

Skimming the Surface of Possibilities: Synergies between the Miniboat Program and OOI

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STUDENT ENGAGEMENT IN SCIENTIFIC INQUIRY WITH MINIBOATS

Educational Passages, a 501c3 not-for-profit organization, enhances student engagement in scientific inquiry through its Miniboat Program, which offers a hands-on, collaborative, and global learning experience. Through an international educational community, participants build, launch, and recover miniboats, creating an "ocean classroom" that connects students worldwide, whether they are on the coast or landlocked.

For more information, see Stymiest, C., & et al. (2022). *Collecting to Connect: Student-built Miniboats Contributing to Ocean Science Research*. The Journal of Ocean Technology, 17(3).



MINIBOATS AS OCEANOGRAPHIC TOOLS

Miniboats are small (1.5m long) uncrewed vessels, designed to sail with the wind and currents, and therefore can serve as valuable oceanographic tools by collecting critical environmental data as they travel. They can be equipped with a variety of sensors, as shown in diagram to the right, and in the example shown of *Lady Lance* (Figure 2). Data are made available to researchers to help provide insights into climate change, ocean currents, and other critical environmental factors. The accessibility and versatility of miniboats make them an innovative and cost-effective solution for expanding oceanographic research, allowing for widespread data collection even in remote or hard-to-reach areas.

