Unraveling The Mystery Of Coastal Hazards Models: A non technical summary

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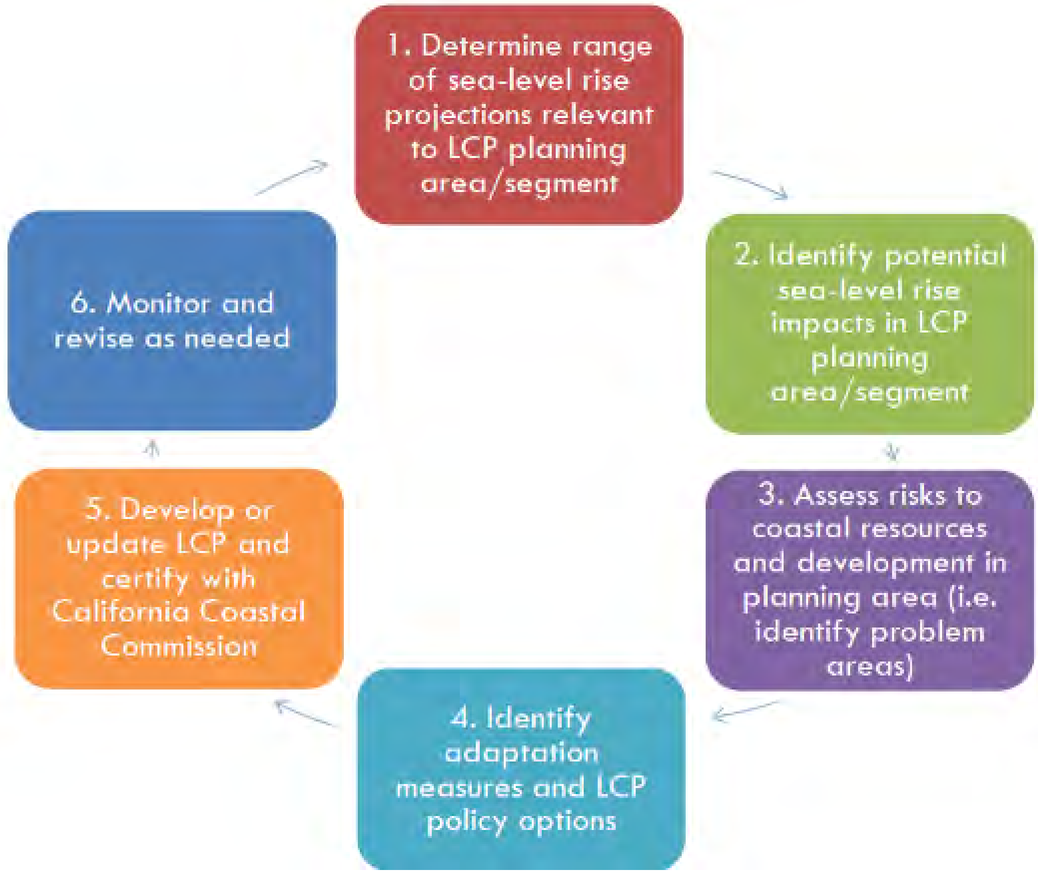
Sea Level Rise Policy Guidance



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Vulnerability Assessment

- Evaluates the impacts of each type of hazard (e.g. erosion, flooding, inundation)
- Assesses impacts to each resource sector over time (e.g. infrastructure, habitat, land use, utilities)
- Identifies thresholds in either time or rise in sea level
- Different levels of VA

Flooding at Fairview and Hollister (1998)

Consideration in Selecting Models

- Time versus Elevation
- Spatial coverage
- Type of Hazards mapped
- Ease of Use
  - Data Size
  - Closed polygons
- Applications
  - Economic
  - Flood Depth
- Availability and Technical Documentation

