Modeling Salt Pond Restoration in San Francisco Bay
High Resolution Hydrodynamic Modeling

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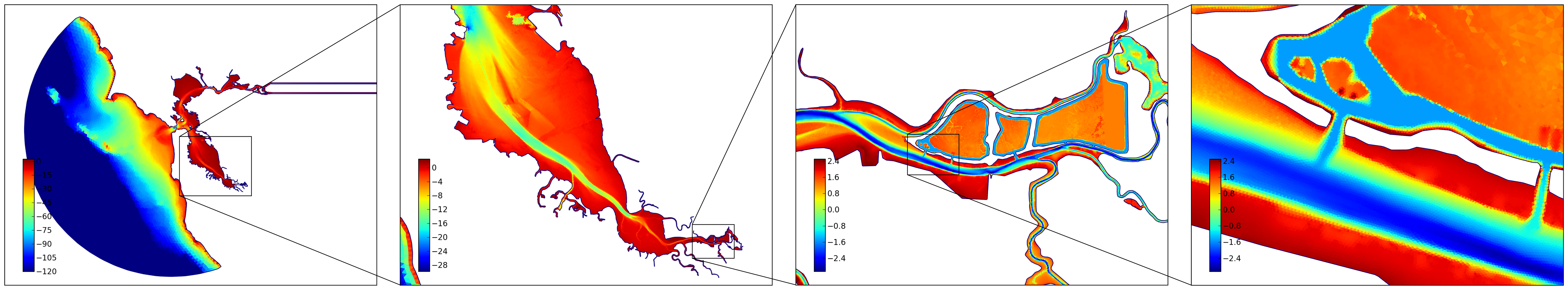
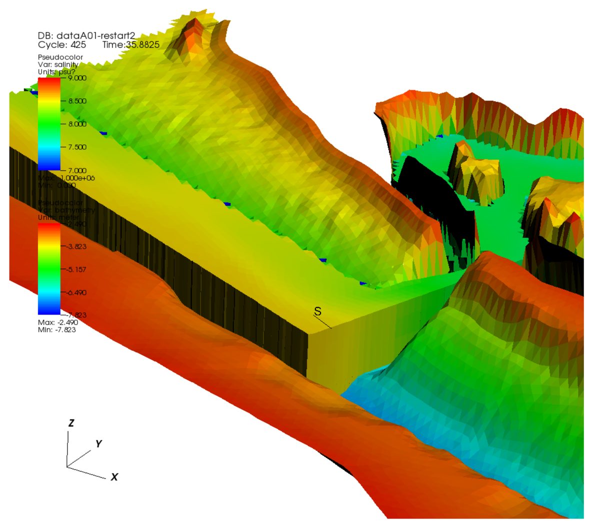
Introduction

The effects of salt pond restoration activities in South San Francisco Bay are potentially far-reaching, including effects on salt intrusion dynamics, tidal range, and spatial distributions of erosion and deposition.



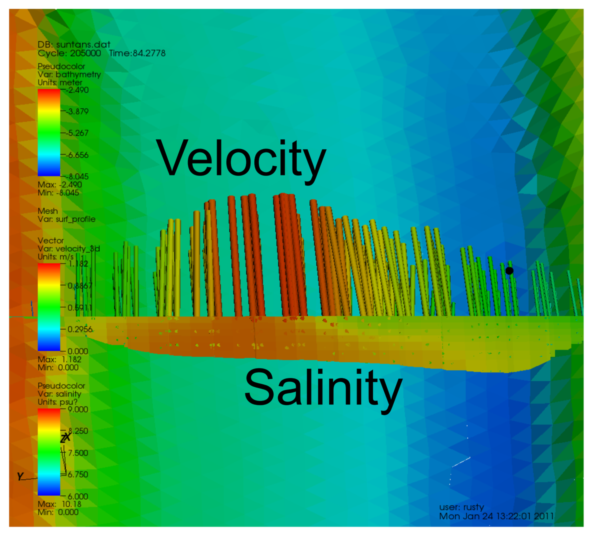
Numerical modeling provides an indispensable tool for evaluating restoration scenarios. The high resolution hydrodynamic model presented here can support a wide range of studies at spatial scales from meters to tens of kilometers. Using SUNTANS, an unstructured grid, hydrodynamic modeling code, we have developed a model encompassing all of San Francisco Bay with a focus on South San Francisco Bay and the Island Ponds. The use of an unstructured grid allows seamless coupling between the highly resolved areas such as levee breaches, represented in our model at a nominal resolution of 5 meters, to the coastal ocean, resolved at a nominal scale of 3000 meters.

