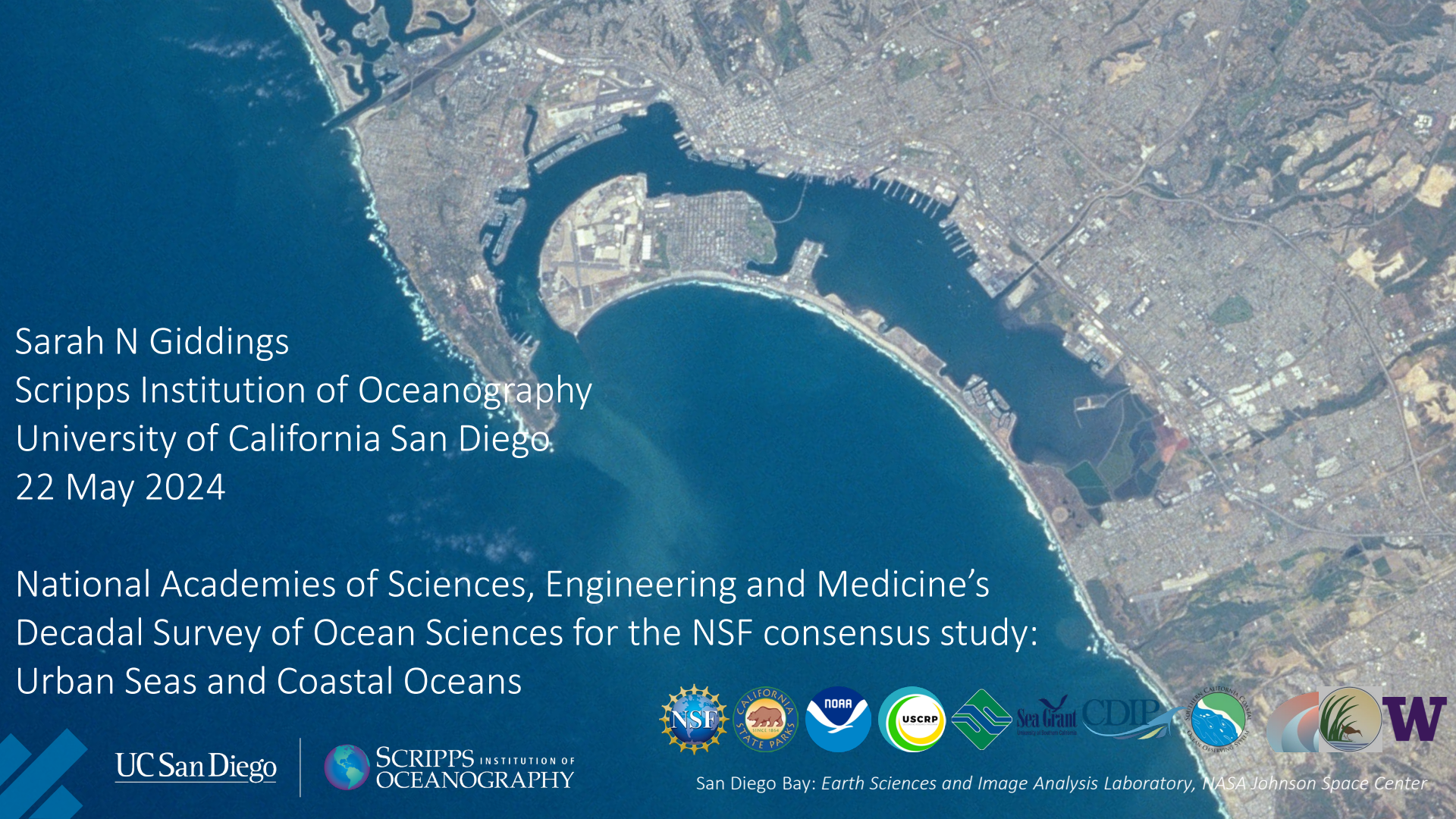


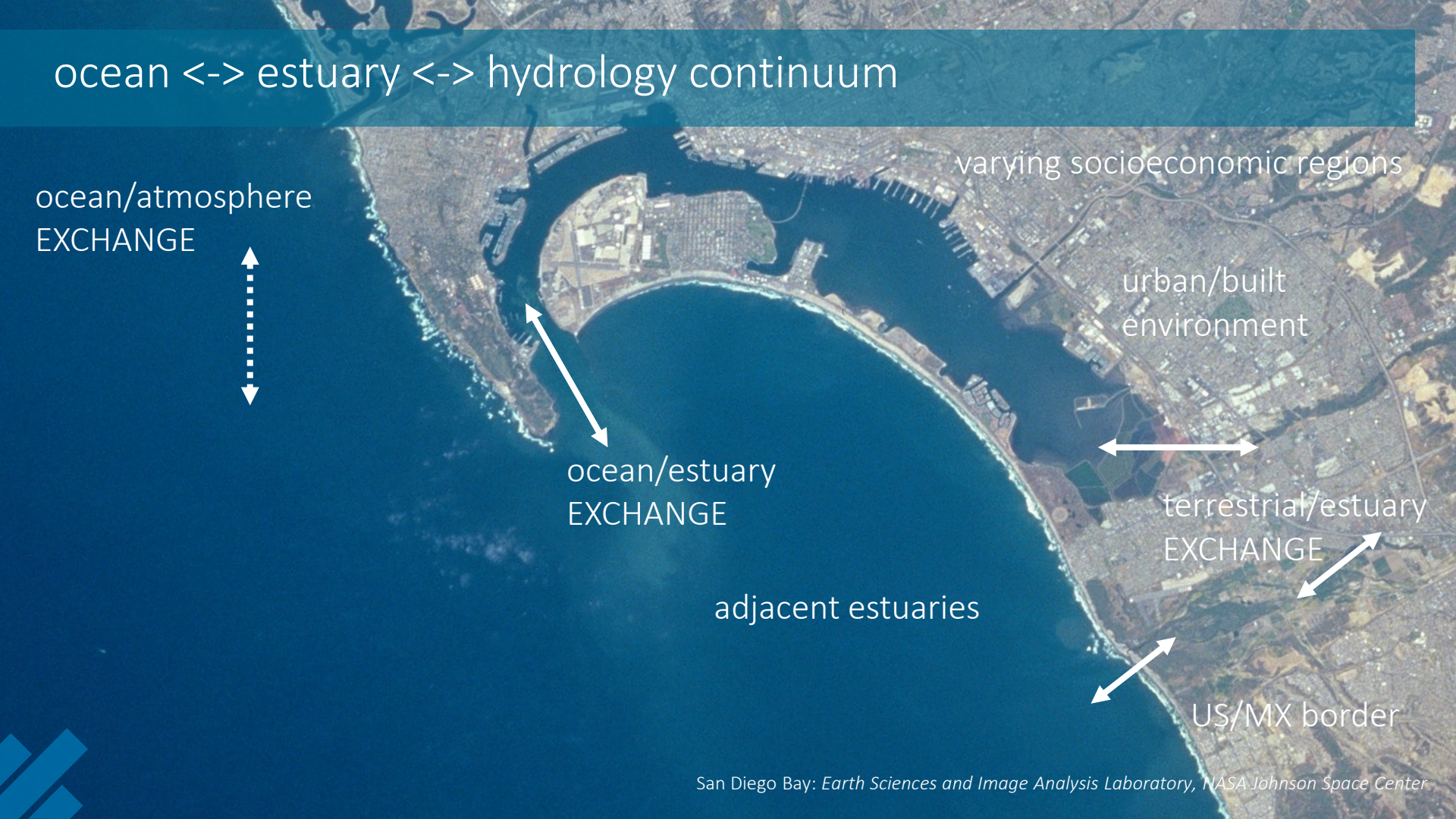
Sarah N Giddings
Scripps Institution of Oceanography
University of California San Diego
22 May 2024