Definitions

Wave Flooding vs. Tidal Inundation vs. Erosion vs. Nuisance Flooding

Erosion

Wave Flooding

Tidal Inundation

Nuisance Flooding

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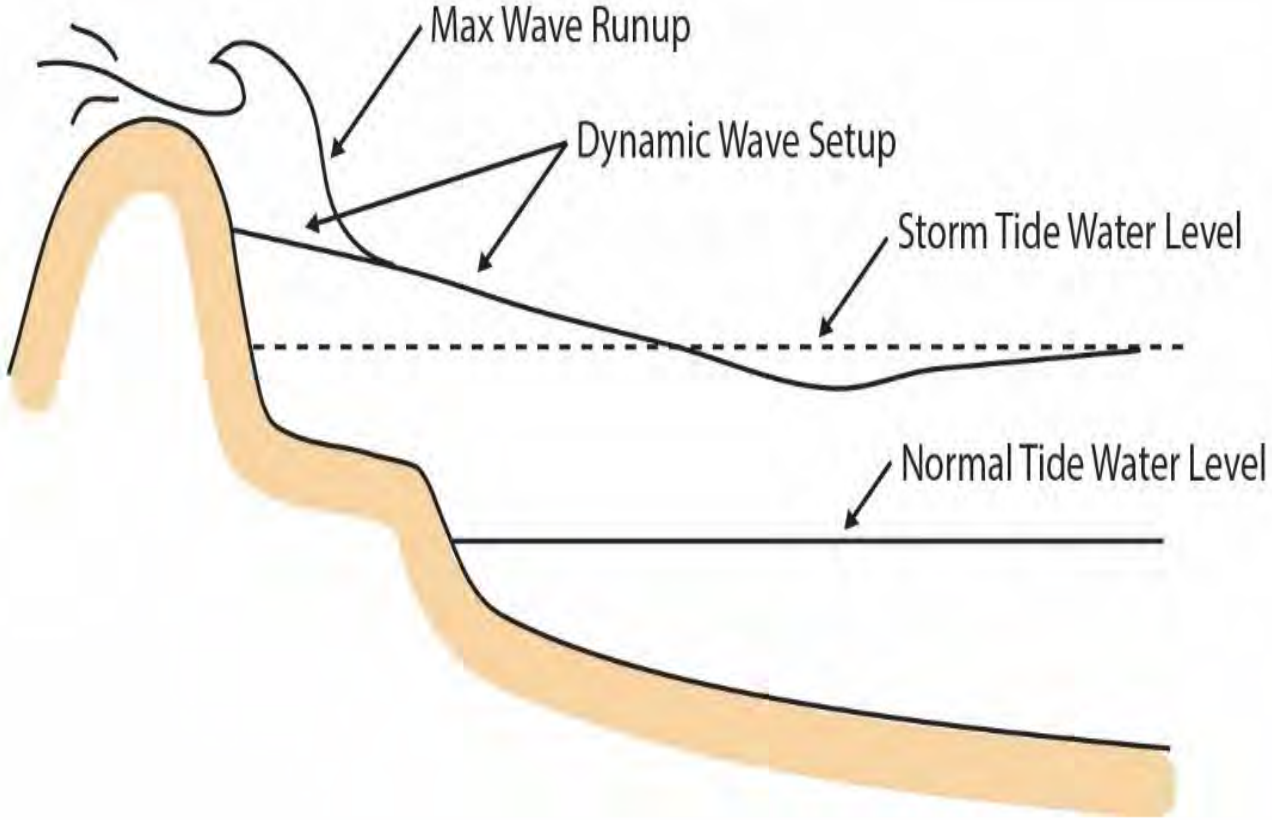
Definitions of Key Coastal Processes



