An Interdisciplinary Response to Mine Water Challenges - Sui, Sun & Wang (eds)

Influence Analysis of the Leaching Water of Waste Rock Site on Surrounding Groundwater Quality

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Abstract Influenced by conditions for mining and benefication and associated ore, metal mining areas tend to have a variety of pollutions and pollution sources, which would effect the surrounding groundwater quality. Based on an iron mine waste rock site as an example, and combined with the hydrogeological conditions of the study area, this paper analyzed the migration law of contaminant-Mn by using numerical simulation model. The results prove that contaminant-Mn once leak, it would pollute groundwater in the surrounding aquifer. After ten years, the horizontal distance of the pollutant dispersion would be 188 m, and the concentration of central point would reach 0.45mg/L.
Keywords waste rock site, visual modflow, leaching water, groundwater pollution

Introduction

Chinese Mining Industry develops very quickly, and has made remarkable achievements. However, according to figures, sorts of industrial solid wastes and tailings have reached 6×10^8t every year as of 2002 in China. Leaching water of waste rock bring harmful substance into environment with surface runoff, and pollute surface water, soil, and groundwater(Wang et al. 2006).The groundwater pollution is a slow process, which has accumulation and hysteresis effect, and sometimes it wouldn't be found until leakage has occurred for several years or even decades(Yang et al. 2008, Zhao et al. 2007).Therefore, this paper takes an iron waste rock site in Anhui province as an example, and in view of the possible accident scenarios, it simulates and forecasts the influence of the leaching water of waste rock site on surrounding groundwater quality.

Study area

In the mining area, there is no obvious aquifuge between every adjacent aquifers, therefore there is a very close hydraulic connection between every adjacent aquifers in natural state, and different adjacent aquifers have unified groundwater chemical field. In the rock of near-surface, weathering fissure is developed, which is the main channel for rainfall infiltration recharge. Mainly in the control of terrain, groundwater flow direction from south to north.

Methodology and results

Using Visual MODFLOW and MT3D software and combined operating flow and water quality model, this paper designs the situation without seepage and leak detection, and gets the forecast result of the migration of the contaminant–Mn.(tab.1,fig.1;fig (a) represents west waste rock site, fig (b) represents east waste rock site).

Table 1 *During simulation period, variation of migration direction and concentration of contaminant with time*

time(d)	West waste rock site			east waste rock site		
	Influence scope		Concentration of central point (mg/L)	Influence scope		Concentration of central point (mg/L)
	horizontal distance (m)	vertical distance (m)		horizontal distance (m)	vertical distance (m)	
730	96	44	0.14	111	91	0.10
1825	105	61	0.18	135	92	0.20
3650	120	68	0.20	188	96	0.45

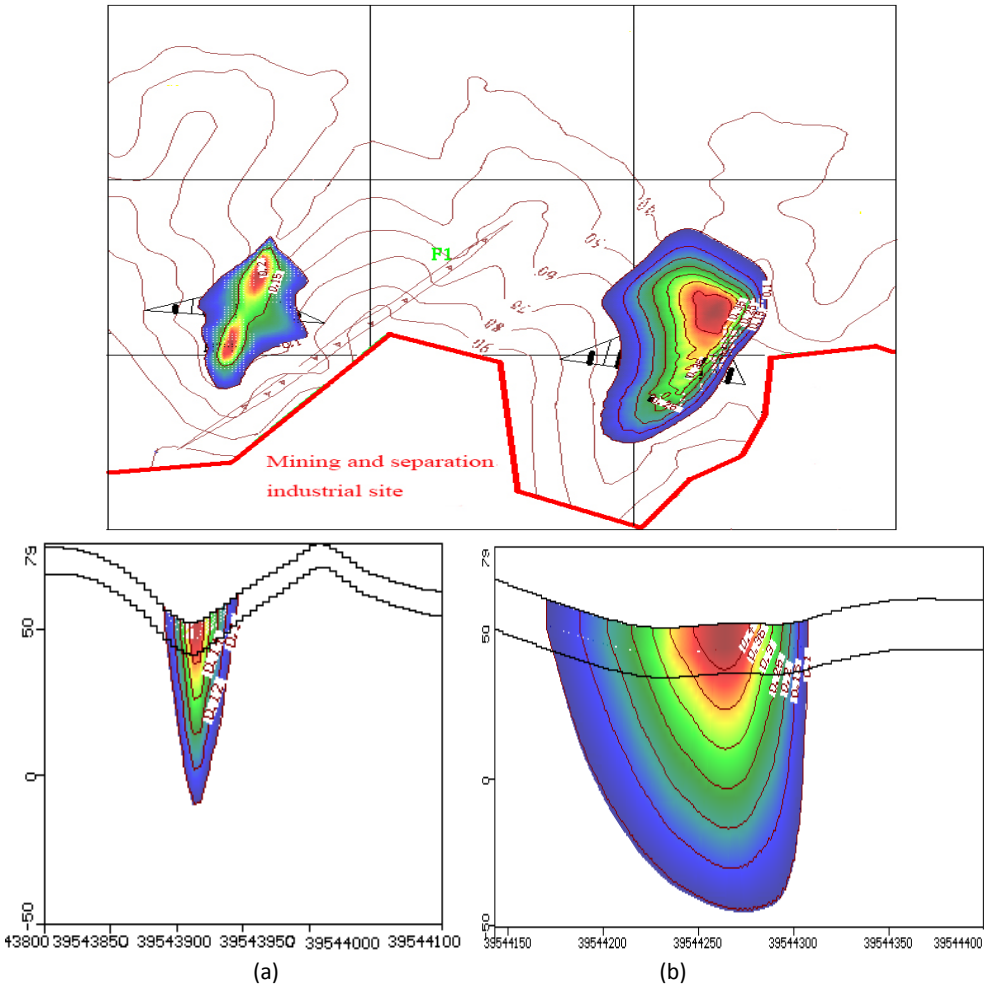

Fig. 1 *Concentration distribution of Mn leaking for ten years(unit: m)*

Conclusion

Base on the establishment of hydrogeological conceptual model, which accords with practical condition, establishing mathematical model of groundwater flow and solute transport about the study area.

In the study area, the leakage pollution of Mn, which would keep a longer time to transport, has significant influence for phreatic water quality, and contaminant would flow into confined aquifer. Once Mn leak, phreatic water would be polluted.

References

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