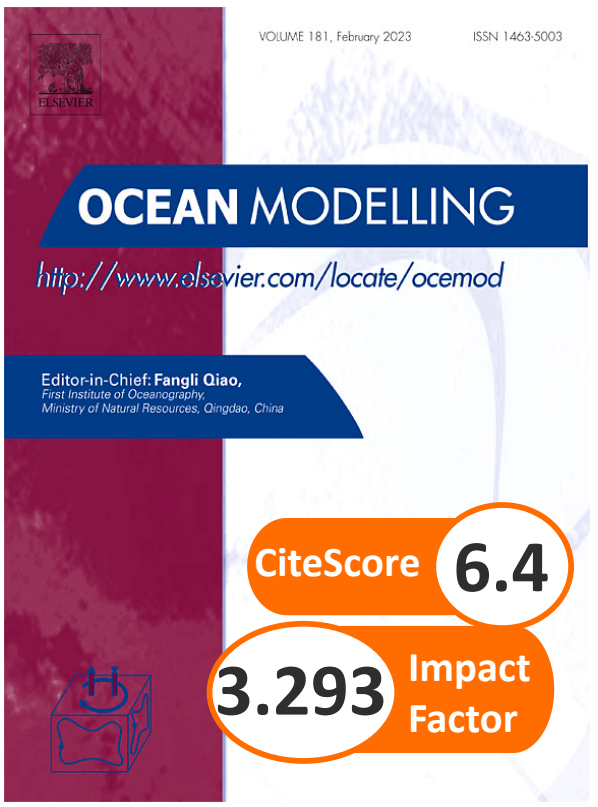
*Special Issue*

# Machine Learning for Ocean Modelling




Ocean science challenges include the sparse data and expensive sea experiments with multiple platforms and sensors managed by different people, where much time is devoted to planning, execution, and data processing. Accurate data-assimilative or process-oriented ocean modeling is as time-consuming, with complex numerical schemes and implementations, many parameters sensitivity studies, and ensembles of simulations. Relatively less effort is spent on exhaustive analyses of measured or simulated data. Much ocean research thus leaves behind significant amounts of unanalyzed, yet scientifically-valuable data.

The nascent explosion of artificial intelligence (AI) methods, from dynamic Bayesian inference to deep learning (DL), provides an unprecedented opportunity to help ocean modelers analyze data and accelerate scientific progress by extracting new knowledge and models. A range of issues and challenges however need to be addressed to realize this feat. They include: account for the fundamental conservation laws, known invariants, stochastic partial differential equations (PDEs), and other uncertain prior knowledge; go beyond inference engines that are mostly statistical regression based; develop robust machine learning (ML) with theoretical guarantees; learn from dynamic, nonlinear, spatiotemporal, multiscale, and stochastic high-dimensional simulation fields; deal with sparse, multivariate, heterogeneous, and noisy ocean measurements; identify the most informative data for diverse learning objectives; implement and validate AI software that can work with uncertainty and real ocean complexity, and interact with humans; interpret the learned ML models and weights into fundamental high-level knowledge; and finally, discover ocean processes and deduce new underlying algebraic/symbolic dynamical relations through the automated application of such software, hence improving ocean models and increasing predictive capabilities.

We are interested in studies that provide important new developments in all aspects of Machine Learning for Ocean Modelling, including the above challenges but also related questions.

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## Submission deadline:

**December 1, 2023**

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