This poster includes results from a sample application of the model in which simulated flows were used to drive a particle-tracking based sediment transport model in Coyote Creek. Other potential applications include studying the effects of coastal ocean conditions (*e.g.* sea level rise) on restoration sites and quantifying the extent to which larger scale hydrodynamics are affected by local restoration efforts such as levee breaches.



Left: Lateral salinity structure in breach. Salinity field clipped at thalweg of channel and breach.

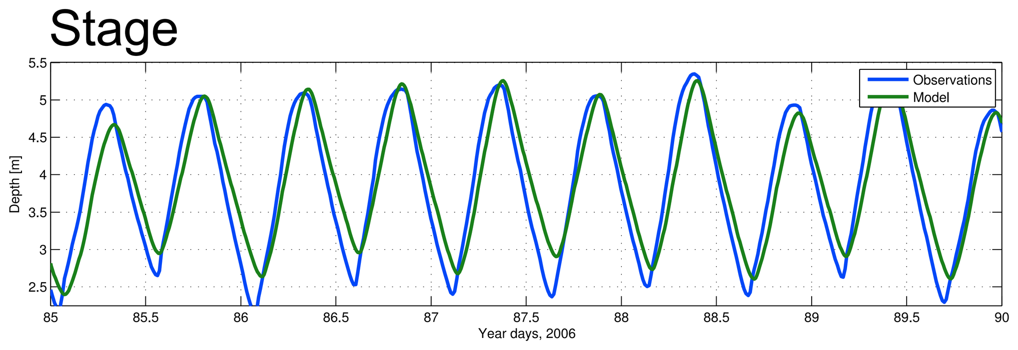
Right: Secondary density-driven flow in Coyote Creek. Flood tide, looking upstream.



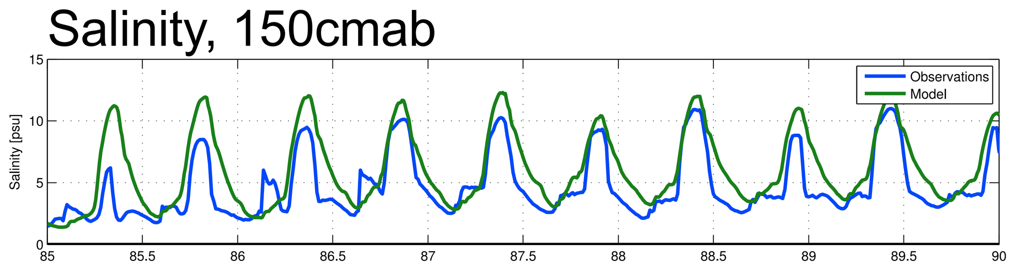
Validation: Model-Data Comparison at the Island Ponds