Available Coastal Hazard Models

All models are wrong, some models are useful…

Pacific Institute (2008) www.pacinst.org

- Initial model study for coastal flooding coastal erosion from SB North

FEMA http://www.r9map.org/Pages/CCAMP-Open-Pacific-Coast-Study.aspx

- Existing regulatory maps

Coastal Resilience www.coastalresilience.org

- Version 2.0, (Ventura), 3.0 (Santa Cruz, and Monterey Bay) and 4.0 (Santa Barbara County and Los Angeles County of Pacific Institute modeling (Revell et al 2011, PWA, ESA, Revell Coastal)

COSMOS (USGS) www.ocof.org

- 1.0 Southern California, 2.0 North Central Coast , 2.1 SF Bay, 3.0 Southern California (Barnard et al, Erikson et al, 2016, 2017 etc)

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NOAA SLR Viewer / Climate Central

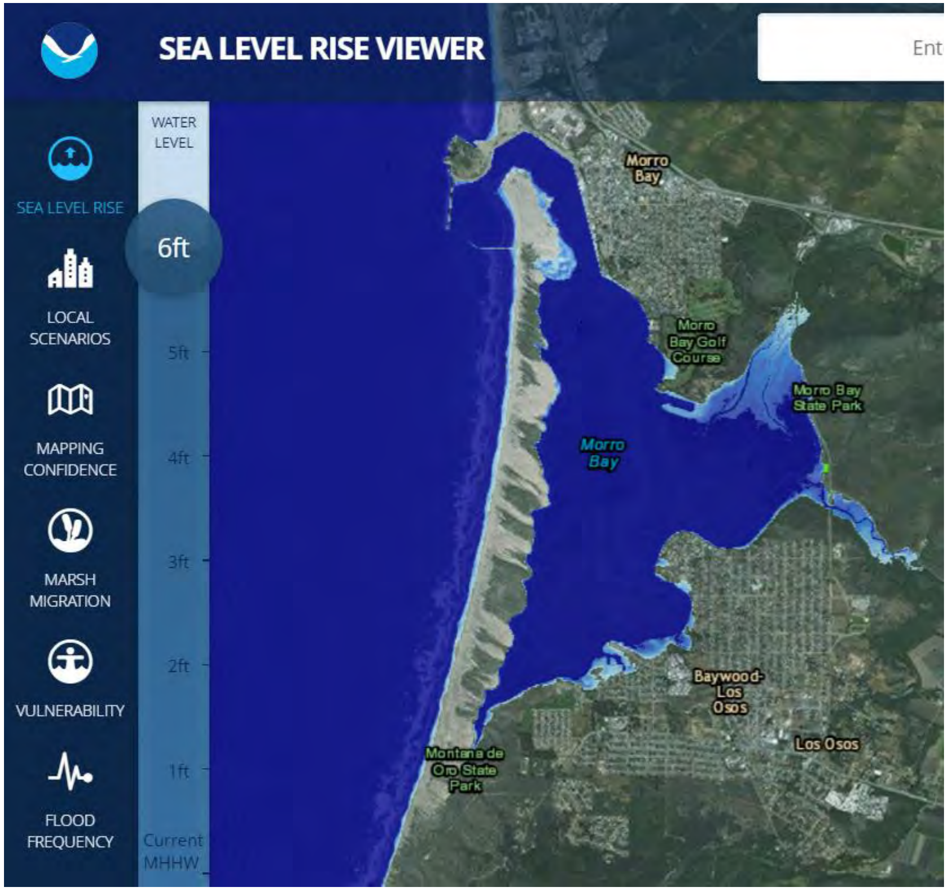
Maps Mean Higher High Water + up to 6 feet of sea level rise

