

# Multidisciplinary Simulation, Estimation, and Assimilation Systems Seminar Series

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## 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 ( $p\text{CO}_2$ ) 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.

Friday, July 29, 2022

2:00 PM; Rm. 5-314

Massachusetts Institute of Technology  
77 Massachusetts Avenue  
Cambridge, MA 02139

Host:

Pierre Lermusiaux  
<http://mseas.mit.edu>

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