Seawater Intrusion and its Effect on Groundwater Quality and Ecology

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Abstract: Seawater intrusion would lead to groundwater pollution and also has a great impact on the underground microbial community and destroys the balance and stability of the whole ecosystem. Microorganisms in aquifers are extremely sensitive to environmental changes and thus can be a useful indicator for environmental changes. Two seawater intrusion areas were selected as the object of study, and the hydrochemical characteristics, salt sources, major biogeochemical effects and microbial community structure characteristics of groundwater in the seawater intrusion area were analyzed by using various technologies, isotope means and high-throughput sequencing technologies. Study results show that the groundwater hydrochemistry varied greatly and isotope analyses (2H, 3H, 18O, and 14C) indicated that the groundwater in the confined aquifer was recharged by local precipitation and seawater. The further 14C analysis shows that the salinity of groundwater was likely attributed to the Holocene transgression. The bacteria in groundwater mainly include Proteobacteria, Firmicutes and Bacteroidetes, while archaea are Thaumarchaeota and Euryarchaeota. Seawater intrusion has great influence on microbial community composition and diversity, some biological groups existing in salt water, such as Alteromonadales and Marinobacter, can be used as biomarkers for seawater invasion.

Key words: seawater intrusion, environmental indicators, 16S rDNA gene sequencing, isotope geochemistry

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Fig. 1. Geographical map of sampling locations in six boreholes.

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References

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HU Xiaolong was born in 1962. He has been a professor and dean at Institute of Groundwater and Earth Sciences, Jinan University, China, since 2015. He obtained his Ph. D. degree in 1996 from Purdue University, USA, and then worked at Desert Research Institute and Florida State University as assistant professor, associate professor and professor until he accepted his current job as one of China 1000 talent program. In his long education and work experience, his research mainly focus on modeling groundwater flow and solute transport in complex subsurface environments using numerical and stochastic approaches. In the last 15 years, his group has conducted various field measurement, field and laboratory experiments and developed several numerical method to explore flow and transport in karst media. He has conducted various research projects on Solute transport, karst hydrology and seawater intrusion, and published more than 180 peer-reviewed papers. He currently serves as a topic editor or associate editor for HESS, SERRA and China Science-Earth Science.