**Background**

High Frequency Radar (HFR) ocean surface backscatter (sorted by range) "Range Series"
HFR measured ocean surface radial velocities  "Radial Velocities"
HFR derived total vector velocities "near real-time total vectors (RTVs)" via High Frequency Radar Network (HFRNet)

Range Series – binary because they vendor specific to the acquisition software.

1.) Codar Ocean Sensors – SeaSonde: Refer to: <http://support.codar.com/> >Manuals & Documentation >Guides to File Formats > File\_RangeSeries.pdf

2.) WEllen RAdar (WERA): (Refer to: http://www.helzel.com/de/9293-wera-service

3.) Least Expensive RAdar (LERA):

Radial Velocities – asci or binary files because they vendor specific to the processing software 1.) Refer to: <http://support.codar.com/> >Manuals & Documentation >Guides to File Formats > File\_LonLatUV\_RDL\_TOT\_ELP.pdf

2.) Refer to: http://www.helzel.com/de/9293-wera-service

3.) Least Expensive RAdar (LERA):

RTVs –NetCDF because the format is widely used within the oceanography community, the format for compression, and there are publicly available tools for distribution

(Refer to: <https://cordc.ucsd.edu/projects/mapping/documents/HFRNet_RTV-NetCDF.pdf>)

**Data Ingestion**

Field Ingestion: Near real time data telemetry has been done over FTP and managed by a custom Perl script run through cron on the remote site. The script determines which files need to be sent by comparing files available in the recent radial directory, normally /Codar/SeaSonde/Data/Radials, with a log of files that have already been successfully sent to the FTP server. Various other options are available for accomplishing this task including rsync over SSH. The HFR\_Progs toolbox developed at the Naval Postgraduate School in Monterey, CA and the University of California at Santa Cruz may offer additional options and capabilities for this task. SIO has phased out its use of its custom Perl scripts used for data telemetry from remote sites in favor of the Antelope solution developed for the National Network. The Antelope solution requires no code installation at the remote site. The only requirements are access over SSH and the presence of a single static path for recent radial files (see also section 3). Instead of posting data to an FTP server, Antelope stores data to an observer which is capable of serving data to the entire HF-Radar Network in real-time. Additional information on Antelope solution for data telemetry is available in ‘Data Management and Real-time Distribution in the HF-Radar National Network’, Terrill et. al., IEEE OCEANS06 (available through www.rowg.org). Further integration between Antelope managed data telemetry and CODAR central site processing is being carried out in collaboration with San Francisco State University. 5.3 Local Data Management/Backups

<http://cordc.ucsd.edu/projects/mapping/documents/SCCOOS-BestPractices.pdf>

Range Series – acquired at a high frequency radar site on an onsite computer and stored locally. Doppler Radar sends radio waves in the 10 to 50MHz band and listens to the scattered signal from the surface waves that have wavelengths in the 15 to 3m range

Radial Velocities - processed at an onsite computer for each site location and then sent via network to a site aggregator/portal system. The site aggregator/portal system then sends radial velocities via the network to a node for total vector processing. System directly measures the speed of the waves that scatter the radar signal. Differences between the measured speed and the theoretical speed of the waves are the ocean surface currents

(Refer to: https://cordc.ucsd.edu/projects/mapping/documents/HFRNet\_Portal\_RefGuide.pdf)

RTVs - processed on a node system via HFRNet. The resulting ocean surface radial velocities are combined with radial velocities collected by neighboring sites with overlapping coverage to produce near real-time total velocities.

<https://cordc.ucsd.edu/projects/mapping/documents/HFRNet_Node_RefGuide.pdf>

**Data Management**

Range Series – data are archived locally by HF radar operator shared by request.

Radial Velocities - data are transmitted in near real-time to the HF Radar Network (HFRNet) DAC in La Jolla, CA. Radial velocities are shared within the network hourly (approximately).

RTVs - Data are distributed in near real-time via HFRNet. RTVs are shared approximately within 3 hours.

**Data Distribution**

Data are updated every hour.

HFR Access to Data (http://hfrnet.ucsd.edu/thredds/catalog.html)

THREDDS data are organized into Archived and Real-time folders:

1. OPENDAP - provides URL that can be used in Python/Matlab to automatically grab NetCDF file of data from server. Also provides option to download user-specified variables/time periods as ASCII or Binary file.
2. WCS
3. Netcdf Subset
4. WMS
5. NCML (NetCDF Markup Language) - XML document used to define a CDM dataset, and to allow user to add/delete/change metadata and variables, or combine data from multiple CDM files.
6. ISO - XML metadata record for each station.
7. UDDC (Unidata Data Discovery Convention) - tool to determine how well file metadata conforms to list of recommended metadata attributes.

Numeric Data

* THREDDS Data Server provides full access to combined vector data. The TDS provides OPeNDAP, WCS, NetCDF subsetting, and WMS access. Please note that because this service holds the full data series, load times may be slower than normal.
* Rolling FTP access provides recent NetCDF output for easy access. The time window is narrow. For older data, we recommend using out THREDDS server.
* Shapefiles provide numeric data in a format digestible by many visualization software packages.

Visual Data

We provide these files as an easy means of bringing in HF RADAR data to other applications. These methods do not contain numeric data, and are therefore of limited use in scientific applications.

* KML Recent RTVs displays the most recent 7 days of combined total vectors. The KML is divided into folders for hourly and 25hr averaged processing. It is further divided into sub-directories for each of the data resolutions available.
* KML Station Status is a simple KML file that contains Placemarks and basic metadata for each of the installed HF RADAR sites.
* Embeddable mapping API. You can use this API to embed the total vector maps into your website, allowing you to create custom, rich applications with the ability to add your own layers.

Data are accessible in a variety of formats: Google Earth KML (7 days), mapping HPI (For off-site maps), CORDC THREDDS server, NDBC THREDDS server, FTP (3 day rolling archive), shapefile access (California) via FTP (3 day rolling archive), shapefile access (Gulf Coast) via FTP (3 day rolling archive).

**Quality Control**

Quality Control: <http://www.cordc.ucsd.edu/projects/mapping/documents/HFRNet_QC-RTVproc.pdf>

Radial Encoding:

<http://www.cordc.ucsd.edu/projects/mapping/documents/HFRNet_Radial_NetCDF.pdf>

Data Management Plan: <http://www.cordc.ucsd.edu/projects/mapping/documents/HFRNet_Portal_RefGuide.pdf>

**Archiving**

NetCDF files with the appropriate metadata are archived at the National Centers for Environmental Information (NCEI) federal archive.

NCEI Submission Information Form: <http://sccoos.org/documents/home/archive/>

**Permission Restrictions**

HFR data and products are freely available for public use.

**Intellectual Property Rights**

The funding agency & the University of California, San Diego through a contractual agreement.

If you have previously published research data, list the citations here (including the website or persistent identifier).

Contact us at hfrnetadm@ucsd.edu

**Publications:**