

Geochemical characterization of the Simao observation well water in the Yunnan Province, SW China

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This research takes the Simao observation well in Yunnan Province China as the subject. The geochemical and isotopic methods were applied to investigate the origins of materials and the hydraulic connections with surrounding reservoirs. Meanwhile, the mathematical method was used to identify the anomalies of hydrochemical monitoring before the major earthquake and their causes based on the long-term monitoring data. The monitoring aquifer was charged by meteoric water without directly connection with surrounding reservoirs. The mainly reasons caused hydrochemical variations might be the leakage of the aquifer and the intense water-rock reaction caused by the tectonic stress.

Based on the long-term hydrochemical monitoring data and the results obtained from second-order differential acceleration, the acceleration value of the groundwater chemicals tended to have a high-frequency fluctuation before major earthquakes, which was different from the phenomenon during the seismic quiescence period. The reasons attributed to the difference maybe:

(1) The chemical compositions varied significantly because of the mixture of waters from different aquifers. This transfluence were caused by the permeability contrast and the appearance of the new channels between different granite aquifers in the process of tectonic stress increasing.

(2) The micro-fracturing of rock structure and the rock rupture caused by the loading tectonic stress in the crust increase the fresh surface of the rock. The chemical compositions varied as the equilibrium between groundwater and rock was broken because of the reaction of underground water and the increased fresh rock surface.

As a result, the anomaly in monitoring data of chemical compositions and the accelerated velocity was easily distinguished by geochemical methods. Meanwhile, this result showed the process of the stress loading in crust and provided further evidence for the earthquake precursor analyzing.

Key words: geochemical and isotopic methods; earthquake precursor; tectonic stress

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