

Effects of the buffer models in the estimation of the spatial SPM distribution at the sky of the Yokohama city

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In the estimation of the SPM distribution on successive region of interest from the concentrations observed at the observatories located in various places, the kriging method (Matheron, 1973) has been frequently employed. At the case, the universal kriging with auxiliary maps is used for minimize the variance of the estimation. In this study, two types of the auxiliary maps were used in the universal kriging estimation of the SPM concentration distribution. One of the map was a terrain map based on the DEM, and the other map is a buffer map generated from the buffer model based on the buffer distance from the coastline. However, if the region of interest is a wide area that includes a sea part and the land part, and if the observed values of SPM concentration at sea part have not been obtained, the validity of the estimated SPM distribution by the universal kriging may be affected by the used buffer models. Therefore, the effect of the buffer maps in the estimation of the SPM spatial distribution by a universal kriging was investigated in this study.

The SPM concentration data used in this study were published by the National Institute for Environmental Studies. The DEM data was extracted from the digital elevation models that have been published from the Geographical Survey Institute used with the FGDV application. The buffer model were created by the GIS applications based on the coastline data extracted from 1:200,000 Japan seamless geological map that was published from the Geological Survey of Japan. The coordinate projection method of all data were converted to Japan datum 2000 (JGD2000) to minimize the occurrence of error due to the difference of the projection method in geospatial computing. In the representation and geospatial statistical analysis of the data, the R language and its geospatial packages and, the Google earth and FOSS4G were used.

In this study, the observation points of the SPM concentration were present only on the land area and not present on the sea part. Moreover, the altitude of the sea part were all zero in the DEM data. Therefore, in the prediction by the universal kriging at the sea part, even if the variance of the prediction is small, the accuracy of the prediction may be lost at the relatively large buffer distances. So, some care may be required when the predicted distributions are used.

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