

Semi-annual Program Performance Report for NA16NOS0120027
FY 2016-20 Implementation and Development of a Regional Coastal Ocean
Observing System: Alaska Ocean Observing System
For reporting period June 1, 2019 – November 30, 2019
Prepared by Molly McCammon, Project PI on December 20, 2019

1.0 PROGRESS AND ACCOMPLISHMENTS

1.1 Regional Governance & Management Subsystem

1.1.1 Support ongoing board and committee activities.

- The AOOS Board's Executive Committee met July 19 to accept some additional funds and projects in the annual AOOS agreement with NOAA and make minor budget adjustments.
- Alaska Department of Fish and Game Trustee Doug Vincent-Lang appointed Dr. Katherine Howard as his board designee.
- The future of the Data Management Advisory Committee will be discussed at the December 16 board meeting.

1.1.2 Provide ongoing fiscal and administrative oversight for program.

- Executive Director Molly McCammon conducted annual evaluations for OA Network Director Darcy Dugan and Operations Director Carol Janzen.
- Subawards and contracts for Year 4 of our NOAA Cooperative Agreement were implemented.
- IOOS Management and Program Analyst Debra Esty visited AOOS in Anchorage and the Alaska SeaLife Center in Seward in September to gain a better understanding of how AOOS operates financially.
- The AOOS audit was completed with no negative findings.
- AOOS continues to seek additional external funding, and in this reporting period, met with the Moore Foundation staff in Palo Alto and by webinar about the marine atlas digitization project and other potential collaborations.

1.1.3 Support national and international partnerships and collaborations.

- AOOS staff met with a number of NOAA visitors in this reporting period, including Sherri Fields, Director of the Charleston Marine Labs, Steve Kibler, NCCOS oceanographer, and Nicole Fernandes with Policy & Constituent Affairs Division. Staff also met with several staff of the Senate Appropriations Committee and NOAA senior leadership in August.
- McCammon gave 3 lightning talks and co-lead a session on Arctic observing at OceanObs'19 in Honolulu, HI in September. Janzen was a lead on 2 peer-reviewed conference papers, and McCammon a co-author on several others, now published in *Frontiers in Marine Science*.
- The IOOS Program's 20th anniversary was celebrated at Ocean Obs.
- McCammon attended the Arctic Futures 2050 conference in Washington DC Sept 4-6.
- McCammon was invited by PICES to represent Alaska at a UN Decade of the Ocean planning meeting in Tokyo, Japan July 31-August 2.
- McCammon met with other members of the Advisory Committee for a Coastal Resilience Assessment, conducted by the National Fish and Wildlife Foundation and NOAA's Office of Coastal Management.
- McCammon attended a meeting in October in Portland of the NOAA Science Advisory Board's Ecosystem Sciences and Management Working Group. The group is finishing a report on new technologies to help with NMFS stock assessments.
- McCammon finished her term on the Consortium for Ocean Leadership board by attending the fall meeting as well as several teleconferenced meetings. She continues to serve on COL's Public Policy Committee.

- Operations Director Carol Janzen participated in the PI meetings for the *Exxon Valdez* Oil Spill Trustee Council Gulf Watch Alaska and Herring Research Monitoring Programs in October and provided a status report to the Trustee Council.
- Janzen participated in the OCEANS'19 technical conference in Seattle October 27-31.
- Janzen presented at the Symposium on Arctic Maritime Domain Awareness (MDA) held at the national Geospatial and Intelligence Agency offices in Washington DC Nov. 21.
- McCammon participated in a July executive director retreat and the IOOS meeting and 20th anniversary celebration in Honolulu in September, as well as numerous teleconferences and work groups with the IOOS Program Office and the IOOS Association.
- McCammon attended the IOOS Federal Advisory Committee meeting August 21 by phone.
- As one of the co-leads for IARPC's Environmental Intelligence Collaboration team, McCammon continued to participate in events highlighting the unusual weather, ice and ecosystem conditions in 2018-19 in the Bering Sea and attended the IARPC Team Leaders Workshop in Anchorage June 5-6.
- Dugan attended an Alaska Women's Climate Adaptation Conference November 14-15 hosted by The Nature Conservancy.

1.1.4 Support Alaska and regional partnerships and collaborations.

- McCammon helped AOOS member Prince William Sound Science Center celebrate its 30th anniversary in Cordova June 8.
- AOOS co-sponsored a workshop in Nome July 16-17 to provide an introduction to algal toxins to health care providers, the general public and others.
- McCammon and Dugan continue to meet with Landscape Conservation Cooperative staff to keep the programs mutually updated.
- As a member of the advisory committee for the Alaska Center for Climate Assessment and Policy, McCammon met by phone in August and in person in Anchorage in November.
- McCammon participated in an NSF-sponsored planning workshop in Fairbanks in October for a potential High Arctic research facility.
- See sections 1.2.3 for activities relating to the Alaska Ocean Acidification Network, the Alaska Harmful Algal Bloom Network, and the Alaska Water Level Watch.

1.1.5 Finalize certification application

- This activity is completed.

1.2 Outreach, Stakeholder Engagement & Education Subsystem

1.2.1 Support website, Facebook and printed publications as key AOOS communication tools.

- Kent continued to add content to the AOOS website and Facebook page, including news, featured stories, and descriptions of new data tools.
- Staff produced monthly updates and monthly (as needed) proposal updates for board members.
- Staff circulated a printed newsletter in August and an e-newsletter in December to a list of over 400.
- Staff produced and distributed press releases announcing the 20th anniversary of IOOS and the redeployment of the Nome buoy.
- Kent has been working with a contractor on a refresh of the AOOS website.

1.2.2 Support ongoing stakeholder interactions.

- AOOS continues to use the Alaska OA Network, the AK HAB Network, the AK Water Level Watch and other forums to engage with stakeholders. Staff are expanding their engagement activities in the next 6 months in preparation for the next AOOS 5-year proposal to NOAA.

1.2.3 Support stakeholder working groups including ocean acidification network, integrated water level observation network, harmful algal bloom network.

Alaska Ocean Acidification Network

- The network produced two new outreach documents: an Alaska OA Science Update for stakeholders which was reviewed by fishermen and will be circulated at events over the next year; and a 2-pager on ocean acidification impact on fish and crab in the face of other stressors.
- Network director Darcy Dugan continued writing and producing monthly eNews, including articles about monitoring, research, outreach and scientist interviews, as well as maintaining the network website as a hub for OA information in Alaska.
- The network organized the first ever briefing on ocean acidification to the Alaska Board of Fish in October, as well as an evening presentation for the public in Anchorage following the meeting.
- The network hosted an information booth at the Pacific Marine Expo in Seattle in November, an annual event that draws 7,000 fishermen from across Alaska and the Pacific Northwest
- Dugan presented to the USFWS, the Alaska Prospectors Society, the Unitarian Universalist congregation, the Kodiak Mariculture Association, and the Adapt Kodiak workshop.
- Dugan produced a webpage and initial project outreach for the interdisciplinary “Tipping Points” project focusing on OA and salmon.
- Dugan attended and presented at the OA State to State Action Plan workshop hosted by the International OA Alliance in NYC in September.
- Dugan facilitated two meetings of the Alaska OA Network steering committee to keep track of progress and identify new activities and objectives for the network.

Alaska Harmful Algal Bloom Network

- With AOOS support, Sea Grant Fellow Kayla Schommer continued coordinating the network until the conclusion of her fellowship in September.
- The network hosted a workshop in Nome in July to provide an introduction to algal toxins, their effect on humans and marine species, and what we know so far about their presence in western and Arctic Alaska. The first day of the workshop was targeted for local entities and the public. The second day was designed to inform local health care professionals in the region on the symptoms of algal toxin poisoning and how to effectively treat it.
- The network has continued to host monthly calls to share updates on HABS monitoring efforts and conditions around the state, and maintain the AHAB website.
- AOOS staff and members of the network have identified key tasks to be completed in the near term until new funding for an AHAB coordinator can be identified.

Alaska Water Level Watch

- McCammon and Janzen continue to work with partners to implement pilot projects for alternative water level observation technologies, including a demonstration project of the “Hydroball”.
- See section 1.4.2.3 for information about the new water level Tiered Data Portal.

1.2.4 Support partnerships with marine education and outreach programs.

- Kent, Dugan and Schommer participated in a 2-day facilitation training sponsored by NOAA in Juneau June 18-19.
- Staff supported the Shorezone project as a partner.
- Kent maintained a web page with resources for educators on AOOS.org.
- Staff provided support to Alaska Sea Grant’s marine education programs.

1.2.5 Support Alaska Marine Policy Forum

- AOOS partnered with Alaska Sea Grant to host sessions of the Alaska Marine Policy Forum (AMPF) in July, September and November 2019.

1.2.6 Continue AOOS short film contest.

- AOOS has discontinued the film contest. The fourth and final annual Short Film Contest was held in November 2017 with 13 entries.

1.2.7 Continue to co-sponsor the Alaska Marine Science Symposium.

- AOOS staff serve on the organizing committee and are helping coordinate workshops and keynote addresses for symposium week.

1.2.8 Participate in IOOS Outreach Committee

- Kent attended monthly meetings of the committee and responded to various requests for materials from the IOOS office for inclusion into IOOS publications and website.

1.3 Observing Subsystem

1.3.1 Marine Operations

1.3.1.1 Sustain weather observations in the GOA.

- **Subaward to Prince William Sound Science Center to service 8 SnoTel stations in Prince William Sound and Cook Inlet.**
 - Service Snotel stations in Prince William Sound; Original Completion Date: September 2019.
Status: Completed - September 2019.
 - Contract with Natural Resources Conservation Service (NRCS) to maintain the most critical SnoTel stations in PWS and Cook Inlet providing real-time web accessible data; Original Completion Date: May 2020.
Status: On Track.

