

ALEXANDER K. EKHOLM

PROFESSIONAL EXPERIENCE

Woods Hole Oceanographic Institution – Department of Physical Oceanography – Float Group

- Research Engineer – *May 2023 to Present.*
- Engineer II – *October 2018 to May 2023.*
- Engineer I – *July 2013 to October 2018.*
- Engineering Assistant II – *May 2010 to July 2013.*

EDUCATION

University of Massachusetts Dartmouth – Department of Electrical and Computer Engineering

- B.S.Cmp.E., B.S.E.E. (dual major) – *2012.*

PATENTS

Ekhholm, A. K. (2023, March). Wave-Field Inertial Measurement System. *U.S. Non-Provisional Patent Application No. 18/120,365.*

PUBLICATIONS

Sanabia, E., Jayne, S. R., Densmore, C., & **Ekhholm, A.** (2022, December). Surface Wave Field Observations During the Passage of Hurricanes Teddy (2020) and Ida (2021). In *AGU Fall Meeting Abstracts* (Vol. 2022, pp. NH23A-04).

Jayne, S. R., Owens, W. B., Robbins, P. E., **Ekhholm, A. K.**, Bogue, N. M., & Sanabia, E. R. (2022). The Air-Launched Autonomous Micro Observer. *Journal of Atmospheric and Oceanic Technology*, 39(4), 491-502.

Wood, K. R., Jayne, S. R., Mordy, C. W., Bond, N., Overland, J. E., Ladd, C., Stabeno, P. J., **Ekhholm, A. K.**, Robbins, P. E., Schreck, M.-B., Heim, R., & Intrieri, J. (2018). Results of the first arctic heat open science experiment. *Bulletin of the American Meteorological Society*, 99(3), 513-520.

Sanabia, E., Jayne, S. R., Robbins, P., & **Ekholm, A. K.** (2018, February). Upper Ocean Temperature and Salinity Observations During the Passage of Hurricane Irma. In *2018 Ocean Sciences Meeting*. AGU.

Jayne, S. R., Robbins, P., Owens, B., **Ekholm, A.**, Dufour, J. E., & Sanabia, E. (2016). Air-Deployable Profiling Floats for Tropical Cyclone Research. *American Geophysical Union, 2016*, A51A-02.

PRESENTATIONS

Ekholm, A. K. (2017, September). Buoyancy engines: Comparison of various implementations and engineering tradeoffs. *2017 Argo Float/Sensor Workshop*. University of Washington, Seattle, WA. (PowerPoint presentation).

Ekholm, A. K. (2017, September). Floats & waves: An inertial, directional wave-field measurement system for neutrally-buoyant profiling floats. *2017 Argo Float/Sensor Workshop*. University of Washington, Seattle, WA. (PowerPoint presentation).

Fortier, P., Viall, B., Shannon, S., DaSilva, P., & **Ekholm, A.** (2012, October). A Mobile, Non-Intrusive, Cardiac Monitor for Patient Post-Operative Care Management. *IEEE Sensors 2012*. Taipei Taiwan. (Poster presentation).

Fortier, P., Viall, B., Shannon, S., DaSilva, P., & **Ekholm, A.** (2012, August). A Flexible Low-cost Mobile Non-Intrusive Cardiac Monitor Supporting Patient Post-operative Care Management. *SensorComm 2012*. Rome, Italy. (Poster presentation).

FIELD OPERATIONS

Beaufort Sea; Chukchi Sea; and Fairbanks, AK – *September 2020* – Predeployment preparations, aircraft deployment from NOAA DHC Twin Otter N56RF, and remote operation of ALAMO profiling floats as part of NOAA's Arctic Science Open Heat Experiment.

Beaufort Sea; Chukchi Sea; and Utqiagvik, AK – *September 2018* – Predeployment preparations, ship deployment, and remote operation of ALAMO profiling floats with experimental delayed-release anchors as part of the Stratified Ocean Dynamics in the Arctic (SODA) project.

Beaufort Sea; Chukchi Sea; and Utqiagvik, AK – *July 2018* – Predeployment preparations, ship deployment, and remote operation of ALAMO profiling floats with experimental delayed-release anchors as part of the Stratified Ocean Dynamics in the Arctic (SODA) project.

