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What can short temporal changes of stable isotope ratios and geochemical parameters of tap water at a single sampling site tell us?

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Investigations of tap water and its source groundwater reflect combined features of regional hydrological processes and human activities including the changes in water supply system (WSS). In this context, multi-parameter characterization can present a reliable tool to propagate the geochemical “fingerprints” of water source from natural or artificial mixing. If the geochemical composition of different water source end members is significantly different, we can estimate the proportions of source water and their changes from particular source to tap.

To test this hypothesis, we performed a 24 hours sampling experiment of tap water in April 2019 at selected location in Ljubljana (i.e. at Jožef Stefan Institute), where groundwater from two different water fields and aquifers (i.e. from Kleče at Ljubljansko polje and Brest from Ljubljansko barje) is mixed. In-situ measurements of temperature, electrical conductivity and pH were performed and 25 water samples were collected hourly for determination of isotopic composition of oxygen ($\delta^{18}O$), hydrogen ($\delta^{2}H$) and dissolved inorganic carbon ($\delta^{13}C_{DIC}$), $^{87}Sr/^{86}Sr$ isotope ratio and major (Ca, K, Mg and Na) and trace elements (Ag, Al, As, B, Ba, Cd, Co, Cr, Cu, Fe, Li, Mn, Mo, Ni, Pb, Rb, Sb, Se, Sr, Tl, U, V and Zn).

The diurnal variations of parameters are not very large; however, temporal differences of some parameters (e.g. Ba, Mg) indicate that proportion of groundwater from Kleče and Brest water fields changed during the experiment. Based on observed temporal differences during the 24 hours experiment we could identify three different patterns: a.) higher values in the beginning and at the end and lower in between (i.e. $\delta^{18}O$, $\delta^{13}C_{DIC}$, Ca, Na, B, Ba, Cr, Li, Sr); b.) lower values in the beginning and at the end and higher in between (i.e. K, Mg, As, Mn, V) and c.) higher values at the beginning of experiment (i.e. Cd, Co, Cu, Fe, Mo, Ni, Pb, Sb, Zn). The first and the second pattern (a and b) indicate the mixing of different groundwater from different water fields with different geochemical characteristics. The third pattern (c) however indicates the influence of release of elements due to corrosion of water supply system. Based on results of 24 hours experiment and additional information on functioning of water supply system changes in proportion of water from Kleče and Brest water fields will be estimated.