

Deep groundwater recharge sources in North Jiangsu, China

FENYAN MA¹, JIANGSHENG CHEN²

¹ Key Laboratory of Ministry of Education for Geomechanics and Embankment Engineering, Hohai University, Jiangsu Nanjing, China. fyma@hhu.edu.cn

² Key Laboratory of Ministry of Education for Geomechanics and Embankment Engineering, Hohai University, Jiangsu Nanjing, China. jschen@hhu.edu.cn

Comprehensive investigations of water were performed in the rivers and aquifers in the northern Jiangsu province, China, which lies downstream of the rivers. The surface water and shallow groundwater are polluted and a large amount of deep groundwater has been exploited for living and agricultural irrigation. This results in depression cones of deep groundwater, of which the lowest level is ~ 40 m below the China Yellow Sea. However, the quantity of exploitation does not match the distribution of deep groundwater depression cones, and the groundwater has not been affected by seawater invasion. The groundwater level near the faults has not decreased significantly, and ascending springs and high water level have been found. Hydrochemistry and isotopic tools were combined to get an insight into the processes of deep groundwater recharge and water-rock mineralization. The stable isotope (¹⁸O and ²H) signatures and dissolved constituents in surface water, shallow and deep groundwater were investigated. The hydrochemical types of deep groundwater are comparatively single, which is NaHCO₃. High contents of Sr²⁺ and H₂SiO₃ are detected in deep groundwater and the content of Sr²⁺ increase from the area with high water level near the faults to depression cones. The rising springs on the beach ruled out the lateral recharge of groundwater from the rivers. The stable isotope signatures of deep groundwater are the same and were below the global meteoric water line (GMWL) and local evaporation line. Hydrogen and oxygen isotopes in deep groundwater are more depleted than surface water, indicating the precipitation isotopes in the recharge source area of deep groundwater are depleted. It is revealed that the deep groundwater recharge areas of the rising springs are at high altitude plateau, and the deep circulating groundwater is discharged to the surface through the deep faults in the northern Jiangsu province.

Acknowledgments:

This study is supported by the National Natural Science Foundation of China (515035711), A Project Funded by the Priority Academic Program Development of Jiangsu Higher Education Institutions, the Fundamental Research Funds for the Central Universities (B18020488).