National Academies of Sciences, Engineering and Medicine's Decadal Survey of Ocean Sciences for the NSF consensus study: Urban Seas and Coastal Oceans

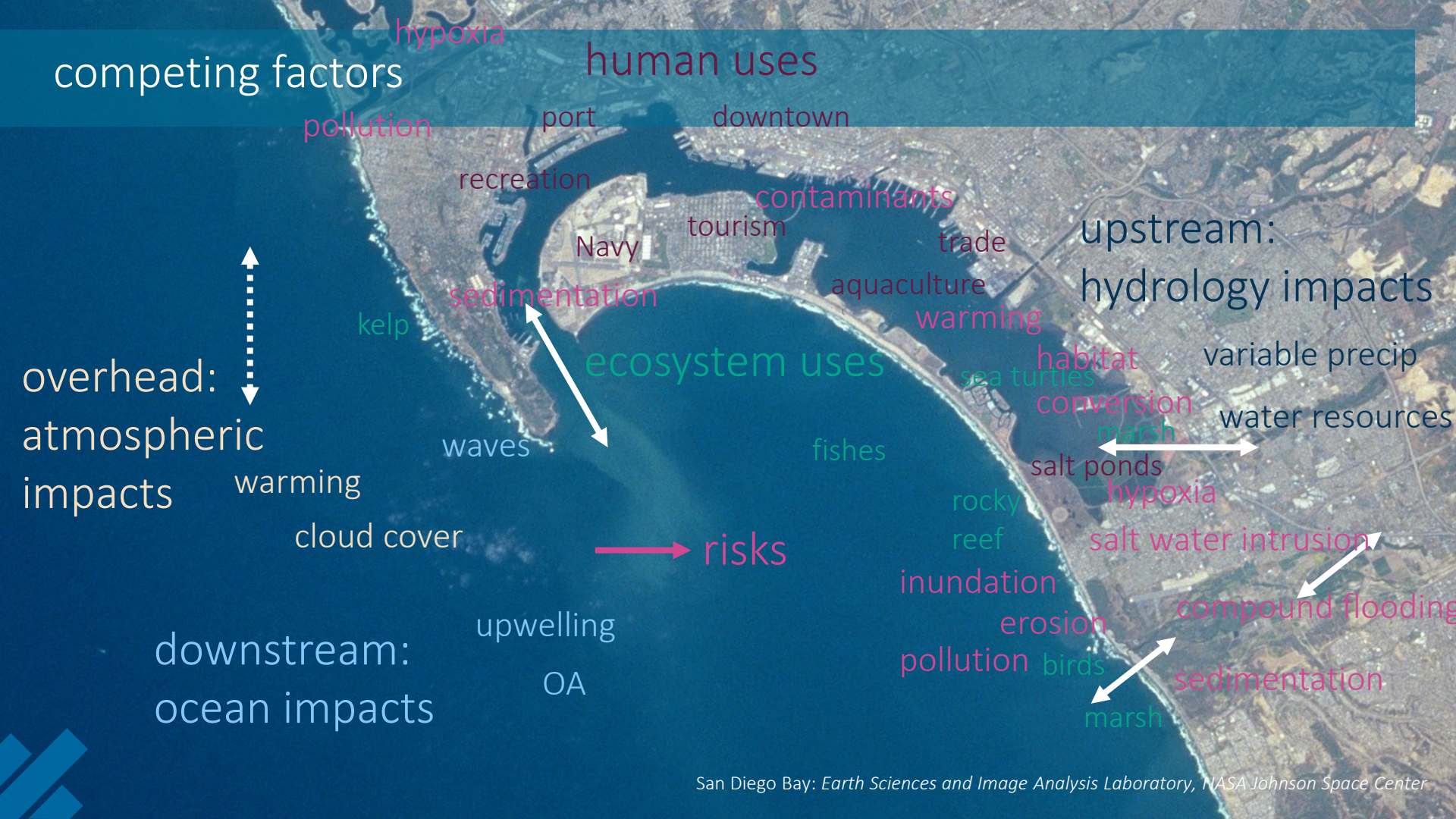
UC San Diego | SCRIPPS INSTITUTION OF OCEANOGRAPHY

