The Integrated Ocean Observing System HF Radar Network: U. S. Status

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IOOS Coastal Component
11 Regional Associations; 17 Federal Agencies
IOOS HF Radar Network (HFRNet)

Years of Operation: 11 years
Participating Organizations: 33
Number of files: approx. 10+ million
Number of Physical Sites: ~140

2009/2015 – National HF Radar Plan
Scripps
- Backend management and distribution
- Online visualization and interactive display
- Advanced programming interface
- Data Services for integration
- Site Diagnostics and IOOS Metrics
**Network Architecture**

**Data Acquisition**

**Example Node to Site Aggregator communications**

**Example Site Aggregator to Site communications**

**Site** - the individual field installations of HF radar equipment

**Portal or Site Aggregator** - a local regional operations center which maintains multiple installations

**Node** - Centralized locations which aggregate data from multiple regions

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**Network Architecture Diagram**

- **Tiling Engine**
- **FTP Data Access**
- **Google Maps Website**
- **ThREDDS Data Server**

**SI0 Node**

**UNLS RTV**

**Example Node to Site Aggregator communications**

**Example Site Aggregator to Site communications**

**Portal or Site Aggregator**

- **OSU Portal**
- **SIO Portal**
- **U. Miami Portal**
- **U. Delaware Portal**

**Site**

- **SIO Portal**
- **U. Miami Portal**
- **U. Delaware Portal**

**Node**

- **SIO: AGL1**
- **SIO: DCSR**
- **SIO: LUIS**
- **SIO: ARG1**
- **SIO: UES**
- **SIO: PTC1**
- **SIO: DCLR**
- **SIO: FBK1**
- **SIO: RAGG**
- Portals/Site Aggregators server as ‘point-of-entry’ machines for radial data
- Nodes are typically used as independent data concentrators
- Ingestion of local archive volumes may be achieved through hfradar2db
1.) Online Visualization – http://cordc.ucsd.edu/projects/mapping/maps/fullpage.php
Online visualization of HF radar surface currents with ability to change date, resolution, colorbar, and station information

2.) Web Overlays - http://cordc.ucsd.edu/projects/mapping/api/
Application programming interface (api) that allows programmers to overlay the currents into any website

3.) THREDDS access –
http://sdf.ndbc.noaa.gov/thredds/catalog.html
http://hfrnet.ucsd.edu/thredds/catalog.html
THREDDS service that allows folks to acquire or used the data via thredds for processing and/or visualization.

4.) Diagnostics -
http://cordc.ucsd.edu/projects/mapping/stats/?sta=SDBP&aff=SIO
Individual station statistics and diagnostics for operators

5.) Archiving – NCEI totals starting in January, 2015
2008 (east coast) / 2009 (west coast)
METRICS FY15 (Oct ’14 - Sept ‘15)

The percentage of time NOAA IOOS funded radars are operational during a given reporting period.

An HF radar derived data file where the number of Observed radial solutions meets or exceeds a nominal number of radial solutions \((X - 300)\) and the file was reported within \((Y - 25)\) hours of the observation.
Radial Diagnostics

Improvements: operator input and outage estimations
Radial velocities

• ROWG community endorses two versions of radial velocity data – the near-real time version and, as needed, a reprocessed or otherwise Q.C.’d version

Total velocities

• Now: HFRNet reprocessing currently 26 hours for near real-time
• Soon: Climatological data - monthly and annual statistics (mean, variance, minimum and maximum) of HFR derived surface currents (from 2012)
• Sub-groups to Level 2 data:
  • Level 2a: Near real-time total velocities
  • Level 2b: Monthly (or some interval) reprocessed data with any available
IOOS Working Group Initiatives

Equipment Inventory: 15 year old hardware
- # of radars
- supporting infrastructure
- communications

O&M costs: $ annual operating costs not budgeted
- staffing
- hardware
- calibrations
- infrastructure

Metrics: google analytics
- Applications
- Users
- Uptime
HF Radar Public Data Distribution and Benefits

1. Search and Rescue - U.S. Coast Guard - Search and Rescue Optimal Planning System (SAROPS)

2. Oil Spill Response –
   • California Office of Prevention and Response (OSPR)
   • NOAA Office of Response and Restoration (OR&R) Emergency Response Division (ERD) - General NOAA Operational Modeling Environment (GNOME)

3. Assessment - OR&R Assessment and Restoration Division (ARD) - Environmental Response Management Application (ERMA)

Data Management Standards

- **Standard for Gridded Velocity Format** – Network Common Data Format (NetCDF) format
  [http://www.unidata.ucar.edu/software/netcdf/](http://www.unidata.ucar.edu/software/netcdf/)

- **Standard Metadata Naming Conventions** for data – Climate Forecast Interoperability

- **Standard Metadata for Dataset Discovery**
  Attribute Convention for Dataset Discovery (ACDD)

  *Example can be found at:*

- **Standard Distribution Service** – THREDDS Data Server (TDS)
  [http://www.unidata.ucar.edu/software/thredds/current/tds/](http://www.unidata.ucar.edu/software/thredds/current/tds/)
High Frequency Radar Network (HFRNet)
Global Partnerships

- Australia
- Canada
- Continental U.S.A.
- Puerto Rico and U.S. Virgin Is.
- Hawaiian Is.
- Mexico
- Alaska
- South Korea
- Spain/Balearic Islands

IOOS Integrated Ocean Observing System
http://www.emodnet-physics.eu/map/
Portugal, Italy and Spain
Thank You
Resources

http://cordc.ucsd.edu/projects/mapping