Coastal Storm Modeling System (CoSMoS) FAQ

What is CoSMoS?
A numerical modeling system to predict coastal flooding due to both sea level rise and storms driven by climate change.

Why include storms?
Sea level is expected to rise up to 1.7 m (~6 ft) along the California coast by 2100, BUT during winter storms coastal water levels can be elevated by an additional 5 m (~16 ft) or more due primarily to large waves and storm surge (low atmospheric pressure and wind). Without this dynamic component an important aspect of future vulnerability would be missed.

How is the modeling accomplished?
The results of the latest Global Climate Models (GCMs) are fed into a global wave model to develop wave conditions for the U.S. West Coast through 2100. Those offshore wave conditions, combined with tides and storm surge, are modeled down to the local level using state-of-the-art numerical modeling tools to determine coastal water levels which are then projected onto a 2 m Digital Elevation Model (DEM) to estimate the extent of flooding. This is peformed for virtually every combination of anticipated sea level rise (SLR) and storm condition.

Why use GCMs?
Future storm conditions are likely to evolve in a fashion that is unlike past conditions and is ultimately dependent on the complicated interaction between the Earth's atmosphere and ocean systems, which GCMs simulate. Therefore, the past several decades of wave measurements may not be indicative of the future wave climate.

What makes CoSMoS unique?

- Explicit, deterministic modeling of all the relevant physics (e.g., tides, waves, surge) of a coastal storm scaled down to local flood resolution projections
- Driven by GCMs, waves are modeled at the global scale, and then dynamically downscaled, along with regional additions of wind, atmospheric pressure, tides and SLR, to produce hazard projections for managers
- Scenarios feature the full spectrum of SLR (0 to 2 m, 5 m) and coastal storms (daily to 100-year return) to meet every possible management planning horizon and degree of risk tolerance
- Product tool allows the user to select from 50 combinations of SLR and storms to visualize the flooding depth extent, and uncertainty associated with each event, in addition to predictions of wave heights, current strength, and event-based shoreline change, and can be overlain with a huge database of ecology, land use, and infrastructure attributes

Where can I get more information?

- Online report- 'The Framework of a Coastal Hazards Model—A Tool for Predicting the Impact of Severe Storms': http://pubs.usgs.gov/of/2009/1073/
- Our Coast Our Future- Interactive Map showing flooding impacts for the North-central California Coast due to climate change based on CoSMoS (in partnership with PRBO and NOAA): www.prbo.org/ocof
- Southern California Pilot Project- A few simple climate change scenarios to broadly assess the vulnerability of the Southern California coast to climate change: KMZs of flooding projections available upon request

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