East Station

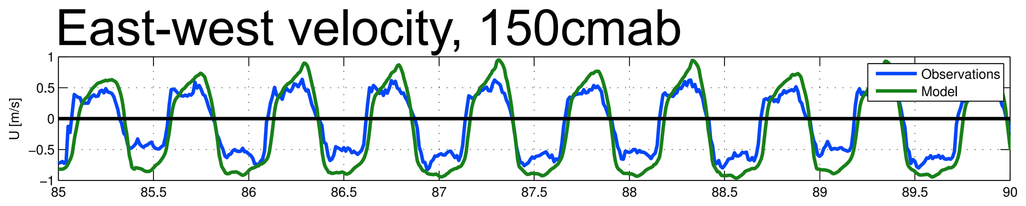
Stage



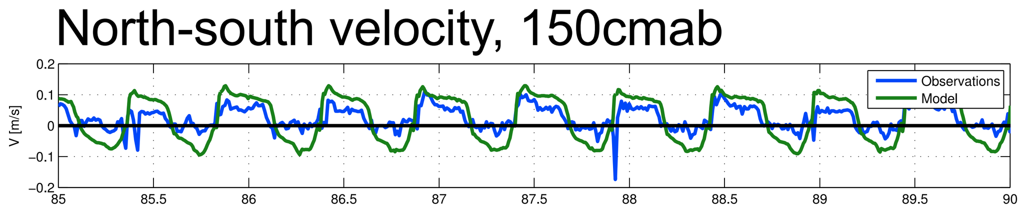
Salinity, 150cmab



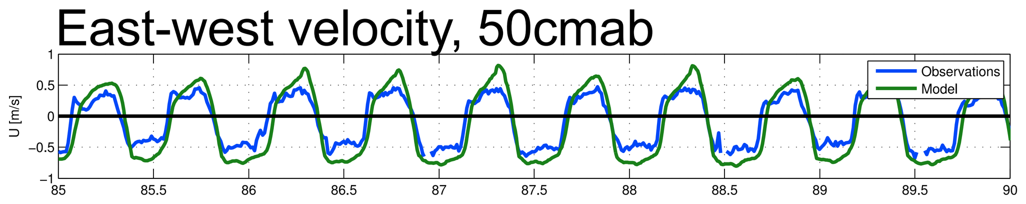
East-west velocity, 150cmab



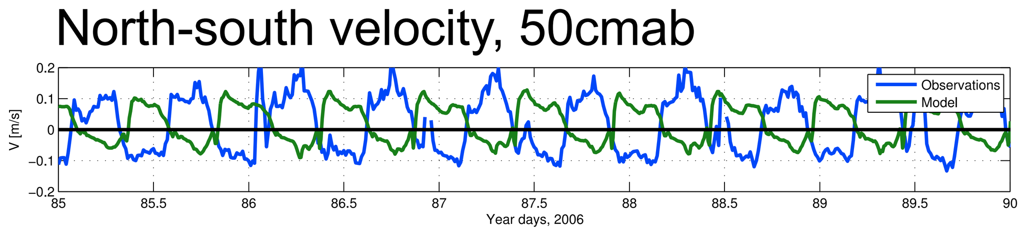
North-south velocity, 150cmab



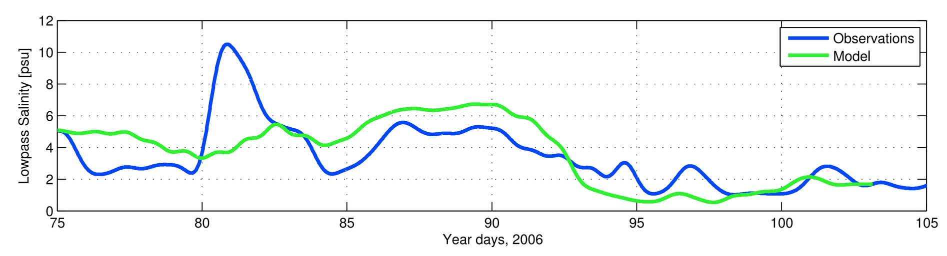
East-west velocity, 50cmab

