

Open Source GIS and other Geospatial Data from the Pacific Islands Ocean Observing System (PacIOOS)

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GIS Day. University of Hawai'i at Mānoa. November 13, 2019.



3.10.0
3.4.13 LTR

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[FOR USERS](#)

[GET INVOLVED](#)

[DOCUMENTATION](#)

English

Time until freeze 2020-01-17 12:00:00 UTC 65d 15h 51m
Time until packaging 2020-02-21 12:00:00 UTC 100d 15h 51m
Time until next pointrelease 2019-11-22 12:00:00 UTC 9d 15h 51m

QGIS

A Free and Open Source Geographic Information System



QGIS 3.10 A Coruña
has been released!

New release: **3.10!**
Get the [installer](#) or [packages](#) for your Operating System!

Create, edit, visualise, analyse and publish geospatial information on Windows, Mac, Linux, BSD (Android coming soon)

For your desktop, server, in your web browser and as developer libraries

Download Now

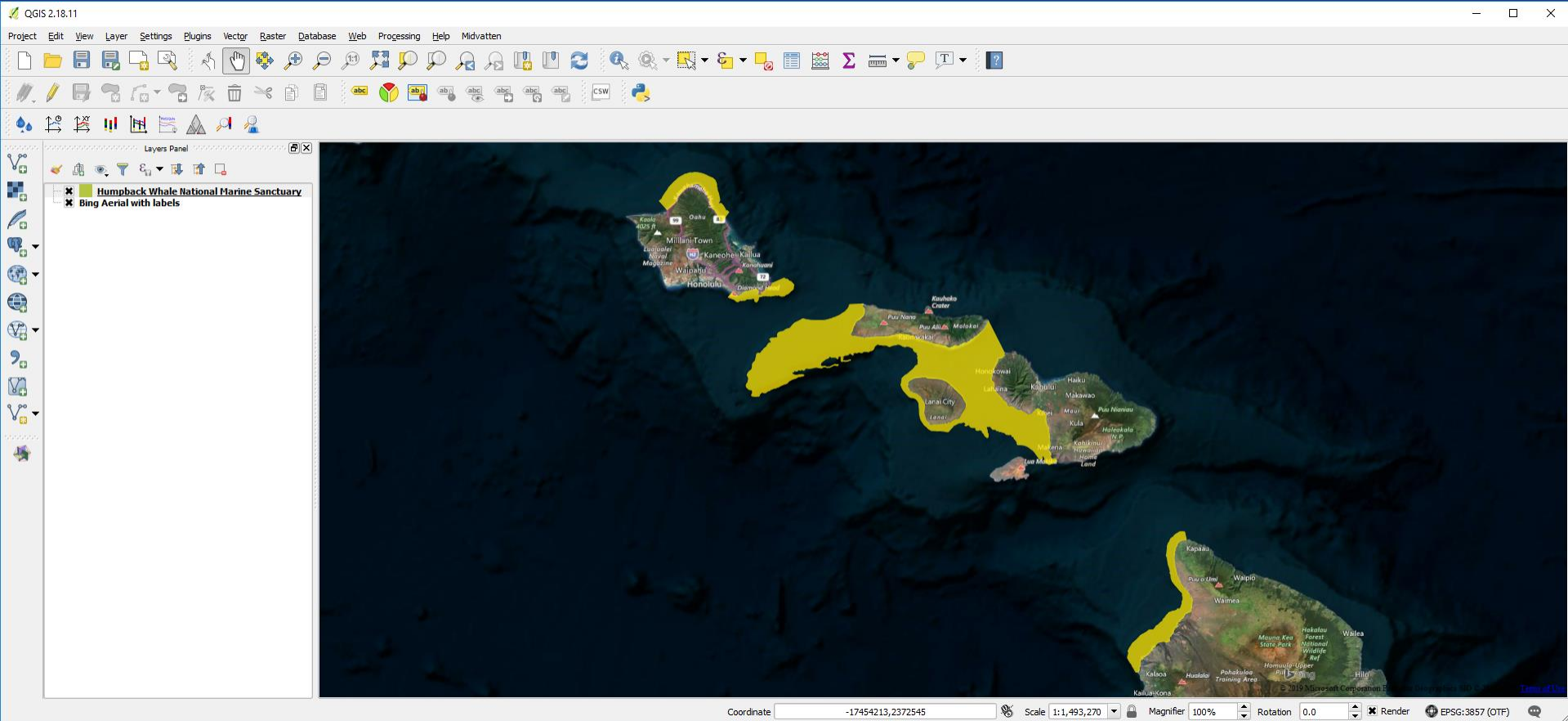
Support QGIS

Version 3.10.0
Version 3.4.13 LTR

Donate now!

QGIS 2.18.11

Project Edit View Layer Settings Plugins Vector Raster Database Web Processing Help Midvatten



Layers Panel

- Humpback Whale National Marine Sanctuary
- Bing Aerial with labels

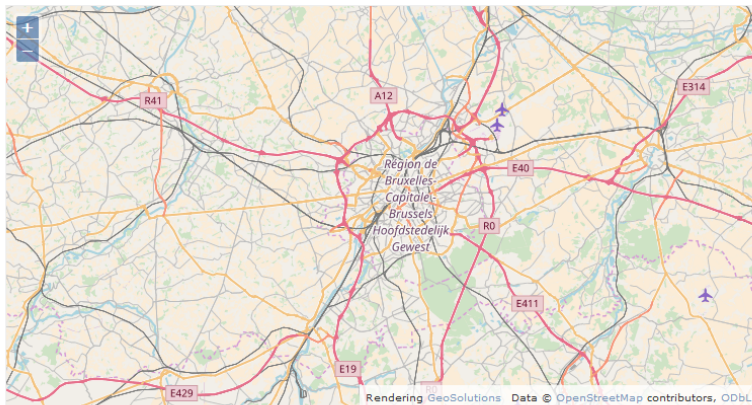
Coordinate: -17454213,2372545 Scale: 1:1,493,270 Magnifier: 100% Rotation: 0,0 Render EPSG:3857 (OTF)



Fork me on GitHub

GeoServer is an open source server for sharing geospatial data.

Designed for interoperability, it publishes data from any major spatial data source using open standards.



Download

Stable

2.16.0
Nightly

Maintenance

2.15.3
Nightly

Development

Master

News

[GeoServer 2.15.3 released](#)

We are pleased to announce the release of GeoServer 2.15.3 with downloads (zip/war), documentation (html) and extensions. This is a maintenance release recommended for production. This release is made in conjunction with GeoTools 21.3 and GeoWebCache 1.15.3. Thanks to everyone who contributed to this release. For more information see the [GeoServer 2.15.3 release notes](#). Improvements and Fixes This release [...]

[GeoServer 2.16.0 released](#)

We are happy to announce the release of GeoServer 2.16.0. Downloads are available (zip and war) along with docs and extensions. This is a GeoServer release candidate made in conjunction with GeoTools 22.0. Faster map rendering of complex styles if you have very complex styles, with lots of rules and complex filtering conditions you'll be pleased to hear [...]

[Join Me in Funding an Important GeoServer Initiative](#)

TLTR GeoServer Project has been at the forefront of the standards-based geospatial web since 2001. Meanwhile, it's been some years since GeoServer has been formally certified OGC-compliant. There is an opportunity to permanently improve how this is done by boosting a crucial component of the GeoServer software build infrastructure. OSGeo has put forth an initiative and [...]