1.3.1.2 Increase access to weather observations using AIS.

- **Subaward to the Marine Exchange of Alaska to increase access to Weather Observations using AIS.**
 - Install new weather sensors and service existing peripheral equipment at the Port of Kodiak; Original completion Date: July 2019.
Status: Delayed – Site survey completed, awaiting final permission from site host. Planning to install this winter.
 - Install new weather sensors at Ship Island and Tree Point; Original completion Date: August 2019.
Status: Completed – August 2019.
 - Install new weather sensors and service existing peripheral equipment in proximity of Saxman; Original completion Date: September 2019.
Status: Delayed - site host permission granted, planning to install this winter or spring.
 - Install new weather sensors at George Rock; Original completion Date: May 2020.
Status: Completed – September 2019.
 - Recapitalize three existing weather sensors at Kodiak Gull Island, Homer Port, and Tenakee Springs; Original completion Date: May 2020.
Status: On Track – Kodiak Gull Island and Homer Port completed.

1.3.1.3 Support sea ice radar in Barrow

- **Subaward to University of Alaska Fairbanks (UAF), Geophysical Institute.**
 - Replace the UAF coastal sea ice radar system in Utqiagvik. Original Completion Date: May 2019.
Status: Pending. – System needs complete replacement. PI is seeking funds to do so, with possible AOOS contribution.

1.3.1.4 Sustain critical wave buoys for navigation safety.

- **Operate and maintain Cook Inlet buoy; Original completion date: May 2020.**
Status: On Track.

1.3.1.5 Map surface currents with high frequency radars (HFRs).

- **Subaward to University of Alaska Fairbanks to support operation and maintenance of three HFR sites on the Chukchi and Beaufort Seas as part of a consortium.**
 - Install Wainwright and Point Barrow HF Radar field sites to collect hourly surface current data in real-time; Original Completion Date: June 2019.

Status: Complete – June 2019.

- Install Cape Simpson HF Radar field site to collect hourly surface current data in real-time; Original Completion Date: July 2019.

Status: Complete – August 2019.

- Monitor HF Radar and power systems and perform maintenance, as necessary, until freezeup; Original Completion Date: July to November 2019.

Status: Complete – Through November 2019

1.3.1.6 Install two new high frequency radar field sites in the Bering Strait

- **Subaward to University of Alaska Fairbanks to install two new HFR field sites in the Bering Strait Region.**

- Plan logistics for deployment and ship field site equipment; Original Completion Date: May – July 2019.

Status: Complete – July – September 2019.

- Install two HFR field sites in Bering Strait region; Original Completion Date: August – September 2019.

Status: Complete – September 2019.

- Operate and Maintain HFR sites; Original Completion Date: October – present.

Status: Complete – October to present.

1.3.2 Coastal Hazards & Inundation

1.3.2.1 Increase water level observations in western & northern Alaska

- **Subaward to the Alaska Department of Natural Resources to Facilitate an Integrated, Interagency Water Level Network for the Alaska Coast.**

- Support 5 locations with operational real-time water level sensors by conducting maintenance on an opportunistic basis. Status: On Track. Still having problems with some sensors. The sensor in Naknek was converted from a short-term sensor to a long-term sensor.

- Install tide staffs for the documentation of maximum storm water levels at locations that can be opportunistically travelled to. Status: Complete. Installation occurred at Nunam Iqua.

- Create color-indexed maps for flood communication at communities where tide datums, community infrastructure, and elevation information are available. Status: On Track. Plans underway for collection of new tidal datums in 8 communities that could lead to new maps.

- Develop state database for coastal storm flood documentation. Status: Parts Delayed; but other components are On Track.

- Inform the National Weather Service (NWS) of potential flood impacts in advance of storm events. Status: On Track.

- Maintain Alaska Water Level Watch Webpage. Status: On Track.

- Train NWS and SEOC to use coastal flood mapping products. Status: On Track.

- Attend conferences and meetings for discussions on water level sensors and deployments. Status: Complete

- Contract with JOA Surveys to install a tide station at Naknek; Original Completion Date: May 2020.

Status: On Track.

- **Subaward to ASTRA LLC for a Pilot Study to Monitor Ocean Tides and Space Weather Using GPS Receivers.**

- Build and deliver remote power support for GPS hardware; Original Completion Date: May 2019.

Status: Complete.

- Remove and redeploy equipment from Seward to Anchorage and Homer and train AOOS personnel in deployment and routine maintenance of equipment; Original

- Completion Date: July 2018.
Status: Complete – July 2018.
- Monitor daily health status of the re-deployed equipment, review and provide quality-controlled tide and space weather data on a daily basis for these new locations; Original Completion Date: May 2019.
Status: Complete.
 - **Subawards to JOA Surveys and ASTRA to install water level instrumentation at Utqiagvik, Alaska.** Original Completion Date: May 2020.
Status: Delayed. Subaward agreements is in the process of finalization.
 - **Subaward to ASTRA to operationalize codes that process GNSS observations to extract water level measurements.** Original Completion Date: May 2020.
Status: Delayed. Subaward agreement is in the process of finalization.
- 1.3.2.2 Increase wave observations for forecasting and planning*
- **Deploy & support CDIP buoy in Nome;** Original completion date: June-October 2019.
Status: Complete, but buoy destroyed before could be pulled for winter. Now being replaced by barge company that hit it.
 - **Support operations and maintenance for the NREL owned Kodiak CDIP buoy;** Original Completion Date: July 2019.
Status: Completed.
- 1.3.2.3 Initiate statewide geospatial mapping coordination*
- Funding was acquired for a short-term AOOS position to develop a statewide coastal mapping strategy and implementation plan with support from NOAA and the state of Alaska. Status: On Track. The survey to help prioritize locations for coastal mapping was conducted in the spring. A compilation of the results into a draft report is completed and is now being reviewed internally before being circulated for broader review. A final report will be released in early 2020.
- 1.3.2.4 Improve the robustness of NOAA tsunami warnings for earthquakes in Alaska.*
- **Subaward with the Alaska Earthquake Center at the Geophysical Institute of the University of Alaska Fairbanks.**
 - Field maintenance was performed at Atka Island, Bessie Mountain, Deception Hills, Dot Lake, and the Cordova Ski Area from June through September 2019. Original Completion Date: October 2019.
Status: Completed.
 - Stream seismic data from the Alaska Earthquake Center to the Tsunami Warning Center for all supported sites. Original Completion Date: May 2020.
Status: On Track - Seismic data was streamed 24/7 in real-time for all sites.
- 1.3.3 Ecosystems, Fisheries & Climate Trends*
- 1.3.3.1 Sustain ship-based sampling along the Seward Line.*
- **Subaward to University of Alaska Fairbanks to support sampling along the Seward Line.**
 - Original Completion Date: September 2019.
Status: Complete.
- 1.3.3.2 Support ecosystem moorings in Alaska's Large Marine Ecosystems.*
- **Subaward to University of Alaska Fairbanks to begin the incremental build-out of a moored Gulf of Alaska Ecosystem Observatory (GEO) by providing funding for equipment purchases.**
 - Continue equipment purchases with funds that would be available in UAF Fiscal Year 2019; Original Completion Date: July 2018.
Status: Complete.
 - Assemble first mooring for deployment in Spring or Summer of 2019; Original

Completion Date: July 2019.

Status: Complete.

- First GEO mooring deployment; Original Completion Date: July 2019.
Status: Complete. Mooring was deployed July 11, 2019.
- First real time data from GEO moorings.; Original Completion Date: July 2019.
Status: On Track.
- Begin incorporation of real time data into Axiom/AOOS data portals; Original Completion Date: July 2019.
Status: Complete.
- Purchase equipment; Original Completion Date: October 2019.
Status: Complete.
- Take delivery of ordered equipment and begin 2nd set of moorings assembly; Original Completion Date: January 2020.
Status: Complete.
- Continue updates of project website; Original Completion Date: March 2020.
Status: On Track.
- Preparations for 2020 mooring turn-around; Original Completion Date: May 2020.
Status: On Track.
- Full set of second moorings deployment following recovery of Year 1 moorings:
Original Completion Date: May 2020.
Status: On Track.

1.3.3.3 Pilot use of gliders to monitor ocean conditions and marine mammals

- **Subawards to Woods Hole Oceanographic Institute, University of Alaska Fairbanks and University of Washington to conduct a simultaneous marine mammal and oceanographic survey of the Chukchi Sea using a Slocum autonomous underwater glider.**

- Update marine mammal call library, prepare DMON; Original Completion Date: April 2020.
Status: On Track.
- At-sea test of glider near Seward, Alaska; Original Completion Date: May 2020.
Status: On Track.
- Deploy glider in southern Chukchi Sea using ship of opportunity or small vessel charter from coastal village; Original Completion Date: July 2020.
Status: On track pending finding a suitable deployment vessel.
- Provide real-time detections on a publicly available website; Original Completion Date: May 2020.
Status: On track. The website is dcs.whoi.edu
- At sea data collection. Maintain website with real time acoustic detections and oceanographic data; Original Completion Date: October 2020.
Status: On track
- Glider recovered, acoustic and oceanographic data downloaded; Original Completion Date: October 2020.
Status: On track
- Present results at Alaska Marine Science Symposium; Original Completion Date: January 2021.
Status: On track.
- Data QA/QC'd, delivered to Axiom or uploaded to AOOS website; Original Completion Date: June 2021.
Status: On track

1.3.3.4 Pilot the use of gliders to assist in an ecosystem approach to fisheries management

- **Subaward to University of Alaska Fairbanks to purchase equipment and begin glider**

surveys in the Bering Sea.

- The subaward agreement for this project is currently being finalized.
Status: On Track.

1.3.3.5 Host regional ATN workshop

- AOOS to host a regional ATN workshop and build on data tools previously developed;
Original Completion Date: December 2017.
Status: Complete.

