Geochemical characterization of thermal springs in the Tete Province, Northern Mozambique

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A first geochemical survey was carried out in the Northern Mozambique in March-April 2013, with the aim to investigate chemistry and origin of some thermal springs in the Tete Province. The investigated area is located in the East African Rift, adjacent to the marginal sedimentary Mozambique Basin. This area is crossed by the *Rio Zambezi*, one of the main river in Africa and explored during the 19th century by Davi Livingstone.

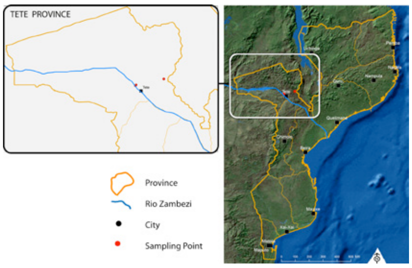

Figure 1: Location of the study area.

Many thermal springs are present in this province due to the proximity with the rift, but considerably little geochemical and geothermal studies have been done, due to the difficulties related both to the site accessibility and social interaction with local tribes. Three thermal springs were sampled close to the *Missao de Boroma,* Tete, crossing the Rio Zambezi by a traditional pirogue. Collected samples are being analysed to determinate major, minor and trace elements, $\delta^{18}O$ and δD, dissolved gas, carbon isotopic ratios of TDIC (Total Dissolved Inorganic Carbon) (expressed as $\delta^{13}C$‰vs. VPDB), the $^{3}He/^{4}He$ and the dissolved Radon. The measured temperature ranges between 66°C to 42°C and the pH from 7.9 to 8. The conductivity is around 2400 µS/cm and the Eh is between -208 to -404 mV. The chemical and isotopical analysis are in progress, anyway this first sampling suggests the need to plan and perform a national geochemical survey of the thermal springs in Mozambique. Data should be organized in organic geodatabase and geographic information systems. This information could have a big relevance not only for the geochemical, hydrogeological and geological knowledge of the Country but also for a potential geothermal exploration and exploitation.

Age of the Bird River Sill (Manitoba, Canada) and the Secular Variation of Layered Intrusion-hosted Stratiform Chromite Mineralization

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The Archean Bird River Sill, a 20 km long and up to 800 m thick mafic-ultramafic layered intrusion in the Bird River greenstone belt of southeastern Manitoba, Canada, contains significant resources of chromium and nickel-copper, and locally anomalous concentrations of platinum group elements (PGE). Stratiform chromitite, displaying both remarkable lateral continuity and local irregularities due to synmagmatic disruption, occurs in up to six main intervals over a thickness of ~60 m in the Chromitiferous Zone of the lower ultramafic part of the intrusion. Ni-Cu sulfide mineralization is hosted in ultramafic rocks at the base of, or just below, the sill (e.g., past-producing Maskwa-Dumbarton mines). We report U-Pb zircon ages (chemical abrasion, single grains, ID-TIMS) for cumulates from below and above the Chromitiferous Zone, including (1) a locally pegmatitic, sulfide-bearing, feldspathic peridotite from the PGE Zone beneath the lowermost chromitite horizon (Lower Group) of 2743.72 ± 0.31 Ma (n=6), and (2) a leucogabbro in the Lower Gabbro Zone, approximately 35 m above the uppermost chromitite horizon (Upper Paired Group) of 2743.19 ± 0.31 Ma (n=9; revised from [1]). These ages are interpreted as the age of crystallization of the sill and they define the timing of the associated Cr-Ni-Cu±PGE mineralization. Other Neoarchean mafic-ultramafic intrusions containing economic concentrations of chromite and/or Ni-Cu-(PGE) occur in the northwestern part of the Superior Province in the Canadian Shield (e.g., McFaulds Lake, Big Trout Lake, Puddy Lake, Shebandowan) and share broadly similar geologic relationships. The age of significant intrusion-hosted stratiform chromite mineralization worldwide ranges from Eoarchean (e.g., Akilia, Greenland) to Paleoproterozoic (e.g., Bushveld, South Africa), which is comparable to the range for komatiite-related Ni deposits. This temporal restriction is consistent with both deposit types requiring the involvement of high-MgO, Cr-rich parent magmas produced during large degrees of mantle melting early in Earth history.

[1] Scoates & Scoates (2013) *Econ. Geol.* **108**, 13 p.

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