TA PROJECT REPORT

1. Project Information

Proposal reference number[1]	**JS3_CALL_2_4040_IMAPOCEAN**
Experiment Acronym (ID)[2]	IMAPOCEAN
Title of the project[3]	**Integrated Multilevel Active Passive Ocean Current Education Advancement Network**
Host Research Infrastructure[4]	**Hellenic Center for Marine Research educational unit- POSEIDON calibration Laboratory (PCL)**
Starting date - End date[5]	June 2022 - May 2023
Name of Principal Investigator[6] **Home Laboratory** **Address** **E-mail address** **Telephone**	Ariadne Dimoula Paramount Planet Product 42 Mill St. Orono Maine 04473 ariadne@p3rd.earth (207)307.9393

2. Project objectives[7] (250 words max.)

- Quantify the transport of intermediate and deep waters.
- Monitor ocean surface flow through active drifting ocean drones.
- Engage the public in ocean current research through building and deploying Drifters.
- Guide and lead students to reach their own conclusions about our impact on the Earth.
- Activate and connect schools and communities across the Globe, creating a web of oceanographic data and increasing global connectedness and climate awareness.

Scientific and technical objectives are over a 1 year time period to execute a multilevel study of the water column using both active and passive monitoring tools. These tools are Sea Horse Tilt Current Meter, and student-built biodegradable oceanographic drones called "Drifters" which use GPS to monitor ocean surface currents. This is a continuation from EMSO-Link Transnational Access (TNA) 2020 and the POSEIDON coastal . Our

[1] Reference number assigned to the proposal by the TA-Office.
[2] User-project identifier used in the proposal.
[3] Title of the approved proposal. The length cannot exceed 255 characters
[4] Name of the installation/infrastructure accessed with this project. If more than one installations/infrastructures are used by the same project, please list them in the box.
[5] Specify starting and end date of the project (including eventual preparatory phase before the access).
[6] Fill in with the full contact of the Principal Investigator (user group leader).
[7] Write the short-term, medium and long-term objectives of the project. Use no more than 250 words.

instruments will be deployed on a mooring and will collect additional measurements of currents and waves at different depths, which will provide data for comparison and cross calibration of the instruments performance.

3. Main achievements and difficulties encountered (250 words max.)[8]

Integrated Multilevel Active Passive Ocean Current Education Advancement Network (I.M.A.P.O.C.E.A.N) experiment successfully started on the 30th of August 2020 at 08:50 am, UTC in the South East Ionian Sea, offshore Pylos (Peloponnese), Greece (36º84'N, 21º61'E). The main achievement of IMAPOCEAN was the launch and recapturing of a Sea Horse Tilt Current Meter. On 08/09/2021 The Philos our vessel was able to retrieve the mooring line, which was delivered to our base in Crete. One of four sensors deployed made it to the surface. The two hobos (alternative sensors for Lowell Tilt Meters, still structured as a seahorse tilt meter) and one of the current meters were lost at sea and the mooring line attachment points surfaced empty in the 3 depths, only the deepest one surveyed. With its recapture, one year's worth of data from 2020-2021 was retrieved. A computing program such as python or R was used in order to understand the movement of ocean currents at different levels. A difficulty that was encountered directly stemmed from the Corona Virus Pandemic. Unfortunately, COVID-19 halted countries' sea-going research activities worldwide, as well as travel restrictions and long periods of lockdowns. Due to the pandemic, IMAPOCEAN had to alter its experiment timeline in order to contribute to the slow Corona Virus. Schools limited all outside parties from in-school interaction to prevent the spread of the Corona Virus.

In November 2023 IMAPOCEAN citizen science research component was brought to students for them to understand and participate in Ocean research data exploration.

[8] Describe briefly the main achievements obtained and possible impacts, as well as possible difficulties encountered during the execution of the project. Use no more than 250 words.


hcmr
JERICO

4. Dissemination of the results[9]

Data can be displayed on web portals (eg Poseidon webpage). To ensure the output from our research informs research facilities and educational institutions we will be using The Sea Horse Tilt Current Meter, and student-built biodegradable oceanographic drones called “Drifters” which use GPS to monitor surface ocean current flow. Sea Horse Tilt Current Meter is a novel instrument developed recently by CoPI(Sheremet) for US National Oceanic

[9] Describe any plan you have to disseminate and publish the results resulting from work carried out under the Transnational Access activity in JERICO -S3: scientific articles, books - or part of them -, patents, as well as reports and communication to scientific conferences, meetings and workshops. Highlight peer-reviewed publications. **Note that any publications resulting from work carried out under the JERICO -S3 TA activity must acknowledge the support of the European Commission – H2020 Framework Programme, JERICO -S3 under grant agreement No. 871153.**

Atmospheric Administration (NOAA) to be used during fishy surveys. Our instruments will be deployed on the existing mooring and will collect additional measurements of currents and waves at different depths, which will provide data for comparison and cross-calibration of the instruments performance. Ocean Drifters provide valuable real-time data for scientists as well as stakeholders and engages students in citizen science.

The students will follow their student drifters on this website https://studentdrifters.org/tracks/

As the data set of both tools grows, additional scientific reporting opportunities can be identified.

This data was collected during the 2020-2021 season off of Pylos Greece, Demonstrating the seahorse current tilt meter.

1. Basically, only one current meter (out of 4) was recovered.

2. When reprogramming the logger, Manolis specified very sparse sampling rate once an hour for 20sec - should be about every 5 min or so.

