

Analysis on the Dynamic Characteristics of Limestone Groundwater and Its Influencing Factors in Panxie Coal Mine Area, Anhui

Xu Li, Guangquan Xu, Li Chen, Jianghui He, Kangli Qiu, Xianglong Zhao
School of Earth and Environment, Anhui University of Science and Technology, Huainan, Anhui,
765790349@qq.com, gqxu67@163.com, 1207097152@qq.com

Abstract Coal mines in northern China are becoming exhausted in the shallow buried areas. So mining depth is increasing, at same time, the mine safety production will inevitably be threatened by the limestone groundwater. Water inrush accident happened in recent years, so it is of great significance for ensuring mine safety in production to research the limestone groundwater dynamics characteristics. The mechanism of groundwater dynamic change is analyzed by groundwater system in this paper. Groundwater system is a key component of natural hydrological cycle, and its main link includes recharge, runoff and discharge, which is often disturbed by coal mining activity, source of water-inrush come from limestone groundwater, which is an important part of the groundwater system. The drainage and depressurization lead to form a range of cone of depression, and increase the new discharge point of limestone water in the meanwhile, so water level greatly declines. Huainan Panxie coal mine area is located in the southern edge of the North China Plate, which belongs to the concealed type mining area that is covered with Quaternary deposition. The hydrogeological conditions of limestone aquifers including Cambrian, Ordovician and Carboniferous are complex, and there are much karst developed, and the lower coal group A is threatened with limestone inrush water during mining. Therefore, on the basis of systematically analyzing the hydrogeological conditions of limestone, by the multiple regression method, the groundwater dynamic characteristics of different limestone aquifers has been studied from 1996 to 2013; especially, the groundwater dynamic change of each limestone aquifer due to mine drainage in Panji anticline and Zhangji and Xieqiao coal mine limestone outcrop area by using the time series analysis method. Meanwhile, the water quality correlation of each aquifer has been discussed with the clustering methods type R and type Q. and combined with the geothermal gradient, the groundwater temperature dynamics of different limestone in inrush water points has been revealed. Karstic collapse column and transmissible faults can through the multiple aquifer, which cause hydraulic connection among multiple aquifer, so if the mining area occur water burst, which causes huge casualties and economic losses. Combined with distribution of collapse column and water inrush data, different influencing factors about limestone water dynamic variation have been discussed. The research results provides an important reference for more farther analyzing hydrogeological condition and how to prevent water intush and control limestone water during mining coal group A. The influence factors of limestone groundwater dynamic are artificial and natural factors. The artificial factors are attributed to mining activities and pressure-relief of water. In addition, the natural factor is mainly geological structure. Karst fissured aquifer has hydrodynamic relation to the aquifer in coal bearing series by fault, fracture and collapse column channel, especially which is usually found in limestone outcrop area of the Panxie. Due to the discharge of groundwater, Ordovician and Cambrian limestone water recharges Taiyuan group limestone, which makes water quality become similar in different aquifers. The research shows that the mining area boundary is controlled by fault, which is impervious boundary. Groundwater systems of limestone aquifer is unified over the Panxie coal mine area, due to the influence of pressure-relief of water, level of limestone aquifer water has been falling, especially aquifer rate of fall is the largest in the C₃- I of Taiyuan group. Managers will spend many yeas achieving safety water level of mining by pressure-relief of water, because the recharge condition is better in the limestone outcrop area. Therefore, the pressure-relief of water should have been performed, meanwhile, the grouting reconstruction technique of lower confining bed can be used to control the water hazard from coal floor.

Keywords limestone aquifers, groundwater viriation, influence factors, Panxie coal mine area