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SPEEDY-NEMO: performance and applications of a fully-coupled intermediate-complexity climate model

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A fully-coupled general circulation model of intermediate complexity is documented. The study presents an overview of the model climatology and variability, with particular attention for the phenomenology of processes that are relevant for the predictability of the climate system on seasonal-to-decadal time-scales. It is shown that the model can realistically simulate the general circulation of the atmosphere and the ocean, as well as the major modes of climate variability on the examined time-scales: e.g. El Niño-Southern Oscillation, North Atlantic Oscillation, Tropical Atlantic Variability, Pacific Decadal Variability, Atlantic Multi-decadal Variability. We demonstrate the ability of the model in simulating non-stationarity of coupled ocean-atmosphere modes of variability. Potential applications of the model are discussed, with emphasis on the possibility to generate sets of low-cost large-ensemble retrospective forecasts. We argue that the presented model is suitable to be employed in traditional and innovative model experiments that can play a significant role in future developments of seasonal-to-decadal climate prediction.