

ADAC 26 JANUARY 2018 QUARTERLY REVIEW

Using Vessel Tracking Data to Prioritize Bathymetric Surveying in a
Rapidly Changing Arctic

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Using Vessel Tracking Data to Prioritize Bathymetric Surveying in a Rapidly Changing Arctic: Research Schedule and Milestones

	First year of Project Research		Progress	Why Not Reached
	QTR 3	QTR 4		
Convene Steering committee meetings (teleconference, webinar)	X		Steering Committee established - Q2. SC will inform on reporting metrics, communication & outreach strategy for life of the project. Product scoping meeting will introduce proto-type data queries, solicit feedback on product function, look, and capability. Webinar TBD - February 22,23,26-28.	NA
Prepare and quality review AIS data	X		Completed quality review and correction of Beaufort Sea and Bering Strait AIS Vessel Traffic in Q2-3. Completing the Bering Sea phase in Q3-4.	Bering Sea region much larger w / more ships.
Transfer AIS data	X	X	Transferred 5 years of raw AIS data (2013-2017). Correction tables for raw AIS data in Beaufort Sea and Bering Strait thru 2017 with over 7,200 vessels (researched, vetted and corrected) completed and transferred. Remainder (Bering Sea) underway.	NA
Optimize high-computer cluster workflow	X	X	High Performance Computing (HPC) optimized by integrating Alluxio as a data caching mechanism. Processing of all AIS data transformation steps (raw messages -> clean pings -> voyages -> heatmaps) improved by 600%. Success!	NA
Develop plan to transform AIS data into application ready NOAA-OCS Hydro Health Model format	X	X	Axiom staff have been working with Patrick Keown of NOAA OCS on defining specific outputs to plug into hydrographic health model. Outputs have been produced and verified by NOAA-OCS as valid. Complete.	NA
Implement cluster parallelization of U.S. Arctic EEZ AIS data to assess vessel density patterns	X	X	Data processing pipeline has been operationalized and applied to several large AIS data sets successfully (AK Marine Exchange, Danish AIS, OCS Archive and Marine Cadastre)	NA



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Using Vessel Tracking Data to Prioritize Bathymetric Surveying in a Rapidly Changing Arctic: Current Year Metrics

Current Year Metrics Year 1	Progress	Why Not Reached
Complete AIS data quality review and processing	Marine Exchange Completed quality review and correction tables of Beaufort Sea AIS Vessel Traffic in Q2, Bering Sea in Q3 AIS data from over 7,200 vessels researched, vetted and corrected and provided to Axiom.	Bering Sea region is much larger and more ships. Will be completed in Q3-4
Complete configured AIS data transfer	All raw AIS data through 2017 transferred in Q2. Evaluation and configuration of vetted data correction tables is occurring in three regional phases: Phase 1 – Barrow to Eastern Beaufort Sea (Q2); Phase 2 (Q2-3) – Bering Strait to Barrow and Phase 3 – North of Aleutians to Bering Strait (in process, Q3-4).	NA
Complete optimization of the high-computer cluster workflow for high quantity data handling	Performance optimization complete with integration of Alluxio caching system into SPARK resulting in 600% performance increase.	NA
Initiate development of vessel density maps generated from the transferred AIS data	Several types of vessel density maps using the fully vetted MXAK AIS data will be presented to the Steering Committee at the February 2018 Webinar. Following this meeting, feedback will be incorporated into the products and passed along to the committee for further comment Mid-April to early May.	NA
Document and curate AIS metadata throughout the project (in preparation for data archival);	All processes and workflow modifications are being tracked and documented.	NA
Develop technical documentation of data ingestion and prioritization processes utilized on the project to facilitate re-use and workflow scaling for other big-data analysis projects.	On target: Members of the project team are currently authoring a technical whitepaper on data ingestion processes, and will use this as a start to the development of specific technical documentation for this project.	NA



Using Vessel Tracking Data to Prioritize Bathymetric Surveying in a Rapidly Changing Arctic: Steering Committee

