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Hierarchical domain decomposition in FESOM v.2.0: Speedup and scalability

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In this work, we focus on performance optimization issues in the Finite Element Sea Ice-Ocean Model (FESOM) v.2.0.

Compared to the previous version v.1.4, which employs the finite element discretisation for solving the dynamical equations, the recently emerged release is based on the finite volume approach with the cell centred placement of horizontal velocities (quasi- B-grid). The new version of FESOM shows a significant improvement in the performance compared to older releases and demonstrates a factor of 3 speedup in model runs.

Further improvement is achieved by making use of hierarchical mesh decomposition based on recursive use of METIS software package. This feature allows to take into account the specifics of the target hardware platform in order to obtain a partitioning that is better optimized in terms of communication and load balance.