Beckett Colson
Joint Program in Oceanography/Applied Ocean Science & Engineering
Woods Hole Oceanographic Institute (WHOI)

Developing In Situ Instrumentation
to Monitor Anthropogenic Change

Abstract: To predict and mitigate anthropogenic impacts on the ocean, we must understand the underlying systems that govern the flow of carbon and pollutants throughout it. In situ observations over time provide empirical evidence to ground analytical models, which could predict impacts or simulate intervention strategies. Unfortunately, in situ instrumentation is often lacking or nonexistent for key indicators of anthropogenic change. To help fill the technological gap, we developed two instruments for (1) the ocean carbon system and (2) microplastic quantification. The CSPEC is a carbon system instrument that measures the partial pressure of carbon dioxide (pCO₂) and dissolved inorganic carbon (DIC) using tunable diode laser absorption spectroscopy (TDLAS) and a deep-sea membrane inlet. The design of the CSPEC will be presented, from first-principles modeling, to surface-monitoring prototype, to a deep-sea demonstration at the Guaymas Basin hydrothermal vent fields. Finally, the demonstration of impedance spectroscopy for flow-through detection of microplastics, and its potential for in situ microplastic quantification will be shared.

Biography: Beckett Colson is a PhD candidate in the MIT and Woods Hole Oceanographic (WHOI) Joint Program. He received his SB in Mechanical and Ocean Engineering from MIT in 2016. He is a student in Dr. Anna Michel's laboratory at WHOI where he designs in situ instrumentation for dissolved gases, the carbon system, and microplastics. He enjoys the interdisciplinary nature of oceanographic research and his goal is to develop tools to help scientists understand anthropogenic impacts on the world’s oceans. As part of his doctoral research, Colson has participated in three oceanographic research cruises.