

NASA MUREP/SMD Ocean Biology and Biogeochemistry Awards (OCEAN)

**Title: Quantifying vulnerability to sea level rise across multiple coastal typologies**

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**Summary:** Assessing future impacts and vulnerability of coastlines and nearshore resources is increasingly important in this time of rapid climate change and rising anthropogenic activities. One of the most significant climate-induced changes in the coastal zone, and to the communities living within them, will be sea level rise. Given projected increases in sea level exceeding 1.0-3.0 m by the year 2100, tropical islands pose a major challenge to measuring and monitoring coastal vulnerability because slight changes in sea level may rapidly cover significant portions of available land area. Not only will this impact onshore ecosystems, such as rocky intertidal habitat, dune systems, and coastal vegetation, but the mixing of materials from land into nearshore waters will impact reef health and coastal ocean dynamics. The vulnerability of coastal and aquatic ecosystems to sea level rise has mostly been studied in the context of low gradient wetlands and sandy coastal environments. A major gap in knowledge is the extent to which sea level rise will modify habitat and community structure along rocky shorelines and concomitant coastal vegetation.

The proposal seeks to address the impact of climate change, particularly sea level rise and coastal inundation, on land/ocean interfaces and nearshore ecosystems (e.g., corals and reefs). The main hypothesis of this project deals with how the vulnerability of nearshore aquatic, intertidal and coastal ecosystems will accelerate when sea level rise (SLR) exceeds a critical elevation point. It uses the big island of Hawaii as a case study. The idea is that resilient coastal ecosystems will migrate upslope towards shore unless impeded by an obstacle. The objectives of the study are to (1) characterize aquatic and coastal habitat conditions across varying coastal typologies using remotely sensed and observational data, (2) quantify aquatic and coastal ecosystem vulnerability relative to a critical elevation across multiple typologies, and (3) model aquatic and coastal ecosystem change due to future sea level rise. The proposal intends to investigate the impact of sea level rise on tropical and rocky intertidal zones and coastal vegetation, the loss of which will impact humans and economics for these culturally significant ecosystems. The proposers will use a multi-scale approach to link in-situ, UAS (unmanned aerial systems) and airborne with satellite remote sensing data to quantify the vulnerability of coastal island ecosystems to sea level rise across multiple coastal typologies to enable model prediction of future impacts, among which they hypothesize landward, or “upslope”, migration of intertidal species as SLR intensifies. The project may allow researchers to understand and predict changes in ecological patterns, habitat shifts and the effects of climate change on the biology and economy of low-lying islands and their coastlines.