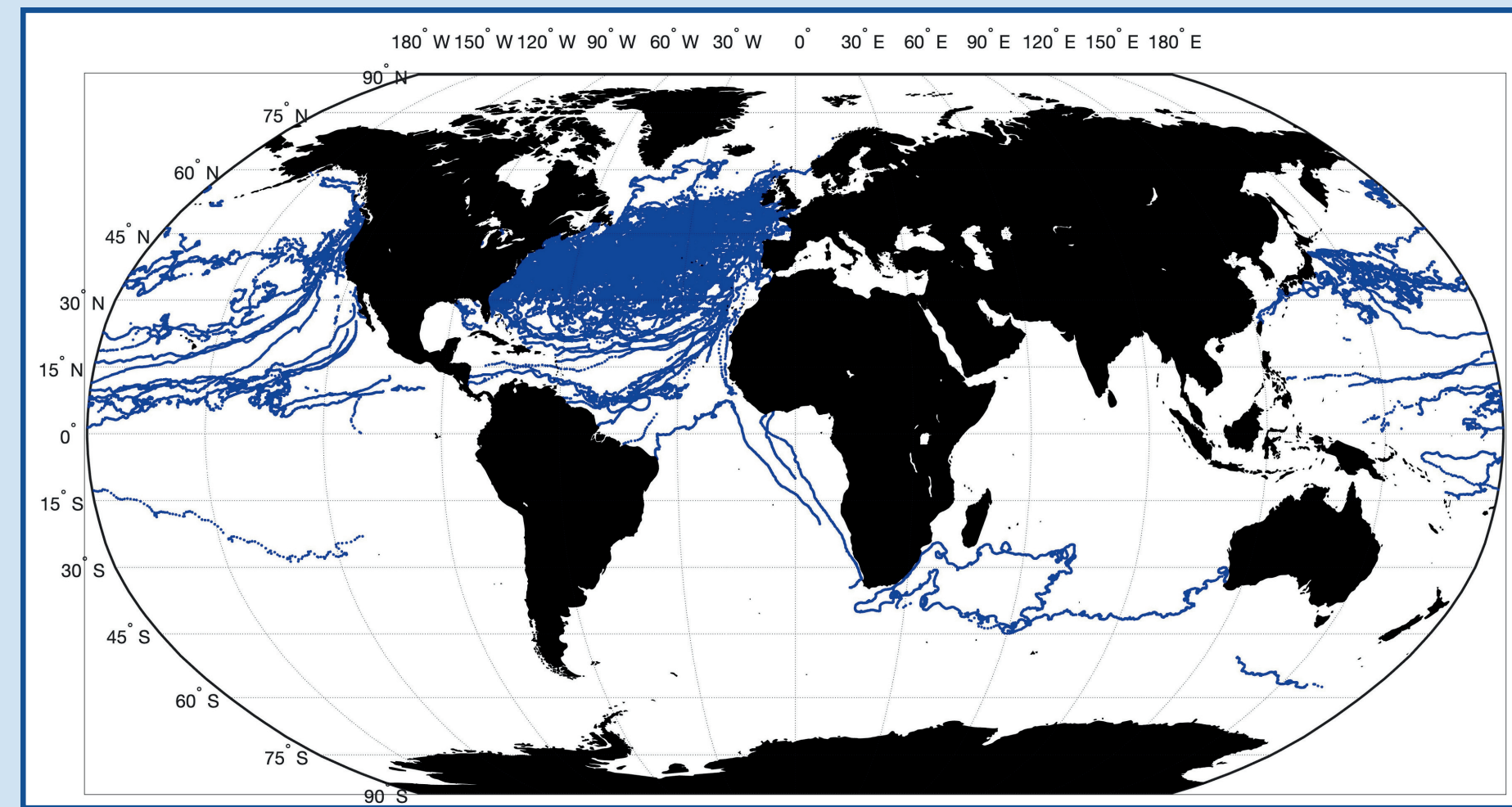


FIGURE 1. GLOBAL MAP OF ALL MINIBOAT TRACKS (BLUE LINES) SINCE 2008, REPRESENTING A COMBINED DISTANCE TRAVELED TOTALING OVER 2 MILLION KILOMETERS AS OF JANUARY 1, 2024.

A UNIQUE BROADER IMPACT: ENHANCING SCIENTIFIC RESEARCH AND EDUCATION

Given the temporal and spatial coverage of past miniboat tracks (Figure 1), the addition of sensor packages has potential to enhance scientific research and capacity in ocean observing systems and therefore complement the work of OOI (see Pioneer Array examples to the right). As small, cost-effective solutions for data collection, they are also a valuable educational tool. By involving students in the construction and customization of miniboats as well as the installation of sensors, we provide an educational platform that bridges the gap between classroom learning and real-world scientific exploration. Supporting these miniboat projects can greatly help scientists reach broader impacts, and inspire career pathways.



There are many opportunities to join the miniboat adventure, including:

- Sponsor a miniboat build to support broader impacts
- Connect with students around the world to talk about your research (and theirs!)
- Join our science advisory group to enhance the use of our data and integrate more sensors

