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

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Taiwan is tectonically situated in a terrain resulting from the oblique collision between the Philippine Sea plate and the continental margin of the Asiatic plate, with a continuous stress causing the density of earthquakes and faults. 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 structures show significant variation prior to and after some disaster seismic events. Such variations, including radon activity, CH_4/CO_2, $CO_2/^3He$ and $^3He/^4He$ 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. Variations of gases composition are transmitted to the laboratory through internet. Furthermore, a syringe pump apparatus for the retrieval and temporal analysis of helium (SPARTAH) [1] is also installed for obtaining the detailed time series records of He and H-O isotopic compositions, DIC concentration and $\delta^{13}C$ isotopic ratios, and anion concentration of water samples at this station. After continuous monitoring for about one year, some anomalies occurred prior to some local earthquakes. This automated system has been demonstrated to be feasible for long-term continuous seismo-geochemical research in this area.

[1] Barry et al. (2009), *G-cubed* **10**, doi: 10.1029/2009GC002422.