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Biogeochemical modelling of the Arctic system: role of the sea-ice and pelagic systems linkage on the primary production

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The Arctic system is subjected to a rapidly changing environment since the last tens years. In this system, the primary production is principally supported by pelagic phytoplankton production. However, sea-ice algae play an important role in the total arctic primary production, and therefore represent a crucial element in the entire Arctic food web dynamic. A proper representation of the sea-ice algae phenology and the linkage with the pelagic and benthic ecosystems taking into account the sea-ice structural changes appear essential to understand the Arctic ecosystem dynamics and its future changes. In order to study the dynamics of the Arctic ecosystem in the Barents Sea area, we have further developed the biogeochemical model ECOSMO by implementing a sea-ice algae group in the model formulation. In a first attempt to investigate and solve the scientific and technical challenges related to the coupling between the pelagic ecosystem and the sea ice biology, the model was implemented in a 1-d application of the general ocean turbulence model GOTM. Here we present results from this numerical framework, aiming specifically at understanding the linkage between pelagic and sea-ice ecosystem. The results already indicate how the physical environment and the projected changes in sea-ice coverage impact the entire arctic ecosystem dynamic.