Statistical Approaches for the Sources Proportions of Organic Carbon in the East Siberian Sea

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Abstract

This thesis is a study on organic-carbon emission in the Arctic region which is a potential contributor to global warming. The carbon from different sources have distinct characteristics and contribute differently to the greenhouse effect. Accurate statistical approaches are needed for the problem of determining the proportions of OC sources. This study focuses on testing alternative meth- ods to the proportions estimation problem, based on sample data measured in East Siberian Sea located near Kolyma river delta. The sources are carbon from the Kolyma river, coastal erosion and the Arctic Ocean. There are 8 measurement stations where data were collected, and 4 of them are consid- ered in this study. The measurement stations are located from Kolyma river mouth all the way to the deep Arctic Ocean. Two OC isotopes δ^{13} and Δ^{14} were measured in each of the stations. A suitable model in this case is so called the (Gaussian) mixture model, and the solution of this model can be obtained by both frequentist methods and Bayesian methods. This thesis will cover both of the two methods. Eventually the results show that the riverine OC proportion declines when measurement stations move further away from river mouth; the marine OC proportion increases when measurement stations move towards the ocean; and the proportion for erosion OC stays relatively constant. However the results from the two respective methods indicate they have some different stochastic behavior.

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