1.3.3.6 Regional Sentinel Observations

- **Subaward to Prince William Sound Science Center to support partnership to operate and maintain acoustic arrays across major PWS entrances and maintain conductivity sensor.**
 - Swap conductivity sensor at Cordova tide station; Original Completion Date: June 2019
Status: Completed June 2019.
 - Clean conductivity sensor at Cordova tide station; Original Completion Date: September 2019
Status: Completed September 2019.
 - Clean conductivity sensor at Cordova tide station; Original Completion Date: December 2019.
Status: On Track.
 - Upload data from OTN array; Original Completion Date: February 2020
Status: On Track.
 - Submit data to OTN, upload PWSSC data to PWSSC historical data workspace;
Original Completion Date: March 2020.
Status: On Track.
 - Clean conductivity sensor at Cordova tide station; Original Completion Date: March 2020. Status: On Track.
 - Send conductivity sensor for calibration; Original Completion Date: April 2020
Status: On Track.
- **Funding set aside to NOAA/UAF's Kasitsna Bay Laboratory and other partners to collect oceanographic data along repeated transects in Kachemak Bay and lower Cook Inlet.**
 - Conduct repeated small boat CTD surveys across Kachemak Bay from the end of the Homer Spit (north) to Mckeon Flats (south) and from Bluff Point (north) to Barabara Point (south); Original Completion Date: May 2020.
Status: On Track
 - Conduct intensive CTD surveys in Kachemak Bay in the spring and summer along the mainstem of Kachemak Bay and within sub-bays along the south side of Kachemak Bay to assess estuarine conditions from the head to the entrance of the bay; Original Completion Date: May 2020.
Status: On Track
 - Collect water samples at surface and depth with Niskin bottles at selected CTD stations, for later carbonate chemistry and nutrient analyses to assess variability in estuarine waters; Original Completion Date: May 2020.
Status: On Track
 - Use project data to analyze spatial and temporal variability in the estuarine response to climate change, ocean acidification and nutrients and incorporate the results from those analyses into NOAA NCCOS technical reports and peer-reviewed publications; Original Completion Date: May 2020.
Status: On Track
 - Provide CTD data to the AOOS data management team, to NOAA data centers for archiving, to NOS CSDL, BOEM and other organizations for ocean circulation model validation and to NOAA, federal/state agency, tribal and university partners to facilitate

development of decision support tools for resource and coastal management; Original Completion Date: May 2020.

Status: On Track

- Improve the Kachemak Bay harmful algal bloom risk assessment tool, in collaboration with AOOS, and work with partners in the Alaska Harmful Algal Bloom Network to transfer lessons learned for development of harmful algal bloom risk assessment tools in other Alaska regions; Original Completion Date: May 2020.

Status: On Track

1.3.3.7 Climate Products

- **Subaward to University of Alaska Fairbanks, Alaska Center for Climate Assessment and Policy to develop distance learning modules on climate decision support.**

- Identify training objectives, scope, delivery format, and potential audiences; original Completion Date: December 2018.

Status: Complete.

- Develop prototype module; Original Completion Date: October 2019.

Status: Complete.

1.3.4 Water Quality

1.3.4.1 Sustain Ocean acidification (OA) monitoring including moorings, sampling along the Seward Line, Burkolators and an instrumented ferry.

- **Subaward to University of Alaska Fairbanks to continue a ten-year time-series in the Gulf of Alaska along the Seward Line as well as support the deployment of OA moorings adjacent to the oceanographic sampling line.** Original Completion Date: May 2020.

Status: On Track.

- **Subaward to Alutiiq Pride Shellfish Hatchery to maintain continuous ocean acidification monitoring using a permanently installed Burke-o-Lator;** Original Completion Date: May 2020.

Status: On Track.

- **Subaward to University of Alaska Fairbanks to conduct a regional Ocean Acidification Monitoring Cruise in the Gulf of Alaska;** Original Completion Date: May 2020.

Status: Delayed. Awaiting further information from the NOAA OAP.

- **Subaward to Hakai Institute to purchase equipment for Burkolators;** Original Completion Date: June 2019.

Status: Complete.

- **Subawards to Southeast Alaska Tribal Ocean Research and Alutiiq Pride Shellfish Hatchery to analyze water samples from remote Alaskan communities for ocean acidification parameters;** Original Completion Date: May 2019.

Status: Complete.

- **Subaward to Hakai Institute to operate and maintain the ocean acidification instrumentation onboard the Alaska Marine Highway ferry Columbia;** Original Completion Date: May 2019.

Status: Delayed. Ferry operations have been stalled due to budgetary constraints, project will continue in spring 2020.

1.3.4.2 Support Alaska OA Network

- **AOOS received funding from the national OA Program to support the Alaska OA Network.** Original Completion Date: May 2020.

Status: On Track.

1.3.4.3 Support Alaska Harmful Algal Bloom Network

- **Subaward to the Native Village of Kotzebue to collect water samples and analyze for microcystins;** Original Completion Date: May 2019.

Status: Complete.

- **Subaward to Alaska Sea Grant to provide outreach support to Bering Strait Communities;** Original Completion Date: September 2019.

Status: Delayed, one workshop was conducted in Nome and a workshop for Kotzebue is being planned.

1.3.4.4 Support the University of Alaska's Ocean Acidification Research Center (OARC).

- **Subaward to the University of Alaska Fairbanks to execute a comprehensive carbonate chemistry assessment of US Distributed Biological Observatory (DBO) activities.**
 - Research Cruise for the Distributed Biological Observatory (DBO); Original Completion Date: May 2020.
Status: On Track – Cruise completed and samples are being analyzed.
 - Participate in a national meeting or workshop; Original Completion Date: May 2020.
Status: On Track. Natalie Monacci will be attending the American Geophysical Union Fall meeting in December 2019.
- **Subaward to the University of Alaska Fairbanks to support the ocean acidification monitoring network in Alaska Coastal Seas.**
 - Support equipment maintenance and turnaround for OA surface mooring at GAKOA; Original Completion Date: May 2020.
Status: Complete.
 - Support equipment maintenance and turnaround for OA surface mooring at M2; Original Completion Date: Fall 2019.
Status: Complete.
 - Participate in a national meeting or workshop to present any new findings; Original Completion Date: May 2020.
Status: On Track. OARC Deputy Director Natalie Monacci will be attending the American Geophysical Union Fall Meeting in December 2019. Data from the M2 surface mooring will be presented on poster OS11C-1491 titled: Ocean Acidification in Alaska: Chemistry, Clams, Cod, and Crabs.

1.3.5 Streamline access to Observations

- AOOS received \$75k in FY18 to help fill gaps and streamline access to ocean observations.
Original Completion Date: June 2019.
Status: On Track. The AOOS Board approved \$25k to go towards Phase I of a pilot data portal for Tier B and C water level data. The remaining funds were to be used for an additional AIS/weather station on St. Lawrence Island to support needs of the National Weather Service and subsistence hunters. That did not prove to be feasible. Instead, the funds will be used to add weather to 3-6 existing AIS stations in the Bering and/or Chukchi Seas.
- AOOS received \$80k in FY 19 to help fill gaps and streamline access to ocean observations.
Original completion Date: June 2020.
Status: On Track. Funds are being used for the Utqiaqvik GNSS water level install and for data solutions for GNSS data into water level data.

1.4 Data Management & Communications Subsystem, subaward to Axiom Data Sciences

1.4.1 Provide Core Data Management Support

1.4.1.1 Provide technical support for AOOS cyber infrastructure.

- Completed first phase of integrating newer generation compute nodes for faster processing and new storage hardware for next storage appliance generation. Implemented two new storage servers for all Axiom applications, and built the pipeline to provision a third storage server.

Status: On Track.

1.4.1.2 Continue development of AOOS Data Portal.

- A version 2.11 of the Ocean Data Explorer was released, which realized full integration and enhancements of the v2 sensor system together with the calculation and display of QARTOD tests for observation data within the portal. A summary of the version releases and full release notes can be found: <https://axiomdatascience.com/portal-updates/>.

Status: Ongoing. On Track.

1.4.1.3 Implement QARTOD QA/QC checks for AOOS real time and delayed-mode data feeds.

- The basic/required quality tests for IOOS RA assets are now being run on observation data with documentation of the test code and thresholds available through open-source QARTOD libraries accessible through the portal. Flags from quality tests run by data provider are viewable and available for download in the data portal and/or ERDDAP data servers for the AOOS region. Axiom participated in the IOOS DMAC Code Sprint in October 2019 to lead the QC/QARTOD code sprint group. A number of improvements were made to improve quality testing and visualization through the Ocean Data Explorer.

Status: On Track.

1.4.2 Develop and Maintain Special Data Products

1.4.2.1 Support existing data products.

- Axiom completed a backend refresh of the Geoserver service for delivering hex bin visualizations of the GulfWatch Alaska marine mammals and GAK 1 data layers. Additionally, several maintenance fixes were made to the ShoreZone data layers, including a photoserver refresh, zoom resolution bug, and a code fix for displaying nearest photo for adjoining shorelines. The SNAP sea ice dataset was refreshed with the latest data through December 2019.

Status: Ongoing. On Track.

1.4.2.2 Ingest new datasets and metadata.

- Axiom worked to ingest the following new datasets and metadata during this performance period: data backfill for the [Cordova NOAA CO-OPS](#) historical timeseries to 1978; clean-up data standardization and visualization for Chukchi Ice Detection buoy [2015](#) and [2017](#); and ingestion of the following new in-situ sensors: NOAA PMEL OA moorings, six [UAF Water and Environmental Research Center \(WERC\)](#) air and water temperature stations; two [Prince William Sound Regional Citizens' Advisory Council \(PWSRCAC\)](#) weather buoys; two [Alaska NSF EPSCoR](#) stream gauges; and migration of 2,140 [Canada Water Office](#) stream height gauges to v2 sensor system to begin backfill of historical data.

Status: Ongoing. On Track.

1.4.2.3 Develop new data products.

- Axiom began Phase II development of the AWLW Data Portal to support the needs of AOOS, through the Alaska Water Level Watch (AWLW) partnerships.
Status: On Track.
- Axiom began work to support the National Weather Service Arctic testbed project. Several meetings were held with the NWS team to scope the ingest of 7 new sea ice models to the AOOS data portals and to discuss skill assessment frameworks that would be migrated to Jupyter Notebooks for application by the National Snow and Ice Data Center team.
Status: On Track.
- Biological Data: Axiom is working with the Coastal Observation and Seabird Survey Team (COASST) at University of Washington to ingest historical records of sea bird mortality data to the AOOS data portal.
Status: On Track using both FY18 and 19 funds.
- Axiom is developing electronic versions of NOAA's Integrated Ecosystem Assessment Indicators and working to support expansion of these indicators for broader public use.

1.4.2.4 Engage with data providers and data stakeholders.

- Axiom provided support services on an as needed basis to ensure that data providers and users can access, understand, and appropriately document data (metadata and QA/QC). Status: Ongoing. On Track.