Chukchi Sea and Kotzebue, AK – *May/June 2017* – Predeployment preparations, aircraft deployment from NOAA DHC Twin Otter N56RF, and remote operation of ALAMO profiling floats as part of NOAA’s Arctic Science Open Heat Experiment.

Chukchi Sea and Kotzebue, AK – *September 2016* – Predeployment preparations, aircraft deployment from NOAA DHC Twin Otter N56RF, and remote operation of ALAMO profiling floats as part of NOAA’s Arctic Science Open Heat Experiment.

Beaufort Sea; Chukchi Sea; Kotzebue, AK; and Utqiagvik, AK – *May/June 2016* – Predeployment preparations, aircraft deployment from NOAA DHC Twin Otter N56RF, and remote operation of ALAMO profiling floats as part of NOAA’s Arctic Science Open Heat Experiment.

St. George’s, Bermuda – *August 2012* – Assisted in predeployment preparations, deployment, and recovery of Spray Glider.

OTHER OPERATIONS

Norse Float Operations – *November 2022* – Predeployment preparations and sole remote operation of WHOI ALAMO profiling floats in the Norwegian Sea part of the APL-UW’s Northern Ocean Rapid Surface Evolution (NORSE) project.

MIZ Acoustic Under-Ice Float Operations – *October 2022 to Present* – Lab testing and validation of floats equipped with WHOI Micromodem-2 acoustic transceivers and Seascan Real-time Clocks for under-ice geolocation via acoustic time-of-flight triangulation in the Arctic; predeployment preparations and sole remote operation of WHOI Acoustic ALAMO profiling floats in the Beaufort Sea part of the Marginal Ice-Zone (MIZ) project.

Microstructure Alto Float Operations – *October 2022 to Present* – Lab testing and validation of floats equipped with Rockland Scientific temperature and shear microstructure sensors; predeployment preparations and sole remote operation of WHOI Micro-ALTO profiling floats for upcoming deployments.

SASSIE Float Operations – *September 2022* – Predeployment preparations and sole remote operation of WHOI ALAMO profiling floats in the Beaufort Sea; and remote operation of NAVO ALTO floats in the Beaufort Sea as part of NASA’s Salinity and Stratification at the Sea Ice Edge (SASSIE) project.

Argo ALTO Float Operations – *November 2016 to Present* – Predeployment preparations and remote operation of WHOI ALTO profiling floats in the world’s oceans part of the international Argo float project.

Hurricane Float Teleoperations – *July 2015 to Present* – Sole remote operator of ALAMO profiling floats utilized in 2015 through 2022 NAVO Hurricane projects.

INSTRUMENTATION

Electromagnetic Current Profiler (EMCP) – *2022 to Present* – Ongoing development of an EM-based subsurface current sensor designed for use in aircraft-deployable neutrally-buoyant profiling floats.

Submersible Humidity Sensor – *2021 to Present* – Ongoing development of a submersible, psychometric relative humidity sensor for use on a neutrally-buoyant profiling float.

LVDT-Based Ballast Sensor System – *2020 to Present* – Ongoing development of improved system for automated measurement of submerged neutrally-buoyant instruments’ weights in a pressurized tank and calculation of required internal weight changes utilizing Linear Variable Differential Transformer (LVDT) for measuring displacement in response to linear-elastic force.

Wave-field Inertial Measurement System (WIMS) revision 2.06 – *2020 to 2022* – Improved system for acquisition, processing, and spectral analysis of inertial measurements for estimation of directional wave-field properties featuring new Inertial Motion Unit (IMU) and improvements to power regulation and low-power standby feature.

Tilt-Shear Sensor System – *2018* – Compact system for recording inertial measurements using a high-precision Microelectromechanical System (MEMS) sensor for measuring tilt on a rotating neutrally-buoyant float as a proxy to derive subsurface ocean shear currents.

Wave-field Inertial Measurement System (WIMS) revision 1.18 – *2017 to 2019* – Compact, low-power system for acquisition, processing, and spectral analysis of inertial measurements for estimation of directional wave-field properties designed for use in aircraft-deployable neutrally-buoyant profiling floats.

