

Modelling spatio-temporal variation of surface hydrography in an Arctic shelf sea

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The Arctic Ocean has gained increasingly interest since the climate change is modifying the physical conditions and the biota in the Arctic. Through the decline of Arctic sea ice, there has been changes in the heat and salinity budgets, which control habitats of many marine species. Understanding spatial and temporal variation of hydrography is needed when assessing biological changes.

We use a hierarchical spatio-temporal Bayesian model to study the variation of sea surface temperature and salinity in the Kara Sea from 1980 to 2000. We are able to make accurate predictions and calculate the uncertainties related to them. The seasonal and inter annual variation of hydrography is explained by local ice conditions and regional climate related variables. The lowest salinity levels are found in front of the river estuaries and salinity increases through distance to the rivers as the impact of Atlantic water increases. The fresh water circulation and saline water inflow are controlled by air pressure changes. Temperature decreases when moving to north and is related more to seasonality than to environmental variables. Salinity is a major factor defining the species composition between saline and brackish water communities as temperature is more important to biological activity.

This is the first study to model surface hydrography in the Kara Sea in order to make accurate predictions and to analytically assess their uncertainty. As there is a need for hydrographic information for marine area planning, climate change studies and biodiversity assessments, our methodology supports them with an efficient statistical tool.

Keywords: Spatio-temporal, Arctic shelf sea, surface hydrography, Bayesian inference, uncertainty

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