No Waves

No Erosion

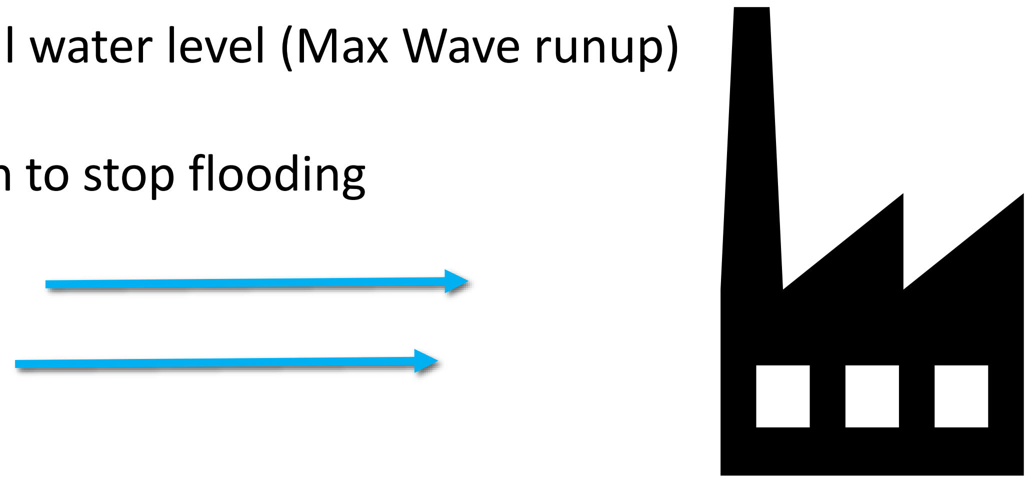
Screening level tool

https://coast.noaa.gov/slr/#



FEMA

Regulatory – Flood Insurance Rate Maps
Does not include Sea Level Rise
1% annual chance total water level (Max Wave runup)
Dunes don’t erode
Dunes are high enough to stop flooding



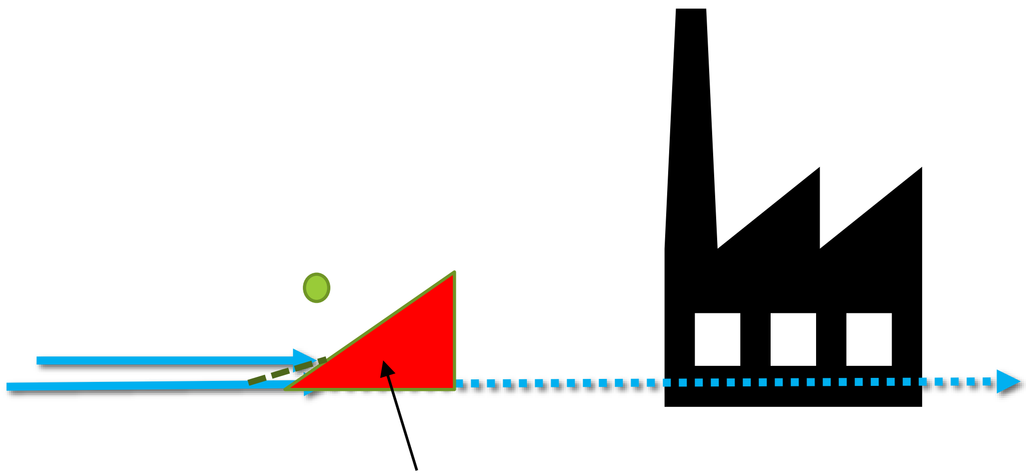
Preliminary versus Effective
Can escalate by including both elevation and transgression
http://www.water.ca.gov/floodmgmt/lrafmo/fmb/docs/Technical-Methods-Manual_FINAL_2016_12_02_clean.pdf

