



# Explore Geomorphic Response of Estuaries to Climate Change and Sea Level Rise

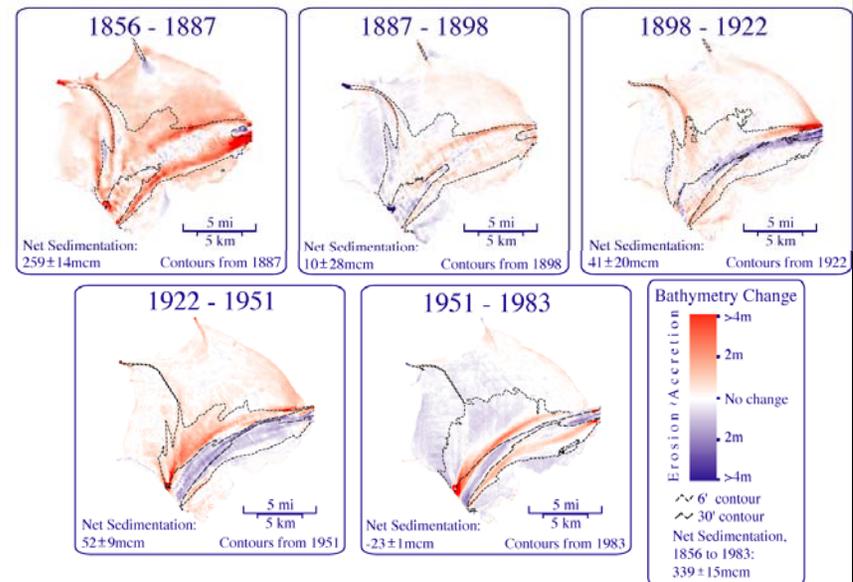
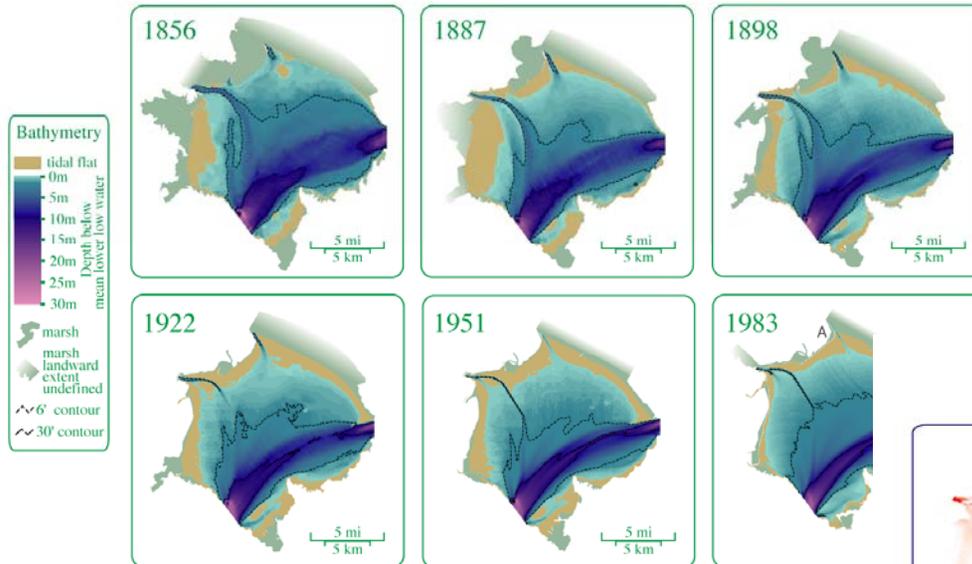
- Sediment supply and demand
  - Historical data and numerical models
- Limitations of simple models
  - Bruun rule
- Change in hydrodynamics and sediment transport
  - Numerical models

Examples and modeling presented in this talk will focus on San Pablo and Suisun Bays, two sub-embayments of the San Francisco Estuary

