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# Projected 21st Century Coastal Flooding in the Southern California Bight. Part 1: Development of the Third Generation CoSMoS Model

**Andrea C. O'Neill [1,*], Li H. Erikson [1], Patrick L. Barnard [1], Patrick W. Limber [1], Sean Vitousek [2], Jonathan A. Warrick [1], Amy C. Foxgrover [1] and Jessica Lovering [1]**

1 U.S. Geological Survey, Pacific Coastal and Marine Science Center, 2885 Mission Street, Santa Cruz, CA 95060, USA; lerikson@usgs.gov (L.H.E.); pbarnard@usgs.gov (P.L.B.); plimber@usgs.gov (P.W.L.); jwarrick@usgs.gov (J.A.W.); afoxgrover@usgs.gov (A.C.F.); jlovering@usgs.gov (J.L.)

2 Civil and Materials Engineering, University of Illinois at Chicago, 2095 Engineering Research Facility, 842 W. Taylor Street (M/C 246), Chicago, IL 60607-7023, USA; vitousek@uic.edu

* Correspondence: aoneill@usgs.gov; Tel.: +1-831-460-7586

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**Abstract:** Due to the effects of climate change over the course of the next century, the combination of rising sea levels, severe storms, and coastal change will threaten the sustainability of coastal communities, development, and ecosystems as we know them today. To clearly identify coastal vulnerabilities and develop appropriate adaptation strategies due to projected increased levels of coastal flooding and erosion, coastal managers need local-scale hazards projections using the best available climate and coastal science. In collaboration with leading scientists world-wide, the USGS designed the Coastal Storm Modeling System (CoSMoS) to assess the coastal impacts of climate change for the California coast, including the combination of sea-level rise, storms, and coastal change. In this project, we directly address the needs of coastal resource managers in Southern California by integrating a vast range of global climate change projections in a thorough and comprehensive numerical modeling framework. In Part 1 of a two-part submission on CoSMoS, methods and the latest improvements are discussed, and an example of hazard projections is presented.

**Keywords:** sea-level rise; coastal storm flooding; coastal hazards

## 1. Introduction

With over 600 million people living in the coastal zone worldwide [1], changes in sea-level and atmospheric conditions, including winds, sea-level pressures (SLPs), and precipitation [2], represent significant potential hazards. As such, changes will affect coastal erosion and flood patterns [3], increasing development and populations in these areas [1] will exasperate vulnerabilities and exposure unless methods to identify future hazards are developed and appropriate mitigation and adaptation strategies implemented.

Global Climate Models (GCMs) are often the best tools to evaluate potential changes in large-scale conditions and hazards. The coarse resolution and inability of GCMs to represent meso-scale conditions essential for local coastal impact studies [4], however, make downscaling of GCMs necessary [5] for community-scale coastal hazard identification. Several studies have conducted regional downscaling of GCMs for evaluation of changes in future storm surges and wave conditions of interest to coastal communities [6–10]. However, only a few have translated that work to the coastal zone and developed flood hazard maps from the combined impacts of projected sea-level rise (SLR), wave setup and runup, storm surge, and other coastal water level contributors.