1.4.3 Host and Support AOOS Website

- During the performance period the AOOS web site, hosted by Axiom, was stable and secure. Additionally, Axiom initiated activity working with the AOOS Web Team on the website redesign and new portal interface pages. During this performance period, data views were created for 12 coastal communities to provide easy access to real-time ocean observation data (see [Homer](#), [Juneau](#), and [Dutch Harbor](#) for examples). These continue to be a work in progress as the website redesign develops. Status: Ongoing. On Track.

1.4.4 Provide DMAC support to the AOOS program

1.4.4.1 Provide overall DMAC project management and oversight.

- Participated in regular, bi-monthly meetings with AOOS to discuss and communicate progress on project tasks. Maintained a Trello project management board to track progress. Contributed monthly data management highlights to the AOOS newsletter Status: Ongoing. On Track.

1.4.4.2 Participate in regional, state, national and international DMAC activities

- Axiom attended or presented at the following meetings related to AOOS DMAC activities: Arctic Domain Awareness Center (ADAC), AK Harmful Algal Bloom, Network, AK Department of Natural Resources, Audubon Alaska, Cook Inlet Regional Citizens Advisory Council, Alaska Fisheries Development Fund, Defenders of Wildlife, The Nature Conservancy, the NOAA Arctic Research Program Water Level and the National Weather Service, and the Bureau of Ocean Energy Management (BOEM). Axiom also participated in national meetings of interest to AOOS and/or the IOOS community, including: OceanObs IOOS 20th Anniversary (Sept 2019); IOOS DMAC Code Sprint (October 2019); IOOS Coastal and Modeling Testbed (COMT) annual meeting (October 2019); and the NOAA Regional Ocean Partnership Meeting (November 2019). Status: Ongoing. On Track.

1.4.4.3 Implement recommended and standard data management procedures for AOOS data assets.

- Through this period Axiom maintained IOOS compliant services and applications for integration with national products. Further, Axiom implemented ERDDAP ‘gold standard’ updates relative to the new IOOS Metadata Profile 1.2, which is being developed to inform a larger IOOS-wide strategy for migrating national sensor data products to an ERDDAP ingestion service. See: <https://standards.sensors.ioos.us/erddap/index.html> and accompanying documentation ([IOOS Data Contribution Guidelines: Proposed ERDDAP Standards](#)). Status: Complete.

1.4.4.4 Implement AOOS Data System Review recommendations

- During this period a draft business plan based on Intellectual Property considerations and cost sharing transparency, as recommended by the independent AOOS DMAC review committee in November 2017, was delivered to AOOS for review and comment. Revisions were made to the document, based on AOOS feedback, in December 2019 for final review prior to dissemination to the review committee. Axiom staff continued testing of a draft disaster recovery plan with test case system failures that was established in November 2018. The test outcomes have been solidified into a formal recovery plan that is being delivered in the final report to the review committee for external feedback. Status: On Track.

1.4.5 Support national IOOS Program data management activities

1.4.5.1 Support ATN DAC

- Provide technical support and maintenance to the ATN DAC cyberinfrastructure; Original Completion Date: May 2020.
Status: On Track
- Operationalize and enhance the ATN DAC system tools; Original Completion Date: May 2020.
Status: On Track
- Enhance data ingestion pathway from tag manufacturers into the ATN data portal; Original Completion Date: May 2020.
Status: On Track
- Scope and enhance technical strategy for dTAG data access and dissemination through the ATN DAC data portal; Original Completion Date: May 2020.
Status: On Track
- Integrate tools and packages into the Research Workspace Python and R Notebook kernels to support data analysis and product development by ATN PIs; Original Completion Date: May 2020.
Status: On Track
- Publish and archive ATN data to national archives and data centers, making it available for research, management, and long-term preservation; Original Completion Date: May 2020.
Status: On Track
- Maintain and enhance ATN data portal to showcase animal telemetry datasets; Original Completion Date: May 2020.
Status: On Track
- Provide technical assistance to ATN PIs and the broader community interacting with the ATN DAC system; Original Completion Date: May 2020.
Status: On Track
- Provide project management support for the ATN DAC; Original Completion Date: May 2020.
Status: On Track

1.4.5.2 USGS Geospatial Data Portal Development

- AWS Infrastructure and Support (80%); Original Completion Date: May 2020.
Status: On Track
- Photography and Video Portal Maintenance (10%); Original Completion Date: May 2020.
Status: On Track
- Oceanographic Model and Data Portal Maintenance (10%); Original Completion Date: May 2020.
Status: On Track

1.4.5.3 Maintain and Enhance Data Access Service Software - ERDDAP and Environmental Sensor Map and Global Data Integration.

- **Maintain and Enhance Data Access Service Software – ERDDAP**
 - Define High-Level Feature Roadmaps (5%); Original Completion Date: May 2020.
Status: On Track
 - Release Planning and Management (10%); Original Completion Date: May 2020.
Status: On Track
 - Development & Implementation (40%); Original Completion Date: May 2020.
Status: On Track
 - Improved User Documentation (15%); Original Completion Date: May 2020.
Status: On Track
 - Establishment of Test Environments and Test Datasets (10%); Original Completion Date: May 2020.

Status: On Track

- **Environmental Sensor Map and Global Data Integration**

- Defining a high-level roadmap (5%); Original Completion Date: May 2020.
Status: On Track
- Release Planning and Management (10%); Original Completion Date: May 2020.
Status: On Track
- Enhancements, Bug Tracking and Fixes (75%); Original Completion Date: May 2020.
Status: On Track
- Improved documentation (10%); Original Completion Date: May 2020.
Status: On Track

1.4.5.4 MBON Portal Development

- Tool development (15%); Original Completion Date: May 2020.
Status: On Track
- Improve documentation (5%); Original Completion Date: May 2020.
Status: On Track
- Load and visualize more data (55%); Original Completion Date: May 2020.
Status: On Track
- Conduct technical scoping to identify technical improvements to building data views (10%);
Original Completion Date: May 2020.
Status: On Track
- Release Planning and Management (5%); Original Completion Date: May 2020.
Status: On Track
- Meeting Participation and Travel (10%); Original Completion Date: May 2020.
Status: On Track

1.4.5.5 Finalize HFR Range Series File Archiving through the Research Workspace

- Provide space in the Research Workspace to store all range series files for all HFR operators within the IOOS HFRNet (100%); Original Completion Date: May 2020.
Status: On Track
- With input from the IOOS Program Office, scientists, and HFR operators, evaluate and develop new data tool(s) for improved decision-making; Original Completion Date: May 2020.
Status: On Track

1.4.6 Saildrone: Developing quality test configurations

- Variables: Of the 32 variables measured by Saildrone this project will deliver an implementation of 8 variables; Original Completion Date: May 2020.
Status: On Track
- Quality control foundation: The basis for developing additional quality control software will be the existing open-source IOOS Quality Control community software package. The software is an implementation of the U.S. Integrated Ocean Observing System (IOOS) developed Quality Assurance for Real Time Observation Data (QARTOD) manuals; Original Completion Date: May 2020.
Status: On Track
- Adaptive Quality Control: Using the 2017 to 2019 Arctic Saildrone data, we will develop software to ingest data, and flag individual values using the QARTOD flagging scheme; Original Completion Date: May 2020.
Status: On Track
- Data Accessibility: Once the data has been QC'ed, it will be ingested into an ERDDAP data server, which will provide access for global, near-real time data distribution as well as access by domain scientists for their research; Original Completion Date: May 2020.
Status: On Track

- Programming language: All code will be written in the Python programming language;
Original Completion Date: May 2020.
Status: On Track
- 1.4.7 *Optimizing Machine Learning Pipelines for Novel Biological Data Streams***
 - Optimize the existing proof-of-concept pipeline to better handle streaming datasets and transition to an efficient system; Original Completion Date: May 2020.
Status: On Track
 - Develop a RESTful API that provides access to all data ingested by the system irrespective of data source; Original Completion Date: May 2020.
Status: On Track
 - Support communities concerned with the proliferation of HABs and marine phytoplankton biodiversity through data and knowledge and technology transfer; Original Completion Date: May 2020.
Status: On Track
- 1.5 Modeling, Analysis & Product Development Subsystem**- 1.5.1 *Support existing models & data products including Historical Sea Ice Atlas, Research Assets Map and Yukon-Kuskokwim Chinook Run Timing Forecast***
 - Subaward to University of Alaska International Arctic Research Center to update Historical Sea Ice Atlas twice a year; Original Completion Date: May 2020.
Status: On Track.
 - Support and maintain Research Assets Map; Original Completion Date: May 2020.
Status: On Track, although future of map is to be determined.
 - Coordinate with the Alaska Department of Fish and Game to update Yukon-Kuskokwim Chinook Run Timing Forecast pages on AOOS.org website; Original Completion Date: May 2020.
Status: On Track.
- 1.5.2 *Support for the NOAA State of the Arctic Report***
 - Subaward to University of Alaska Fairbanks to support NOAA Climate Program Office development of annual report card.
 - Report prepared, peer-reviewed, and made available for publication: Original Completion Date: December 2019.
Status: Complete.
 - Continue to expand NOAA involvement in web-based and print report card products; Original Completion Date: December 2019.
Status: Complete.
- 1.5.3 *Support enhancement of OceanMesh2D capabilities to develop more accurate and efficient meshes of the global and coastal ocean.***
 - Subaward to University of Notre Dame.
Status: The subaward agreement for this project is in final development.
- 1.5.4 *Support development of a Regional Ocean Data Partnership Project.***
 - Subawards to University of Alaska Fairbanks and Axiom Data Science to provide outreach materials and community engagement activities and develop a Bering Sea data portal. for this new data sharing initiative. The subaward agreements for this project are in final development.
- 1.6 Additional Activities and Successes Related to Mission**
 - Continued financial support for Alaska Harmful Algal Bloom Network is being sought.
 - Future support for the Shorezone program is also being pursued.
- 2.0 Scope of Work**

We do not expect any other changes to the project Scope of Work at this time.
- 3.0 Personnel and Organizational Structure**

Funding for a one-year Alaska Sea Grant fellow to assist with harmful algal bloom network activities ended in September 2019. We did not seek an additional fellow in this year.

