Implementation and Inter-comparison of the CICE and LIM Sea Ice Model Component in the Common UKMO-NOCS NEMO Configuration

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At present the National Oceanography Centre Southampton (NOCS) employs a range of sea ice models in the NEMO-NOCs system: LIM2 [1], LIM3 [2] and CICE [3]. In WP4 of the *MyOcean* EU Program we carry out inter-comparison of the LIM2/3 and CICE components in the context of the global simulations. The aim is to assess the importance of sea ice dynamics and thermodynamics for global and regional sea ice distributions and the impact on the ocean simulations.

We have examined model sensitivity (in 1 and ¼ degree model configurations) to the choice of ice parameters, ocean- and air-ice drag, sea ice-ocean coupling frequency, and to different forcing fields, DRAKKAR Data Set v.3 and v.4 (DFS) [4], and Coordinated Ocean Referenced Experiments (CORE2) [5]. We have also performed tests with model resolution (horizontal and vertical), length of the model spin-up, initial sea ice conditions, and strength of salinity restoring. From the tests we identified atmospheric forcing and, specifically, air near surface temperature as a main sensitivity parameter for our model configurations. The main difference came from the runs with DFS3 forcing on one hand and runs with DFS4 and CORE2 forcing on the other: CORE2 increases mean annual sea ice thickness by 35 cm (compared to DFS3), with DFS4 the thickness is up by 15 cm.

We have examined the impact of model resolution and the choice of sea ice model on the ocean circulation; the preliminary results with eddy-permitting model configurations (ORCA 1/4) show a tighter and stronger Atlantic inflow through the Nordic Sea and warmer Fram Strait Branch in the Eurasian Arctic Ocean. Both ORCA 1 runs demonstrate a certain degree of similarity, although the simulations with CICE present weaker Atlantic water inflow through the Norwegian Sea and Fram Strait, as well as a more diffusive circulation of this water mass in the Nansen and Amundsen Basins and colder Beaufort Sea Gyre. The returned southward flow of the Atlantic water through the western Greenland Sea is weak in the ORCA 1 integrations.

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