



# Energy Harvesting for Underwater Gliders

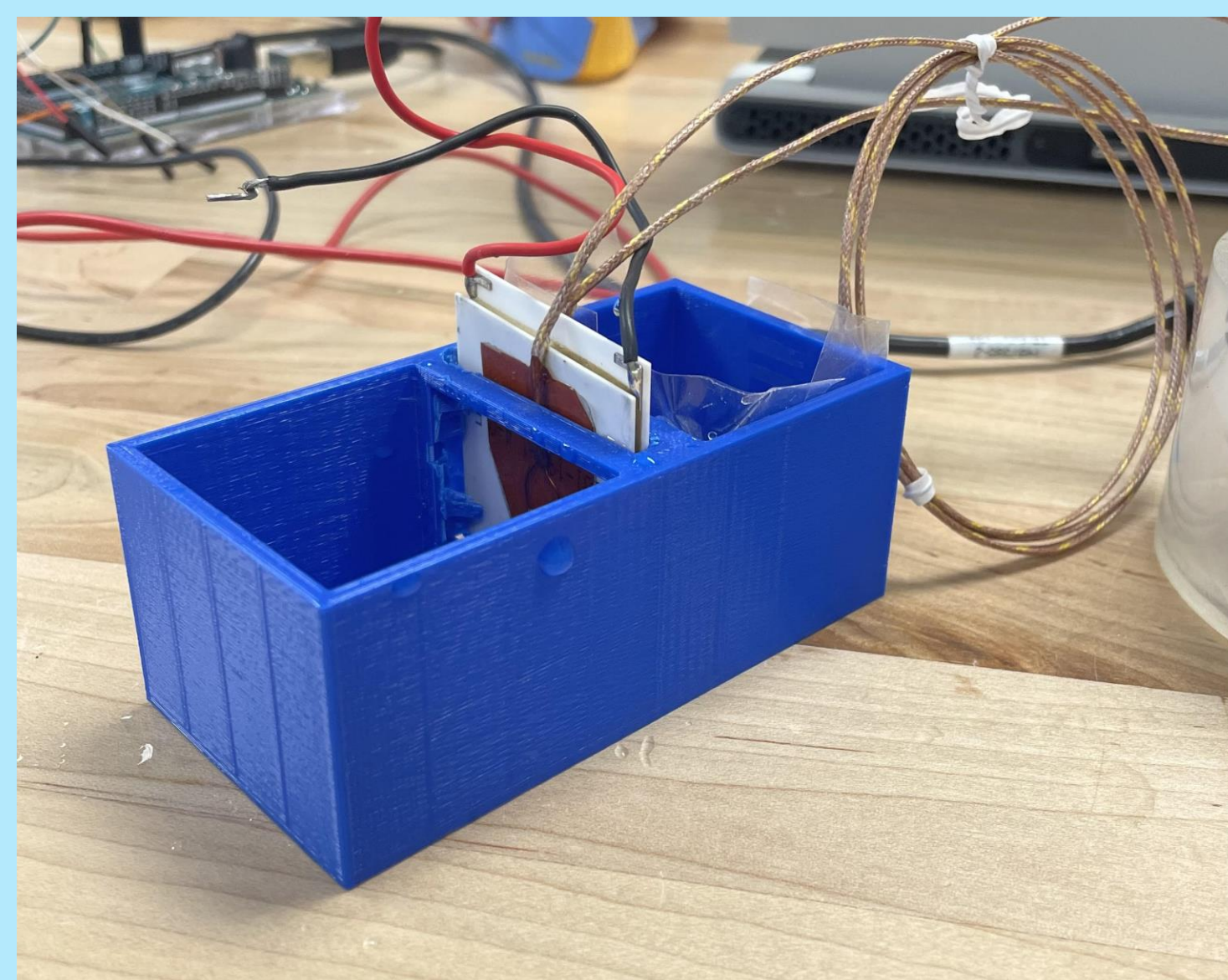
Joseph Mollica, Sara Bradley, Samuel Duval, and Patrick Molnar

