Projects and ActivitiesTue Apr 16 22:20:00 HST 2024

Name	Predicting the Impact of Storm Waves and Sea-Level Rise within the Papahanaumokuakea Marine National Monument
Capability Area: Variability/Changes	- Understanding Climate Variability and Change - Research/Development - Projections (modeling and downscaling)
ECV	- Surface (e.g., temp, precip, wind) - Surface (e.g., SST, SSH, salinity, ocean color)
Timeframe	- Seasonal (outlook) - Intra-annual to Decadal - Multi-decadal (scenarios)
Capability Area: Impacts/Adaptations	- Understanding Climate Impacts and Informing Adaptation - Climate Impacts - Research/Development - Projections (modeling and downscaling)
Sectors	- Public Health and Safety - Community Planning and Development - Social and Cultural Resources - Ecosystems
Status	- Ongoing
Focus Area	- Coastal Inundation/Sea Level Rise, Extreme Weather, and Community Resilience
Regions	- Central North Pacific - North Western Hawaiian Islands
Description	The goal of this study is to provide maps of wave impact and storm-induced inundation levels for islands of high conservation value. Vulnerability will be assessed for Midway Atoll and Laysan Island using historical data and new high resolution Digital Elevation Models (DEMs) for a variety of sea-level rise scenarios. Research to date forecasts sea-level rise with only passive flooding scenarios, and until now, was limited by a lack of topography data for Hawaii's remote atolls. Predicting impacts of flooding and storm-induced waves is needed to develop climate-change adaptation plans for the biological communities and resident endangered species. This information is also needed for managers to understand risks and determine emergency responses for the range of parameters where natural, historical, and cultural resources and remotely stationed personnel may be threatened from sea-level rise and storm-induced waves.

Objectives/Outcomes	The following products will be produced for both Midway Atoll and Laysan Island: 1) Wave climatology (long-term characterization of wave patterns) delineating the different end-member wave conditions that impact the islands; 2) GIS maps of wave parameters (significant wave height, wave period, wavelength) for the different wave climatologies at present sea level; 3) GIS maps of wave parameters (significant wave height, wave period, wavelength) for the different wave climatologies at potential future sea levels; 4) GIS maps showing the limit of inundation for the different wave climatologies at present sea level relative to the locations of natural resources and infrastructure; 5) GIS maps showing the limit of inundation for the different wave climatologies at potential future sea levels relative to the locations of natural resources and infrastructure; and 6) Plots showing percentage of natural resources potentially inundated for the different wave climatologies at potential future sea levels. Products generated will also utilize historic monitoring data collect by project cooperators were appropriate (NOAA, USFWS). This project will also provide the essential baseline and understanding for potential future efforts to predict the potential effects of: a) tsunamis on natural and cultural resources; b) wave-induced forces on structures and predictions of coastal erosion and accretion; and c) sea-level rise's influence on waves to better define impacts to Federally-managed marine resources (e.g., coral reefs).
Lead Agencies	U.S. Geological Survey, Pacific Coastal and Marine Science Center
Contacts	Curt D. Storlazzi, cstorlazzi@usgs.gov
Partnering Agencies	U.S. Geological Survey, Pacific Islands Ecological Research Center - Help conduct analyses, do visualization, and add terrestrial ecology to impact map products.
Required Resources	1) MSc. student support 2) USGS Open-File Report EPN publication charges
Projected Timelines	See table embedded in full worksheet.