OPPORTUNITIES WITH THE OOI PIONEER ARRAY

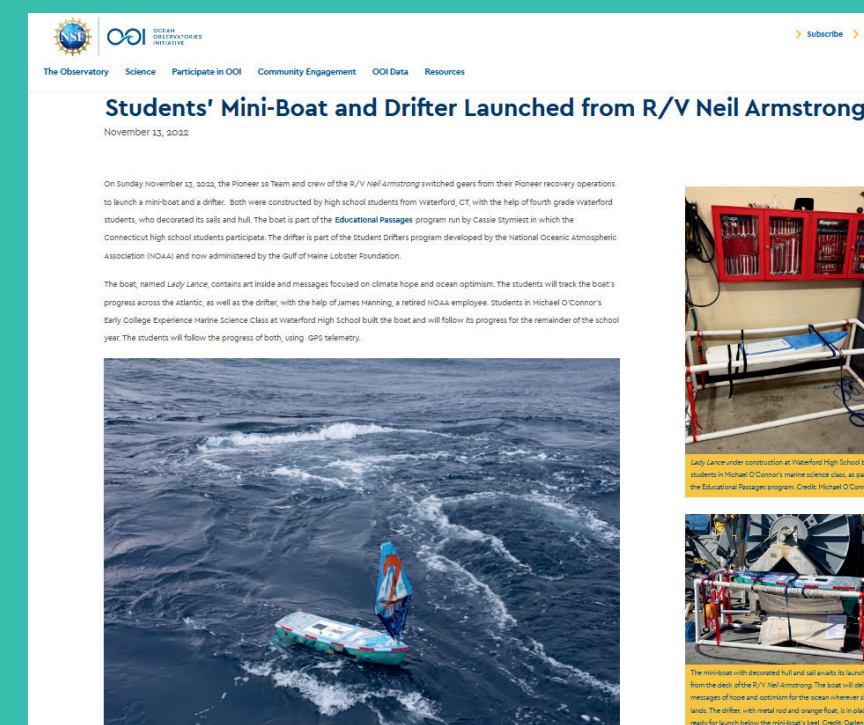
NORTHEAST SHELF EXAMPLE: LADY LANCE



LAUNCHED: NOVEMBER 13, 2022
FROM: WATERFORD HIGH SCHOOL, CT
LAUNCHED BY: R/V NEIL ARMSTRONG

RESULTS: RECOVERED IN THE AZORES MAY 12, 2023 AFTER TRAVELING OVER 8,000 KM

IMPACT: CONNECTED STUDENTS FROM CONECTICUT TO A SCHOOL IN THE AZORES AND COLLECTED SENSOR DATA



"We are delighted to be able to support the work of the Waterford students. Their interest, curiosity, and enthusiasm for this project is contagious, and we all will be tracking Lady Lance as she moves through the Atlantic. We also hope that some students are so inspired by this work that they go on to be scientists." John Lund, Chief Scientist of the Pioneer Array recovery team