Faculty Advisors: Camilo Ordonez and Juan Ordonez

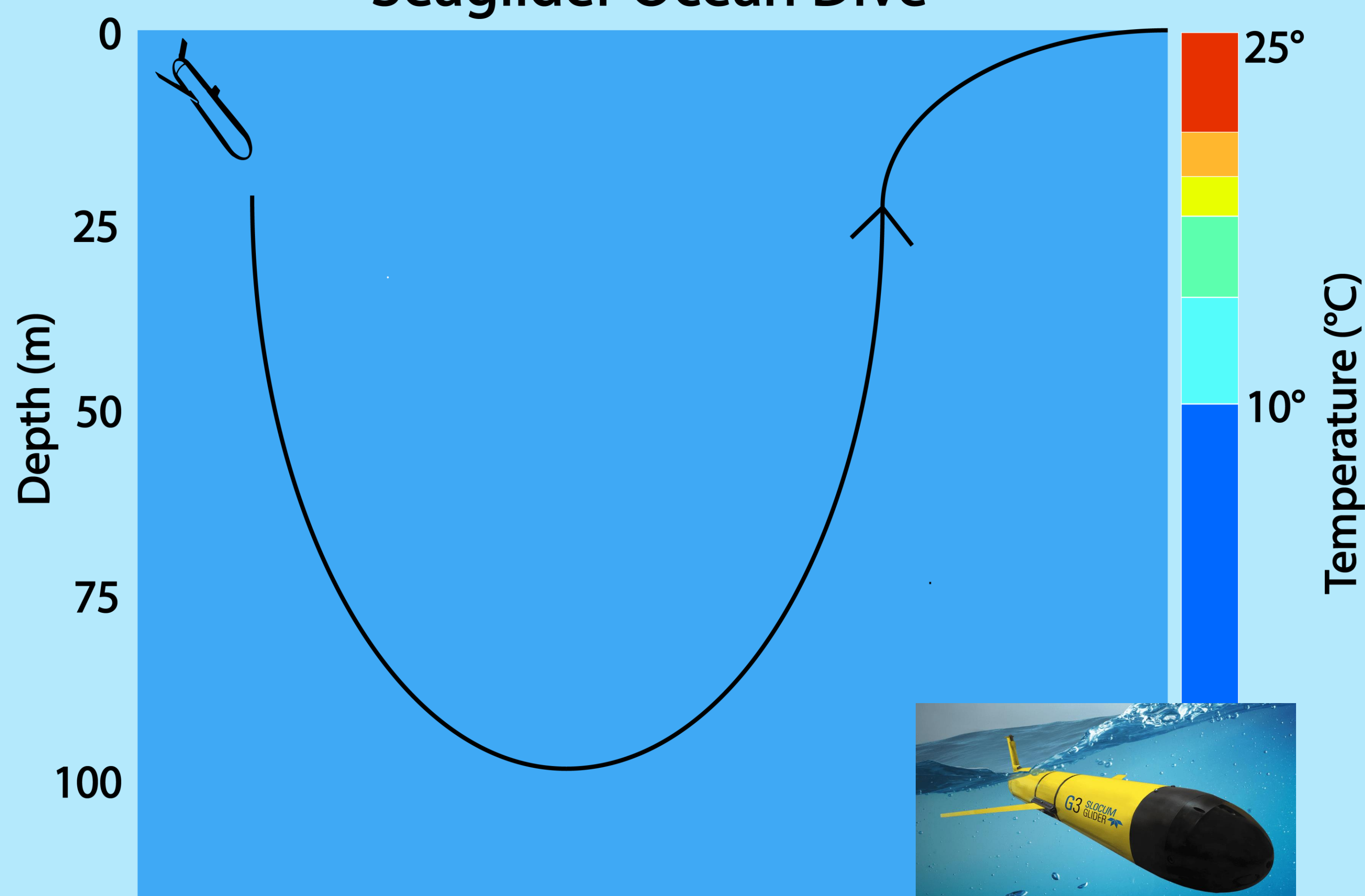


## Abstract

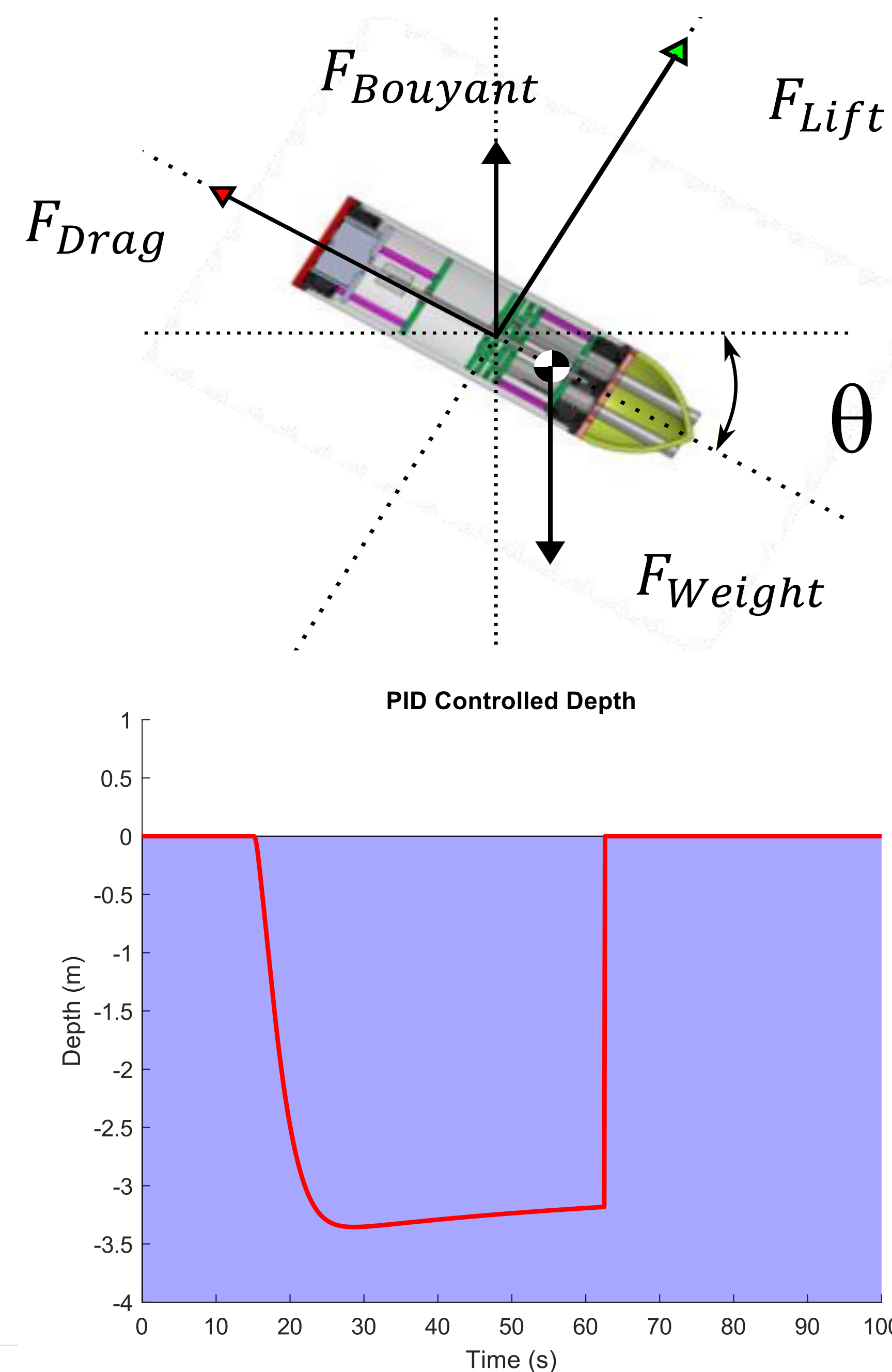
Seagliders are autonomous underwater vehicles that collect data about the ocean. This includes information about temperature, conductivity, currents, and depth. They function by traveling in sine-like wave patterns, traveling deep into the ocean while collecting water, and then using energy to release the water as they travel back to the surface, where they transmit information back to the base station. To improve their endurance, this research studies the potential of using Phase Changing Materials (PCMs) to harvest energy for such systems.



