

**Isotopic and trace elements
geochemistry from surface and
ground waters: a new tool for mineral
resources exploration, example from
the Li-Ta-Nb-Sn-W deposits of
Echassières (France).**

MELLETON J, MILLOT R., LIONS J, RENAUD C
AND GLOAGUEN E

BRGM , ISTO , UMR 7327, Orléans, France r.millot@brgm.fr

For a big part of the planet, the majority of economic deposits located near the surface have been targeted. Then, new exploration projects must aim to discover "hidden" deposits for which "traditional" methods of exploration like stream sediments or soil geochemical prospecting are unfortunately less efficient. However, groundwater interacts extensively with these deposits in subsurface. For a limited number of mineralization types, several studies have demonstrated the existence of geochemical and isotopic tracers in groundwaters.

Metals related to peraluminous granites-related deposits like W, Sn, Ta or Cs are crucial for the developments of some "green" and "high" technologies. The Beauvoir-La Bosse deposits of Echassières, located in the North of the Variscan French Massif Central belongs to at least two distinct metallogenic systems, a stockwork constituted by quartz-wolframite veins, crosscut by the Beauvoir rare-elements granite. Moreover, in the southern watershed, Sb and Cu occurrences have been documented by former prospectings. It is located on the top of a hill, and past and actual operations on the deposits provided good conditions for water-mineralization interactions.

Waters from surrounding streams and springs located on and around the different deposits were collected. In order to investigate the hydrogeochemical signatures related to these deposits, we performed major, trace elements and rare-earth elements analyses as well as isotopic measurement (O, D, C, Li, S, Zn, Cu and Sr isotopes). According to these preliminary results, we are able to decipher the geochemical signature of shallow and surface groundwater to understand water migration through the deposits and water-rock-interactions. Moreover, it is possible to distinguish several geochemical types that could be relied on the composition of the deposits. These results give thus good indications on the applicability of hydrogeochemical prospecting for these kinds of deposits, with valuable results in complex systems such as overlapping of several metallogenic systems