

EGU22-1094

<https://doi.org/10.5194/egusphere-egu22-1094>

EGU General Assembly 2022

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Ocean Modeling with Adaptive Resolution (OMARE) – A new multi-scale modeling framework based on NEMO

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We propose a new ocean modeling framework (OMARE) which supports multi-scale simulation of the ocean through adaptive mesh refinement (AMR). It is based on refactoring NEMO model onto a modern software middleware of JASMIN, which enables, besides AMR, parallel computing platforms (with MPI), dynamic computational load balancing, transparent parallel I/O, etc. We demonstrate the three-level dynamical refinement which span the climate-centric resolution (0.5-deg) and submesoscale-resolving resolution (0.02-deg). The idealized double-gyre test case simulates realistic western boundary current system, and captures the dynamically changing, mesoscale- and submesoscale-rich regions with AMR. We also evaluate and analyze the computational performance of OMARE on typical high-performance computing platforms.