Seaglider Ocean Dive



## AUV Dynamics and Control

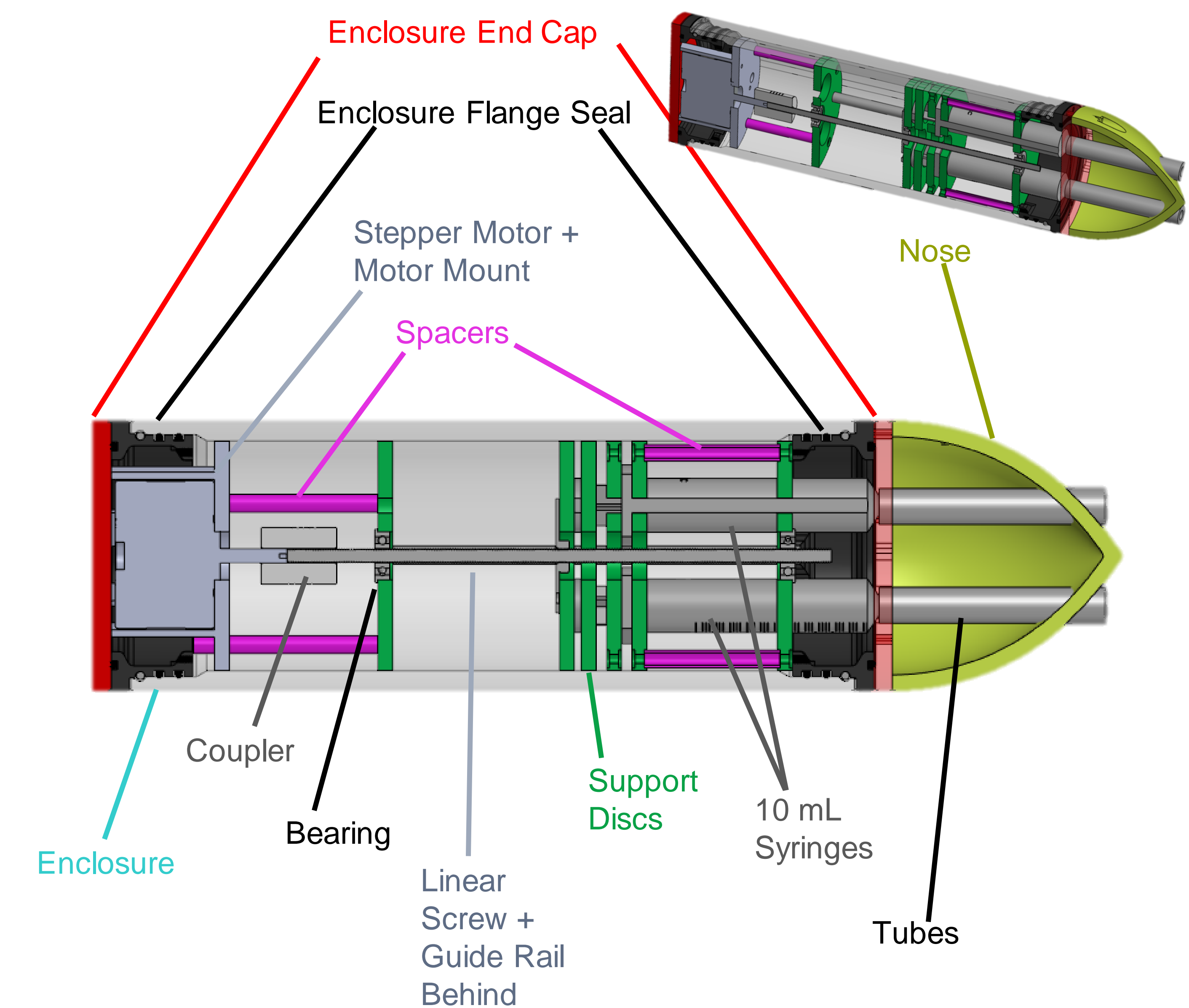


## PCMs and Energy Harvesting

An initial task of the project targets the selection of the PCM. The principal characteristics to be selected are the PCM's phase transition temperature –that should be consistent with the one that results from the radiative energy balance once the glider reaches the surface, the latent heat, and the density of both phases.

A testbed to evaluate different PCMs is being built. It consists of a PCM containment unit, a controlled heater, and instrumentation.

## Mechanical Design of AUV



## Future Plans

- Characterization of thermoelectric generator and PCM under AUV operating conditions.
- Incorporation of PCM into the AUV.
- Field Testing of AUV.
- Integrate system with motion planning.

## References

- Tatone, Francesco & Massimo, Vaccarini & Longhi, Sauro. (2009). Modeling and Attitude Control of an Autonomous Underwater Glider. IFAC Proceedings Volumes (IFAC-PapersOnline). 42. 217-222. 10.3182/20090916-3-BR-3001.0047.
- Raoux, Simone, Et Al. "Phase Change Materials And Phase Change Memory." *MRS Bulletin*, Vol. 39, No. 8, 2014, Pp. 703–10, <https://doi.org/10.1557/Mrs.2014.139>.