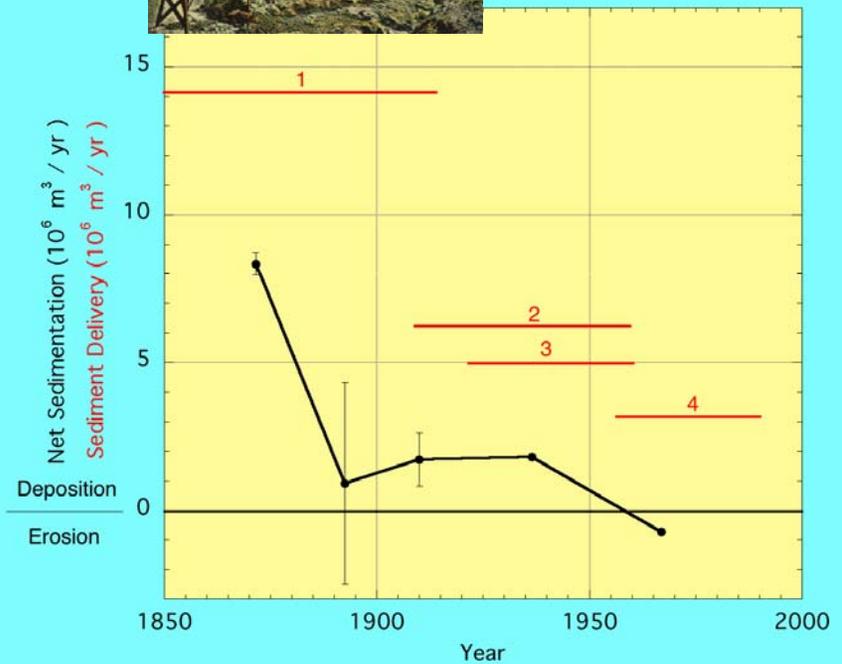
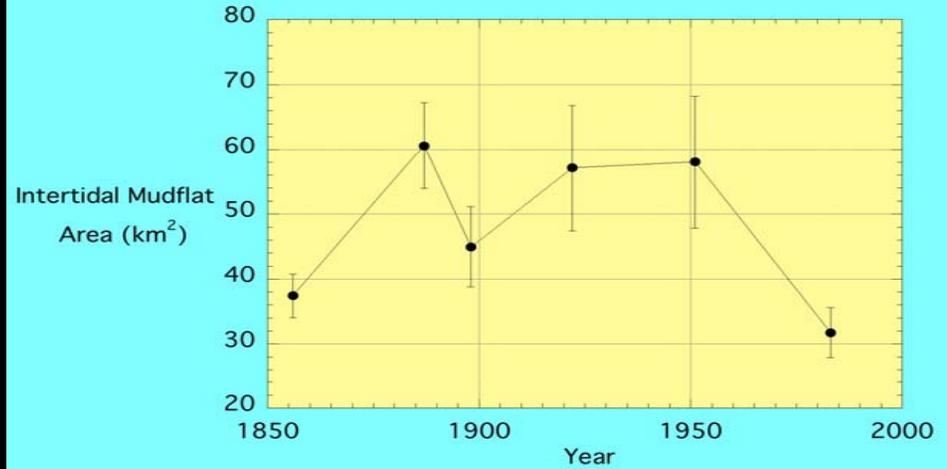