OGC Implementation

GeoServer implements industry standard OGC protocols such as Web Feature Service (WFS), Web Map Service (WMS), and Web Coverage Service (WCS). Additional formats and publication options are available as extensions including Web Processing Service (WPS), and Web Map Tile Service (WMTS).

GeoServer is working with the OSGeo Foundation to be certified as compliant and we need your help. We ask for your sponsorship or donation to integrate OGC testing into our nightly build. See [blog post](#) for details.

Part of a Vibrant Open Source Community

GeoServer is developed, tested, and supported as community-driven project by a diverse group of individuals and organizations around the world. We are proud to be a recognized [Open Source Geospatial Foundation](#) project.

GeoServer participates in the annual [Free and Open Source Software for Geospatial](#) conference, join us in Bucharest for FOSS4G 2019!



Username Remember me [Login](#)

Layer Preview

List of all layers configured in GeoServer and provides previews in various formats for each.

<< < 1 2 3 4 5 > >> Results 1 to 25 (out of 707 items)

Search

Type	Name	Title	Common Formats	All Formats
	PACIOOS:hi_otp_all_fishing_com_net	Commercial Net Fishing Estimated Average Annual Catch of Reef Fish, 2003-2013 - Hawaii	OpenLayers KML	Select one
	PACIOOS:hi_otp_all_fishing_rec_boat	Non-commercial Boat-based Fishing Estimated Average Annual Catch of Reef Fish, 2004-2013 - Hawaii	OpenLayers KML	Select one
	PACIOOS:hi_otp_all_fishing_rec	Non-commercial Fishing Estimated Average Annual Catch of Reef Fish, 2004-2013 - Hawaii	OpenLayers KML	Select one
	PACIOOS:hi_otp_all_osds_phosphorus	Phosphorus Flux from Onsite Sewage Disposal Systems (OSDS) - Hawaii	OpenLayers KML	Select one
	PACIOOS:hi_otp_all_chlor_avg	Chlorophyll-a Long-term Mean, 2002-2013 - Hawaii	OpenLayers KML	Select one
	PACIOOS:hi_otp_all_par_std	Photosynthetically Active Radiation (PAR) Standard Deviation of Long-term Mean, 2002-2013 - Hawaii	OpenLayers KML	Select one
	PACIOOS:as_comp_all_road	Roads - American Samoa	OpenLayers KML GML	Select one
	PACIOOS:as_dw_aun_bldngs	Building Footprints - Aunuu, American Samoa	OpenLayers KML GML	Select one
	PACIOOS:as_dw_aun_femafrm	Flood Hazard Zones - Aunuu, American Samoa	OpenLayers KML GML	Select one
	PACIOOS:as_dw_aun_shore	Shoreline - Aunuu, American Samoa	OpenLayers KML GML	Select one
	PACIOOS:as_dw_leo_awl	Wetland, Agreed Line - Leone, Tutuila, American Samoa	OpenLayers KML GML	Select one
	PACIOOS:as_dw_ma_l_sma	Malaeimi Special Management Area - Tutuila, American Samoa	OpenLayers KML GML	Select one
	PACIOOS:as_dw_manall_ascmp	Administrative Boundary for Coastal Management Program - Manua, American Samoa	OpenLayers KML GML	Select one
	PACIOOS:as_dw_manall_cntybndrs	County Boundaries - Manua, American Samoa	OpenLayers KML GML	Select one
	PACIOOS:as_dw_manall_cont_10m	Elevation Contours, 10m - Manua, American Samoa	OpenLayers KML GML	Select one
	PACIOOS:as_dw_manall_cont_20m	Elevation Contours, 20m - Manua, American Samoa	OpenLayers KML GML	Select one
	PACIOOS:as_dw_manall_cont_50m	Elevation Contours, 50m - Manua, American Samoa	OpenLayers KML GML	Select one

About & Status

[About GeoServer](#)

Data

[Layer Preview](#)

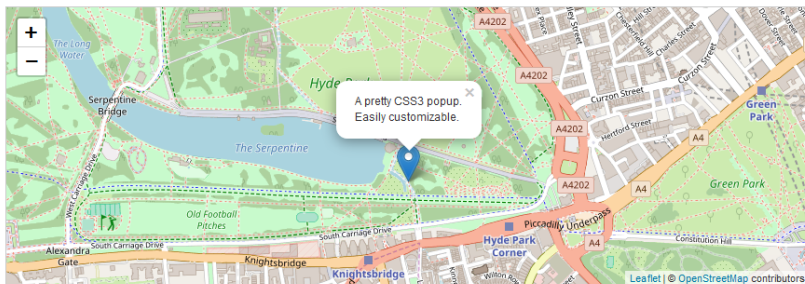
Demos



an open-source JavaScript library
for mobile-friendly interactive maps

Leaflet is the leading open-source JavaScript library for mobile-friendly interactive maps. Weighing just about 38 KB of JS, it has all the mapping [features](#) most developers ever need.

Leaflet is designed with *simplicity*, *performance* and *usability* in mind. It works efficiently across all major desktop and mobile platforms, can be extended with lots of [plugins](#), has a beautiful, easy to use and [well-documented API](#) and a simple, readable [source code](#) that is a joy to [contribute](#) to.



Here we create a map in the 'map' div, add [tiles](#) of our choice, and then add a marker with some text in a popup:

```
var map = L.map('map').setView([51.505, -0.09], 13);

L.tileLayer('https://{s}.tile.openstreetmap.org/{z}/{x}/{y}.png', {
  attribution: '&copy; <a href="https://www.openstreetmap.org/copyright">OpenStreetMap</a> contributors'
}).addTo(map);

L.marker([51.5, -0.09]).addTo(map)
  .bindPopup('A pretty CSS3 popup.<br>Easily customizable.')
  .openPopup();
```



