

Summary of ROWG-8 Technical Program

2-4 November 2015

Woods Hole Oceanographic Institution

Woods Hole, MA, USA

November 2nd, 2015: Evening Networking meeting.

November 3rd, 2015: ***Program and results:***

Jack Harlan (US IOOS Program) - State of the IOOS HF Radar Network

Jack discussed the growth of the US radar network in the last 10 years and how the network has now become important for operational needs such as US Coast Guard search and rescue, oil spill response, marine navigation and NOAA National Weather Service marine forecasting. Some of the new projects underway were highlighted along with innovative new ways to measure antenna patterns.

Lisa Hazard (Scripps) - HFRnet updates

Lisa gave an overview of the existing ten year US IOOS HFRNet data management system as well as a discussion of the GEO global HF radar display. The IOOS network has grown to a network of approximately 135 HF radars and 33 participating organizations. Future goals of the data management system include optimizing the near real-time vector processing, re-programming the backend infrastructure for open source, improving and expanding diagnostics, and enabling both versioning and reprocessing. Data management standards for formats, naming conventions, and metadata were discussed.

Break

Mark Bushnell (US IOOS Program) - HFR QARTOD

Mark described the QARTOD process in general then presented some open questions about specific parameters that might be considered for HF radar. IOOS is funding an effort to create a QARTOD Manual for HF radar surface current data. Mark also made a call for volunteers to help write the initial manual.

Brian Emery - Rapid Response to the Refugio Oil Spill

Brian described UCSB's experience setting up a temporary radar site to assist the mapping of surface currents during the recent oil spill, as well as his work to model the plume trajectory.

A lively discussion about the solar powered system used followed along with an exploration of the costs/benefits of having temporary systems ready to go for such instances. With hardware normally unavailable for such endeavors and the time necessary to 'set up' the server-side operations minimal, the group consensus was to handle new instances as they arose, rather than attempting to pre-plan.

Lunch

Group Discussion Topics

1) QA Checks (Teresa Updyke):

Every group and operator handles site and data checks differently. There are a few documents available which suggest what diagnostics and data to check on a routine basis (COCMP doc, IOOS/CODAR doc, Mid-Atlantic doc). By show of hands, none of these checklists are used by any operators at ROWG. By gathering information about what operators are actually checking, at what frequency and what tools they used to check, we could update the existing checklists to make one improved guidance document that is more useful to the community. This effort would inform the new QARTOD effort as well as the new National Network diagnostic pages.

Some specific notes:

Forward/reflected power, temperature, max range, disk space, radial coverage are all considered very important.

A good number of operators use the CODAR radial web sever pages. Others use scripts or custom-made diagnostic tables.

Examples include

- diagnostic tables for a set of particular sites that is automatically updated displaying red/green colored boxes where red indicates a potential problem with a diagnostic parameter
- scripts to check radial maps
- script that generates a map animation for daily review

Checking total maps first can quickly show a data problem and lead to further investigation.

Then other checks can determine whether any potential problems are brewing, problems that would cause an disruption in data collection (e.g. high temperature, low disk space) but signs may not appear in the maps.

There were requests to include maximum range on the National Network diagnostic pages – that plot was dropped in the transition to the new pages. Operators appreciate the diagnostic history supported by the older diagnostic pages. (The old pages are no longer supported and will go away soon.)

2) Drone pattern measurement (Eduardo Romero):

Ed showed the new quadcopter developed for measuring antenna patterns and explained its capabilities. He is able to share the part lists, plans and give advice to anyone who is interested in building one ([see http://washburnlab.webdev.msi.ucsb.edu/aapm](http://washburnlab.webdev.msi.ucsb.edu/aapm), which will soon be <http://washburnlab.msi.ucsb.edu/aapm>). While everyone thinks drone-based APMs would be useful, the hurdles to mass emulation of this UCSB-model of APMs were discussed including

operator training, processing the resulting data, and obtaining FAA permissions. Operator training is a crucial factor, as was demonstrated by the carefulness of Eduardo's approach to these operations and attention to safety details. One suggestion was that ROWG should produce a best practices document for the use of drones for APMs, or perhaps a section in the best practices wiki (http://hfrnet.ucsd.edu/bestpractices/index.php/Main_Page). Jack reported that NOAA-IOOS has limited abilities to assist these types of operations for a number of permitting reasons. He also stated "Nothing preventing IOOS awardees from using funds to fly drones". One takeaway from the meeting was that the FAA landscape is changing so rapidly on drone use that it might be significantly easier to proceed with such operations by the next ROWG.