# San Pablo Bay- A prime example of the effects of changing sediment supply

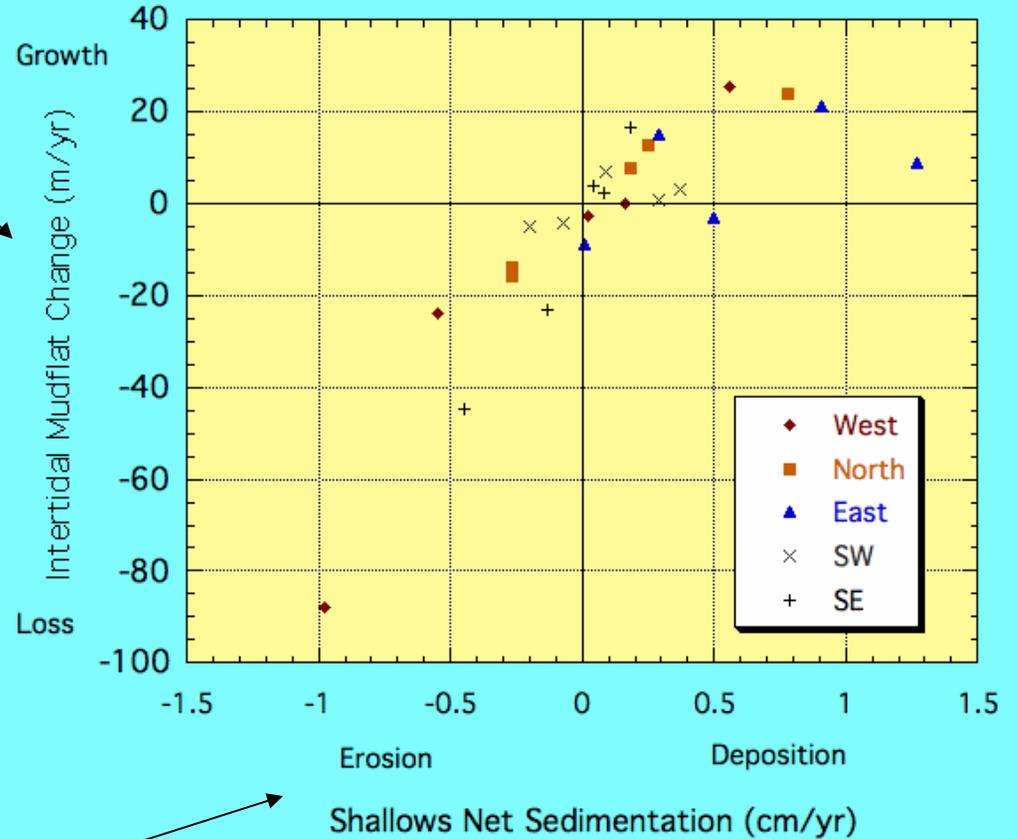
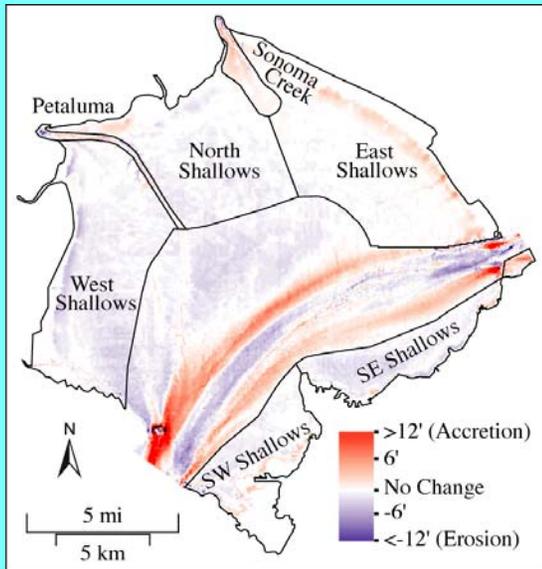
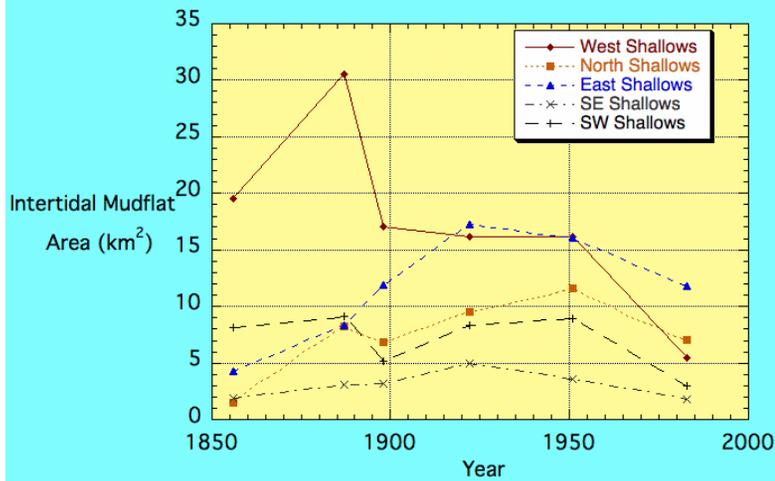
Change from depositional to erosional system