4.0 Budget Analysis

All financial reports are up to date and have been submitted on time. There are no risks to the project that need identifying. The following equipment was purchased during this period:

| Quantity | Description | Cost |
|-----------------|--|-------------|
| 1 | Aanderaa SeaGuard RCM with sensors | \$20,000 |
| 1 | Edgetech 8242 Acoustic Release | \$14,000 |
| 1 | TRDI 150 KHz ADCP | \$42,000 |
| 1 | WetLabs ECO Triplett optical sensor | \$8,500 |
| 1 | Pacific Gyre Buoy data transmission system | \$7,500 |
| 1 | Lithium Glider Battery | \$17,330 |

2019 Template for reporting HF Radar expenditures - AOOS

| Staff Member | (% FTE or #person-months) |
|---|---|
| Principal Investigator: Seth Danielson | Existing Chukchi Sea HFR Sites: 1 person/0.5 month/year New Bering Strait Sites: 1 person/1 month/year |
| Technicians: Rachel Potter, Hank Statscewich, Jordan Maisch | Existing Chukchi Sea HFR Sites: RP and HS/2.5 months each/year + JM/1.0 month/year= 6 months/year total technician time New Bering Strait Sites: RP/2.0 months/year + HS/3.0 months/year + JM/2.0 months/year = 7 months/year total technician time |

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|--|
| Total # of Radars Supported: 3 existing + 2 new |
| 2019 Funding Sources: AOOS/IOOS (100%) |
| Names, locations (lat,lon), locations (city, state), Transmit Frequency, Operating Institution for each radar: |
| Chukchi Sea Sites: |
| SIMP - 71.0586°N, 154.75056°W - Cape Simpson, AK - 4.55 MHz - University of Alaska Fairbanks (UAF) |
| PBRW - 71.3784°N, 156.4801°W - Point Barrow, AK - 4.75 MHz - University of Alaska Fairbanks (UAF) |
| WAIN - 70.6434°N, 160.0271°W - Wainwright, AK - 4.80 MHz - University of Alaska Fairbanks (UAF) |
| Bering Sea Sites: |
| SHSH - 66.2543°N, 166.0785°W - Shishmaref, AK - 4.80 MHz - University of Alaska Fairbanks (UAF) |
| WALE - 65.6110°N, 168.0943°W - Wales, AK - 4.55 MHz - University of Alaska Fairbanks (UAF) |

[illegible]

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185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 | 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 | 280 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 | 300 | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 | 311 | 312 | 313 | 314 | 315 | 316 | 317 | 318 | 319 | 320 | 321 | 322 | 323 | 324 | 325 | 326 | 327 | 328 | 329 | 330 | 331 | 332 | 333 | 334 | 335 | 336 | 337 | 338 | 339 | 340 | 341 | 342 | 343 | 344 | 345 | 346 | 347 | 348 | 349 | 350 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | 359 | 360 | 361 | 362 | 363 | 364 | 365 | 366 | 367 | 368 | 369 | 370 | 371 | 372 | 373 | 374 | 375 | 376 | 377 | 378 | 379 | 380 | 381 | 382 | 383 | 384 | 385 | 386 | 387 | 388 | 389 | 390 | 391 | 392 | 393 | 394 | 395 | 396 | 397 | 398 | 399 | 400 | 401 | 402 | 403 | 404 | 405 | 406 | 407 | 408 | 409 | 410 | 411 | 412 | 413 | 414 | 415 | 416 | 417 | 418 | 419 | 420 | 421 | 422 | 423 | 424 | 425 | 426 | 427 | 428 | 429 | 430 | 431 | 432 | 433 | 434 | 435 | 436 | 437 | 438 | 439 | 440 | 441 | 442 | 443 | 444 | 445 | 446 | 447 | 448 | 449 | 450 | 451 | 452 | 453 | 454 | 455 | 456 | 457 | 458 | 459 | 460 | 461 | 462 | 463 | 464 | 465 | 466 | 467 | 468 | 469 | 470 | 471 | 472 | 473 | 474 | 475 | 476 | 477 | 478 | 479 | 480 | 481 | 482 | 483 | 484 | 485 | 486 | 487 | 488 | 489 | 490 | 491 | 492 | 493 | 494 | 495 | 496 | 497 | 498 | 499 | 500 | 501 | 502 | 503 | 504 | 505 | 506 | 507 | 508 | 509 | 510 | 511 | 512 | 513 | 514 | 515 | 516 | 517 | 518 | 519 | 520 | 521 | 522 | 523 | 524 | 525 | 526 | 527 | 528 | 529 | 530 | 531 | 532 | 533 | 534 | 535 | 536 | 537 | 538 | 539 | 540 | 541 | 542 | 543 | 544 | 545 | 546 | 547 | 548 | 549 | 550 | 551 | 552 | 553 | 554 | 555 | 556 | 557 | 558 | 559 | 560 | 561 | 562 | 563 | 564 | 565 | 566 | 567 | 568 | 569 | 570 | 571 | 572 | 573 | 574 | 575 | 576 | 577 | 578 | 579 | 580 | 581 | 582 | 583 | 584 | 585 | 586 | 587 | 588 | 589 | 590 | 591 | 592 | 593 | 594 | 595 | 596 | 597 | 598 | 599 | 600 | 601 | 602 | 603 | 604 | 605 | 606 | 607 | 608 | 609 | 610 | 611 | 612 | 613 | 614 | 615 | 616 | 617 | 618 | 619 | 620 | 621 | 622 | 623 | 624 | 625 | 626 | 627 | 628 | 629 | 630 | 631 | 632 | 633 | 634 | 635 | 636 | 637 | 638 | 639 | 640 | 641 | 642 | 643 | 644 | 645 | 646 | 647 | 648 | 649 | 650 | 651 | 652 | 653 | 654 | 655 | 656 | 657 | 658 | 659 | 660 | 661 | 662 | 663 | 664 | 665 | 666 | 667 | 668 | 669 | 670 | 671 | 672 | 673 | 674 | 675 | 676 | 677 | 678 | 679 | 680 | 681 | 682 | 683 | 684 | 685 | 686 | 687 | 688 | 689 | 690 | 691 | 692 | 693 | 694 | 695 | 696 | 697 | 698 | 699 | 700 | 701 | 702 | 703 | 704 | 705 | 706 | 707 | 708 | 709 | 710 | 711 | 712 | 713 | 714 | 715 | 716 | 717 | 718 | 719 | 720 | 721 | 722 | 723 | 724 | 725 | 726 | 727 | 728 | 729 | 730 | 731 | 732 | 733 | 734 | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | 744 | 745 | 746 | 747 | 748 | 749 | 750 | 751 | 752 | 753 | 754 | 755 | 756 | 757 | 758 | 759 | 760 | 761 | 762 | 763 | 764 | 765 | 766 | 767 | 768 | 769 | 770 | 771 | 772 | 773 | 774 | 775 | 776 | 777 | 778 | 779 | 780 | 781 | 782 | 783 | 784 | 785 | 786 | 787 | 788 | 789 | 790 | 791 | 792 | 793 | 794 | 795 | 796 | 797 | 798 | 799 | 800 | 801 | 802 | 803 | 804 | 805 | 806 | 807 | 808 | 809 | 810 | 811 | 812 | 813 | 814 | 815 | 816 | 817 | 818 | 819 | 820 | 821 | 822 | 823 | 824 | 825 | 826 | 827 | 828 | 829 | 830 | 831 | 832 | 833 | 834 | 835 | 836 | 837 | 838 | 839 | 840 | 841 | 842 | 843 | 844 | 845 | 846 | 847 | 848 | 849 | 850 | 851 | 852 | 853 | 854 | 855 | 856 | 857 | 858 | 859 | 860 | 861 | 862 | 863 | 864 | 865 | 866 | 867 | 868 | 869 | 870 | 871 | 872 | 873 | 874 | 875 | 876 | 877 | 878 | 879 | 880 | 881 | 882 | 883 | 884 | 885 | 886 | 887 | 888 | 889 | 890 | 891 | 892 | 893 | 894 | 895 | 896 | 897 | 898 | 899 | 900 | 901 | 902 | 903 | 904 | 905 | 906 | 907 | 908 | 909 | 910 | 911 | 912 | 913 | 914 | 915 | 916 | 917 | 918 | 919 | 920 | 921 | 922 | 923 | 924 | 925 | 926 | 927 | 928 | 929 | 930 | 931 | 932 | 933 | 934 | 935 | 936 | 937 | 938 | 939 | 940 | 941 | 942 | 943 | 944 | 945 | 946 | 947 | 948 | 949 | 950 | 951 | 952 | 953 | 954 | 955 | 956 | 957 | 958 | 959 | 960 | 961 | 962 | 963 | 964 | 965 | 966 | 967 | 968 | 969 | 970 | 971 | 972 | 973 | 974 | 975 | 976 | 977 | 978 | 979 | 980 | 981 | 982 | 983 | 984 | 985 | 986 | 987 | 988 | 989 | 990 | 991 | 992 | 993 | 994 | 995 | 996 | 997 | 998 | 999 | 1000 | 1001 | 1002 | 1003 | 1004 | 1005 | 1006 | 1007 | 1008 | 1009 | 1010 | 1011 | 1012 | 1013 | 1014 | 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1158 | 1159 | 1160 | 1161 | 1162 | 1163 | 1164 | 1165 | 1166 | 1167 | 1168 | 1169 | 1170 | 1171 | 1172 | 1173 | 1174 | 1175 | 1176 | 1177 | 1178 | 1179 | 1180 | 1181 | 1182 | 1183 | 1184 | 1185 | 1186 | 1187 | 1188 | 1189 | 1190 | 1191 | 1192 | 1193 | 1194 | 1195 | 1196 | 1197 | 1198 | 1199 | 1200 | 1201 | 1202 | 1203 | 1204 | 1205 | 1206 | 1207 | 1208 | 1209 | 1210 | 1211 | 1212 | 1213 | 1214 | 1215 | 1216 | 1217 | 1218 | 1219 | 1220 | 1221 | 1222 | 1223 | 1224 | 1225 | 1226 | 1227 | 1228 | 1229 | 1230 | 1231 | 1232 | 1233 | 1234 | 1235 | 1236 | 1237 | 1238 | 1239 | 1240 | 1241 | 1242 | 1243 | 1244 | 1245 | 1246 | 1247 | 1248 | 1249 | 1250 | 1251 | 1252 | 1253 | 1254 | 1255 | 1256 | 1257 | 1258 | 1259 | 1260 | 1261 | 1262 | 1263 | 1264 | 1265 | 1266 | 1267 | 1268 | 1269 | 1270 | 1271 | 1272 | 1273 | 1274 | 1275 | 1276 | 1277 | 1278 | 1279 | 1280 | 1281 | 1282 | 1283 | 1284 | 1285 | 1286 | 1287 | 1288 | 1289 | 1290 | 1291 | 1292 | 1293 | 1294 | 1295 | 1296 | 1297 | 1298 | 1299 | 1300 | 1301 | 1302 | 1303 | 1304 | 1305 | 1306 | 1307 | 1308 | 1309 | 1310 | 1311 | 1312 | 1313 | 1314 | 1315 | 1316 | 1317 | 1318 | 1319 | 1320 | 1321 | 1322 | 1323 | 1324 | 1325 | 1326 | 1327 | 1328 | 1329 | 1330 | 1331 | 1332 | 1333 | 1334 | 1335 | 1336 | 1337 | 1338 | 1339 | 1340 | 1341 | 1342 | 1343 | 1344 | 1345 | 1346 | 1347 | 1348 | 1349 | 1350 | 1351 | 1352 | 1353 | 1354 | 1355 | 1356 | 1357 | 1358 | 1359 | 1360 | 1361 | 1362 | 1363 | 1364 | 1365 | 1366 | 1367 | 1368 | 1369 | 1370 | 1371 | 1372 | 1373 | 1374 | 1375 | 1376 | 1377 | 1378 | 1379 | 1380 | 1381 | 1382 | 1383 | 1384 | 1385 | 1386 | 1387 | 1388 | 1389 | 1390 | 1391 | 1392 | 1393 | 1394 | 1395 | 1396 | 1397 | 1398 | 1399 | 1400 | 1401 | 1402 | 1403 | 1404 | 1405 | 1406 | 1407 | 1408 | 1409 | 1410 | 1411 | 1412 | 1413 | 1414 | 1415 | 1416 | 1417 | 1418 | 1419 | 1420 | 1421 | 1422 | 1423 | 1424 | 1425 | 1426 | 1427 | 1428 | 1429 | 1430 | 1431 | 1432 | 1433 | 1434 | 1435 | 1436 | 1437 | 1438 | 1439 | 1440 | 1441 | 1442 | 1443 | 1444 | 1445 | 1446 | 1447 | 1448 | 1449 | 1450 | 1451 | 1452 | 1453 | 1454 | 1455 | 1456 | 1457 | 1458 | 1459 | 1460 | 1461 | 1462 | 1463 | 1464 | 1465 | 1466 | 1467 | 1468 | 1469 | 1470 | 1471 | 1472 | 1473 | 1474 | 1475 | 1476 | 1477 | 1478 | 1479 | 1480 | 1481 | 1482 | 1483 | 1484 | 1485 | 1486 | 1487 | 1488 | 1489 | 1490 | 1491 | 1492 | 1493 | 1494 | 1495 | 14 |
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AOOS Data Management, Products and Services Reporting for December 2019 IOOS Annual Report