USGS COSMOS 3.0

Dynamic water level flooding with Maximum inland extent of run up points

Dune erosion 2-step process: **NOT YET AVAILABLE**

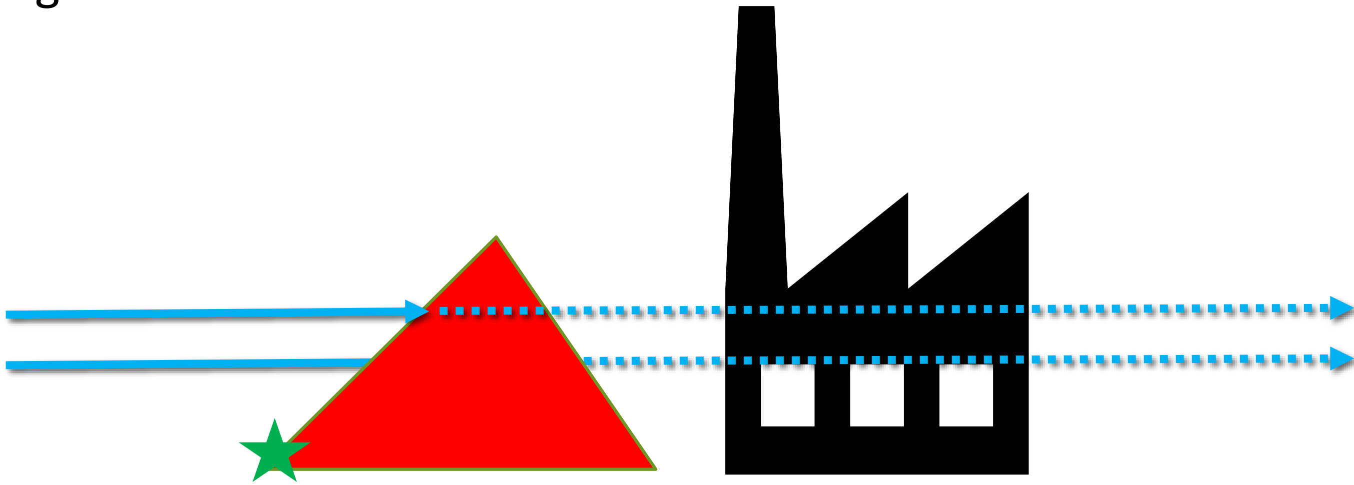
1. Long-term (decades): based on translation of MHW position and profile
2. Short-term (storm event): computed with XBeach using an initial profile from step 1



Variable total erosion based on local conditions and forcing
Exact volumes for transects not yet published

Coastal Resilience

1% annual chance total water level causes dune erosion
Dunes erode assuming storm water level duration is unlimited



http://maps.coastalresilience.org/california/

"If a model can accurately hindcast, we can have some confidence in its forecasts of the future." – CEC staff

Storm impact data is difficult to obtain

Model validation is often reduced to things we measure - tides, buoys

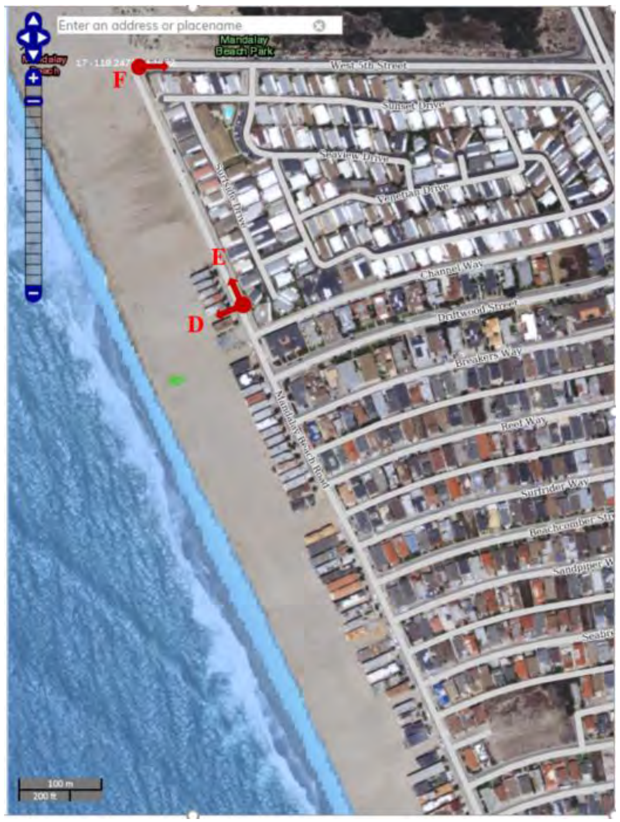
Simple Tests

Does the beach get wet during an extreme wave event?

