



Time-series based water quality index for characterizing spatial-temporal variations of water quality in the middle and down streams of Han River

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A large river system exhibits significant spatial-temporal variations of water quality with differences in nature conditions and anthropogenic impacts. Assessment of the impacts based on long-term water quality monitoring data is essential to water quality management. In this study a novel WQI (named as MAFAWQI) was constructed based on a time-series analysis technique (min/max autocorrelation factor analysis, MAFA). MAFAWQI was applied to identify the contribution of each individual variable to overall water quality and evaluate water quality statuses with monthly data from June 2014 to April 2017 at 8 sampling sites in the middle and down streams of Han River. It was identified by MAFAWQI method that organic and nutrient pollution are principle pollution sources at seriously polluted areas (tributaries sites in the study), and the scores of MAFAWQI are similar to those of a widely used WQI method (National Sanitation Foundation WQI, NSFQI). At the downstream of Han River surrounded by agricultural lands, MAFAWQI method determined that suspended solid and nutrients, especially phosphorus, contribute more to water qualities, and the scores of NSFQI are slightly higher (i.e. slightly overrate water quality) than those of MAFAWQI because NSFQI cannot identify the strong contribution of nutrients to overall water quality. In addition, MAFAWQI method also determined high potential of nitrogen pollution at the middle stream of Han River. The variables and corresponding importance in MAFAWQI can also be modified according to other territorial characteristics in other watersheds, which provides an efficient tool for evaluating water quality by considering characteristics of each area.