Data Management, Products, and Services Section:

DMAC is the framework for RA ingestion, management, and publication of digital data sets. These data sets can be generated by observing system assets, numerical models, or through any other process that results in a value added product. The specific requirements for DMAC participation are described at <https://ioos.noaa.gov/data/contribute-data/>.

Each section contains specific requirements that, when implemented, provide the standards-based foundation for DMAC capabilities. Progress and challenges toward addressing each requirement should be described following the section headings on the web site above.

1. [Open Data Sharing](#)

IOOS, being a part of the Global Earth Observing System of Systems (GEOSS), ascribes to the [GEOSS data sharing principles](#):

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| GEOSS Data Sharing Principles: |
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- There will be **full and open exchange** of data, metadata and products shared within GEOSS, recognizing relevant international instruments and national policies and legislation;
- All shared data, metadata and products will be made available with minimum time delay and at minimum cost;
- All shared data, metadata and products being free of charge or no more than cost of reproduction will be encouraged for research and education.

2. [Data management planning and coordination](#)

Data management is an increasingly important aspect of IOOS activities. Data management plans and the coordination of activities between Regions and the IOOS Program Office ensure that data are maintained in easily accessible formats that are archived for long-term storage.

3. [Provision of data to the Global Telecommunication System \(GTS\)](#)

U.S. IOOS is committed to ensuring that all relevant U.S. coastal ocean observations will be contributed in near real time to the global GTS network.

- All real-time stations must be assigned a WMO ID.
- All real-time observations must be submitted to the WMO GTS

4. [Data access services](#)

All IOOS Data Providers must serve all data and products through these DMAC recommended services.

- All data and products must be made available via data access services, and [registered in the IOOS Catalog](#)

- For gridded data you must use OPeNDAP and WMS
- For in-situ observations (including point, profile, trajectory, timeseries, or other sampling types) you must use SOS and optionally OPeNDAP
- For tabular data ERDDAP/TableDAP should be used

5. [Catalog registration](#)

The IOOS Catalog is the master inventory of IOOS DMAC datasets and data access services. All DMAC [data access services](#) shall be registered in the IOOS Catalog.

6. [Common data formats](#)

U.S. IOOS® data providers are expected to offer data in one or more approved U.S. IOOS® formats .

7. [Metadata standards](#)

All IOOS data providers are expected to ensure relevant metadata is produced, accessible and compliant with IOOS conventions, and to participate as appropriate in the development of such conventions. Descriptive information about datasets, sensors, platforms, models, analysis methods, quality-control procedures is essential for the long-term usability and reuse of information.

- [ISO 19115-2 XML Metadata](#): Metadata: Part 2: Extensions for Imagery and Gridded Data
- [CS-W](#): Catalog Service-Web
- [IOOS Metadata Profile for NetCDF](#)
- [NetCDF-CF](#): Climate and Forecast conventions for NetCDF
- [ACDD](#): Attribute Conventions for Data Discovery

8. [Storage and archiving](#)

Data providers are expected to provide for storage of data, metadata and other supporting documentation and algorithm descriptions, to establish data recovery mechanisms, and to perform off-site storage of backups until the data and metadata are submitted to NCEI for archiving.

9. [Ontologies, vocabularies, common identifiers](#)

IOOS is presently developing and adopting shared vocabularies for terminology such as names of observed properties, units of measure, coordinate reference systems, animal species, etc.

10. Consideration for Long-term Operations

The IOOS observing, data management, and modeling capacities being developed will, ideally, persist as the overall enterprise matures. In data management plans, IOOS partners should include a discussion of potential plans for maintaining such persistence as part of normal IOOS operations (e.g., by automating as many activities as possible, implementing operational procedures).

| Requirements | AOOS Procedure | Progress | Challenges |
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| Open Data Sharing | <p>The AOOS Data System provides data resources in a one stop data portal, free to the public, with data assets originating from federal and state agencies, local municipalities, academic institutions, research organizations, private companies, non-profit organizations, and community observers.</p> | <p>Status:</p> <p>All data currently served by the AOOS data portal(s) carries with it the permission for public view and access, and carries no privacy or ethical restrictions. Data access is defined here as being permitted to download data through an AOOS data portal.</p> <p>Real-time and near real-time data are served as soon as the data become available.</p> <p>Data assets that come from AOOS funded programs without real-time capability are currently received within 2 years after data recovery, or by the end of the awarded project period (the lesser of both).</p> <p>Sustained AOOS funded assets are now submitted annually through the established AOOS Research Workspace. The AOOS Research Workspace streamlines data submittal, ingestion, and compliant metadata generation. It became operational to AOOS PIs in August 2017.</p> <p>Update 2018: The Research Workspace supports semi-automated pathways to</p> | None at this time. |

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| | | archive final data set through the Research Workspace DataONE Member Node. Further, the Research Workspace is in a testing environment for archive submission to the NCEI national data repository. These efforts began in 2018 and are still ongoing as NCEI is working through internal processing procedures to establish sustained archive pathways. | |
| Data management planning and coordination | <p>The Alaska Ocean Observing System Data Assembly Center and Data Management Subsystem Plan (referred to as the Data Plan) provides the approach to the necessary implementation, describing how data are ingested, managed and distributed from the source to public dissemination.</p> <p>The primary processes involved with data management and flow include data ingestion, standards and format, metadata and discovery, quality control, stewardship and preservation, access and dissemination, archival and security.</p> <p>All non-federal AOOS data assets (referred to as Data Streams) are fully documented for data management in individual Data Stream Plans. These Data Stream Plans are maintained as an Appendix G to the larger AOOS Data Plan New non-federal additions to the regional observational data asset</p> | <p>AOOS became a NOAA certified data provider in 2016. The AOOS Data Plan and all related RICE certification documentation are available at the link below.</p> <p>http://www.aos.org/data-management-advisory-committee/</p> <p>The AOOS data plan (September 2016) will be updated routinely (minimum 5 years) as needed to meet new requirements from the IOOS DMAC.</p> <p>A Data Policies and Procedures document to guide AOOS PIs on data and metadata submittal expectations is included in Statements of Work and contracts for all AOOS funded projects.</p> <p>Update 2019: The 2017 Data Management Review recommendations for the AOOS</p> | None at this time. |

