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Modeling in a Rapidly Evolving Arctic Ocean

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The Arctic Ocean is rapidly warming. The hydroacoustic environment will be impacted by the changing thermohaline structure, increased marine traffic, changes in sea ice coverage, and possible increases in microseism/storm noise. This will inevitably lead to obsolescence for today's ocean acoustic models. The only sophisticated way to make predictions is using decadal to centennial integrations of fully coupled Earth system models (ESMs). At the Los Alamos National Laboratory we are working to create the first version of an ESM, the Department of Energy's Energy Exascale Earth System Model (E3SM), capable of driving an acoustics model in a rapidly evolving Arctic Ocean. Here we analyse existing E3SM simulations to investigate how well we currently capture water properties for the upper 1000 m of the Arctic water column, including changes that could impact acoustic wave propagation. We present preliminary results of model validation against temperature and salinity observations from ice-tethered ocean profilers. The goal of this effort is to provide boundary ocean conditions to the acoustic model, to enable quantification of the ocean acoustic implications of climate change as well as to create a climate aware atlas of global acoustic noise and propagation adjustments for non-proliferation signal detection.

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Promotional text

We use an Earth System Model to estimate physical properties affecting acoustic propagation in a rapidly changing Arctic Ocean and compare the results to measured hydroacoustic travel times.

Oral preference format

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