Characterising the waters of the Bohemian Massif, Czech Republic utilizing geochemistry and stable halogen (Br, Cl) isotopes

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The Bohemian massif underlies much of the Czech Replublic and overlaps into Germany, Austria and Poland. The massif covers more than 150 km^2 and is surrounded by high topographic regions on all sides and contains both old crystalline rock as well as several distinct sedimentary basins [1]. This study investigated both crystalline and sedimentary sources of water in the Czech Republic covering regions in the northwest, north-central, northeast and southeast and including several permo-carboniferous basins with the intention to build on geochemical and isotopic investigations dating back to the late 19th century [2]. A variety of waters containing unique chemical compositions ranging from fresh (<1 g/L) to brine (>100 g/L) exist, the sources of which are not necessarily clear due to the complex history of the region.

The sedimentary waters sampled show the largest variability in both isotopic signature and chemical composition. Halogen isotopes, specifically $\delta^{37}Cl$ and $\delta^{81}Br$ showed a very wide range of isotopic signatures in the sedimentary basinal fluids, from -1.2 to +2‰ vs SMOC and 0 to +3‰ vs SMOB respectively. The permo-carboniferous waters of north-central Czech Republic trend towards an end-member enriched in both ^{37}Cl and ^{81}Br, while the sedimentary oil-field waters of the Vienna basin in the southeast are enriched in ^{81}Br but relatively depleted in ^{37}Cl. The crystalline sources on the other hand show a much smaller range of $\delta^{37}Cl$ and $\delta^{81}Br$ from -0.5 to +0.5‰ vs SMOC and 0 to +1.2‰ vs SMOB respectively. The greater variability in halogen isotopic signatures in sedimentary units reflects significant differences in depositional environments and secondary processes that modified fluids after deposition. The crystalline rock fluids are believed to be meteoric fluids that evolved as a result of longer term water-rock interactions.

[1] Pačes & Šmejkal (2004) *Water-Rock Interaction* **11,** 167-172. [2] Šmejkal & Jetel (1990) *Věstník Ústředního ústavu geologického* **65,** 339-352.