

EGU24-12427, updated on 20 May 2024

<https://doi.org/10.5194/egusphere-egu24-12427>

EGU General Assembly 2024

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Km-scale climate simulations with IFS-FESOM

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Within the EU's Destination Earth (DestinE) initiative we are developing a digital climate twin with km-scale resolution. This enables us to resolve physical processes that, so far, have only been represented by approximations. This core model setup (called digital twin engine) is able to run multidecadal simulations for historic periods as well as different future scenarios in unprecedented resolution which will be used by decision makers.

In phase one of DestinE, our goal is to run a control simulation (under 1950 pre industrial conditions), a historic simulation from 1990 to 2020 and finally, projection simulations from 2020 to 2040. The control run will be performed with a global atmospheric resolution of 9km, while the projection simulations use 4km. The ocean component uses the unstructured NG5 mesh, which means an approximate resolution of 5km.

In this work we present the latest iteration of the IFS-FESOM model, the Integrated Forecasting System coupled to the Finite volume Sea Ice-Ocean Model FESOM2. We explain its components and recent improvements, including the integration of ECMWF's IO-server and post processing toolkit multio into the FESOM2 component and the introduction of a novel runoff mapper. Preliminary results from our kilometre-scale simulations are shown and compared to preindustrial conditions, with the primary objective to quantify effects of a ~1K warming world.