# Intertidal mudflat area responded to changes in sediment supply to San Pablo Bay

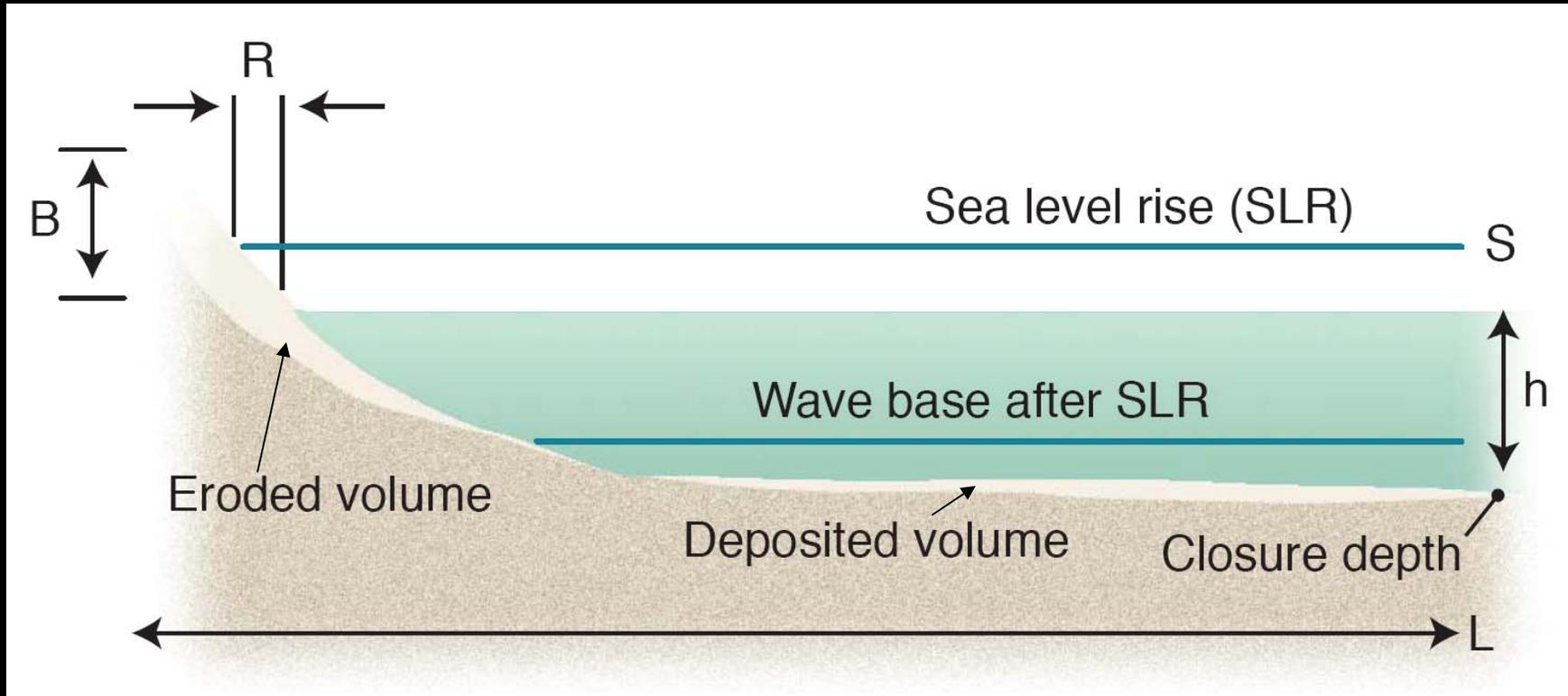