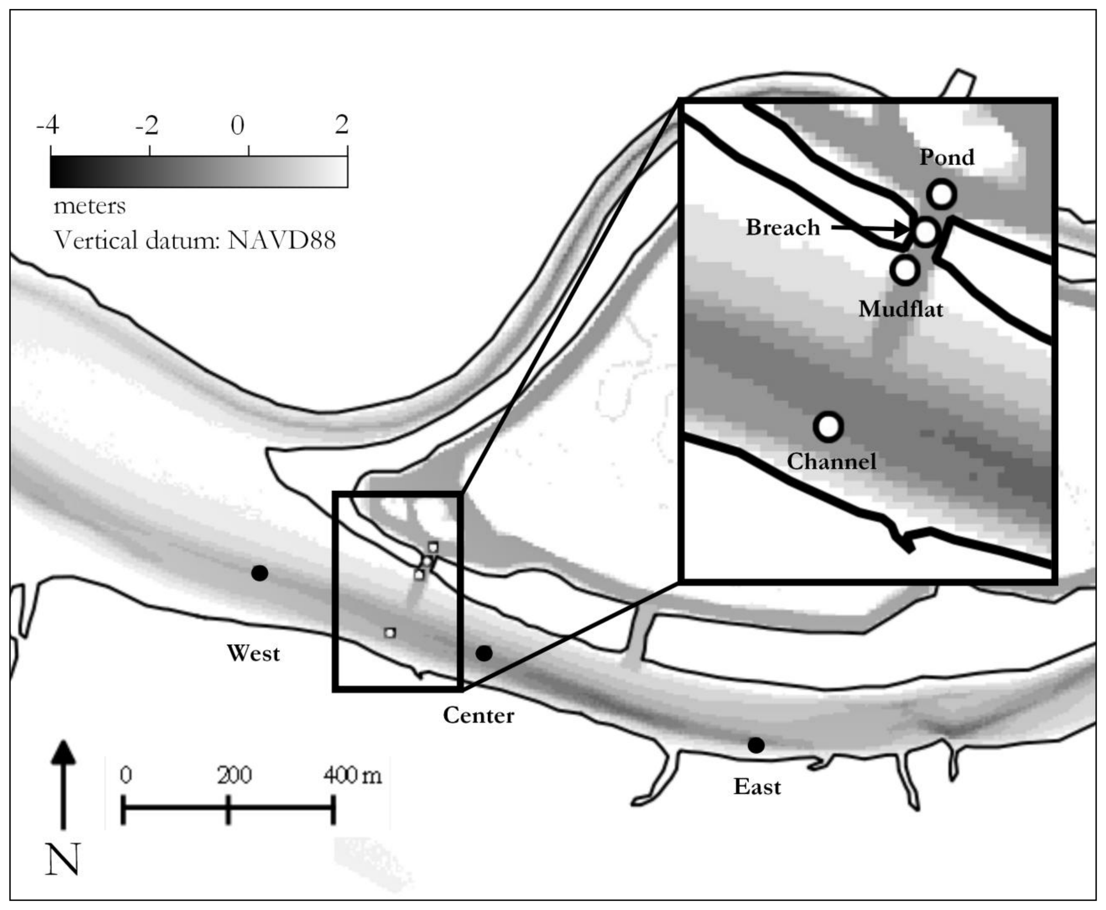


North-south velocity, 50cmab



Long term tidally averaged salinity

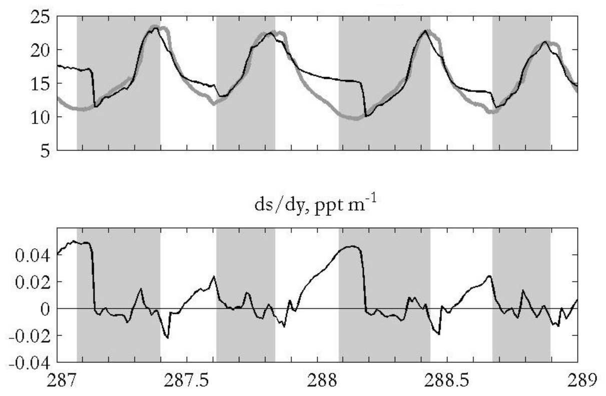




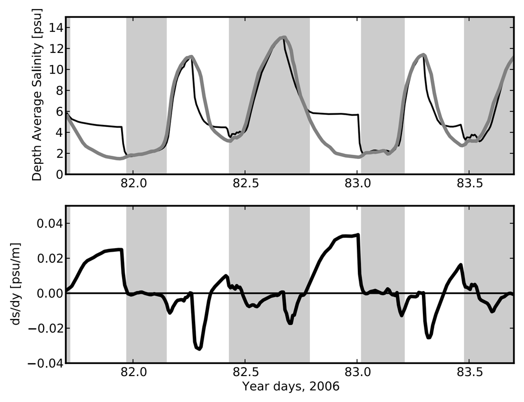
Salinity Dynamics at Levee Breach

Qualitative comparison of salt dynamics at the breach. Note that observations are from a different time period than the simulation.

