研究报告

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北运河水系主要污染物通量特征研究

Fluxes of the main contaminant in Beiyun River

关键词：污染物通量 聚类分析 因子分析 空间分布特征 北运河

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摘要：通过对北运河水系的水质进行季节性监测,采用聚类分析和主成分分析法将北运河29个采样监测点分为3种不同污染类别,对各类别分别进行污染源解析,并进一步估算了年径流量和主要污染物的年负荷通量.研究结果表明:北运河水质污染严重,主要污染物为氮、磷和耗氧有机物;按污染轻重,在空间上分可划分为3种类别:轻污染区位于天津地区,主要污染源为农业非点源污染,其次来自生活废水排放和上游工业废水排放;中污染区位于北运河北京段下游区域,污染物主要来自工业废水排放,其次为生活废水排放和农业非点源污染;重污染区为北京段上游区域,污染源主要为生活污水、工业污水排放.TN、NH_4^+-N、COD的负荷主要来源于重污染区的情况和中污染区的凉水河,两条河流TN、NH_4^+-N、COD输入量分别占总负荷输入量的30.22%和27.32%,32.02%和26.27%,34.17%和21.22%.TP负荷主要来自于清河、小中河,分别占总输入量的31.00%、26.36%.北运河中超过50%的TN、NH_4^+-N、COD污染负荷由轻污染区-天津地区农业灌溉输出.加强对北运河支流附近污水处理的管理力度,可作为治理北运河污染问题的首要措施,同时天津地区的污水灌溉所带来的环境风险应该予以重视.

Abstract: At 29 monitoring sites across Beiyun River, water quality parameters of samples collected at different seasons were obtained. Cluster analysis (CA) and Principal component analysis (PCA) were adopted to identify the spatial distribution of the major pollutants. Pollution sources and pathways were estimated based on the flux of major pollutants. The results indicated that the major pollutants were Nitrogen, Phosphorus and oxygen-demanding organic matters. Cluster analysis grouped 29 sampling sites into three clusters: lowly polluted (LP), moderately polluted (MP) and highly polluted (HP) sites. The varifactors obtained from Principal component analysis indicated that the pollution source in upstream of Beiyun River in Tianjin area was mainly related to agriculture non-point source pollution as relatively LP areas; pollution source in down stream of Beijing area was industrial wastewater pollution as MP areas; and pollution sources in upstream of Beiyun River in Beijing area were domestic sewage, industrial wastewater pollution as HP areas. Pollution loads of TN, NH_4^+-N, COD were mainly come from Qing River and Liangshui River, contributing to 30.22% and 27.32% of TN, 32.02% and 26.27% of NH_4^+-N, 34.17% and 21.22% of COD respectively. The TP load was from Qing River and Xiaozhong River, contributing to 31.00% and 26.36% respectively. More than 50% of TN, NH_4^+-N, and COD loads in Beiyun River was exported as the way of agriculture irrigation in Tianjin. The key measure to control pollution of Beiyun River is to enhance the management of sewage disposal near tributary. More attention should be paid on sewage irrigation in Tianjin area in case of potential environmental risks.

Key words: pollutant flux cluster analysis principal component analysis spatial distribution Beiyun River

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