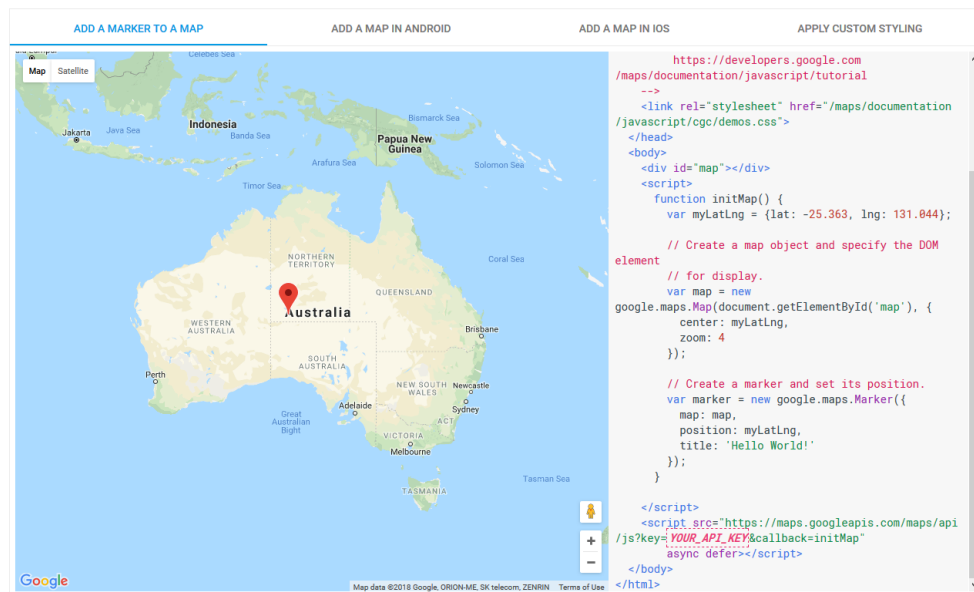
Google Maps Platform

Maps

Bring the real world to your users with customized maps
and Street View imagery

GET STARTED

ADD A MARKER TO A MAP
ADD A MAP IN ANDROID
ADD A MAP IN IOS
APPLY CUSTOM STYLING



```
https://developers.google.com
/maps/documentation/javascript/tutorial
-->
<link rel="stylesheet" href="/maps/documentation
/javascript/cg/demos.css">
</head>
<body>
<div id="map"></div>
<script>
function initMap() {
  var myLatLng = {lat: -25.363, lng: 131.844};

  // Create a map object and specify the DOM
  element
  // for display.
  var map = new
  google.maps.Map(document.getElementById('map'), {
    center: myLatLng,
    zoom: 4
  });

  // Create a marker and set its position.
  var marker = new google.maps.Marker({
    map: map,
    position: myLatLng,
    title: 'Hello World!'
  });
}
</script>
<script src="https://maps.googleapis.com/maps/api
/js?key=YOUR_API_KEY&callback=initMap"
async defer"></script>
</body>
</html>
```



The screenshot shows the OGC website with the following content:

info@opengeospatial.org

OGC®
Making location count.

Menu

OGC® Standards and Supporting Documents

OGC(R) standards are technical documents that detail interfaces or encodings. Software developers use these documents to build open interfaces and encodings into their products and services. These standards are the main "products" of the Open Geospatial Consortium and have been developed by the membership to address specific interoperability challenges. Ideally, when OGC standards are implemented in products or online services by two different software engineers working independently, the resulting components plug and play, that is, they work together without further debugging.

The approved set of standards and documents are identified as being a part of either the OGC Standards Baseline, and/or the OGC Library.

- **OGC Standards Baseline**
 - The OGC Standards Baseline is the complete set of OGC Member approved Abstract Specifications, Standards including profiles and extensions, and Community Standards.
 - A role of the Standards Baseline is to determine consistency with standards.
 - Documents in the Baseline are subject to the Technical Committee Review Process.

OGC® Standards

- 3D Tiles
- 3dP
- ARML2.0
- Cat: eBRIM App Profile: Earth Observation Products
- Catalogue Service
- CDB
- CityGML
- Coordinate Transformation
- Filter Encoding
- GML in JPEG 2000
- GeoAPI
- GeoPackage
- GeoSciML
- GeoSPARQL
- Geography Markup Language
- GeoRSS
- Geospatial eXtensible Access Control Markup Language (GeoXACML)
- Geospatial User Feedback (GUF)
- GeoTiff
- GroundwaterML
- INSPIRE

- ▶ Web Map Service (WMS)
- ▶ Web Feature Service (WFS)
- ▶ Web Coverage Service (WCS)
- ▶ Catalog Service for the Web (CSW)

Regional Associations



- ▶ IOOS is part of NOAA (National Ocean Service)
- ▶ 11 Regional Associations
- ▶ IOOS feeds into GOOS (Global Ocean Observing System)

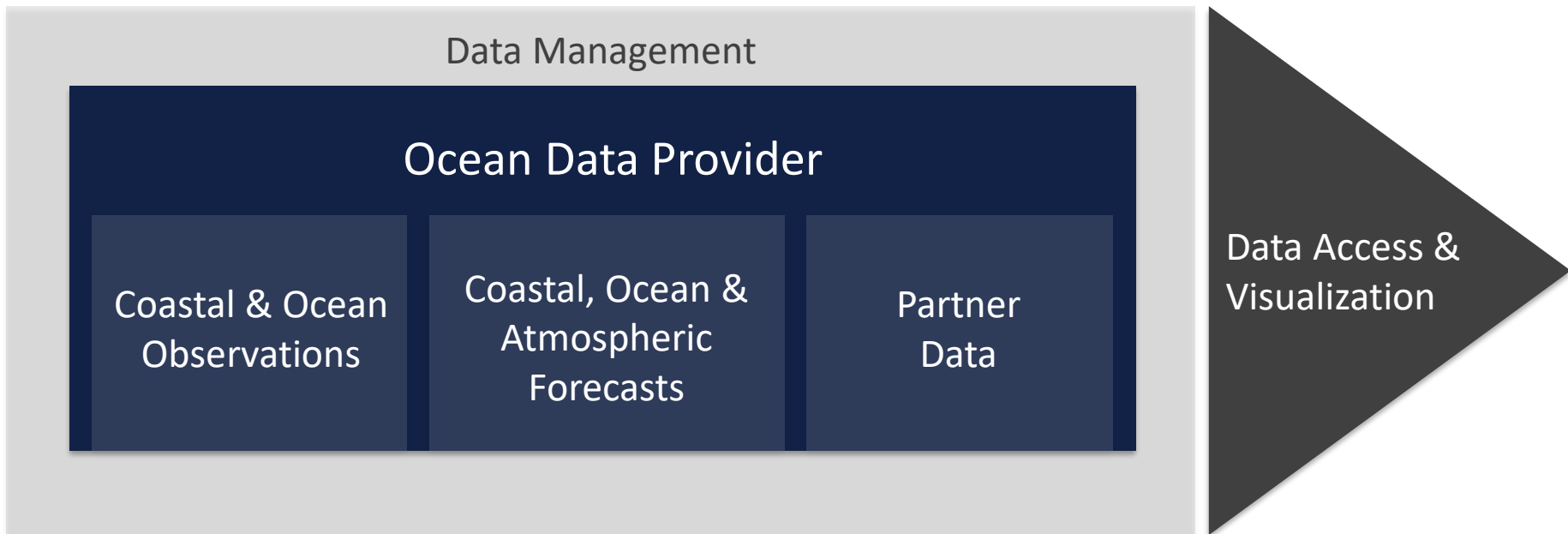
PacIOOS REGION



UNIVERSITY OF HAWAII AT MANOA



What is PacIOOS?



MISSION - PacIOOS empowers ocean users and stakeholders throughout the Pacific Islands by providing accurate and reliable coastal and ocean information, tools, and services that are easy to access and use.

STATIC vs. DYNAMIC GEODATA

A House Divided

Montague "GIS"



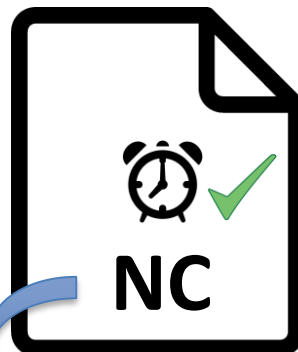
SHP



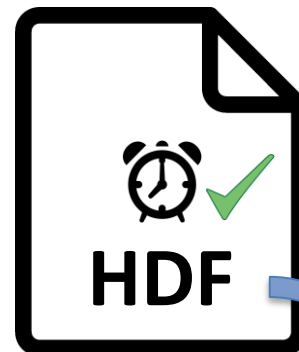
TIF

GeoServer, ArcGIS

Capulet "Scientific"



NC



HDF

THREDDS, ERDDAP

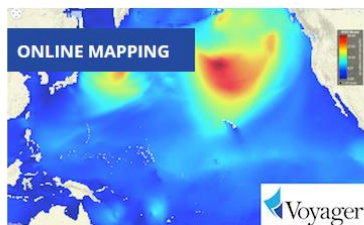


- ▶ [Waves](#)
- ▶ [Currents](#)
- ▶ [Shoreline Impacts](#)
- ▶ [Water Characteristics](#)
- ▶ [Weather](#)
- ▶ [Projects](#)



by observing we learn

PacIOOS empowers ocean users and stakeholders in the Pacific Islands by providing accurate and reliable coastal and ocean information, tools, and services that are easy to access and use.



