快速检索 [　　　] 检索 高级检索

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研究报告

北运河武清段水污染时空变异特征

Temporal and spatial variations of water pollution in Wuqing section of Beiyunhe River

作　者	单位
张汪寿	首都师范大学资源环境与旅游学院,北京　100048
李晓秀	首都师范大学资源环境与旅游学院,北京　100048
王晓燕	首都师范大学资源环境与旅游学院,北京　100048
于　洋	首都师范大学资源环境与旅游学院,北京　100048
任万平	首都师范大学资源环境与旅游学院,北京　100048
李建辉	首都师范大学资源环境与旅游学院,北京　100048

摘要：通过对北运河武清段水系(主河道——北运河和龙凤河,北运河支流——柳河、灌溉沟渠)的水质进行监测,采用灰色关联法对水质状况进行评价,并利用多元统计法对污染的时空变异特征进行了分析.结果表明,北运河武清段水系17个观测点中有23.8%的观测点的水质为Ⅲ类水,12.7%为Ⅳ类水,63.5%为Ⅴ类水.水质存在时空变异,夏、冬季节各河道水质差异不显著,春、秋季节差异显著.沟渠水质最差,其总磷(TP)含量和BOD$_5$值明显高于其他河道;TP、硝态氮(NO_3^--N)、COD、总有机碳(TOC)、温度(T)、溶解氧(DO)和总氮(TN)解释了全部的季节性变异,BOD$_5$、pH、溶解性总固体(TDS)和叶绿素a(Chl-a)的季节变异主要受人为因素影响,氧化还原电位(ORP)、氨氮(NH_4^+-N)和亚硝态氮(NO_2^--N)次之.NH_4^+-N和TN解释了51%的空间变异,主河道的氮污染是由上游工厂和企业排放污水造成的;北运河武清段的主要污染物依次为:有机污染物、氨氮、硝态氮、酸碱废水和磷,污染表现为复合污染,点源仍是最主要的污染源.

Abstract：Understanding the temporal and spatial variations and major sources of water pollution are important in the water resource management. In this work, we collected water samples at 17 monitoring sites along the Wuqing section of Beiyunhe River (Tianjin, China) during the four seasons of 2010. Grey relational analysis categorized the data of 14 water quality variables based on national q uality standards for surface waters, China. There were 23.8% of monitoring sites atⅢclass of water quality level, 12.7% of Ⅳ class, and 63.5% of Ⅴ class. There was no significant difference between the water quality in summer and winter, buta significant difference between the water quality in spring and autumn. The water quality of irrigation canals were the worst, with the total phosphorus (TP) and biochemical oxygen demand (BOD$_5$) significantly higher than thosein other channels. Temporal and spatial variations of water indices were analyzed by multivariate statistical techniques. Total phosphorus (TP), nitrate (NO_3^--N), chemical oxygen demand (COD), total organic carbon (TOC), temperature(T), dissolved oxygen (DO) and total nitrogen (TN) accounted for 100% of seasonal variance. Seasonal variations of BOD$_5$, pH, total dissolved solids (TDS) and chlorophyll-a (Chl-a) were mainly affected by anthropogenic pollution, while the impacts of anthropic pollutionon oxidation reduction potential (ORP), ammonium (NH_4^+-N) and nitrite (NO_2^--N) were less significant. NH_4^+-N and TN accounted for 51% of spatial variance forsmall tributaries, main channel and sub-main channel in the basin. Due to discharge of sewage by factories, the nitrogen pollution in main channel was the heaviest. The major pollutants in Wuqing section of Beiyunhe River were organic pollutants, ammonia, nitrate, pH and phosphorus. In short, point source was still the major source of pollution in the Wuqing section of Beiyunhe River.

Key words：Beiyunhe River　water pollution　multivariate statistical techniques　temporal and spatial variation