

# The Texas A&M – University of Haifa Eastern Mediterranean Observatory: Monitoring the Eastern Mediterranean Sea

By Gianna Milton, Steven F. DiMarco, Anthony H. Knap, John Walpert, and Roeë Diamant

The need for sustained long-term measurements of the ocean has increased due to climate variability and societal desire to mitigate the impact of natural disasters on coastal communities. Knowledge about key ocean variables is essential for monitoring and predicting long-term ocean variability, and real-time capability is needed to inform short-term forecasting systems to assist coastal managers and response teams. Ocean observatories collect oceanographic data for scientific and societal reasons, and open access to these data enables their use by the general public, decision-makers, and stakeholders.

Established in 2014, THEMO is a partnership between Texas A&M University and the University of Haifa to service the eastern Mediterranean Sea nexus of economic, environmental, industry, and scientific interests. The observatory is based on the Texas Automated Buoy System (TABS), which provides near-real-time MetOcean information to regional coastal managers and decision-makers in the context of offshore energy operations (Walpert et al., 2021). TABS data are used to guide emergency response in the event of accidental environmental releases (oil/gas leaks, spills, contamination) and environmental hazards, (severe weather and harmful algal blooms), and to advance scientific understanding of MetOcean processes. THEMO is standing watch in the eastern Mediterranean to provide the same community service.

THEMO is comprised of two real-time reporting 2.25 m diameter surface discus buoys (Diamant et al., 2018; Figure 1). The deep-water (1,500 m depth) buoy, deployed November 2018, is 80 km from the Israeli coast in the Levant Basin (32.79°N, 34.38°E). The shallow (124 m depth) buoy, deployed in June 2017, is 8 km from the northern Israeli coast (33.04°N, 34.95°E). Both buoys are equipped with MetOcean sensors that collect atmospheric (temperature, pressure, wind, humidity) and sea surface (temperature, fluorometer, velocity) observations. Data are relayed in near-real time to the University of Haifa for processing and dissemination via HF radio communication. A McLane profiler (MMP) at the deep location, deployed in August 2019, provides subsurface oceanographic data: conductivity, and temperature measurements and bottom-mounted

acoustic Doppler current profiler (ADCP) data. A stand-alone McLane sediment trap (MK8-13) collects particulate material at monthly intervals.

Data analysis has revealed the temporal evolution of the hydrographic vertical structure and surface mixed layer of the region, surface gravity wave climatology, vertical current structure, and the presence of particle deep resuspension and transport events 200–400 m above bottom.

All data from the mooring sites are processed with internationally recognized quality-assurance and quality-control protocols (Diamant et al. 2020). Increases in oil and gas exploration in the basin will increase the value of THEMO's data to the general coastal population to mitigate potential damage from natural and accidental hazards.

## REFERENCES

- Diamant, R., A. Knap, S. Dahan, I. Mardix, J. Walpert, and S.F. DiMarco. 2018. THEMO: The Texas A&M – University of Haifa – Eastern Mediterranean Observatory. Paper presented at 2018 OCEANS-MTS/IEEE Kobe Techno-Oceans (OTO), May 28–30, 2018, <https://doi.org/10.1109/OCEANSKOBE.2018.8558873>.
- Diamant, R., I. Shachar, Y. Makovsky, B.M. Ferreira, and N.A. Cruz. 2020. Cross-sensor quality assurance for marine observatories. *Remote Sensing* 12:3470, <https://doi.org/10.3390/rs12213470>.
- Walpert, J., A.H. Knap, S.F. DiMarco, and S.G. Buschang. 2020. Texas Automated Buoy System (TABS): 25 years providing data for spill response, modeling and research. Paper presented at Global Oceans 2020: Singapore-US Gulf Coast, October 5–30, 2020, Biloxi, MS, <https://doi.org/10.1109/IEEECONF38699.2020.9389429>.

## ACKNOWLEDGMENTS

THEMO is a collaboration between the University of Haifa, Texas A&M University, and Texas A&M University System. THEMO data are accessible at: <https://themo.haifa.ac.il/>. TABS data are accessible at <http://tabs.gerg.tamu.edu>.

ARTICLE DOI: <https://doi.org/10.5670/oceanog.2023.s1.21>

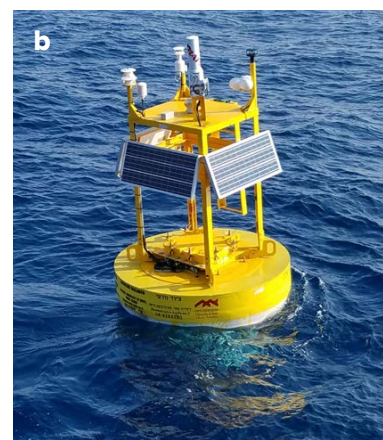


FIGURE 1. (a) A THEMO buoy is prepared for deployment in the eastern Mediterranean Sea off the coast of northern Israel. (b) The THEMO Shallow Buoy is a 2.25 m discus buoy equipped for near-real-time reporting of MetOcean parameters and with downward-looking ADCP.

#### AUTHORS

**Gianna Milton** ([gmilton@tamu.edu](mailto:gmilton@tamu.edu)), **Steven F. DiMarco** ([sdimarco@tamu.edu](mailto:sdimarco@tamu.edu)), and **Anthony H. Knap**, Department of Oceanography and Geochemical and Environmental Research Group, Texas A&M University, College Station, TX, USA. **John Walpert**, Geochemical and Environmental Research Group, Texas A&M University, College Station, TX, USA. **Roe Diamant**, Underwater Acoustic and Navigation Laboratory, Department of Marine Technology, Leon H. Charney School of Marine Sciences, University of Haifa, Haifa, Israel.

#### ARTICLE CITATION

Milton, G., S.F. DiMarco, A.H. Knap, J. Walpert, and R. Diamant. 2023. The Texas A&M – University of Haifa Eastern Mediterranean Observatory: Monitoring the eastern Mediterranean Sea. In *Frontiers in Ocean Observing: Emerging Technologies for Understanding and Managing a Changing Ocean*. E.S. Kappel, V. Cullen, M.J. Costello, L. Galgani, C. Gordó-Vilaseca, A. Govindarajan, S. Kouhi, C. Lavin, L. McCartin, J.D. Müller, B. Pirenne, T. Tanhua, Q. Zhao, and S. Zhao, eds, *Oceanography* 36(Supplement 1):69, <https://doi.org/10.5670/oceanog.2023.s1.21>.

#### COPYRIGHT & USAGE

This is an open access article made available under the terms of the Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by/4.0/>), which permits use, sharing, adaptation, distribution, and reproduction in any medium or format as long as users cite the materials appropriately, provide a link to the Creative Commons license, and indicate the changes that were made to the original content.