ONLINE MAPPING



PacIOOS Voyager

PacIOOS Voyager is a free, interactive,



SHARK TRACKING

Tiger Shark Tracking

Check out recent tracks of Hawai'i tiger



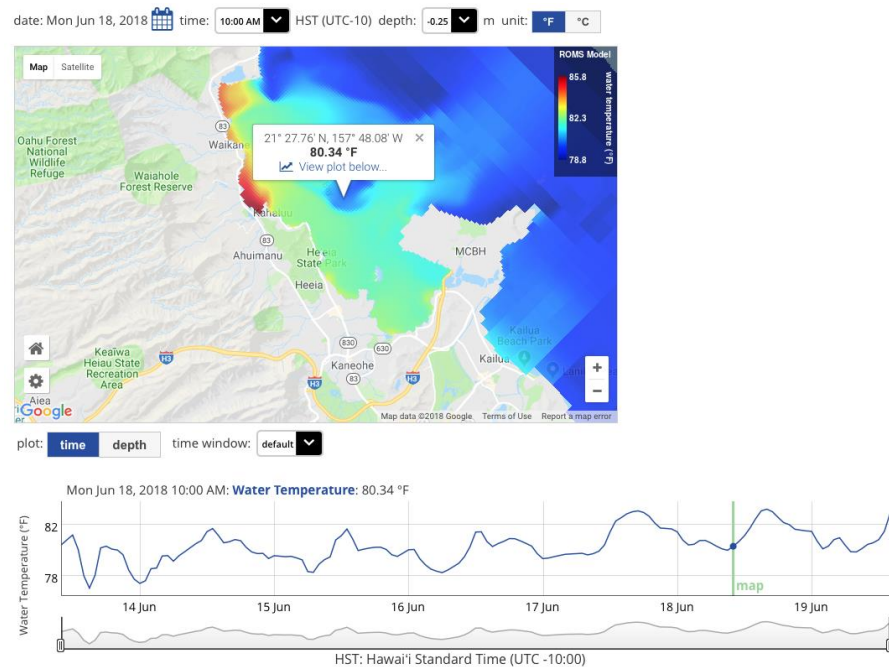
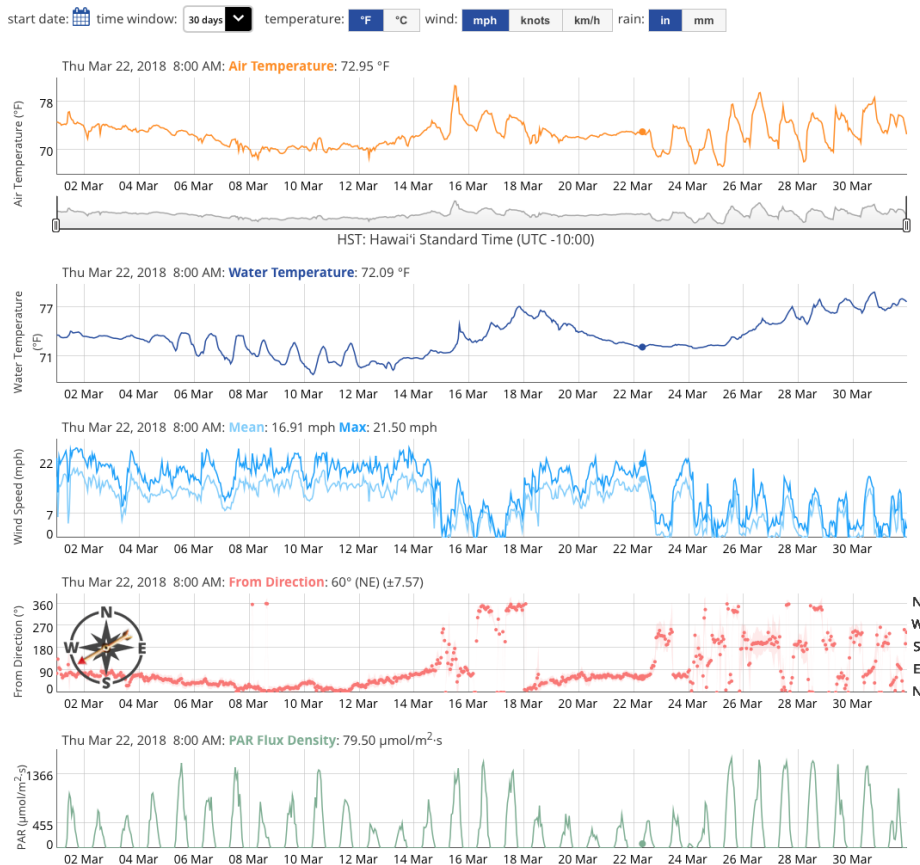
FEATURED TOOL

Hawaiian Ko'a (Coral) Card

Become a citizen scientist and help

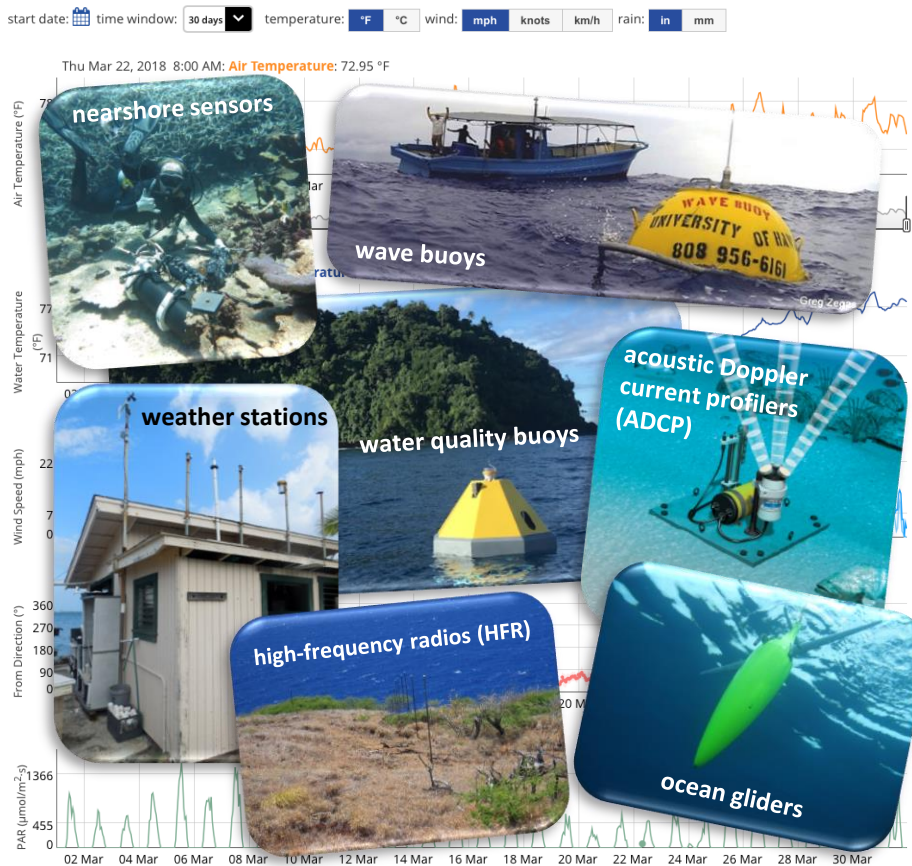
DYNAMIC DATA: TIME SERIES

Observations (left) and Forecasts (right)



