

Ocean and Coupled Earth System Emulator Development

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Abstract

Machine Learning emulators have shown extraordinary skill in replicating atmospheric states and their application to emulate ocean and coupled earth systems offers similar promise. We have adapted the Anemoi framework to predict the couple 3D ocean, atmosphere, ice, and land states. Using a comprehensive suite of baselines to isolate the impact of coupling, we have shown that the two-way coupling significantly impacts the forecast of key surface ocean quantities such as SST and SSH on 10-15 days lead times. The atmospheric variables however show a relatively lower impact on standard error metrics at these time scales, but this is under active investigation using longer lead times and process-level diagnostics. The framework is also set for further advancement using a more optimized set of coupled variables, increased spatial resolution, and refined ocean-only and atmosphere-only components using iterative fine tuning. The most up-to-date results will be presented from both ocean-only and coupled emulators, along with the lessons learned and future directions.