this summer
- Includes sand, mud, Bay bottom, watersheds, data, models, and more good stuff
- Editors: Patrick Barnard, Bruce Jaffe, and David Schoellhamer

USGS