



Schematic of the proposed field experiment

Approach

- Field experimentation
 - Generate turbulent wake signatures in a stratified real-ocean environment using a tow-body deployed from a research vessel
 - With remote-sensing oceanographic sensors mounted on a USV and an AUV, maneuver the unmanned systems through the area to collect in-situ measurements of the wake and surrounding environment.
 - Apply data analysis algorithms, to include machine-learning methods
- Numerical experiments
 - Use DoD High Performance Computing resources to conduct a series of high-resolution numerical simulations to help interpret results of field experiment.

Deliverables

- Collect in situ measurements of turbulent wakes using AUV and USV equipped with remote sensing oceanographic instrumentation.
- Analyze near and intermediate fields in a wake using remote measurements from AUV and USV platforms and corresponding numerical models.
- Explore of wake dynamics as a function of submarine speed and the motion pattern.
- Develop new detection algorithms and assess hydrodynamic detection vulnerabilities.

Operational Impact

- Interest in hydrodynamically-based detection systems has been motivated by: (i) continuous technological advances in sensor development which has led to improved measurement accuracy and (ii) proliferation of ultra-quiet air-independent propulsion submarines whose signal-to-noise levels fall significantly below passive acoustic thresholds.
- Major unresolved dynamical questions and technological challenges remain including the possibility of remote detection using autonomous platforms