# Mudflats widened where sediment was abundant

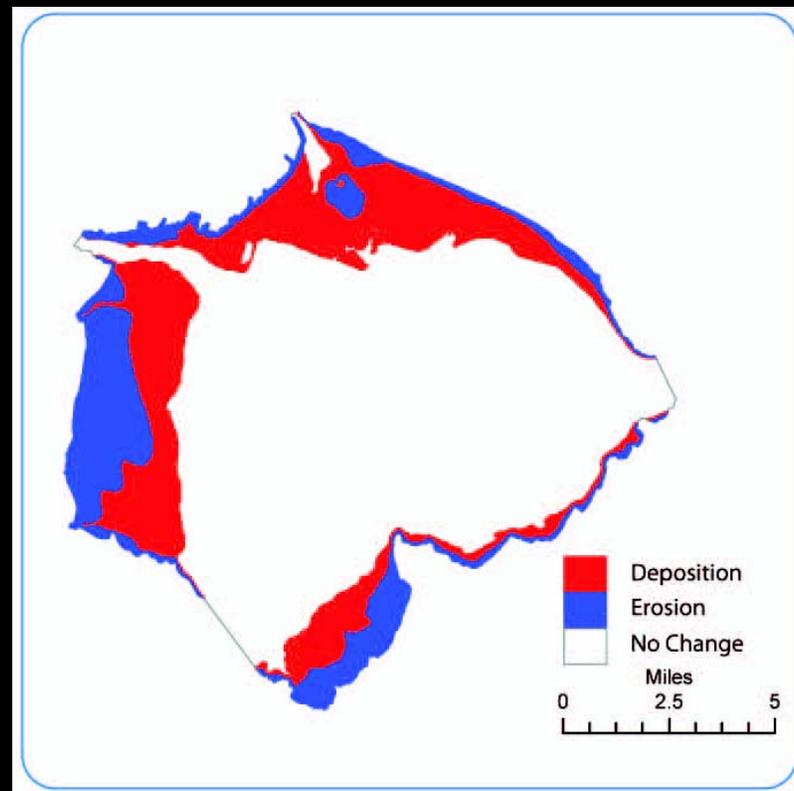
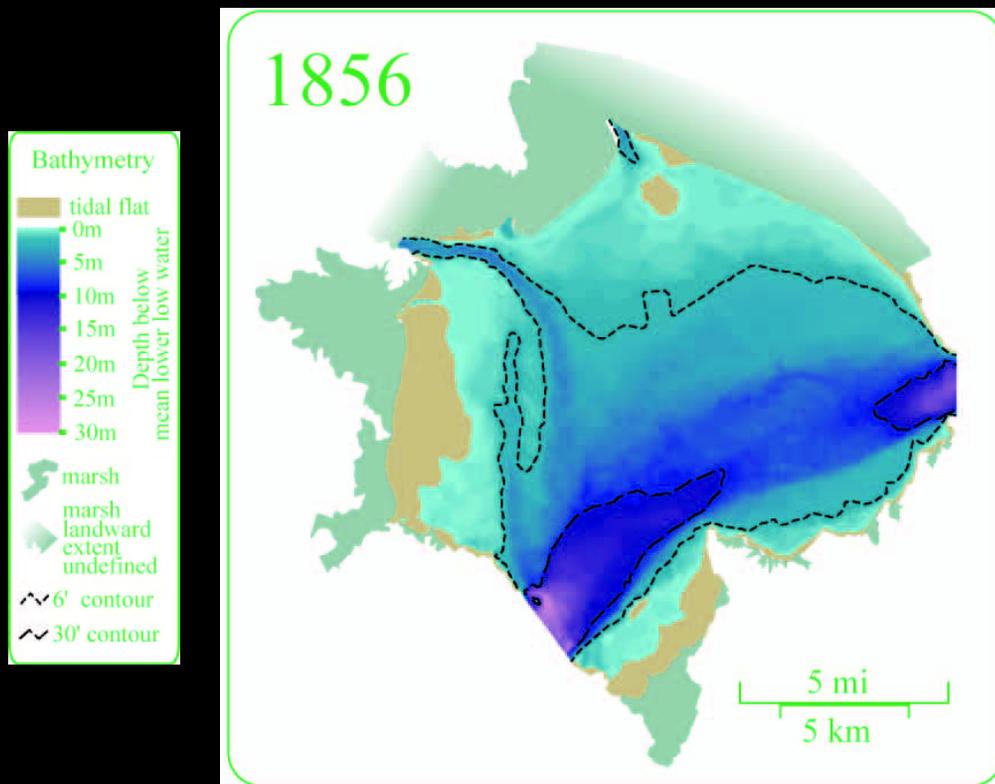


