PacIOOS projects using Open Source GIS for web visualization

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U.S. INTEGRATED OCEAN OBSERVING SYSTEM

Regional Associations

- IOOS is part of NOAA (National Ocean Service)
- 11 Regional Associations
- Stakeholder Driven
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.
Introduction

PacIIOOS 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.

http://pacioos.org
PARTNER DATA VISUALIZATION

Ocean Tipping Points

Projects: Ocean Tipping Points: Hawai‘i Case Study

Discovering when, where, and how ocean tipping points occur in diverse ecosystems

- Provide partners with a ‘one-stop-shop’ to share project information
- Visualize project outcomes in a map viewer
- Provide data repository and public access
Estimated Coral Cover in Hawai‘i

All Coral Species
lat, lon: 20.9230, -156.4173 (dms)
estimated cover: 14.92 %
Putting Data To Use

Sending users to the data.

vs.

Sending data to the users.
SERVING DATA ON THE WEB

Web Services
SERVING DATA ON THE WEB

Web Services

Data Servers

REST = Representational State Transfer
API = Application Programming Interface

http://some.address.org/directory/filename.zip
http://some.address.org/give-me?dataset=place&time=format
A House Divided

Montague “GIS”

- SHP
- TIF

GeoServer, ArcGIS

Capulet “Scientific”

- NC
- HDF

THREDDS, ERDDAP
SERVING DATA ON THE WEB

Web Services

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http://some.address.org/give-me?\textit{dataset}&\textit{place}&\textit{time}&\textit{format}
One size fits all? vs. Made to order.

(One size fits some.)

Case in point: Montagues and Capulets.

JavaScript + Python
Web Mapping APIs

Leaflet is an open-source JavaScript library for mobile-friendly interactive maps. Weighing just about 38 KB of JS, it has all the mapping features most developers 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:

```javascript
var map = L.map('map').setView([51.595, -0.09], 13);

L.tileLayer('https://{{s}.tile.openstreetmap.org/21/{{x}}/{{y}}.png', { attribution: '© OpenStreetMap contributors'}).addTo(map);

L.marker([51.5, -0.09]).addTo(map);

.mapMarker('A pretty CSS3 popup. Easy to customize.').openPopup();
```
SERVING DATA ON THE WEB

Leaflet vs. Google Maps API

😊 Native OGC support; easily ingest WMS and WFS.

😢 No basemaps included; can import large variety with Leaflet-providers plug-in (OpenStreetMap, Esri, Stamen, CartoDB, HERE). Can import Google Maps basemaps using GoogleMutant plug-in but kinda klugey.

😊 Third-party plug-ins for layer menus, etc.

😢 No native OGC support; roll your own.

😊 Best basemaps (fastest, highest res imagery).

😢 Basemaps can be custom styled (see Styling Wizard and Snazzy Maps).

😢 Not many plug-ins available, layer menu up to you.

😢 Geocoder (query addresses) and elevation services.

Need to register for an account (access key) and
Leaflet JavaScript

**Raster Layer:**

// Bathymetry (HMRG 50-m)

```javascript
var bathymetry = L.tileLayer.wms('http://oos.soest.hawaii.edu/thredds/wms/hmrg_bathy_50m_mhi', {
  layers: 'z',
  version: '1.1.1',
  styles: 'boxfill/bathy',
  format: 'image/png',
  transparent: true,
  opacity: 0.75,
});
```

**Vector Layer: Polygons**

// Coastal erosion: year 2100 (Hawaii Sea Level Rise Viewer):

```javascript
var shorehaz_2100_style = {
  weight: 3,
  color: '#FF0000',
  opacity: 1.0
};

var shorehaz_2100 = new L.GeoJSON.AJAX('http://geo.pacioos.hawaii.edu/geoserver/PACIOOS/hi_hcgg_all_shorehazline_2100/ows?service=WFS&version=1.0.0&request=GetFeature&typeName=hi_hcgg_all_shorehazline_2100&outputFormat=application/json', {
  style: shorehaz_2100_style,
  onEachFeature: function(feature, layer) {
    layer.bindTooltip('<b>3.2 ft scenario</b>', {sticky: true});
  },
});
```
Thank you!
Any questions?

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