



An automatic continuous monitoring station for groundwater geochemistry at an active fault zone in SW Taiwan

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Previous studies have revealed that gas compositions of fluid samples collected from southwestern Taiwan where many hot springs and mud volcanoes are distributed along tectonic sutures show significant variation prior to and after some disaster seismic events. Such variations, including radon activity, CH_4/CO_2 , $\text{CO}_2/{}^3\text{He}$ and ${}^3\text{He}/{}^4\text{He}$ ratios of gas compositions, are considered to be precursors of earthquakes in this area. To validate the relationship between fluid compositions and local earthquakes, a continuous monitoring station has been established at Yun-Shui, which is an artesian well located at an active fault zone in SW Taiwan. It is equipped with a radon detector and a quadrupole mass spectrometer (QMS) for in-situ measurement of the dissolved gas composition. Data is telemetered to Taipei so we are able to monitor variations of gas composition in real time. Furthermore, we also installed a syringe pump apparatus for the retrieval and temporal analysis of helium (SPARTAH) at this station. From the SPARTAH samples, we can obtain detailed time series records of H-O isotopic compositions, DIC concentration and $\delta^{13}\text{C}$ isotopic ratios, and anion concentration of the water samples at this station. After continuous monitoring for about one year, some anomalies occurred prior to some local earthquakes. It demonstrates that this automated system is feasible for long-term continuous seismo-geochemical research in this area.

Keywords: monitoring; geochemistry; isotope; dissolved gases; pre-seismic signal.