3) Diagnostics (Lisa Hazard):

This discussion focused on application of the failure modes that Jeff Paduan and others proposed at an earlier ROWG meeting. Suggestions by the group included the following:

- Add environmental, power and unknown to the top level category
- Add "other" to each subcategory
- Do not use the third tier categories but provide a way to enter notes
- Allow multiple selections in top and subcategories
- Allow editing to allow an operator to acknowledge a problem quickly but update later when the actual problem is discovered
- Distinguish between true data outages and cases where data was not transferred to the National Network in time

A way to do this is establish a database associated with the National Network and operators would fill out a form on the network website. Participation would be encouraged as part of participation within IOOS, but constraints on time and funding would need to be considered. Participation may vary based on interest of operators. Broad level categories discussed include: hardware, software, communications, power, operational settings/human errors, and environmental.

Additional note: Operators can "opt in" to alerts from the National Network on when their regional node is not reporting by contacting the admin group at HFRNetAdm@ucsd.edu . Are there alerts for individual sites?

Break

4) Range Series Archiving (Tom Cook):

Tom provided an overview of the reason for archiving the range series and what has been discussed so far in the working group. The Axiom website was shown to the group. We want a better way to interface with the Axiom website to upload files. Some of the information we need to keep includes radial configuration files and the antenna pattern measurement information. Notes on when the APM's apply are very helpful but not everyone keeps this information. The site log file can assist in determining when different patterns may apply. There is no standard on keeping notes for O&M.

5) Software

The most recent version of the HFR progs toolbox was copied to the ROWG github account. Since then, several additional contributions have been made (<https://github.com/rowg>). It was also noted that the rowg.org site has been updated and will become the home of the best practices wiki in the near future.

November 4th, 2015: Program and results:

Tom Cook (Scripps) AIS and APM measurements

Tom graciously gave Chad Whelan's (unable to attend) talk on recent successes using AIS ship tracks within the Southern California Bight to examine the antenna pattern measurements of some of the UCSD and USC radar sites. There was a brief discussion about the AIS pattern software tools that CODAR is developing and how those could be implemented by an operator. Additionally, the examinations of the resulting APM that the operator would still have to make were discussed as well as best practices in when to change the patterns that the software uses to process real-time data.

Sara Haines (UNC) New Radial QC results

Sara reported on work done using the UNC radar observations over-looking the Gulf Stream to implement the QAQC metrics defined by Kirincich, de Poalo, and Terrill (JOAT, 2012). Implementation of the thresholding and weighted averaging acted to improve the radars' realization of the Gulf Stream and specifically the western wall of the current, both in the radial averages and the combined totals. Stepping farther than that done by Kirincich et al. (2012), this work also implemented spatial and temporal averaging windowing to identify and remove outliers.

Sara also previewed a Matlab based GUI that would allow the user to see the effect of different adjustments of both the metric used and its threshold value. While completed entirely in offline post-processing, this work is notable in that it follows the SeaSonde processing schematic carefully, and thus offers the potential to be easily ported into real-time operations.

Discussion on the metrics used for estimating the weighted averaging followed the presentation.

Hugh Roarty (Rutgers) GEO Global HFR

Hugh reported on the recent activities of the GEO Global HFR group and their recent meeting in Crete. He provided an introduction to GEO, a history of the HF radar work within GEO and the goals for the organization. He described the work that has been accomplished so far:

- 1) A new web site <http://rucool.marine.rutgers.edu/geohfr/index.html>
- 2) A global viewer for the measurements
<http://cordc.ucsd.edu/projects/mapping/global/fullpage.php>
- 3) Application success stories <http://marine.rutgers.edu/~hroarty/GEO/ESRI/>

A summary of the meeting has been accepted for publication in EOS.

Break

Final notes from Jack

Jack briefly discussed some of the issues raised during the meeting and paths forward over the course of the next year.

Group Review of the Best Practices Document

http://hfrnet.ucsd.edu/bestpractices/index.php/Main_Page

With numerous questions arising over the course of the meeting about operational best practices, it was decided that the group would benefit from reviewing and possibly updating the current HFR best practices document in a group format. This document, whose creation was led by UCSD, is a wiki document version that is currently maintained by Tom Cook. Discussions were led by Kirincich and Cook.

Reviewing the document as a group, a number of individuals were able to make changes to the wiki version in real time, and a group discussion ensued about a number of organizational and informational issues, including:

Reorganization to support HFR systems other than CODAR SeaSonde-type systems: the decision was made that the document should be reorganized into a more generalized radar format, with hardware-specific sections broken into radar type. Flament offered to provide language more specific to phased array systems for the hardware sections.

How should the recent efforts on QAQC be implemented? A discussion about how ready the radial metrics QAQC efforts were for 'real-time' resulted in the assessment that, recent efforts have proven their utility (see Sara's presentation, Kirincich et al. 2012 and de Paolo et al. 2015) and that some version of the QAQC techniques should be available for public use. Thus, IOOS looks to the vendors to implement such activities in future software updates, allowing QC'ed data to be feed into the national archive along with existing data streams.

The group was encouraged to continue additions to the best practices document in the near future.

Attendees and their affiliations.

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