DYNAMIC DATA: TIME SERIES

Observations (left) and Forecasts (right)



THREDDS Data Server (TDS)

<http://pacioos.org/thredds/>



Catalog http://oos.soest.hawaii.edu/thredds/catalog/hioos/roms_forec/hiig/catalog.html

Dataset: ROMS Hawaii Regional Ocean Model/Best Time Series

- *Data format:* netCDF
- *Data type:* GRID
- *Naming Authority:* org.pacioos
- *ID:* hioos/roms_forec/hiig/ROMS_Hawaii_Regional_Ocean_Model_best.ncd

Documentation:

- **summary:** Best time series, taking the data from the most recent run available.
- **summary:** Regional Ocean Modeling System (ROMS) 7-day, 3-hourly forecast for the region surrounding the main Hawaiian Islands at approximately 4-km resolution. Boundary conditions provided by the global, 1/12-degree (~9-km) Hybrid Coordinate Ocean Model (HYCOM). Atmospheric forcing generated by the Weather Research and Forecasting (WRF) model for the region surrounding the main Hawaiian Islands (WRF_HI) at approximately 6-km resolution. Tide forcing uses the Oregon State University (OSU) Tidal Prediction Software (OTPS) TOPEX/Poseidon global inverse solution (TPXO) to derive barotropic tidal elevation and velocity. Data are assimilated over the previous 3 days using all available observations to improve the model estimate of current ocean state (its "nowcast") before forecasts are run. Assimilated observations may include satellite-based sea surface temperatures from MODIS, AVHRR, or OSTIA; satellite-based sea surface height from AVISO; surface currents from PacIOOS high-frequency radios (HFR); and in-situ water temperature and salinity profiles from ARGO floats and ocean glider autonomous underwater vehicles (AUV). While considerable effort has been made to implement all model components in a thorough, correct, and accurate manner, numerous sources of error are possible. As such, please use these data with the caution appropriate for any ocean related activity.
- **rights:** These model data were generated as part of an academic research project, and the principal investigator, Brian Powell (powellb@hawaii.edu), asks to be informed of intent for scientific use and appropriate acknowledgment given in any publications arising therefrom. The data are provided free of charge, without warranty of any kind.
- **funding:** The Pacific Islands Ocean Observing System (PacIOOS), funded through the National Oceanic and Atmospheric Administration (NOAA), is a Regional Association within the U.S. Integrated Ocean Observing System (IOOS). PacIOOS is coordinated by the University of Hawaii School of Ocean and Earth Science and Technology (SOEST).
- [PacIOOS ROMS Hawaii](#)
- [Regional Ocean Modeling System \(ROMS\)](#)
- [Pacific Islands Ocean Observing System \(PacIOOS\)](#)

Access:

1. **OPENDAP:** [/thredds/dodsC/hioos/roms_forec/hiig/ROMS_Hawaii_Regional_Ocean_Model_best.ncd](#)
2. **NetcdfSubset:** [/thredds/netcdf/hioos/roms_forec/hiig/ROMS_Hawaii_Regional_Ocean_Model_best.ncd](#)
3. **WMS:** [/thredds/wms/hioos/roms_forec/hiig/ROMS_Hawaii_Regional_Ocean_Model_best.ncd](#)
4. **WCS:** [/thredds/wcs/hioos/roms_forec/hiig/ROMS_Hawaii_Regional_Ocean_Model_best.ncd](#)
5. **ISO:** [/thredds/iso/hioos/roms_forec/hiig/ROMS_Hawaii_Regional_Ocean_Model_best.ncd](#)
6. **NCML:** [/thredds/ncml/hioos/roms_forec/hiig/ROMS_Hawaii_Regional_Ocean_Model_best.ncd](#)

Contributors:

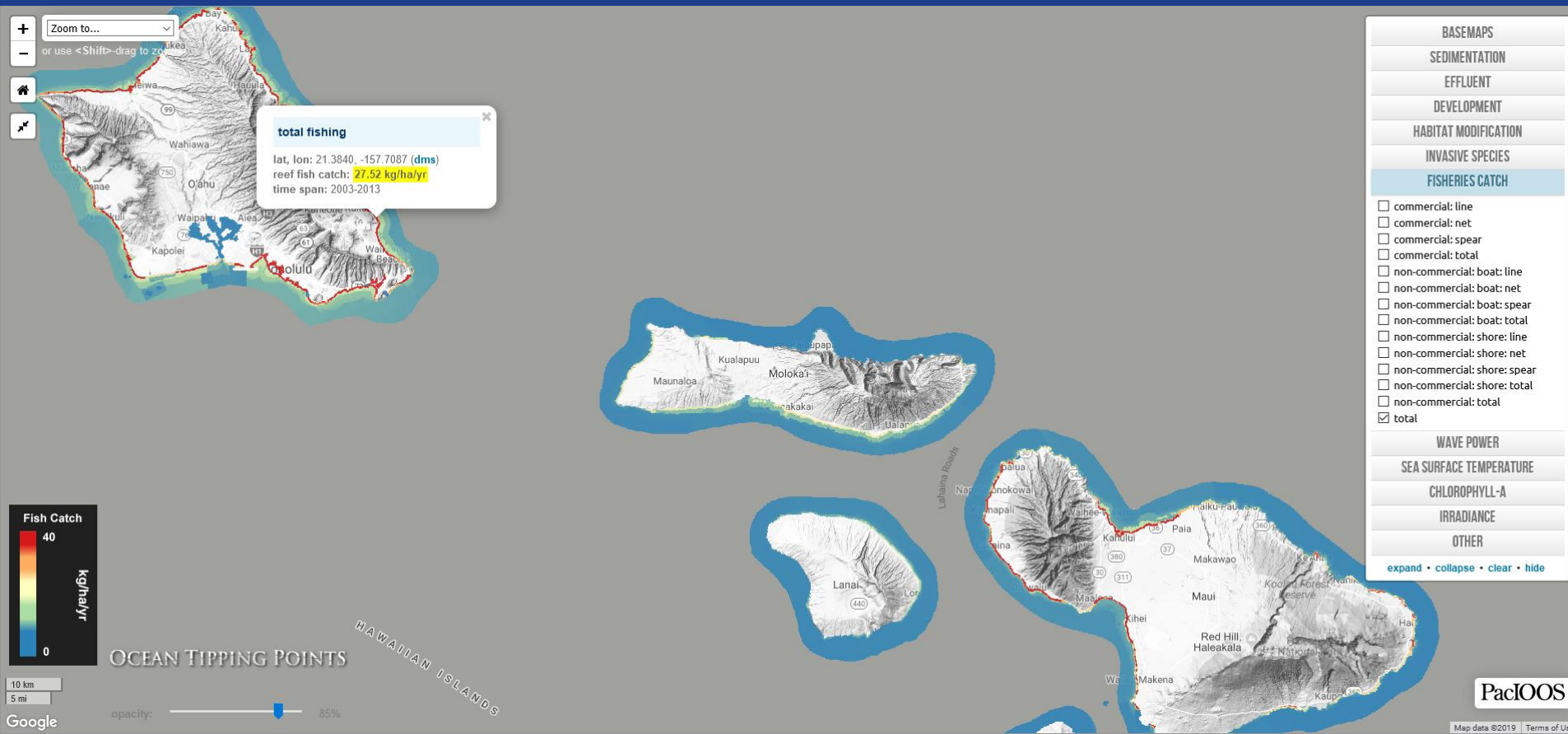
- Dr. Brian Powell (**Principal Investigator**)
- Dr. Jim Potemra (**Data Manager**)

