

HICO Data User's Proposal

Using HICO to derive coastal products at US affiliated Pacific Islands Region: Bathymetry, benthic features, and turbidity

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Abstract/project summary

Coral reef environments exhibit particular characteristics with regard to bathymetry, density and diversity of fish and benthic communities, and environmental patterns and variability. As part of our regular US Pacific Coral Reef Program, the NOAA Coral Reef Ecosystem Division is evaluating long term physical, biological and chemical time-series to better understand how ocean climate change is affecting coral reef ecosystems Pacific-wide. Here, the incorporation of high resolution hyperspectral data, from HICO, is essential to extending our spatial capabilities in nearshore areas. We propose to use retrospective and current HICO imagery to derive coastal products associated with bathymetry, benthic features and turbidity, at specific coral reef areas. NOAA CRED has programmed cyclical monitoring around the Northwest Hawaii islands, Commonwealth of the Northern Mariana Islands (CNMI), Guam, American Samoa and the Pacific Remote Islands, in the coming weeks/years.

1. Statement of work/project description

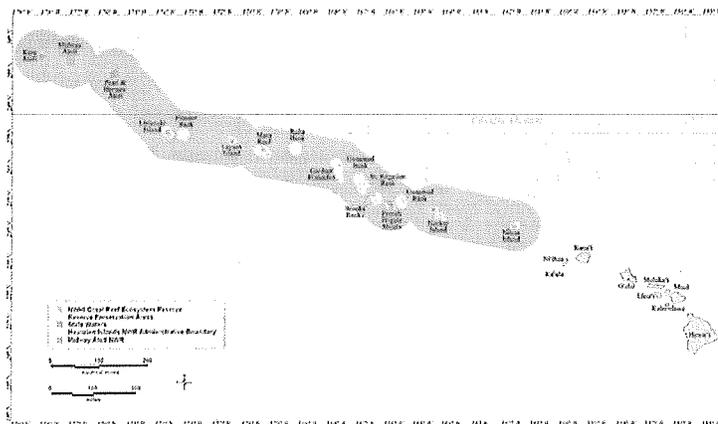
Coral ecosystems are fragile environments where reef structures (e.g. rugosity), sediment transport, light changes and local water dynamics are very important for the evolution of coral reef ecosystems. Many of the islands under the NOAA CRED monitoring plan are affected by strong environmental variability. For example, river discharge and bottom sediment re-suspension are a key factors influencing the survival of reef environments. Using current satellite-derived information for coastal environments allows us to develop indicators of what is

happening on coral reef areas.. HICO, the first space borne imaging spectrometer designed for monitoring the coastal oceans, having very fine spectral resolution (5.7 nm) and spatial resolution (90 m), will provide us with improved spatial data needed for our goals of identifying benthic features (coral vs. sand vs. algae), sediment features (CDOM vs. CHL), and to fill bathymetry gaps.

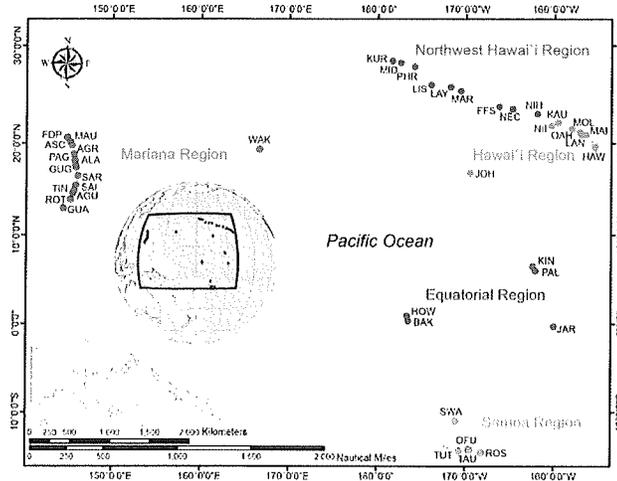
Specifically, NOAA CRED has programmed regular monitoring around the Northwest Hawaiian Islands, CNMI, American Samoa and the Pacific Remote Islands, in the coming weeks/years. We started in 2013 with the Main Hawaiian Islands (MHI) monitoring during August, and now we have scheduled a cruise on September to the Northwestern Hawaiian Islands (NWHI). We will be in CNMI early in 2014, while monitoring American Samoa in mid/late 2014. As part of the regular CRED monitoring we will be sampling nearshore waters conditions, as well as fish and benthic status.

We would like to propose to retrieve HICO images for the period when NOAA CRED will be at the NWHI, from September 3-19:

- September 5-8, 2013: French Frigate Shoals at 23°52.134'N 166°17.16'W
- September 9-12, 2013: Pearl and Hermes Atoll at 27.927687°N 175.737991°W
- September 12-15, 2013: Lisianski at 26.064031°N 173.965802°W



We also would like to request access to retrospective data for MHI (Hawaii, Kahoolawe, Maui, Lanai, Molokai, Oahu, Kauai and Niihau), NWHI (Nihoa, Necker, French Frigate Shoals, Gardner Pinnacles, Maro Reef, Laysan Island, Lisianski Island, Pearl and Hermes Atoll, Midway Island, and Kure Atoll), CNMI (Alamagan, Anatahan, Asuncion, Farallon De Medinilla, Farallon De Pajaros, Guguan, Maug (three islands), Pagan, Rota, Saipan, Sarigan and Tinian), Guam, American Samoa, and the Pacific Remote Islands (Howland, Baker, and Jarvis Islands; Johnston, Wake, and Palmyra Atolls; and Kingman Reef).



2. Biographical sketch and available facilities

We have several ongoing projects focusing on the nearshore sediments dynamics and monitoring at the US Pacific-affiliated islands, which are funded by NOAA Coral Reef Conservation Program. Our host institute, the NOAA CRED lab is part of the National Marine Fisheries Service and the Pacific Islands Fisheries Science Center, located in Oahu, and acts as the main support base for this work. We also have adequate necessary equipment and instruments to carry out the Pacific-wide monitoring NOAA effort.

In addition, Papahānaumokuākea Marine National Monument is building an inventory of remote sensing data for the Northwestern Hawaiian Islands for time series analysis and is interested in hyperspectral data particularly for its utility in characterizing remote and significantly inaccessible sites like Pearl and Hermes Atoll and Maro Reef.

3. Output and deliverables

Anticipated outputs and deliverables are publications on mapping of sediment concentrations and bathymetry using hyperspectral imagery, as well as a potentially new algorithm for coral vs. sand vs. algae discrimination.

4. References

- Brainard R, DeMartini E, Holzwarth S. 2002. Coral reef ecosystems of the Northwestern Hawaiian Islands: Interim results emphasizing the 2000 surveys. J Maragos and D Gulko (eds.). U.S. Fish and Wildlife Service and the Hawaii Department of Land and Natural Resources, Honolulu, Hawaii, pp. 10-11, 17, 31, 39, 43.
- Rooney JJ, Wessel P, Hoeke R, Weiss J, Baker J, Parrish F, Fletcher CH, Chojnacki J, Garcia M, Brainard R, Vroom P. 2008. Geology and geomorphology of coral reefs in the Northwestern Hawaiian Islands. In: Riegl BM and Dodge RE (eds.). Coral reefs of the USA. Coral reefs of the world 1. New York: Springer. Ch. 13: pp. 519-572.