- The project Steering Committee members:
 - Dr. Jon Berkson (USCG HQ and Project Champion)
 - Lt. Bart Buessler (NOAA AK Region, Navigation Manager)
 - Greg Pavellas, Dir Engr. And Special Projects, Crowley; also Rep. AK Waterway Safety Committee
 - Patrick Keown, NOAA OCS Geospatial Data Manager
 - Paul Webb, USCG D17 (AK) (CIV)
 - Randy “Church” Kee, Maj Gen, USAF (Ret), Executive Director ADAC)
- Additional stakeholders proposed for Steering Committee:
 - *Frank Parker, USCG Office of Nav. Systems (to be confirmed)*
 - *Lt. Matthew Forney, NOAA NOS (to be confirmed)*
 - *John Hauman, NGA (to be confirmed – expresses interest in Antarctica too)*
 - *Dr. Guillermo Auad, BOEM (to be confirmed)*



Using Vessel Tracking Data to Prioritize Bathymetric Surveying in a Rapidly Changing Arctic: Planned Research Outcomes – Year 1

- **Application-ready, gridded files describing AIS vessel densities for use in the NOAA-OCS Hydrographic Health Model will be initiated and under development in the second half of Year 1 (to be completed by the second half of Year 2).**
 - **This step is important for the prioritization of areas for bathymetric surveying:**
 - **Gridded files provide the extracted AIS information needed for decision makers and stakeholders in the U.S. Arctic area;**
 - **They also provide patterns of historical as well as emerging vessel traffic patterns.**
 - **Results from this effort will format inputs to the Hydrographic Health Model whilst making those inputs readily accessible for other applications.**
- **The project team will begin planning application products and transition during Year 1, immediately after scoping data product specifications with the Steering Committee (February 2018).**



Using Vessel Tracking Data to Prioritize Bathymetric Surveying in a Rapidly Changing Arctic: Planned Research Outcomes – Year 2

- By the end of the project in Year 2, final data products to be transferred:
 - NOAA-OCS for application in their Hydrographic Health Model.
 - Other applications identified through interactions with assigned USCG Project Champion(s), project Steering Committee and USCG Project Advocates.
 - Public project website/portal hosted by AOOB.
- The investment in this foundational project will be leveraged to:
 - Improve efficiency in vetting, processing and analyzing AIS data that can be used for new research.
 - Improve access to the types of AIS data that is most useful to stakeholders, and make this information visually accessible to those who need it.
 - Expand capacity nationwide for AIS data handling for similar projects.
 - Help identify where the AIS system needs improvement, which could be used to guide USCG efforts at implementation processes and requirements.
- **Knowledge Product** - we (and others via documentation) will be able to apply the techniques pioneered in this project to other big data challenges with different types of data.



Using Vessel Tracking Data to Prioritize Bathymetric Surveying in a Rapidly Changing Arctic: Transition Plans and Pathways

- **Maintain regular (minimum quarterly) communication with the Project Champion Dr. Jon Berkson**
 - **consultation on quarterly reviews and annual meetings, participation in quarterly steering committee meetings, and engagement in all product demos and trials.**
- **Communications and outreach plan for coordinating potential end users will be developed in Year 1 (Q3) with Steering Committee input (February 2018).**
 - **For example: Stakeholders will participate in product prototype trial demonstrations/webinars, and will be asked to provide feedback on visuals, ease of use and other tool functionality.**
- **The project team participates in ADAC “Customers and Partners” Roundtable meetings, and will continue to inform and receive feedback on project progress and usefulness to USCG mariners and ADAC collaborators.**
- **In Year 2, final data products will be transferred in the form of geo-spatial gridded density files to NOAA-OCS for input into their Hydrographic Health Model and to other applications discovered through interactions with assigned USCG Project Champion(s), USCG Project Advocates and project Steering Committee.**
- **Final data products will be made publically available on the AOOs Data System via the project website.**
- **Researchers expect to achieve TRL 7/8 for project-developed information products and software applications.**