Jaffe et al., 2007

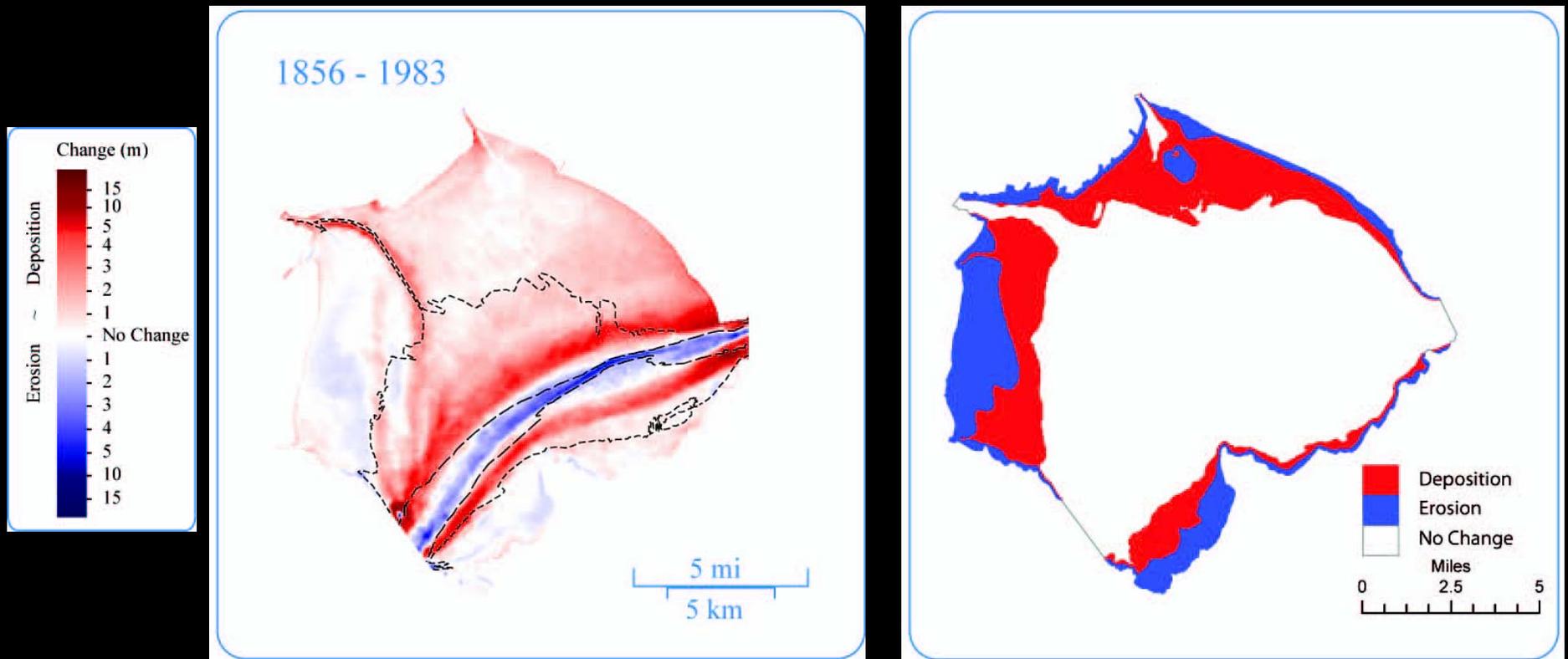
# Bruun Rule- A simple model



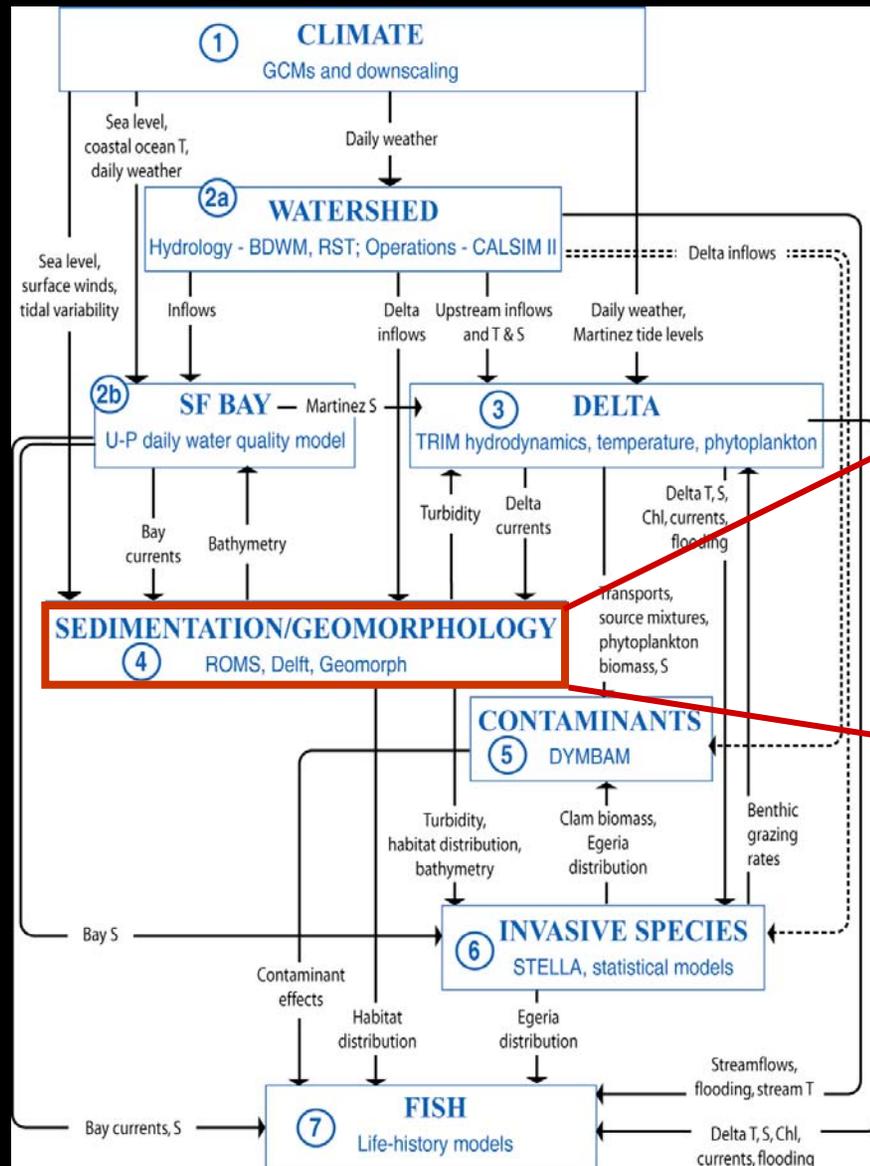
# Conceptual Application of Bruun Rule to San Pablo Bay