IMU Calibration Apparatus – *2017 to 2018* – Custom closed-loop control system for existing electromechanical device that provides variable-rate rotation of test platform and

independent measurement of absolute orientation for calibration and evaluation of magnetic and inertial sensors.

Load-Cell-Based Ballast Sensor System – *2015 to 2017* – Electronics, software, and procedure for automated measurement of submerged neutrally-buoyant instruments' weights in a pressurized tank and calculation of required internal weight changes based on full-bridge strain gauge load cell.

SOFTWARE APPLICATIONS

ALAMO/ALTO Interactive Float Plots – *2022 to Present* – Multithreaded application consisting of collection of Python and shell scripts for parsing floats' telemetered science and engineering data, generating interactive, JavaScript-based plots and web-pages. Available at <http://argo.whoi.edu/alamo/>.

CMIP6 Community Storage Server – *2021* – Administration of 600TB file storage virtual server and creation of custom web application using written in JavaScript, and using Apache Solr server backend, for hosting a faceted search of local subset of Coupled Model Intercomparison Project, phase 6 data. <http://cmip6.whoi.edu/> (WHOI internal network only).

Solo-II Upload Command Utilities – *2016* – Collection of compiled and scripted utilities for validation, packaging, and transmission of mission commands to remote Solo-II profiling floats.

X-Message Mail Telemetry Processing Service – *2014 to Present* – Compiled, multithreaded C++11 application for real-time processing of telemetered neutrally-buoyant profiling float data and submission to global repositories.

ALAMO Upload Command Utilities – *2014* – Collection of compiled and scripted utilities for validation, packaging, and transmission of mission commands to remote ALAMO profiling floats.

CMIP5 Community Storage Server – *2013 to 2017* – Administration of 100TB file storage server and creation of custom web application using in PHP and JavaScript, and using Apache Solr server backend, for hosting a faceted search of local subset of Coupled Model Intercomparison Project, phase 5 data. Available at <http://cmip5.whoi.edu/> (WHOI internal network only).

Argo Atlas & Database (deprecated) – *2010 to 2013* – Java and web-based application for assimilation and management of Argo float data and metadata from local and remote sources, including robust dataset search features.

SPECIALIZED TRAINING

Hazardous Materials Shipper Certification – *August 2022* – Woods Hole Oceanographic Institution, Woods Hole, MA

Hazard Communication & Chemical Safety Training – *August 2022* – Woods Hole Oceanographic Institution, Woods Hole, MA

Hazardous Waste Generator Training – *August 2022* – Woods Hole Oceanographic Institution, Woods Hole, MA

Machine Shop Safety Training – *September 2021* – Woods Hole Oceanographic Institution, Woods Hole, MA

Aviation Survival & Egress Training (ASET1, HUET equivalent) – *April 2018* – Survival Systems USA, Inc., Groton, CT

Forklift Operator Certification – *November 2018* – Woods Hole Oceanographic Institution, Woods Hole, MA

COLLABORATIVE & COMMUNITY OUTREACH PROJECTS

Stellefane Convention 2017 Student Educational Project: Curiosity Rover – *2017* – Creation of remotely-operated mock Mars rover using Chicken Bot Pi hardware for simulation of NASA's Curiosity Rover mission in collaboration with P. Fucile (WHOI).

Lemelson-MIT 2017 InvenTeams Project: Chicken Bot Pi – *2017* – Development of electronic hardware for high school students' project to create a robotic vehicle for autonomous environmental monitoring of poultry livestock enclosures in collaboration with P. Fucile (WHOI).

Stellefane Convention 2016 Student Educational Project: New Horizons – *2016* – Layout and manufacture of electronics for mock space probe and sensor suite for simulation of NASA's New Horizons mission in collaboration with P. Fucile (WHOI).

OTHER INTERESTS

FPV Multirotor Drone Construction and Piloting – *2021 to Present* – Custom construction, tuning, and recreational, radio-controlled piloting of First-Person View (FPV) multirotor unmanned aerial vehicles (UAVs).