Keywords:

- Earth Science Services > Models > Ocean General Circulation Models (OGCM)/Regional Ocean Models (**GCMD Science Keywords**)
- Earth Science Services > Models > Weather Research/Forecast Models (**GCMD Science Keywords**)
- Earth Science > Oceans > Ocean Temperature > Potential Temperature (**GCMD Science Keywords**)
- Earth Science > Oceans > Salinity/Density > Salinity (**GCMD Science Keywords**)
- Earth Science > Oceans > Sea Surface Topography > Sea Surface Height (**GCMD Science Keywords**)

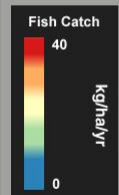
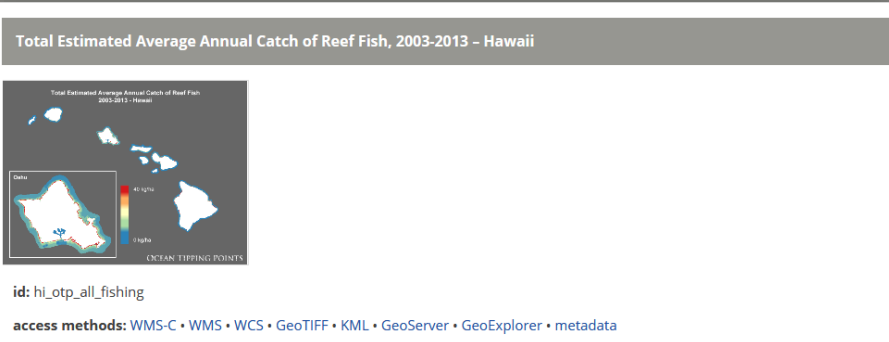
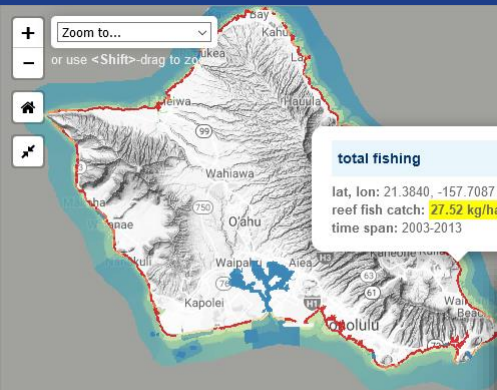
Ocean Tipping Points

<http://pacioos.org/projects/otp/>



Ocean Tipping Points

<http://pacioos.org/projects/otp/>



OCEAN TIPPING POINTS

HAWAIIAN ISLANDS

- BASEMAPS
 - SEDIMENTATION
 - EFFLUENT
 - DEVELOPMENT
 - HABITAT MODIFICATION
 - INVASIVE SPECIES
 - FISHERIES CATCH**
 - commercial: line
 - commercial: net
 - commercial: spear
 - commercial: total
 - non-commercial: boat: line
 - non-commercial: boat: net
 - non-commercial: boat: spear
 - non-commercial: boat: total
 - non-commercial: shore: line
 - non-commercial: shore: net
 - non-commercial: shore: spear
 - non-commercial: shore: total
 - non-commercial: total
 - total
 - WAVE POWER
 - SEA SURFACE TEMPERATURE
 - CHLOROPHYLL-A
 - IRRADIANCE
 - OTHER
- [expand](#) • [collapse](#) • [clear](#) • [hide](#)