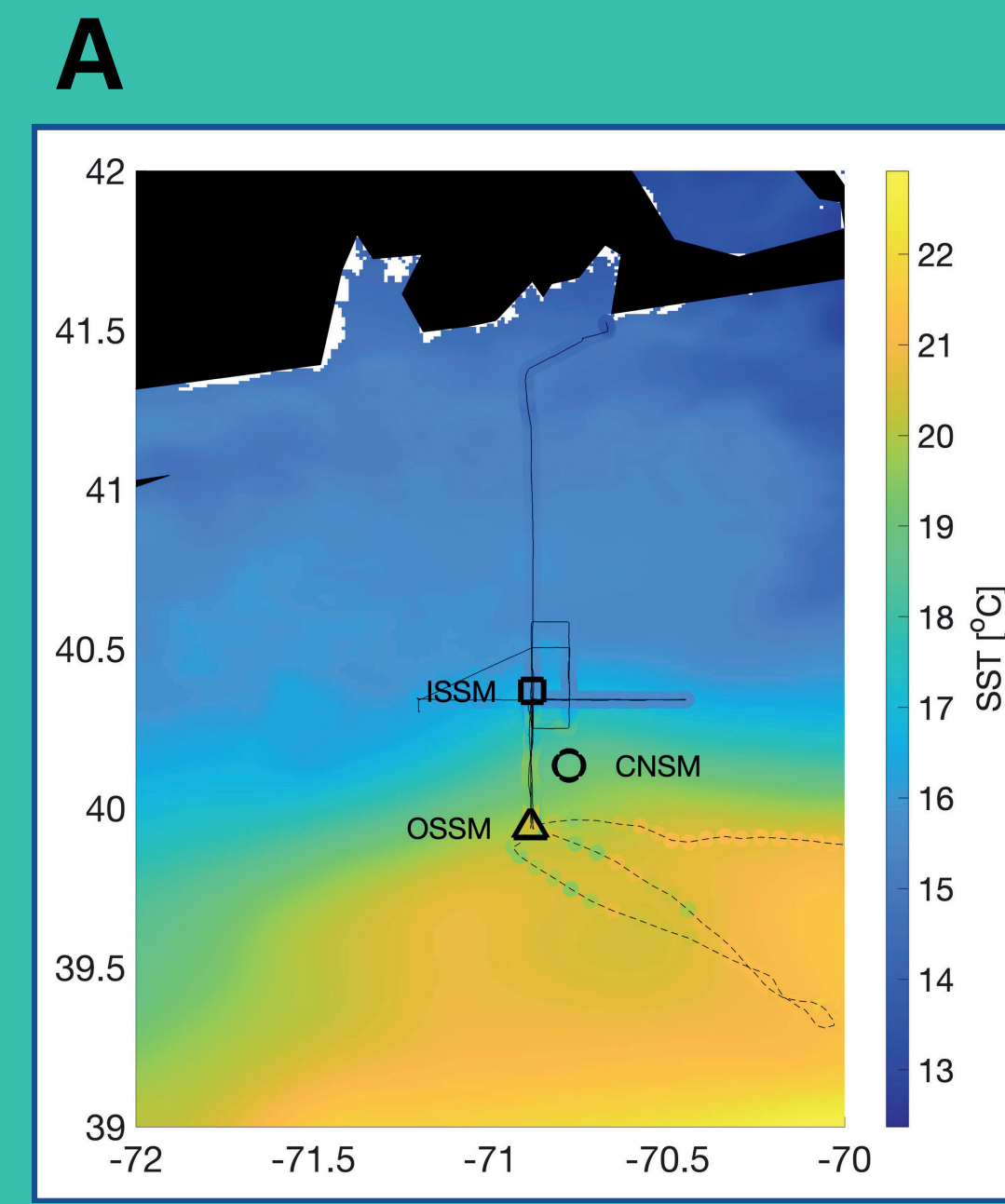


FIGURE 2. (A) MAP OF LADY LANCE MINIBOAT LAUNCHED AT OOI PIONEER ARRAY NES SURFACE MOORING. BACKGROUND COLORS ARE SATELLITE SEA SURFACE TEMPERATURE (SST) FROM GHRSSST L4, WHICH HAS A SPATIAL RESOLUTION OF 1 KM. THE SURFACE MOORINGS ARE INDICATED BY SHAPES, INSHORE SURFACE MOORING (ISSM, SQUARE), OFFSHORE SURFACE MOORING (OSSM, TRIANGLE), AND CENTRAL SURFACE MOORING (CNSM, CIRCLE). THE SEA SURFACE TEMPERATURE COLLECTED BY THE MINIBOAT PATH IS SHOWN AS COLORED DOTS WITH A THIN BLACK DASHED LINE THROUGH IT. SAME FOR THE R/V ARMSTRONG BUT WITH A SOLID BLACK LINE THROUGH. (B) TIMESERIES OF SST FROM THE MINIBOAT (BLUE, TEMPERATURE SENSOR LOCATED AT -0.5 M DEPTH) AND SATELLITE SST INTERPOLATED TO THE TIME AND LOCATION OF THE MINIBOAT (RED). SST FROM THE R/V ARMSTRONG (BLACK, THERMOSALINOGRAPH INTAKE AT -5.0 M DEPTH), OSSM (DARK GREY DASHED, TEMPERATURE SENSOR AT -3.0 M DEPTH), AND ISSM (LIGHT GREY DASHED) ARE SHOWN. DUE TO MOORING RECOVERY, THERE IS NO TEMPORAL OVERLAP FOR COMPARISON BETWEEN THE SURFACE MOORINGS AND MINIBOATS.

MID-ATLANTIC BIGHT EXAMPLE: AIMS INFINITY



LAUNCHED: JUNE 16, 2023
FROM: HOWE HALL ARTS INFUSED MAGNET SCHOOL, SC
LAUNCHED BY: SHIFTING GEARS (RECREATIONAL FISHING VESSEL)

RESULTS: TRAVELED 1,000 KM TO CAPE MAY, NJ BY JULY 2, 2023. SEE TRACK TO RIGHT AS IT SAILED THROUGH THE MID ATLANTIC BIGHT AND AREA OF INTEREST FOR NEW PIONEER ARRAY WORK

IMPACT: STUDENTS IN SC LEARNED AND CONNECTED WITH FISHERMEN AT BIG ROCK BLUE MARLIN TOURNAMENT, INSPIRED OTHER SCHOOLS IN THE OUTER BANKS, MET PEOPLE IN NC AND NJ, AND COLLECTED SENSOR DATA

