



Model-data comparison and data assimilation of mid-Holocene Arctic sea-ice concentration

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The consistency between a new quantitative reconstruction of Arctic sea-ice concentration based on dinocyst assemblages and the results of climate models has been investigated for the mid-Holocene. The comparison shows that the simulated sea-ice changes are weaker and spatially more homogeneous than the recorded ones. Furthermore, although the model-data agreement is relatively good in some regions such as the Labrador Sea, the skill of the models at local scale is low. The response of the models follows mainly the increase in summer insolation at large scale. This is modulated by changes in atmospheric circulation leading to differences between regions in the models that are albeit smaller than in the reconstruction. Performing simulations with data assimilation using the model LOVECLIM amplifies those regional differences, mainly through a reduction of the southward winds in the Barents Sea and an increase in the westerly winds in the Canadian Basin of the Arctic. This leads to an increase in the ice concentration in the Barents and Chukchi Seas and a better agreement with the reconstructions. This underlines the potential role of atmospheric circulation to explain the reconstructed sea-ice concentration changes during the Holocene.