San Diego Bay: *Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center*

ocean <-> estuary <-> hydrology continuum



San Diego Bay: *Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center*



San Diego Bay: *Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center*

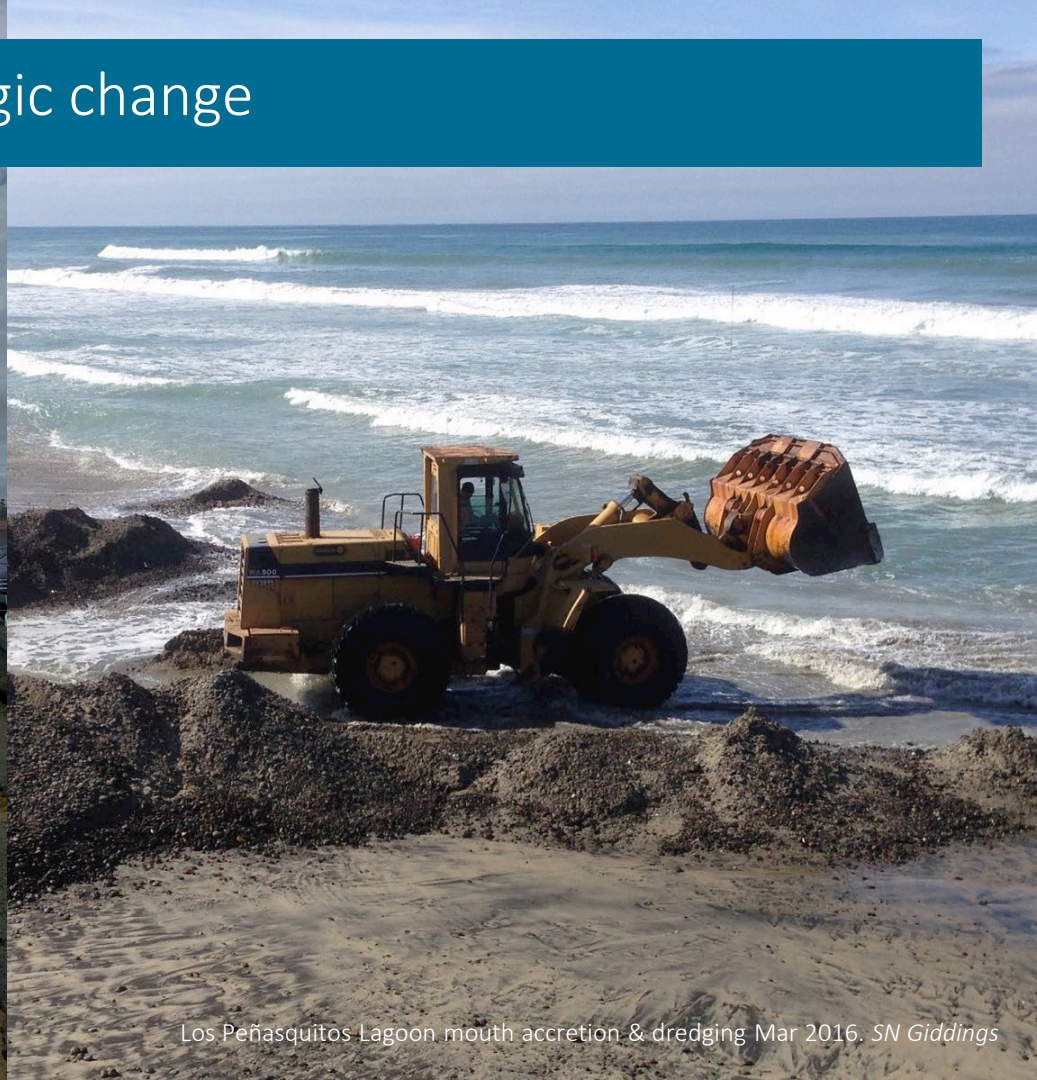
pressing issues

- coastal inundation & morphological change
- water quality
- ocean acidification & remediation strategies
- salt water intrusion