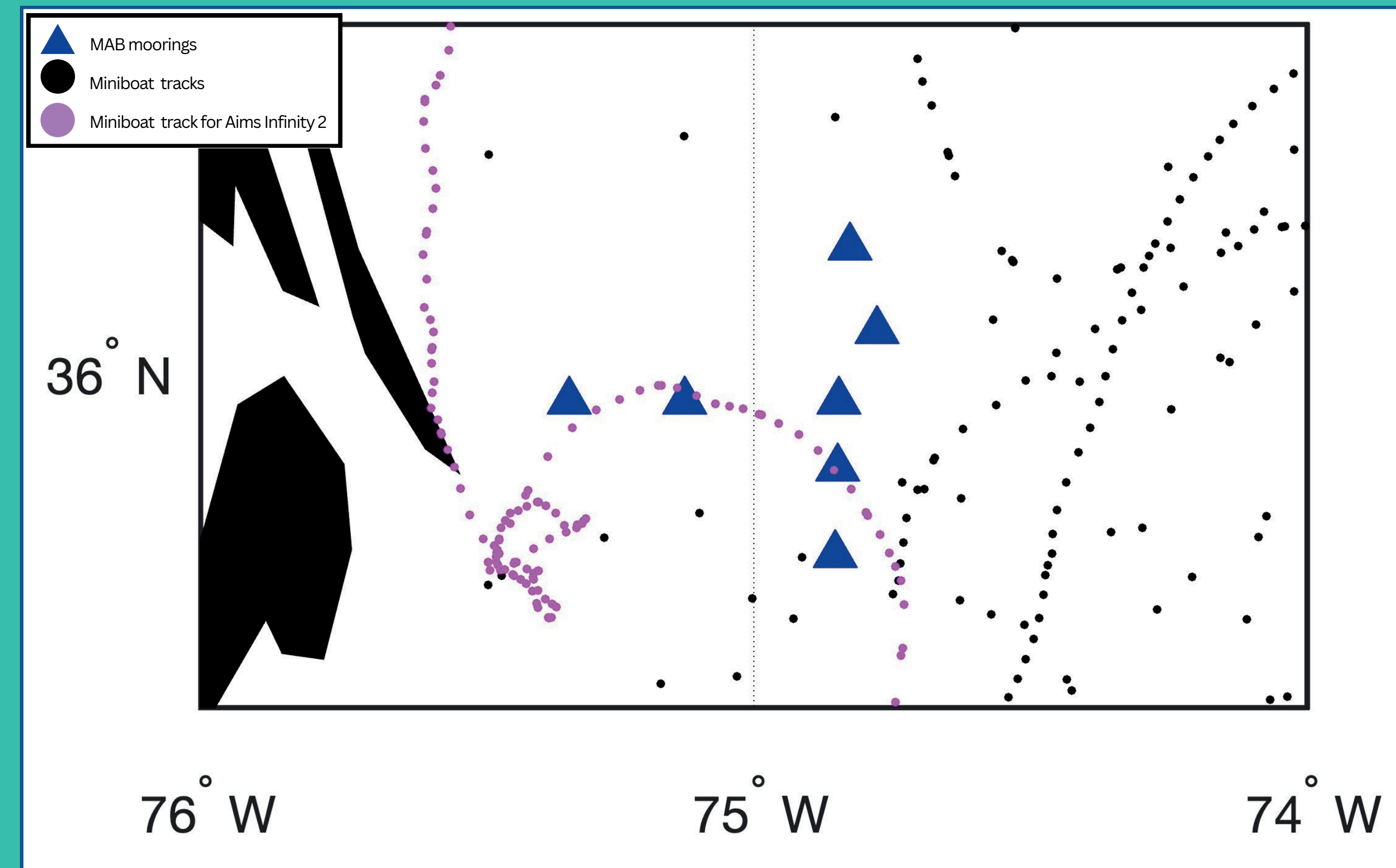


FIGURE 3. MAP OF MINIBOAT TRACKS AROUND THE MAB PIONEER ARRAY. MINIBOAT TRACKS FROM 13 VOYAGES ARE INDICATED BY BLACK DOTS. THE AIMS INFINITY VOYAGE 2 IS HIGHLIGHTED IN MAGENTA DOTS. THE MOORING LOCATIONS OF THE MAB ARRAY ARE SHOWN AS BLUE TRIANGLES.