

Abstract Submitted  
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**Inferring physical parameters in ocean acoustic models using the Fisher information**<sup>1</sup> MICHAEL MORTENSON, TRACI NEILSEN, MARK TRANSTRUM, Brigham Young University, DAVID KNOBLES, Knobles Scientific and Analysis — The Fisher information matrix (FIM) and the Cramer-Rao bound (CRB) are ubiquitous tools for quantifying uncertainty in multi-parameter models. However, the FIM involves derivatives of a forward model with respect to parameters that are difficult to estimate in ocean acoustic models. This work presents a methodology for accurately estimating derivatives using physics-based parameter preconditioning and Richardson extrapolation. The methodology is validated on a case study of transmission loss from a range-independent normal mode model in shallow ocean environments with a single sediment layer over a basalt basement. Five examples of sediment types ranging from mud to gravel are considered across frequencies over the 50–400 Hz band. Results demonstrate the utility of FIM and CRB analysis in quantifying both model sensitivities and parameter uncertainties, and in revealing parameter coupling in the model. This methodology is a general tool that can inform model selection and experimental design for inverse problems in different applications.

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