3. Magnetometer on the current meter has failed - the readings are weird (Figure M.png). Maybe it was next to a magnet at some point during the transit or storage.

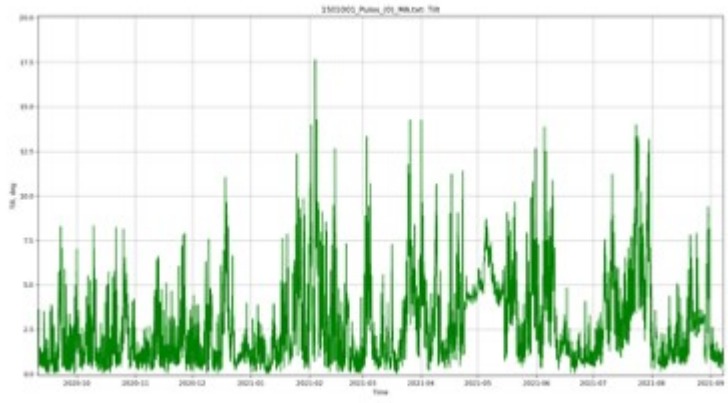
4. Accelerometer and Temperature channels worked well. I am able to derive the tilt of the instrument. See attached plot (Tilt.png).

Axy_zoom1.png shows detailed behavior during a burst (20s long) sampling.

This data is from an early stage of the research, the first deployment. This data allows us to analyze the performance of the instrument. Basically, the range of tilt angles shows that the instrument can work in relatively high current regimes. It will be helpful to compare the tilts with some other current measurements from the same mooring and plot a correlation diagram.

Also, we can plot Tilt vs Wind when we get meteo data from that area.

The sampling rate during bursts was adequate to get estimates of velocity, but the burst samplings need to be set to something faster than once an hour in order to collect more data and resolve higher frequencies.



-

5. Technical and Scientific preliminary Outcomes (2 pages max.)[10]

I.M.A.P.O.C.E.A.N is an international multilevel -ocean depth of 1590m to ocean surface 1m depth – an ocean current research experiment. With capabilities to expand around the globe. Scientific and technical objectives are to execute a multilevel study of the water

[10] Describe in detail results and main findings of your experiment at the present stage.

column using “Active” meaning Lagrangian (moving) and “Passive” meaning Eulerian (moored) monitoring tools. The moored monitoring tool is the “Sea Horse Tilt Current Meter” stationed at different depths on Hellenic Marine Research Center (HMCR) Deep-Sea Research Buoy in Pylos, Greece. These oceanographic tools, designed by scientists at Okeanolog, Lowell Instruments, and University of Rhode Island (URI) are suited for measuring waves and currents. The Sea Horse Tilt Meter used in this experiment is also known as the MAT-1 Data Logger™. This device is capable of recording absolute orientation (tilt), acceleration (including vibration), and temperature. The logger contains three sensors: a 3-axis magnetometer, a 3-axis accelerometer, and a thermistor. The system, packaged in a tough, waterproof PVC (300m depth) or titanium (4500m depth) case, is suitable for continuous use in a wide variety of demanding applications, including underwater. The moving monitoring tool is the student-built oceanographic “Drifter” which uses Global Positioning System (GPS) to monitor the top 1m surface ocean currents. Such Drifters are utilized by U.S.A’s National Oceanographic Atmospheric Administration (NOAA)’s Northeast Fisheries Science Center (NEFSC) to estimate fish larvae transport. Drifters can record and telemeter latitude and longitude position data in real-time via GLOBALSTAR satellite multiple times a day. New designs incorporate biodegradable materials such as wood, aluminum, bamboo, canvas, rocks for ballast. The GPS unit is attached to the top and foam buoys keep the electronic unit above the waterline. Underwater canvas sails catch the ocean current. Drifters can be built in any classroom and provide valuable real-time data for scientists as well as stakeholders while engaging students in citizen science.

In September 2023 project PI presented IMAPOCEAN to HCMR Crete employee during a summer seminar session

The Education Team of HCMR, Crete, and the POSEIDON team hosted students and teachers from the Heraklion School of Arts and Music School of Heraklion at Thalassocosmos (HCMR, Crete) for the JERICO S3 IMAPOCEAN TNA initiative. Under the coordination of Mrs. Ariadne Dimoulas and funded by JERICO S3 (HCMR PI: Dr George Petihakis), the IMAPOCEAN project (Integrated Multilevel Active Passive Ocean Current Education Advancement Network) seeks to actively involve young students in hands-on ocean current data collection by constructing and deploying Drifters. These

Drifters, sourced from the USA's NOAA and the Northeast Fishery Science Center (NEFSC), were initially designed for recording flow data related to fish larva movement. Constructed from materials like aluminum or bamboo, canvas, rocks for ballast, and a foam buoy with a GPS unit above the waterline, these Drifters can be assembled in a classroom setting with minimal experience. The Drifters play a crucial role in recording meaningful sub-surface data by telemetrically reporting their movement using GPS at regular intervals. Beyond the educational aspect, this student-built oceanographic tool has the added benefit of actively involving students and their communities in ocean research through the entire process, from building to launching and monitoring the Drifters. During their visit to HCMR, the students participated in a presentation on ocean currents and scientific monitoring tools. Following the presentation, they engaged in the hands-on experience of building and decorating their Drifters. This initiative not only provides valuable insights into ocean science but also fosters a sense of participation and community engagement in ocean research among the students

[Maine], [Date (14/12/2023]

Location and date

Signature of principal investigator