# Comparison of Actual and Bruun Rule Deposition and Erosion

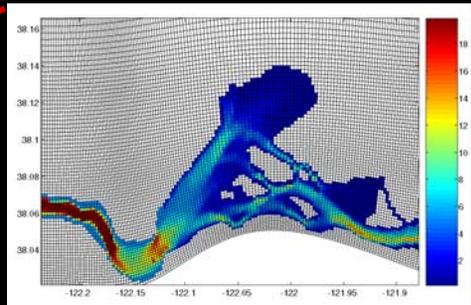


# CASCaDE's Geomorphology Models



**BDWM/CALSIM**

- Delta inflows
- Magnitude
- Timing



**ROMS/DELFT3D**

- Hydrodynamics
- Sediment transport
- Geomorphology

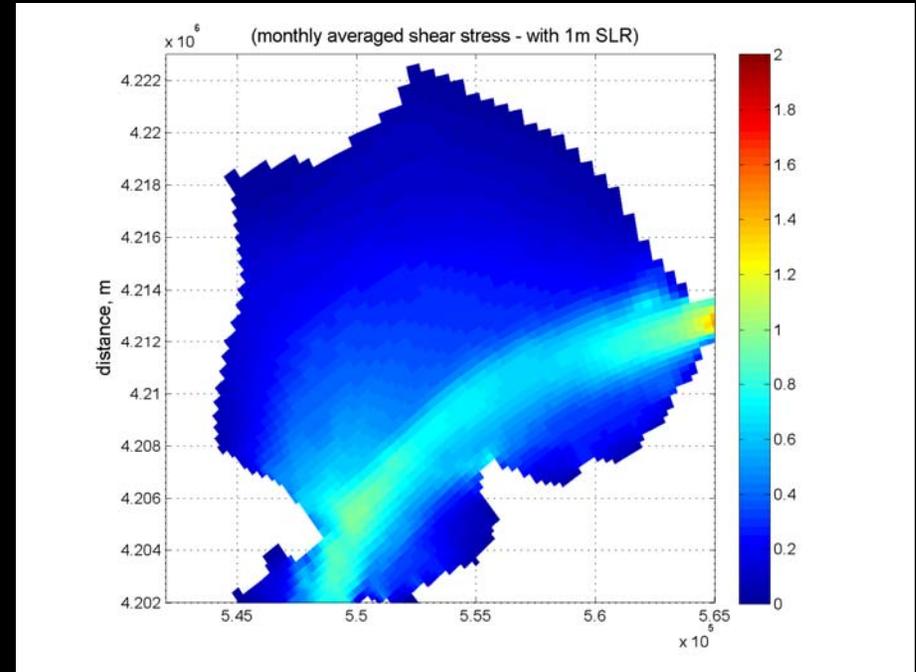
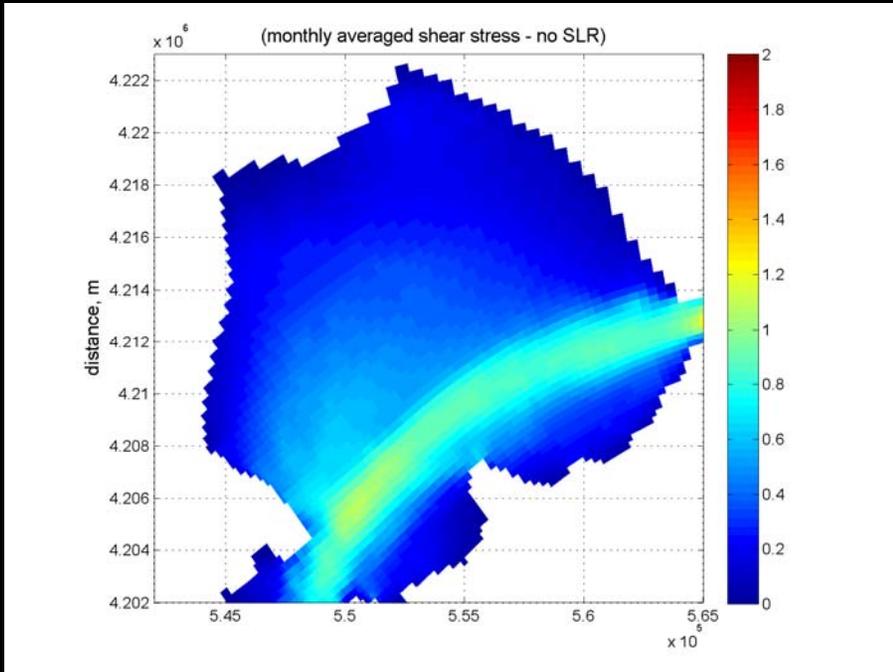


