Lithium isotope fingerprints of fossil fuel resources and associated wastewater

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The impact of fossil fuel development on water resources has become a major public concern. Recent studies have highlighted isotope systems as effective tracers for fossil fuel-affected waters in the environment. [1,2] Lithium isotopes have the potential to be useful conservative tracers of fossil fuel wastewater, especially when combined with the boron and strontium isotope systems. Lithium isotope ratios reported in Warner et al. (2014) and Harkness et al. (2015) show that Marcellus shale flowback and produced water, and effluents from coal ash ponds have distinct Li isotope fingerprints (6 to 10‰ and -7 to 12.8‰, respectively) that can be used to quantify contamination in surface waters and distinguish between different sources of contamination. [1,3] This study aims to expand the Li isotope analysis of water associated with shale gas and coal combustion activities across different basins in the United States, including unconventional and conventional produced water, flowback water, leachates of coal ash and contaminated water sources. Additionally, this study evaluates the Li isotopes of coal ash and produced water from exploration in China to assess potential global variations in Li isotope signatures of fossil fuel resources.

[1] Warner, Darrah, Jackson, Millot, Kloppman and Vengosh (2014), *Environ. Sci Tech.* 48, 12552-12560.

[2] Ruhl, Dwyer, Hsu-Kim, Hower and Vengosh (2014), *Environ. Sci. Tech.* 48, 14790-14798.

[3] Harkness, Ruhl, Millot, Kloppman, Hower, Hsu-kim and Vengosh (2015), *Procedia Earth and Planetary Sci.* 13, 134-137.