

High Frequency (HF) Radar National Network (HFRNet) Performance Metric

I. Overview

Operational support of high frequency radar (HFR) has been identified to support national missions of oil spill response, search and rescue, and maritime operations. The data have also been shown to be valuable for fisheries, ecosystem assessments, and tracking impaired waters including those affected by harmful algal blooms. National and regional planning efforts prioritize the location and transmit frequency of deployed radars for optimal coverage in the offshore (150km from shore) and nearshore (30km from shore) regions. Trade-offs exist between frequency of operation, range, and resolution: radars operating at low frequency (3-5MHz) provide long range coverage with coarse resolution (6km) while radars operating at higher frequencies (13Mhz, 25MHz, 49MHz) provide higher resolution data but at shorter ranges. The national planning documents have designed the U.S. operational array with consideration of these trade-offs and the associated regional application of the network. For example, higher frequency systems are often deployed at high risk regions such as ports and harbors.

Performance metrics described below for IOOS are subject to change as quality assurance and quality control (QA/QC) are defined for the HF radar national network (HFRNet).

II. HFRNet Characterization

The HFRNet surface current mapping network is characterized by a tiered structure that extends from the individual field installations of HF radar equipment (a site), a local regional operations center which maintains multiple installations (an aggregator), and centralized locations which aggregate data from multiple regions (a node). This data system relies on robust aggregator to node communications with centralized data repositories that are updated in near real-time. Hourly Radial files are generated locally at the site and transmitted through the national network for inclusion in the total vector calculation which then produces a near real-time total vector (RTV). RTV's are generated on grids with multiple resolutions (500m, 1km, 2km, and 6km).

III. Performance Metric

The performance metric is based on uptime of the U.S. array over a 12 month fiscal cycle (October through September) or otherwise defined reporting cycles (e.g. quarterly cycle). Currently, uptime is reported quarterly, but updated daily for the current quarter. Uptime is defined as the percentage of time NOAA IOOS funded radars meet a pre-defined threshold of data availability for the reported time period.

A radar site is considered "Up" if its hourly radial file arrives at the national server within 25 hours of its time stamp and if the number of radial velocity data points (aka "solutions") is 300 or more. Then, the number of "up" hours during the month is divided by the total number of possible

hours for that month (e.g., a 30-day month has 720 possible hours). For example, if a site sends 631 hourly files on-time with at least 300 data points for November, that site's uptime would be 87.6%. Within each radar site's diagnostic page, accessible from the main diagnostic web page at <https://hfrnet.ucsd.edu/diagnostics/>, is an indication of "% available". This number will usually be larger than the uptime for any time period because the file does not need to meet the thresholds, mentioned above, for this designation. All radars' uptime for each Regional Association are averaged together for Regional display.

$$\% \text{ Uptime} = \frac{\# \text{ of Operational Radial Files}}{\# \text{ of Hours in reporting period}}$$

Calculation: The percent uptime is calculated by dividing the number of operational radial files reported to the HFRNet by the total number of hours in a given reporting period. An operational radial file is defined as an HF radar data file where the number of *observed* radial solutions meets or exceeds a nominal number of radial solutions (300) and the file was reported within (25) hours of the observation.

Note: there are a small number of sites (about 6) with topographic barriers to the transmitted radar signal cause a diminished coverage area such that the site would never be able to reach 300 points per hour. These sites must only meet a 200 point threshold. There is an even smaller set of sites (currently only 4) having severe limitations whose threshold is only 75 points.