**Outputs**

- Depth distribution
- Turbidity
- Habitat distribution



# Decrease in tidal bottom shear stress



Delft-3D Model

Mick van der Wegen

# Suisun Bay Sea Level Rise and Climate Change ROMS Model

## Sea-level rise:

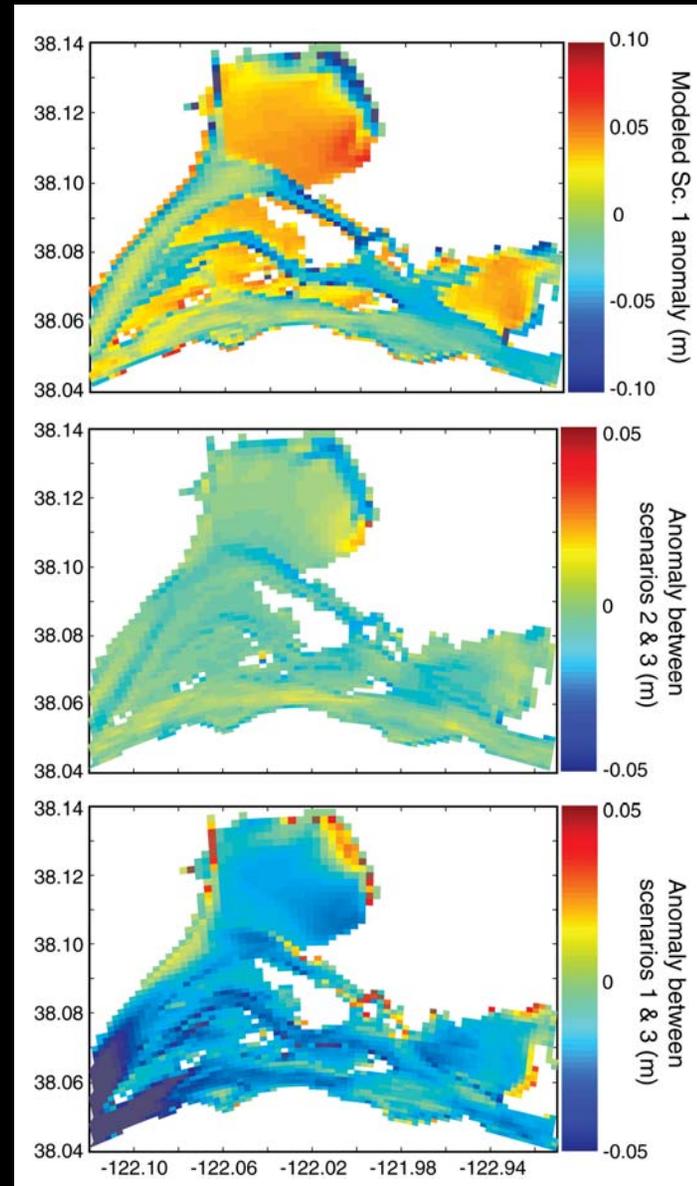
- Increase in water depth reduces wave-induced shear stress
- Less erosion, less redistribution

## Warming:

- Minor changes in redistribution

## Decreased sediment supply:

- Erosion everywhere except fringes



ROMS Model

Neil Ganju

# Summary- Geomorphic Response of Estuaries to Sea Level Rise and Climate Change

- Sediment supply and demand
  - Historical data and numerical models
    - Sediment supply extremely important
    - SLR will increase sediment demand
- Limitations of simple models
  - Bruun rule
    - Does not predict changes in San Pablo Bay
    - Limited by being 2D, not a closed system
- Changes in hydrodynamics and sediment transport
  - Numerical models
    - SLR increases tidal amplitude
    - SLR decreases average tidal bottom shear stress in San Pablo Bay
    - SLR decreases wind wave bottom shear stress in Suisun Bay, induces deposition in shallows