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| | <p>inventory will have a Data Stream plan developed prior to serving of data.</p> <p>In 2017, AOOS and AXIOM developed a guidance document - Data Policies and Procedures – to inform the AOOS/Axiom Data Science (the AOOS data management team) roles and responsibilities. This document is included in all AOOS funded projects, and also provides a guide/pathway for AOOS funded PIs regarding data submission protocols and procedures.</p> <p>AOOS completed an external Data System Review November 27-30 2017, which included but was not limited to evaluation of AOOS data portals and functionality, system usability, documentation of operations, business models, process improvements, and strengths and weaknesses. (AOOS Data Management Review Report, compiled by Peter L. Pulsifer and Review Committee, Dec. 2017; internal document).</p> <p>One major recommendation from the Data Management Review Report (2017) was for Axiom and AOOS to develop a clear business and operations plan for the AOOS Data System. In the summer of 2019, Axiom and AOOS drafted a plan that is currently undergoing internal review by AOOS and is expected to be shared externally with the Board in Spring of 2020.</p> | <p>Data System were heavy on process improvements (i.e., business model, providing user support tools for data portal; improve product release process in operations model). One recommendation was AOOS should focus efforts now on data priorities, portal interface, data products and discovery improvements.</p> <p>In response to this recommendation, AOOS is currently redesigning website and data portal interface; Axiom has been developing data tools to support easy access to most frequently sought after information; AOOS is developing AOOS project pages provide direct links to observational project data and related PI websites ; AOOS staff are also developing data portal products for externally funded projects to improve project-directed functionality needs.</p> | |
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| | <p>Review recommendations were light on technology changes as Axiom provides a state-of-the-art technology foundation, which were key attributes the AOOS Data Management Advisory Committee provided guidance on over the past 6 years. The committee requires evaluation, to determine if it has a role and if that role has changed, or if AOOS should take a different approach for a more mature data system. AOOS and the Board are reviewing the status and future of the AOOS Data Management Advisory Committee at the December 16, 2019 Board Meeting.</p> | | |
| Provision of Data to GTS | <p>A primary goal of the AOOS Data Plan is to deliver real-time, delayed-mode and historical data for in-situ and remotely-sensed physical, chemical and biological observations. The AOOS data inventories (Appendices B, C, and E of the Data Plan) list the multiple types of data, including real-time data and near real-time data (as well as historical and citizen science data) served by AOOS.</p> <p>AOOS defines real-time data consistent manner with IOOS RICE Guidelines:</p> <ol style="list-style-type: none"> 1. <i>Real-time data</i> are ingested, served, and displayed by the AOOS Data System at the same frequency the data are collected (and sometimes reported) by the originator with little to no delay. | <p>Most real-time data assets served by AOOS are federally operated and are already meeting required data management standards.</p> <p>Update 2019: AOOS owned assets include 3 real-time reporting wave buoys. The Lower Cook Inlet wave buoy data are received, processed and served through the CDIP program (WMO # 46108). The Port of Nome wave and current buoy data are also received, processed and served through the CDIP program (WMO # 46265). Both data streams are also available through the CDIP and AOOS websites. The Marine Exchange of Alaska also transmitted both wave and current</p> | <p>Some real-time assets are privately owned and are not currently reporting through the GTS. AOOS staff will continue to work towards making appropriate assets available to the GTS, which requires finding the resource contact person/company on the deployed assets, and also getting the metadata information required for reporting data.</p> <p>Update 2019: As of December 2019, the National IOOS Office has</p> |

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| | <p>Examples of real-time assets include weather stations, oceanographic buoys, and webcams.</p> <p>2. <i>Near real-time data</i> are ingested by the AOOS Data System at the same frequency that the data are made available; however, there is some delay (hours to days) between data collection and when the data provider makes it available. Examples of near real-time assets include satellite images and derived satellite products.</p> | <p>observations through the AIS for the Nome wave buoy. In July 2019, AOOS took over the Ops and maintenance of a Kodiak wave buoy owned by NREL and operated by CDIP (WMO # 46264)</p> <p>Other assets served by AOOS that are not federally sourced fall outside this provision, (e.g., are land-based or considered citizen science). There is also a limit to the age of data that can be pushed to the GTS (about 6 hours or so). WMO IDs are not assigned to “delayed-mode only” moorings because of the GTS limit.</p> | <p>been working on a collaboration with NDBC to setup data ingestion from IOOS RAs through standardized ERDDAP instances. This work includes updating the IOOS metadata 1.2 profile, updating the IOOS Compliance Checker to handle 1.2 profile, and developing pathways to serve data from the IOOS Catalog to IOOS RA ERDDAP instances. NDBC is actively pulling test data through this pipeline process.</p> |
| <p>Data Access Services</p> <ul style="list-style-type: none"> • All data and products must be made available via data access services, and registered in the IOOS Catalog • For gridded data you must use OPeNDAP and WMS • For in-situ observations (including point, profile, trajectory, | <p>All data and products are registered in the IOOS Catalog.</p> <p>AOOS offers six access points:</p> <ol style="list-style-type: none"> 1. <i>Thematic Realtime Environmental Distributed Data Services (THREDDS)</i> AOOS provides THREDDS access points for raster (gridded) data stored in NetCDF format. THREDDS 4.6.10 2. <i>Open-source Project for a Network Data Access Protocol (OPeNDAP)</i> - AOOS provides OPeNDAP access points for raster (gridded) and time-series data. | <p>Any data served by the AOOS portal carries with it the permission to view and access, and carries no privacy or ethical restrictions. Data access is defined here as being permitted to download data through an AOOS data portal.</p> <p>The IOOS Data Catalog is being updated at the time of this report. AOOS Data Managers are involved and aware of updated catalog.</p> | <p>Update 2019: Challenges- Large datasets and heavy usage can strain data access servers and negatively impact user experiences. Axiom and AOOS are continually tuning and enhancing data service software and developing deployment techniques to maximize performance and stability of these services. As new data types and variables come on-line,</p> |

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| <p>timeseries, or other sampling types) you must use SOS and optionally OPeNDAP</p> <ul style="list-style-type: none"> For tabular data ERDDAP/TableDAP should be used | <ol style="list-style-type: none"> Web Map Service (WMS) - AOOS provides WMS access points for point, vector, and polygon information, as well raster (gridded) data. Web Feature Service (WFS) - AOOS provides WFS access points for point, vector, and polygon information, as well as time-series and raster (gridded) data. Environmental Research Division's Data Access Program (ERDDAP) - AOOS primarily uses this service to facilitate device-level downloads (e.g., tabular data). ERDDAP 1.84 - http://erddap.aaos.org/ File Downloads - AOOS often provides data as downloadable files. These files are mostly served in the standard shared data file formats above, or in the case of project-specific data, in their native file formats. | | <p>routine coordination between Axiom, AOOS, and IOOS will be required to make them available.</p> |
| IOOS Catalogue Registrations | <p>All data and products are registered in the IOOS Catalog. AOOS maintains a WAF (https://thredds.aaos.org/iso), which is harvested by the IOOS Catalog.</p> | Compliant and up to date. | None at this time |
| Common Data Formats | <p>AOOS provides nearly all data in four open, standardized forms:</p> <ol style="list-style-type: none"> <i>Network Common Data Form (NetCDF)</i> - a self-describing, machine-independent data format that AOOS uses primarily for raster (gridded) data. Some data stored as unstructured grids use this format as well. | AOOS offers data in IOOS compliant formats through the use of ncSOS, THREDDS and ERDDAP. | None at this time |

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| | <ol style="list-style-type: none">2. <i>Comma Separated Values (CSV)</i> - a human-readable ASCII format that is nearly universally accepted by spreadsheet and programming languages. AOOS uses CSV formats to allow users to download (1) time-series extractions from raster data, and (2) GIS vector and polygon information (e.g., boundaries).3. <i>Shapefile</i> - an open geographic information system format for point, vector, and polygon data. AOOS allows users to download shapefiles of static GIS layers such as boundaries, biologic distributions, etc.4. <i>Portable Network Graphics (PNG)</i> - PNG is a lossless, image format provided as an alternative to shapefiles in the AOOS catalog. PNGs are limited in use as they are pre-projected, pre-scaled, and pre-sized images of data layers. However, AOOS provides PNG files as example WMS requests, which are useful to users who cannot access GIS services and who do not understand how to manipulate WMS requests. | | |
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| <p>Metadata standards</p> <ul style="list-style-type: none"> • ISO 19115-2 XML Metadata: Metadata: Part 2: Extensions for Imagery and Gridded Data • CS-W: Catalog Service-Web • IOOS Metadata Profile for NetCDF • NetCDF-CF: Climate and Forecast conventions for NetCDF • ACDD: Attribute Conventions for Data Discovery | <p>AOOS requires standards-compliant metadata for project-level data (AOOS or IOOS-funded projects). Though AOOS does not require specific metadata standards for ingesting other types of data, most modern data submittals are accompanied by standard ISO/FGDC metadata records.</p> <p>Details and availability of metadata are discussed in individual AOOS Regional Data Stream Plans.</p> | <p>The AOOS web-based data management application, named the Research Workspace (‘Workspace’), is used to assemble, store, and share data by researchers or AOOS partners. Approximately 500 users have uploaded over 20 terabytes of data spread across nearly 1 million files using this system.</p> <p>The Workspace provides users with an intuitive, web-based interface that allows scientists to create <i>projects</i> to represent particular scientific studies or focuses of research within a larger effort. Standard, discovery-level ISO 19115-2 and 19115-10 compliant metadata can be generated in the Workspace using a metadata editor for both projects and individual datasets.</p> <p>Many historical datasets come with informal metadata documentation that is variable in terms of completion and detail required by modern standards. Some data sets are only accompanied with narrative information. In these cases, AOOS works to make the source information easily accessible to the end-user by providing links to source data or data providers, and by making all available metadata information that</p> | <p>AOOS continues to work on data discovery in order to provide quality sourced metadata in the data catalog in addition to the links already leading to source metadata.</p> <p>Current and future data ingestion efforts make use of a metadata editor in the AOOS Workspace to streamline this process and ensure standards-compliant metadata are uploaded with the data.</p> <p>Historical data sets continue to provide occasional difficulties in terms of metadata generation. AOOS will continue to do the best possible to make these valuable data resources available with as much documentation as possible. In some cases, we are able to find data reports that go with these datasets, and can have them scanned and uploaded to the workspace where we can access more metadata information.</p> |
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| | | came with the data available in the data catalogue. | |
| Storage and Archiving | <p>AOOS <u>stores</u> ingested data in a secure, professionally managed external facility and currently has total storage space for over 1.8 petabytes of data. Those resources are geo-replicated between Portland, Oregon and Providence, Rhode Island. Local data storage in Anchorage is limited to temporary files only that are checked in to the main servers on a sub-daily basis.</p> <p>AOOS <u>stores</u> all aggregated data indefinitely beyond the life of each individual project. Real-time sensor feeds will become historical sensor feeds one-month after collection. The only assets that are not kept indefinitely in storage are webcam images.</p> <p>As a federally funded program, AOOS is required to submit data it generates to a national archive center. AOOS is working with the National Centers for Environmental Information (NCEI) to assist with the <u>archival</u> of appropriate data types accepted</p> | <p>AOOS serves many datasets that already have archival mechanisms in place, including CDIP wave buoy data, real-time sensor streams from federal sources (e.g., NSF Circum-Arctic Lakes Observing Network, NOAA CO-OPS, NOAA NDBC, NOAA PMEL, USGS NWIS, etc.), and marine mammal telemetry data from the BOEM-funded MARES program.</p> <p>The AOOS Data System became a DataONE Tier 3 Generic Member Node (GMN) and is attached to an updated version of the Research Workspace launched in 2017. This Tier 3 Member Node will serve as the primary archive for AOOS-managed data assets that NCEI does not accept.</p> | <p>NCEI still does not accept all AOOS data assets served. AOOS continues to make future interest in these data accessible to NCEI and with the required formats to meet NCEI archival requirements.</p> <p>AOOS will continue to work with NCEI to identify the relevant data streams of interest for long-term archival within NCEI and will make those data available.</p> |

