Abstract: Hydrogeological features are closely related to the Quaternary neotectonic movement and sedimentation in the Hetao area of Inner Mongolia. The study of neotectonic movement and sedimentary facies is the basis for understanding the controlling factors and mechanisms of hydrogeological processes. During the Quaternary geological mapping, hydrochemical sampling and tests were carried out on different water bodies consisting of groundwater, lake and river, along the Serteng Mountain to Taerhu town and the Yellow River. The responses of hydrogeological characteristics to the Quaternary neotectonic movement and sedimentation process are discussed, including flow and hydrochemical features typically characterized by high arsenic (As) groundwater. Results are as follows: (1) The piedmont fault activity controlled the sedimentation of the river in the basin, which in turn affected the groundwater flow. Hydrochemical tests reveal that the primary types of spring water in the piedmont, the groundwater in the basin, and the Yellow River are HCO$_3$-Ca, HCO$_3$-Na and Cl-Na, and HCO$_3$-Na respectively. Although the lake body exists difference, its cations and anions are dominated by Na$^+$ and Cl$^-$, indicating that there is a hydraulic relationship between lake and groundwater, that is, HCO$_3$-Na type groundwater transforms into a higher salinity of Cl-Na type lake by evaporation and concentration. The groundwater total dissolved solids (TDS) have a tendency to be larger from the piedmont area to Taerhu town, which are 567 mg/L, 957 mg/L, and 2296 mg/L. The anion basically conforms to the variation pattern of HCO$_3$-$\text{SO}_4^{2-}$-$\text{Cl}^-$, suggesting that groundwater flows from the northern mountain area to Taerhu town. While the TDS values of lakes in the Taerhu area do not rise with the increase of groundwater TDS, but less than that of the corresponding groundwater, indicating that the Taerhulakes have accepted different sources of supply, and the maximum TDS value (1213 mg/L) is the concentrated groundwater discharge area. Since the Holocene (Qh), the three-period paleo-channels have been buried deeper and older in the north in the study area, illustrating that the inherited activities of the northern piedmont fault led to the migration of the Yellow River from north to south. Sedimentary facies analysis shows that the remaining sand layers of the riverbed subfacies are connected to form the main aquifer of shallow groundwater in the Hetao basin. The aquifer inclines to the north, providing the channel and necessary hydraulic gradient conditions for the southern Yellow River to move to the north and recharge groundwater. In addition, there existed the pre-Quaternary paleo-uplift in the deep part of Fuxing town, and there was a buried normal fault inclined to the north, which made the Taerhu areabecome a fault depression, and the convergent discharge area of the southern river and the northern piedmont groundwater. (2) The piedmont fault activity and sedimentation control the formation of high As groundwater. The weathering debris of the mountainous area, containing As-bearing sulfide ores, is the main source of the piedmont alluvial-proluvial fan in the north. The inherited mountain uplift increased the surface height difference of the piedmont, causing the mountain denudation, which provided the force for the transformation and sedimentation of the As-containing materials. During the leaching and carrying of surface runoff, As-containing sulfide minerals seeped down into the underground along the large piedmont fault. Then the high As groundwater enriched through the exchange of surface water and groundwater, and the water-rock interaction in Hulestay town in the northern piedmont area. While in the Fuxing area, there exists small-scale spatial heterogeneity of the high As groundwater distribution. The grain size features of sedimentary facies are coincident with the distribution of shallow high As groundwater, indicating that the complex lithologic structure caused the spatial heterogeneous distribution of As at a small scale. The lacustrine layer in this area

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corresponds to the maximum As concentration. With the grain size increases, from the natural levee microfacies to riverbed subfacies, the As concentration decreases accordingly. The buried fault nearby provides the passage for As transport from deep strata. Therefore, the sedimentary facies and buried fault play a dominant role in shallow As groundwater in the Fuxing area.

**Key words:** hydrogeology, As groundwater, neotectonics, sedimentation, Quaternary, Hetao Plain

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**References**

**Fig. 2.** The section of hydrogeology, palaeo channels, and Quaternary landform from the Serteng Mountain to the Hobq Desert.