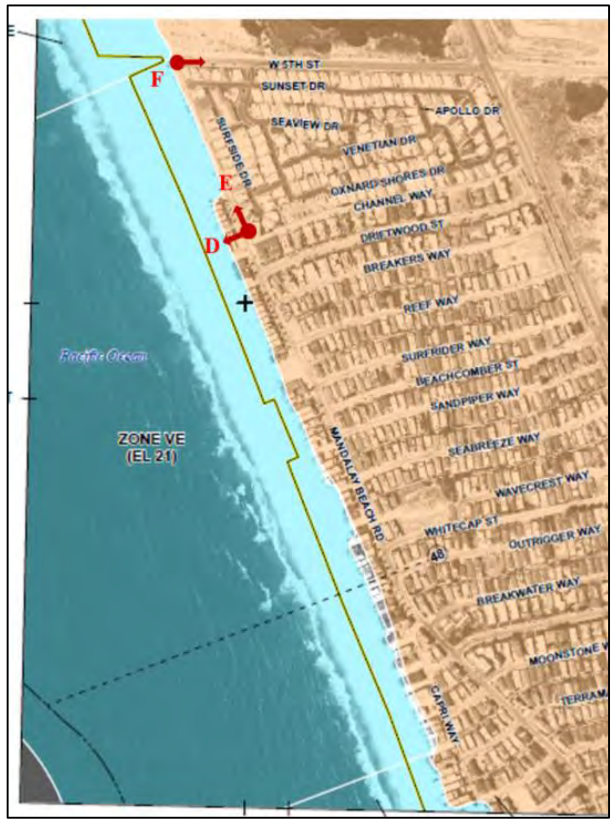
How well do the coastal hazard maps replicate ground photos and videos taken during large events?

Oxnard Shores - 100 year event NO SLR

COSMOS 3.0



FEMA PFIRM



Coastal Resilience

Oxnard Shores – December 11, 2015

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Pierpont Bay - 100 year event NO SLR

COSMOS 3.0

FEMA PFIRM

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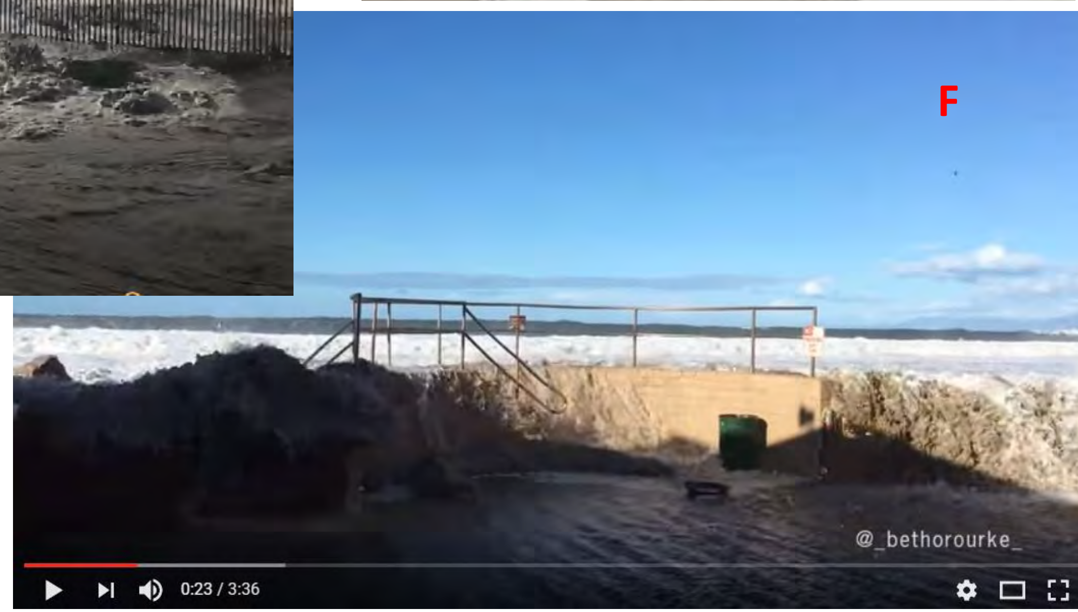
Pierpont– December 11, 2015



