Bayesian source apportionment of organic carbon in the East Siberian Sea

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Abstract

In this thesis work, data from a climatology study exploring the effects of climate warming in northeastern Siberia is analysed. Thawing of the permafrost and subsequent release of greenhouse gases such as carbon dioxide and methane is considered to be one of the most powerful factors that could have a worsening effect on global warming. The study in question seeks to contribute to improving on the current poor understanding of this situation through investigation of the relative proportions of organic carbon from riverine, coastal erosion and marine sources in surface sediments collected from the East Siberian Sea, at four different sites along a 500 km transect of the Kolyma paleoriver. To this end, a so-called linear mixing model can be used. This type of model is used in many scientific applications where the aim is to investigate the relative contributions of multiple sources to a mixture. Statistical problems include how to estimate uncertainty in the proportion estimates. This thesis work illustrates the use of Bayesian methods to analyse this kind of data and different models are compared. The results for the selected model indicate that the marine organic carbon proportion increases with increased distance from the river mouth, while the riverine or coastal erosion or both decrease, and moreover that at the first measurement station, the marine component is lower than both the riverine and the coastal erosion component, while for the last measurement station, the marine proportion is similar to that of coastal erosion while the riverine proportion is lower.

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