these all require looking across the
coastal ocean <-> estuary <-> hydrology continuum
+ including human impacts & a changing climate

coastal inundation & morphologic change

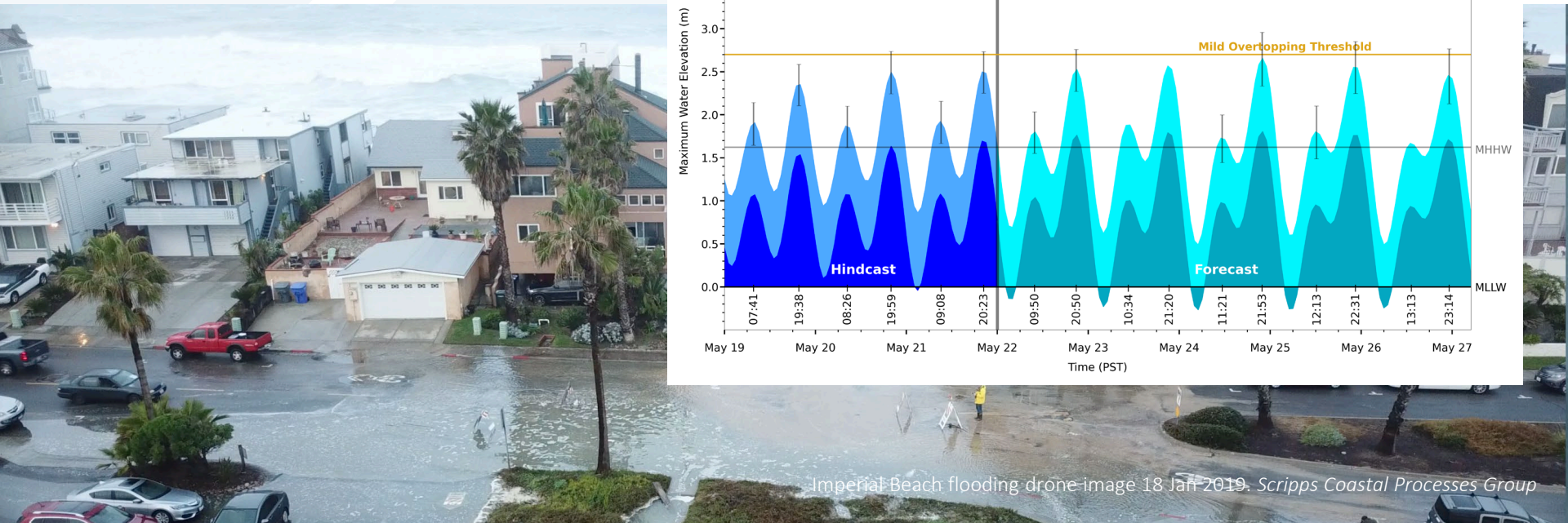
Torrey Pines State Beach erosion & infrastructure damage Mar 2016. *Astrid Hsu*



Los Peñasquitos Lagoon mouth accretion & dredging Mar 2016. *SN Giddings*

coastal inundation & morphologic change

center for Climate Change Impacts and Adaptation
at Scripps Institution of Oceanography
UC San Diego



Imperial Beach flooding drone image 18 Jan 2019. *Scripps Coastal Processes Group*

water quality

freshwater plumes transport terrestrial material to estuaries & the ocean & drive exchange of

- pollution
- nutrients
- sediment
- larvae

→ coastal economies & ecosystems

Tijuana River Estuary plume. *Wildcoast*

ocean acidification & remediation strategies

need scientific studies of potential remediation strategies being considered such as OAE