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| | <p>by NCEI. AOOS maintains an NCEI archive WAF at https://ncei.axiomdatascience.com/aoos/</p> <p>The bulk of the data assets managed by AOOS are non-real-time, nonfederal assets, sometimes from small data originators (e.g., weather reported by a ski resort), and often from distinct research projects or large, integrated ecological research programs. These data may not fall under the purview of the NCEI. Accordingly, AOOS plans to <u>archive</u> these data in the DataONE network.</p> | | |
| Ontologies, vocabulary, and identifiers | <p>The AOOS data system is divided into four logical tiers. <i>Tier 3 (Asset Catalogue)</i> includes an Asset Catalogue, which provides (1) ontological metadata and (2) connections to externally-hosted data via web services. The ontological metadata in the catalogue describes the characteristics including geographic locations, spatial and temporal resolution, units, source location and CF parameter, taxonomy, date of last update, etc. of each data resource. Storing the metadata outside of the files themselves is critical to providing a responsive, up-to-date public-facing catalog. It also allows AOOS to optimize data discovery tools such as advanced searching by parameter or geographic location and build tools such as on-the-fly unit conversions for gridded datasets. External web services in <i>Tier 3</i> provide the catalogue access to external</p> | <p>Data processed through the AOOS data portals have been transformed to adhere to the following CF (Climate and Forecast) conventions. These conventions are designed to promote the processing and sharing of files created with the NetCDF API. The CF conventions are increasingly gaining acceptance and have been adopted by a number of projects and groups as a primary standard. The conventions define metadata that provide a definitive description of what the data in each variable represent, and the spatial and temporal properties of the data.</p> <p>Update 2018: CF Standards used by AOOS most often are provided in</p> | <p>Some parameters have no related name on the CF Standards table, or had the incorrect (non-CF standard) name related to the variable on our RA Asset Inventory list. AOOS and Axiom staff will update this list, and work to make sure all variables are consistent with CF standards where possible, and will seek guidance from IOOS office where we have questions. We will update our Appendix I to our data plan during this process.</p> <p>I would like IOOS to ensure that the RAS are reporting</p> |

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| | <p>(web-based) sources of information. This is commonly used to display data and basemaps from reliable data providers so data do not have to be stored and maintained by AOOS. CF Standards are provided in Appendix I of the AOOS Data Plan.</p> <p>http://www.aos.org/data-management-advisory-committee/</p> | <p>Appendix I of the recently revised AOOS Data Plan, available at: http://www.aos.org/data-management-advisory-committee/</p> <p>During the 2018 reporting period, AOOS noticed the CF Standards appendix table needs to be updated to include more variables. Axiom has been working with the IOOS Program Office and CF to update standard names tables related to the metadata profile 1.2 update. Once this is reviewed and approved by CF, Axiom will work collaboratively with AOOS to ensure all data streams comply with the new 1.2 profile and CF standard names, and those changes are reflected consistently in the RA Asset Inventory list.</p> | <p>data for salinity as Practical Salinity (PSS-78), and not Absolute Salinity. We stress that the correct variable for archival representing salinity should be stored as Practical Salinity using PSS-78. The temperature standard for data archival is ITS-90. However, IPTS-68 is used with electrical conductivity to compute using PSS-78 to compute salinity. So It is best if all the raw variables used to compute salinity are also archived, in case someone makes an error in this calculation (it is not uncommon, even in our oceanographic institutions). So, it should be clear what temperature standard people are using in the CF standard. I am reviewing the CF definitions to be sure this is clear, but I constantly am educating people on this subject. Absolute Salinity is a correction to the Practical Salinity error caused by non-conducting ions in the water.</p> |
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| | | | HOWEVER, this correction is incomplete and will change with time as more total fractional solids data are available to improve the correction regionally. Therefore, we are to archive PSS-78 salinity, and that allows future generations to compute Absolute salinity with the latest corrections. |
| <p>Consideration for long-term operations</p> <p>Potential plans for maintaining persistence of IOOS observing assets (e.g., automating as many activities as possible; implementing operational procedures).</p> | <p>The AOOS Data System hosts several integrated data management tools to ease data access, storage, and sharing by its users including the Research Workspace and its metadata editor, and the AOOS Ocean Data Explorer, the statewide data portals.</p> <p>The AOOS web-based data management application, named the Research Workspace ('Workspace'), is used to assemble, store, and share data by researchers or AOOS partners.</p> <p>The Workspace includes an integrated metadata editor to support the documentation of data and facilitate its accuracy and reuse. Content collected in the Research Workspace metadata editor uses fields from the ISO 19115 suite of standards for geospatial metadata, which is the FGDC endorsed successor to the CSDGM, extended to describe taxonomic classification for</p> | <p>The AOOS Data Plan was completed in September 2016 and will be updated routinely as needed to meet new requirements from the IOOS DMAC.</p> <p>Standard Operations Protocols or Roles and Responsibilities documentation for AOOS owned assets are helping with OnM activities and budget planning. (example: Port of Nome CDIP Wave buoy involves cooperative efforts with Port of Nome, AOOS, CDIP, and Marine Exchange of Alaska).</p> <p>AOOS currently applies three standard and automated QC procedures to real-time and historical observation data before it is stored in the AOOS Data System. These tests include the following:</p> <ol style="list-style-type: none"> 1. <i>Syntax Test</i>: If no data can be extracted, the test fails, and no data | <p>AOOS's data management contractor, Axiom Data Science, has made significant progress redesigning the back end AOOS data system to implement open-source libraries for basic QARTOD tests of real-time data streams. QARTOD flags and libraries are available in the Ocean Data Explorer for visual exploration and download through ERDDAP. The AOOS Glider data provider is also working on QARTOD implementation, and is finding that some tests are flagging good data. They are working on fine tuning the tests and limits. This</p> |

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| | <p>biological datasets. Standard, discovery-level ISO 19115-2 compliant metadata can be generated for both projects and individual datasets.</p> | <p>are accessed, served or stored for that record.</p> <ol style="list-style-type: none"> 2. <i>Gross Range Test</i>: Values outside of the prescribed parameter ranges are rejected and replaced with missing value flags in data storage connected to access points and the graphic displays. 3. <i>Time-Gap Check</i>: If no data are received from an existing observational station for four hours, the icon on the map changes from a scaled color to a small grey-shade dot. <p>AOOS QC syntax and gross range tests meet Quality Assurance of Real-Time Oceanographic Data (QARTOD) protocol requirements for IOOS data. AOOS will continue to implement the necessary QARTOD tests where required.</p> <p>The AOOS Data Management Team has actively been working with developers at NCEI on automating the submission of AOOS-owned data assets and AOOS-managed non-federal real-time assets to the archive. NCEI will advise AOOS exactly what data assets they will accept and will supply information on the data submission</p> | <p>takes time. The glider data is particularly difficult to use QARTOD standard TS corrections on, especially on unpumped CTD data due to salinity spiking caused by a mis-match in T C sensor response and sample volume.</p> <p>Implementing QARTOD takes resources. The current trend is to continue to increase QARTOD manual generation without a clear understanding of how the current QARTOD implementations are coming along and how well they are performing. In 2016, 2017 and again in 2018, we suggested that IOOS assess the current implementation of QARTOD for the existing manuals to ensure that these manuals are providing the correct level of guidance for implementing appropriate QC at the regional level <u>prior</u> to continued development of more</p> |
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| | | <p>forms and all necessary procedures moving forward.</p> | <p>complicated parameter manuals.</p> <p>Axiom is still trying to work with an NCEI testing environment for an automated archive pathway from the Research Workspace to NCEI. Also, NCEI does not accept all data served by AOOS, so AOOS uses DataONE. DataONE is not a federal archive, but provides a published, long-term data access alternative that will allow NCEI future access to any data they want from AOOS, at any time they want it or are ready to receive it.</p> <p>Not all AOOS regional RT assets are capable of sending data to the GTS. As long as the data are QC flagged accordingly, AOOS will continue to provide access to these gap filling observations.</p> |
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| HFR Operations and Maintenance Expenditures - AOS 2019 | | | | | | | |
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| Operator/Principal Investigator | Field Engineer/Technician Salary including fringe benefits & overhead* | O&M Oversight (PI or O&M manager) salary including fringe benefits & overhead* | Travel | Supply and equipment expenses, fees: computer equipment, air conditioners, generators, enclosures, antenna whips, test/calibration/repair tools, cables, services, electrical power, rentals, data communications/networking | # of radars | # of FTE | # of students (FTE) |
| University of Alaska/Seth Danielson | | | | | | | |
| Chukchi/Beaufort Seas (Existing) | \$100,544 | \$11,004 | \$9,190 | \$49,765 | 3 | 0.542 | 0 |
| Bering Strait (New) | \$104,403 | \$11,004 | \$12,706 | \$38,235 | 2 | 0.678 | 0 |
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| | *indirect cost rate(s) = 50.5% | *indirect cost rate(s) = 50.5% | | | | | |
| Totals | \$204,947 | \$22,008 | \$21,896 | \$88,000 | 5 | 1.22 | 0 |
| | | | Does not include overhead | Does not include overhead | | Personnel dedicated to project | |
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*indirect cost rate(s)

FTE Calculations Chukchi Sea HFR

Bering Sea HFR

PI Danielson 0.5 mos

Potter 2.5 mos

Statscovich 2.5 mos

Maisch 1.0 months