Observed



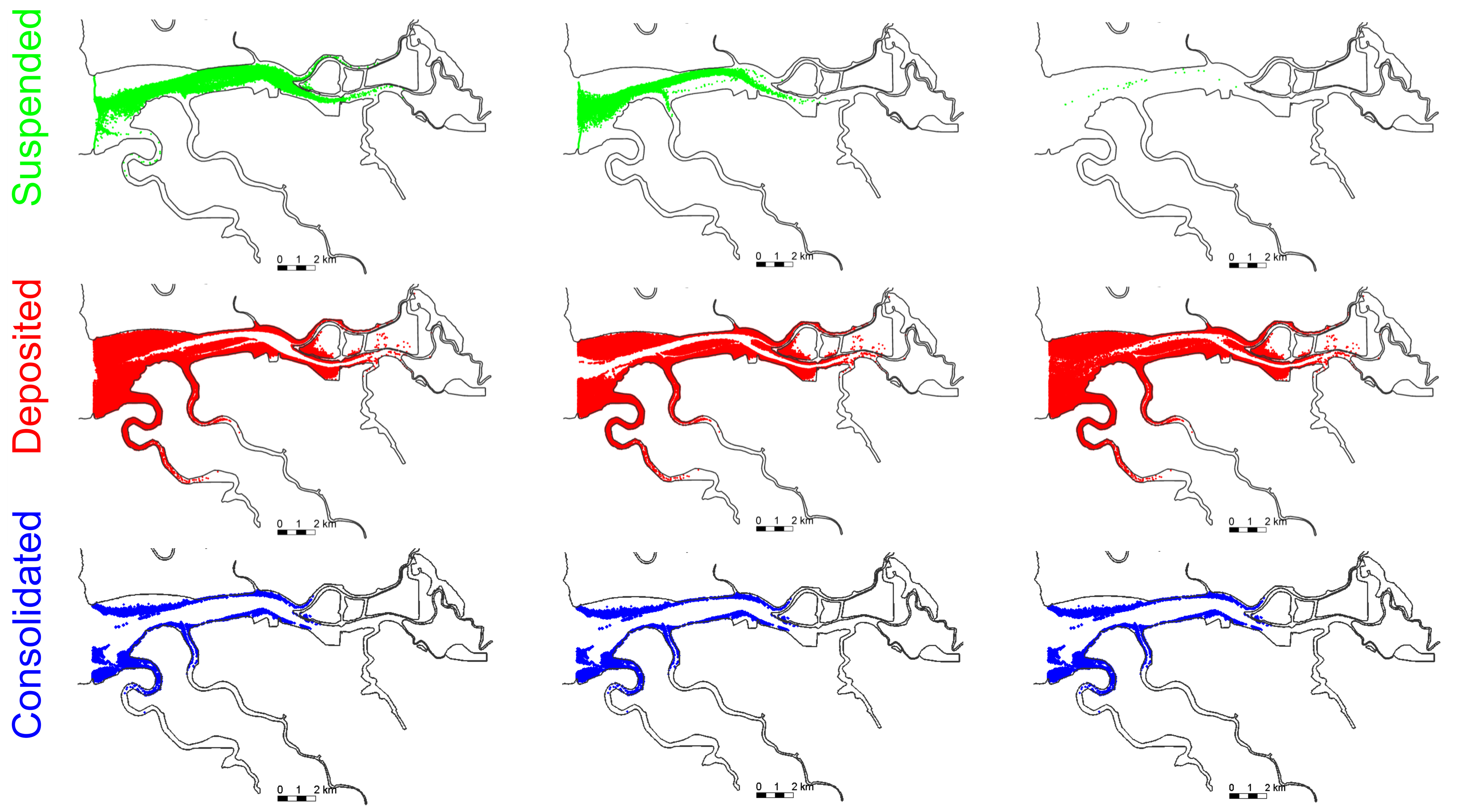
Model



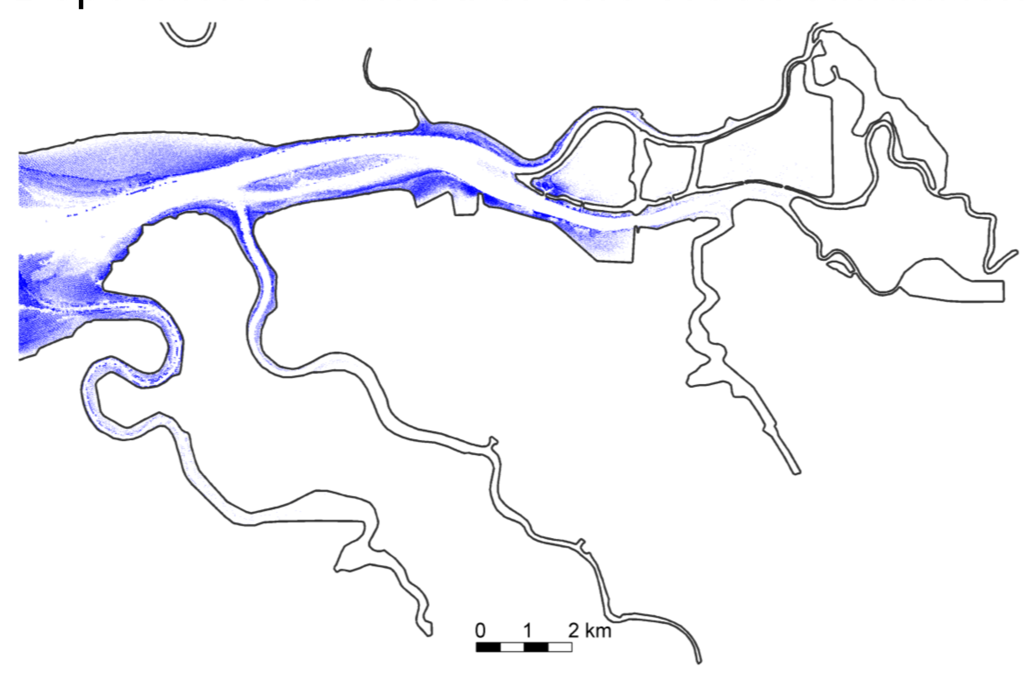
Application: Sediment Transport Particle Tracking

Utilizing the hydrodynamic output of the SUNTANS model, output from a simplified cohesive sediment particle tracking model is shown below. Sediment "particles" are introduced at the western boundary (Calaveras Point), based on observed concentrations at Dumbarton Bridge. Particles are eroded or deposited based on local bed stress. Particles become "consolidated" and unerodible 4 days after being deposited.

March 31, 2006 - spring tides



Deposition Pattern After Two Week Simulation



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