PiNC 2023
Plumes in Nearshore Conditions

PiNC dye release, 01 February 2023. *PiNC drone team*

salt water intrusion

Sacramento-San Joaquin Delta

- water to 2/3 of the state
- 80% commercial fisheries
- irrigates 45% of US fruits & veggies

salt water intrusion risk

- drought
- sea level rise

San Francisco Bay Delta. *Just Transitions project*

salt water intrusion

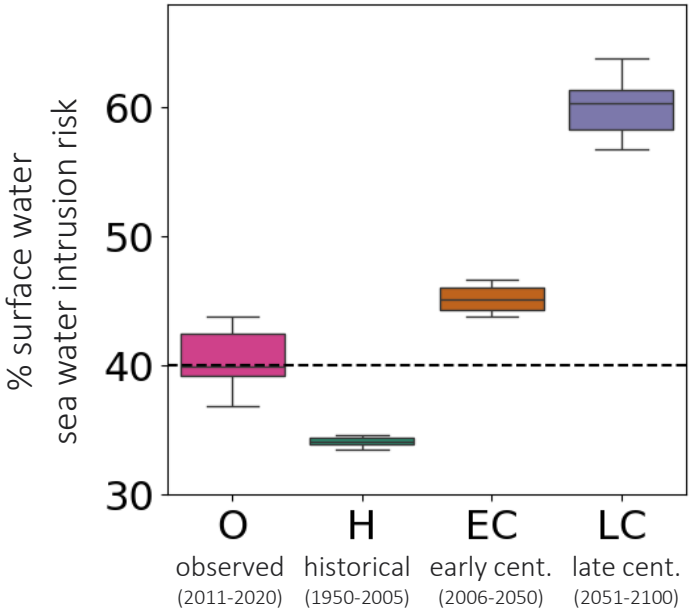
Pajaro River Valley
- $1B agricultural products

salt water intrusion risk
- surface water
- groundwater

flooding risk

Pajaro River mouth. *Dr. Mara Orescanin, NPS*

salt water intrusion



Kim et al., in prep

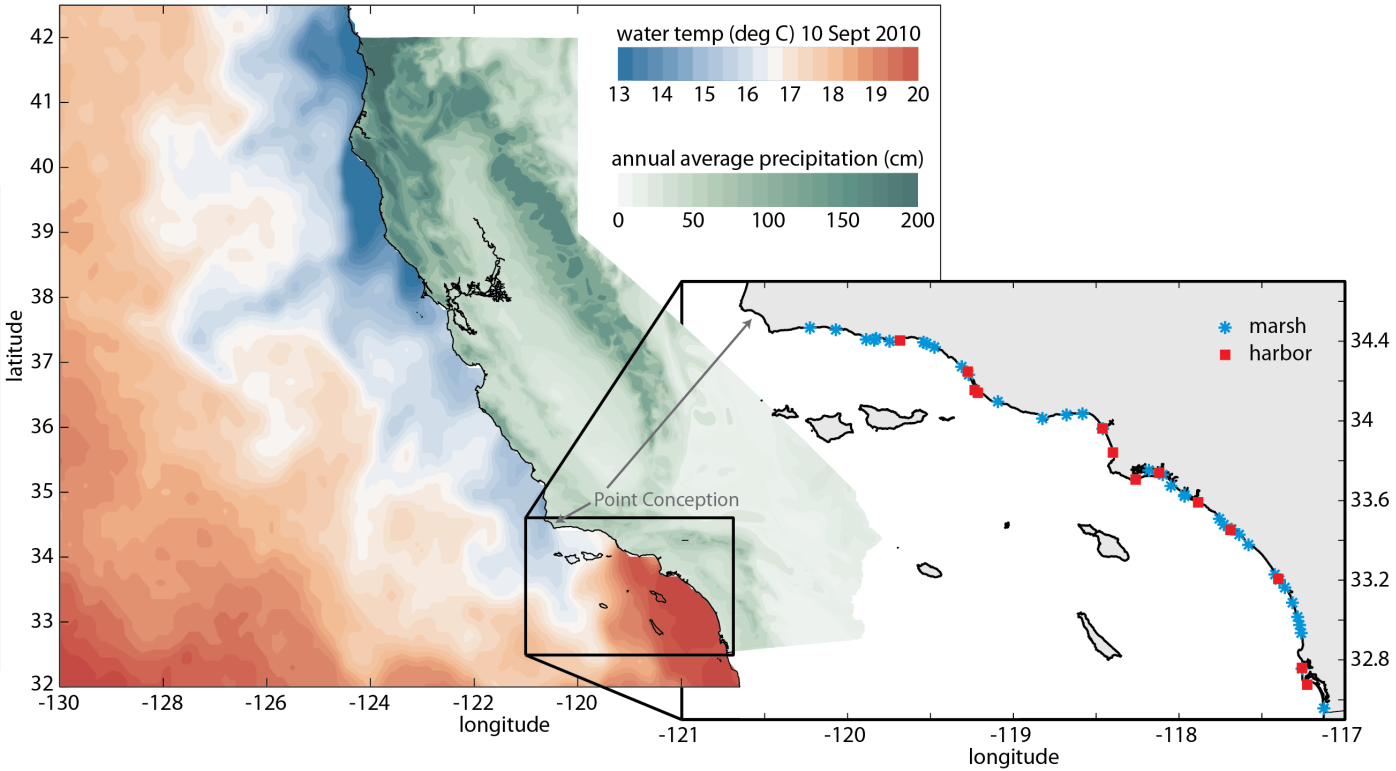
Pajaro River mouth. *Dr. Mara Orescanin, NPS*