Estimated Coral Cover in Hawai'i

<http://pacioos.org/projects/coral/>



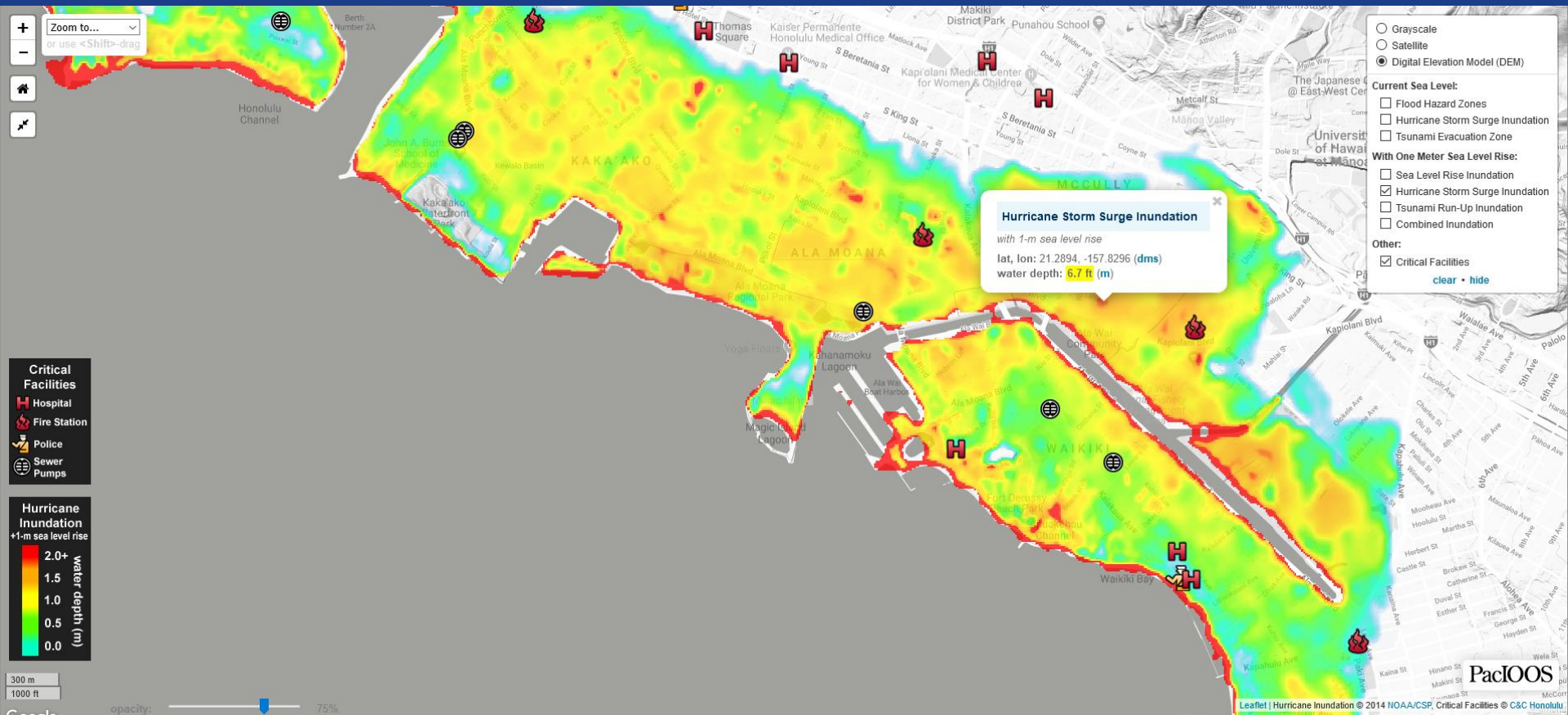
Hawai'i Sea Level Rise Viewer

<http://pacioos.org/shoreline/slr-hawaii/>



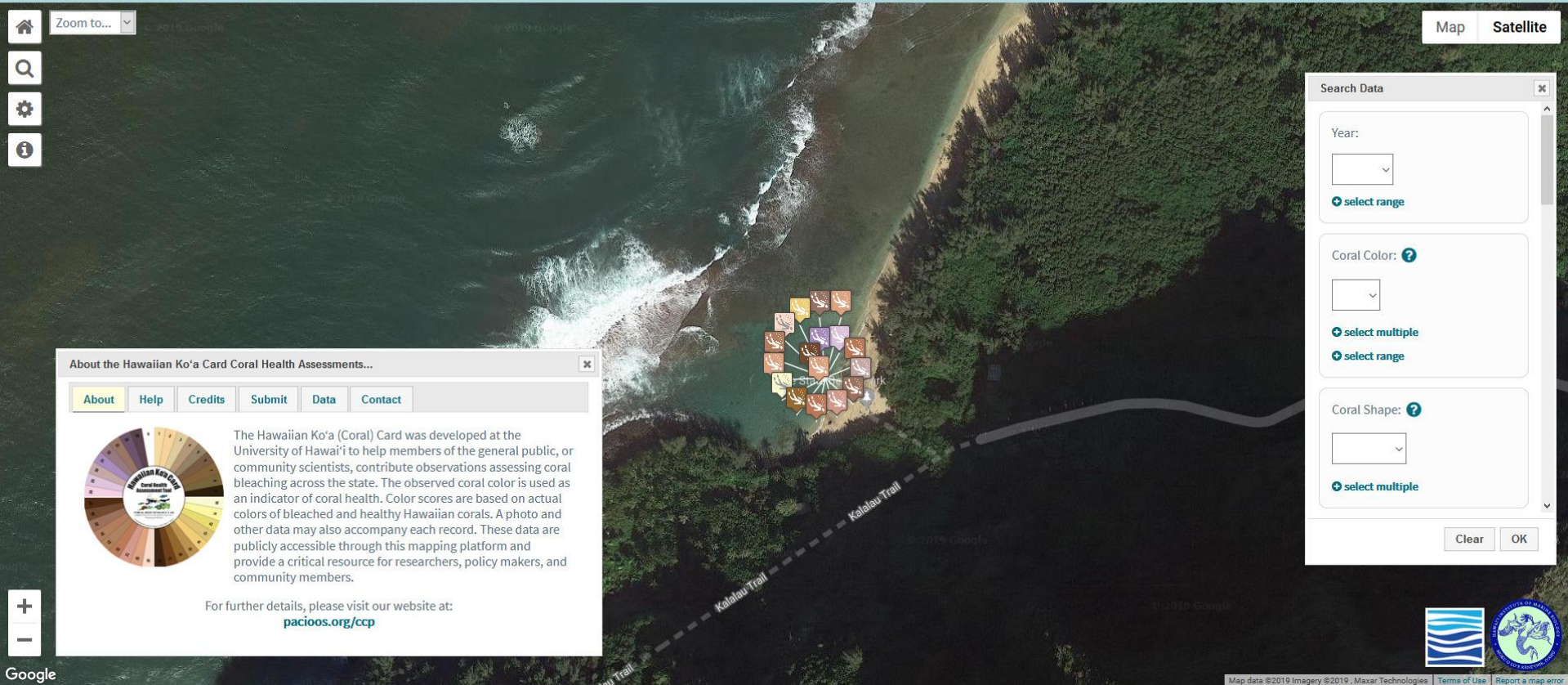
Honolulu Sea Level Rise Inundation Risk

<http://pacioos.org/shoreline/slr-honolulu/>



Hawai'i and Pacific Islands King Tides Project





Zoom to... [v]

Map Satellite

Search Data [x]

Year: [v] [select range](#)

Coral Color: ? [v] [select multiple](#) [select range](#)

Coral Shape: ? [v] [select multiple](#)

Clear OK

Map data ©2019 Imagery ©2019, Maxar Technologies Terms of Use Report a map error

About the Hawaiian Ko'a Card Coral Health Assessments... [x]

[About](#) [Help](#) [Credits](#) [Submit](#) [Data](#) [Contact](#)



The Hawaiian Ko'a (Coral) Card was developed at the University of Hawai'i to help members of the general public, or community scientists, contribute observations assessing coral bleaching across the state. The observed coral color is used as an indicator of coral health. Color scores are based on actual colors of bleached and healthy Hawaiian corals. A photo and other data may also accompany each record. These data are publicly accessible through this mapping platform and provide a critical resource for researchers, policy makers, and community members.

For further details, please visit our website at: pacioos.org/ccp



Zoom to: Island
Which one?...
Enter an address or coordinates here... ? Go!
link save image about

Select overlays:

collapse clear set region

Search overlays...

