Geophysical Research Abstracts
Vol. 21, EGU2019-3524-1, 2019
EGU General Assembly 2019

Estimating the spatial variation of water quality in the middle and down streams of Han River using a modified indicator-ordinary kriging approach

Yi-Ming Kuo, Wen-wen Liu, and Enmin Zhao
China University of Geosciences, School of Environmental Studies, Wuhan, Hubei, China (ymkair@gmail.com)

Accurately estimating the spatial variation of water quality is critical and difficult in complex river systems with various sources of pollutants. Water quality of Han River was influenced by polluted tributaries, engineering projects, and point and non-point pollutants. This study determined the spatial variability of three typical water quality variables (total nitrogen (TN), total phosphorus (TP), and chlorophyll-a (Chl-a)) in Han River using a modified indicator-ordinary kriging (IK-OK) approach with multiple thresholds. The 94 water sampling sites distributed from the middle and down streams of Han River were collected in November 2015 (Dry season) and May 2016 (Wet season).The spatial variation of water quality levels were first estimated using indicator kriging (IK) and ordinary kriging (OK). Based on the water quality classification standard in China, IK accurately estimate spatial distributions of water quality levels for each variable (except for extreme values), and OK determines the influences of extreme values of water quality variables on the water quality of surrounding sites. When the heavy pollutant (extreme values) at the upper stream sites influence that at the downstream sites, the OK estimations were used to amend the IK estimations. Therefore, the combination of IK and OK was adopted to probabilistically categorize water quality of Han River for reducing the underestimation of the high values. The results reveal that the high concentrations (moderate or heavy polluted) of TP (> 0.2 mg/L) and Chl-a (> 12 μg/L) were more frequently observed in the downstream Han River than those in the middle stream in both dry and wet seasons. The intense precipitation in wet season in the downstream Han River increases runoff and carries high amounts of non-point phosphorus pollutants (TP) into receiving waters, and consequently increases the risk of the algal growth (Chl-a > 12 μg/L). The modified IK-OK approach with multiple thresholds can reduce the underestimation of high values and the saltation of water quality estimation, and finally obtain an accurate estimations of Han River water quality. The approach facilitates constructing a numerical model for more effectively evaluating water quality variation which can also provide useful site-specific managements to control water quality.