New Bedford Court –December 11, 2015

Goleta Beach- 100 year event NO SLR

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Goleta Beach

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Carpinteria 100 year event NO SLR

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1987 Storm Event

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Summary

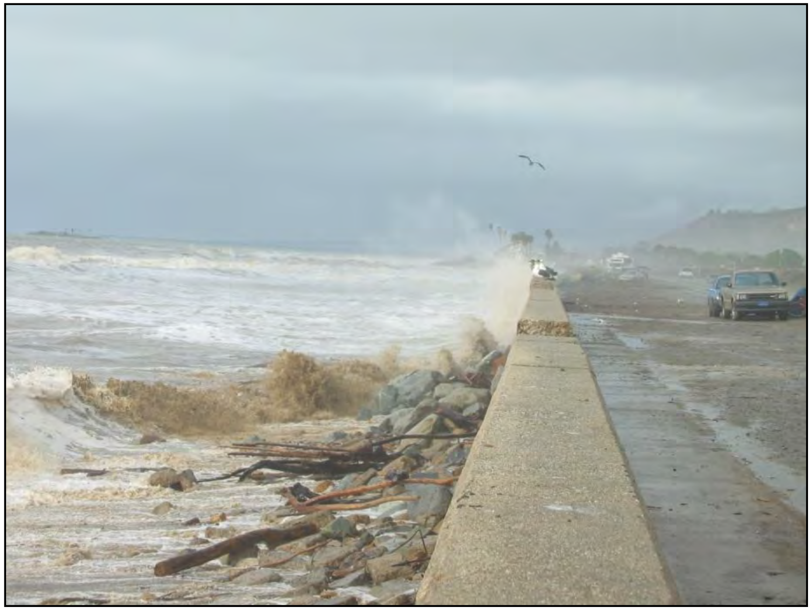
Not all models are created equally

Model Selection is a critical component of Vulnerability Assessments

Do your homework…

- Examine existing conditions model with historic storm photos.

A suite of models provide multiple lines of evidence



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Time to go…

Scenarios

- Time vs elevation
- Planning horizons
- High vs. Low
- Emerging Science versus the available models
- H++ extreme scenario (up to 9.5’ by 2100)

Table 1. Sea level rise projections from NRC (2012), for the Los Angeles region, eustatic (without vertical land motion)

Year	*Low SLR*	*Medium SLR*	*High SLR*
2030	0.1 cm (0.04 inches)	9 cm (3.5 inches)	26 cm (10.2 inches)
2060	7 cm (2.8 inches)	30 cm (11.8 inches)	69 cm (27.2 inches)
2100	27 cm (10.6 inches)	78 cm (30.7 inches)	153 cm (60.2 inches)

Sea Level Rise (meters)	Time based on CEC probabilities (50th to 99th%)
Baseline 100yr	Current
0.25	2035-2055
0.5	2049-2079
1.0	2065-2088
2.0	2085-2092

	50% (1 in 2)	5% (1 in 20)	0.5% (1 in 200)
2030	0.5	0.7	0.9
2050	0.9	1.4	2.0
2100 (RCP 8.5)	2.6	4.6	7.1

Griggs et al 2017