

北京潮白河冲洪积扇地下水水化学的分层分带特征

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中文摘要:为探讨北京潮白河冲洪积扇第四系地下水系统水化学分布特征,依据地层结构及水文地质条件,于2008年枯水期采集浅、中、深层水样293组,用于水化学分析。利用数理统计法计算了总硬度、溶解性总固体、氨氮、铁、氟、硝酸盐、亚硝酸盐、氯化物、重碳酸根、硫酸根等10种组分上、中、下游不同含水层的算术均值和均方差。结果表明,浅层地下水除了NO₃⁻外,其余9种组分的算术均值均呈现由上游到中下游增大的趋势,均方差则中游较上游和下游大;整个冲洪积扇地下水均属偏碱性水,水化学类型多样,由上游的HCO₃-Ca·Mg型逐渐过渡到中下游的HCO₃-Ca·Na·Mg型和HCO₃·SO₄-Na·Ca·Mg型;随着往下游径流,地下水的化学类型趋于复杂多样,Cl⁻、矿化度和硬度等组分浓度升高。TDS、硬度、Cl⁻、NO₃⁻和电导率均与取样深度呈反相关关系,pH值则与深度成正相关。水化学结果显示冲洪积扇地下水具有良好的分层分带特征,上游地区水质均一性高,是单一含水层结构,上下贯通,水动力条件好的反映,而中下游水动力条件较差,含水层分层明显。从测试组分的浓度分布范围和数值来看,均表现出浅层水样>中层水样>深层水样。地下水质量表现为上游好于中游,中游好于下游,分带特征明显。组分含量较高的样点和超标点绝大多数为浅层水样,这一点反映了中下游地区较强的人为输入和多源补给的特征。

中文关键词:潮白河 地下水化学 分层 分带 第四系地下水

Delamination and Zoning Characteristics of Quaternary Groundwater in Chaobai Alluvial-proluvial Fan, Beijing, Based on Hydrochemical Analysis

Abstract:In order to study the characteristics of delamination and zoning of Quaternary groundwater in Chaobai alluvial fan based on the view of hydrochemistry, the authors collected a total of 293 samples for chemical analyses from shallow, middle and deep aquifer respectively in Chaobai alluvial-proluvial fan in the dry period of 2008 according to geological and hydrogeological conditions. Based on the data obtained, the authors calculated the means and mean square deviations of main chemical constituents such as NH₄⁺, HCO₃⁻, Cl⁻, F⁻, SO₄²⁻, NO₃⁻, Fe, NO₂⁻, hardness and TDS, and the results showed that the means of the other nine components except NO₃⁻ in shallow groundwater had the tendency of increase from the upper reaches to the middle and lower reaches. The mean square deviation was higher in the middle reaches than in the upper and the lower reaches. Almost all the Quaternary groundwater of Chaobai River pluvial fan belonged to alkaline water type. The groundwater chemical type changed gradually from HCO₃-Ca·Mg type in the upper reaches to HCO₃-Ca·Na·Mg and HCO₃·SO₄-Na·Ca·Mg type in the middle and lower reaches. The groundwater chemical type became more complicated and varied, and the concentration of Cl⁻, hardness and TDS increased with downstream runoff. Correlation analysis showed that TDS, hardness, Cl⁻, NO₃⁻ and EC (electric conductivity) had negative correlation with the groundwater sampling depth, whereas the pH value had positive correlation. The chemical analysis confirmed the alluvial fan hierarchical zonation. The upstream areas had relative homogeneous water quality, reflecting the single aquifer structure for its good hydrodynamic conditions. In the middle and the lower reaches, the distribution of constituent concentrations and their values showed shallow > middle > deep water samples. In addition, groundwater quality assessment results showed that the upstream area was better than the midstream area, and the midstream area was better than the downstream area. Almost all the higher concentrations and exceeded sample points were from shallow aquifer. This phenomenon reflects the stronger influence from human activity and the characteristics of multi-source input in mid-downstream area.


keywords:[Chaobai River](#) [hydrochemistry](#) [delamination](#) [zoning](#) [Quaternary groundwater](#)

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