hazards

observations

waves

select all clear all

PacIOOS wave buoys

wave height
unit: ft

wave direction

wave period

water temperature
unit: °F

date nearest: now

advanced options

NDBC moored buoys

Liquid Robotics

map options

tide and water level

water quality

water resources

ocean acidification

ocean gliders

ocean observatories

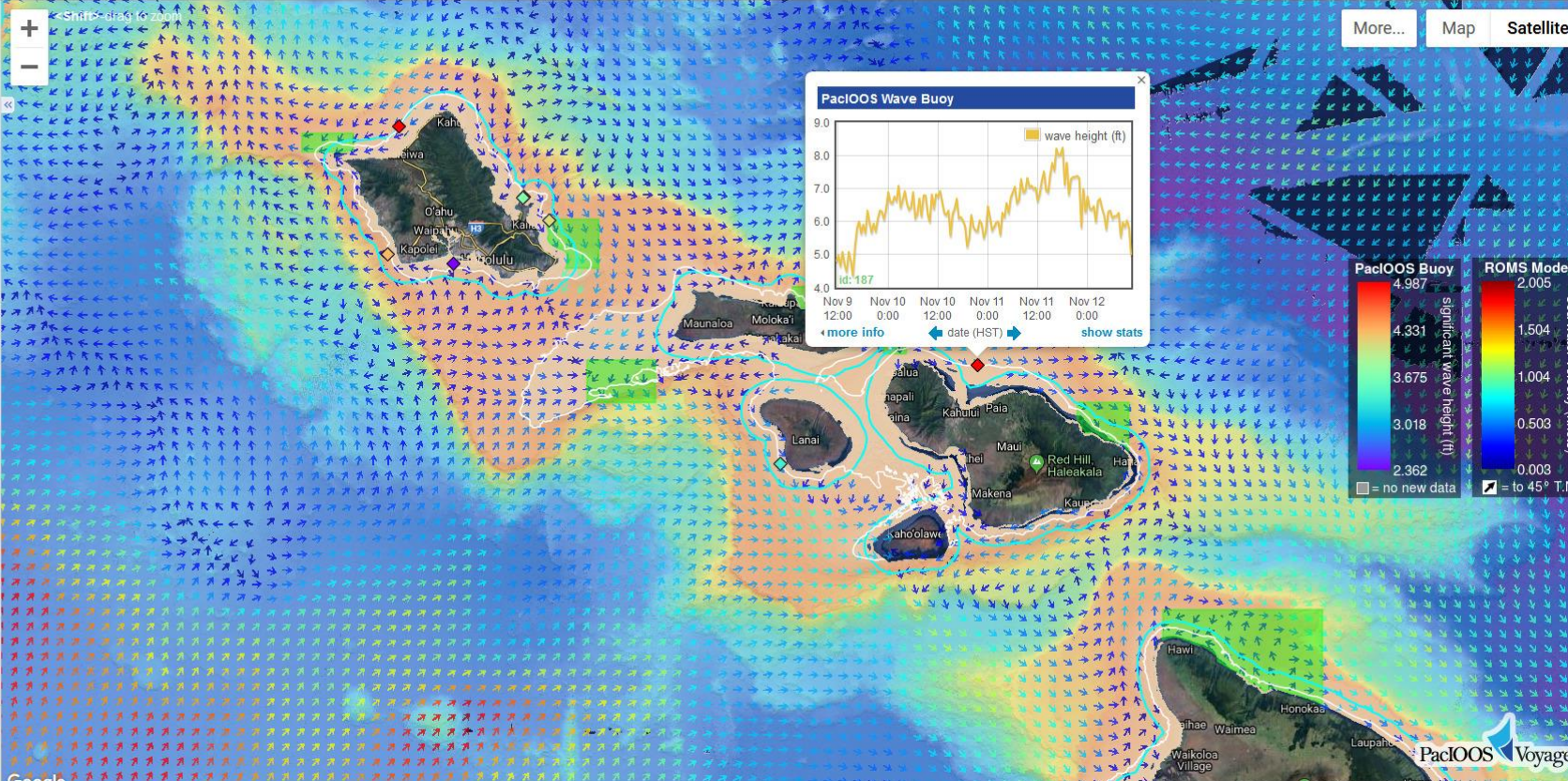
remote sensing

forecasts


weather forecast

lat/lon range distance area
[change units clear all]

show map dimensions



PacIOOS Wave Buoy



more info date (HST) show stats

PacIOOS Buoy 4.987

ROMS Model 2.005

significant wave height (ft)


sea water velocity (knots)

no new data

to 45° T.N.

Google

Map data ©2019 Imagery ©2019 NASA, TerraMetrics | 28 km Terms of Use





Data Services

[Home](#) / [Data Services](#) / [Data Search](#)

SHARE [f](#) [t](#) [p](#) [in](#) [e](#)

Data Services : Data Search

Search for datasets at PacIOOS. For more information on our OGC[®]-compliant Catalog Service for the Web (CSW) and other metadata resources, click here. To search all U.S. IOOS[®] datasets, click here [↗](#).

Basic

 Or click a keyword below...

Aquatic Assemblages **Atmosphere** Bathymetry Biological Biology **Biosphere** Boundaries
Census Cetaceans Chemistry Chlorophyll **Circulation** Classification Coastal
Conductivity Coral Currents Direction Doppler Ecology Ecosystems Environmental **Fish**
Fisheries Forecast Global Guam Habitat **Hawaii** Height Hilo Honolulu Human
Humidity Kauai Lanai Landforms Longwave Mammals Mariana Marshall Maui Micronesia

Models Molokai Monitoring Oahu **Oceans** OGCM Oxygen Pago Palau Period

DATA SERVICES

[PacIOOS Voyager](#)

[Data Access](#)

[Data Search](#)

[Metadata](#)

[Data Management Support](#)

DATA ACCESS

THEEDS

[Home](#) / [Data Services](#) / [Data Search Results](#)

 SHARE [f](#) [t](#) [p](#) [in](#) [e](#)

Data Services : Data Search Results

Search for datasets at PacIOOS. Powered by [pycsw](#). For more information on our OGC® compliant Catalog Service for the Web (CSW) and other metadata resources, [click here](#).

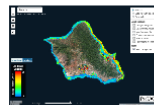
text: coral, **S:** 18.5941° **W:** -160.4498° **N:** 22.4364° **E:** -154.5996°, **exclude global:** true

Showing 20 of 87 results • [modify search](#) • [new search](#) ▶

◀◀ Page 4 of 5 ▶▶

Predicted Coral Cover in the Hawaiian Islands

id: hi_ef_all_coralreefs



Output from a model to predict the total benthic cover of six coral species (Montipora capitata, Montipora flabellata, Montipora patulla, Porites lobata, Porites compressa, Porites meandrina) in the Hawaiian Islands as a proportion (0-1.0). Coral cover was modeled with boosted regression trees (BRT) in R software using data from coral cover surveys and environmental covariates derived from models and/or observations including wave height, benthic geomorphology, and downwelled irradiance. The best performing BRT model was used to predict coral cover for the entire geographic study domain. Data and model output represent conditions for shallow coral reefs in the Hawaiian Islands from 0 m to -30 m depth over the time period 2000-2009. Further ... [More Details](#) ▶

keywords: [show](#) ▶

access methods: [HTML](#) • [WMS-C](#) • [WMS](#) • [WCS](#) • [GeoTIFF](#) • [KML](#) • [GeoServer](#) • [GeoExplorer](#)

DATA SERVICES

[PacIOOS Voyager](#)

[Data Access](#)

[Data Search](#)

[Metadata](#)

[Data Management Support](#)

DATA ACCESS

[THREDDS](#)

[ERDDAP](#)

[LAS](#)

[GeoServer](#)

Data Interoperability

Plug-and-play with PacIOOS data in your chosen software or programming language using standardized web services protocols like OPeNDAP, Web Map Service

Predicted Coral Cover in the Hawaiian Islands

- Identification Information
- Data Quality Information
- Spatial Representation Information
- Distribution Information
- Metadata Reference Information

Identification Information

Citation:

Citation Information:

Title: Predicted Coral Cover in the Hawaiian Islands

Date:

Date: January 25, 2016

Date Type: creation (CI_DateTypeCode)

Identifier:

Code: hi_ef_all_coralreefs

Authority: org.pacioos

Responsible Party:

Organization Name: Erik Franklin

Contact:

Online Resource:

Linkage: <https://sites.google.com/a/hawaii.edu/franklinlab/>

Protocol: http

Function: information (CI_OnLineFunctionCode)

Metadata Views

ISO Text-Only

International Organization for Standardization (ISO) in plain text

ISO XML

International Organization for Standardization (ISO) in Extensible Markup Language (XML)

FGDC HTML

U.S. Federal Geographic Data Committee (FGDC) Content Standard for Digital Geospatial Metadata (CSDGM)



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