Extracting acoustic travel times from modeled ocean circulation

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Direct ocean observing systems are a scarce set of data that build the backbone for understanding the current state of the ocean. These systems are limited in areas of high variability in temperature, salinity, and bathymetry. Pioneering work of [2] and [3] proposed efforts to extract detailed hydrographic information using sound propagation through the ocean, providing the scaffolding to improve our understanding of the ocean's interior. The integrated nature of such measurements makes acoustic thermometry a powerful application for monitoring regional to basin-averaged thermal changes in the ocean, a measurement that is difficult to achieve by individual “point” measurements (moorings, ship-borne CTD casts, or autonomous floats) alone. Through use of an emerging general circulation model [1], this work provides mappings from a discretized ocean circulation grid onto an acoustic domain allowing for inclusive computation of acoustic travel times within a dynamically evolving modeled ocean state. This process provides the necessary operators for model data comparison of ocean acoustic observable quantities within an oceanic state estimation framework.

Keywords: ICTCA 2023; computational oceanography, ray tracing, data assimilation

References

[1] A. Adcroft, et al. *Implementation of an atmosphere-ocean general circulation model on the expanded spherical cube,* Monthly Weather Review, 132 (2004), pp. 2845-2863.
[2] W. Munk and G. Williams, *Acoustic oceanography*, Nature, 267 (1977), pp. 774-778.
[3] W. Munk and C. Wunsch, *Ocean acoustic tomography: A scheme for large scale monitoring,* Deep Sea Research Part A. Oceanographic Research Papers, 26 (1979), pp. 123-161.