projections under future climate scenarios

offshore
- sea level rise
- waves?
- SST
- upwelling?
- chemistry

upstream
- drought
- storm intensity

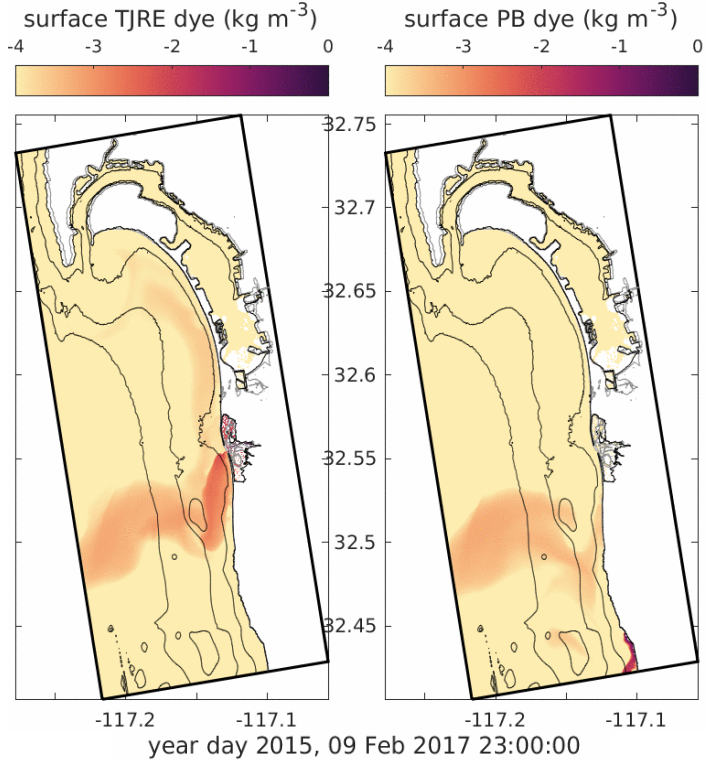
above
- temp
- cloud cover



what do we need?

these all require looking across the coastal ocean <-> estuary <-> hydrology continuum + human impacts + climate

- long term observations
- integrated observations & modeling (across disciplines)
- integrating with local communities, stakeholders, & managers
- cross-estuary understanding



water quality predictions. *Feddersen et al., 2021*