



Chemical and isotopic composition of the Monfortinho thermal water (Portugal): contribution to the aquifer conceptual model and resource evaluation

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Abstract

Groundwaters from quartzite aquifers are usually cold waters with very low mineralization as consequence of circulation in fractured aquifers and rocks with very low solubility. In the Monfortinho, Beira Baixa region in Portugal, a thermal water occurs associated to a Ordovician quartzite syncline, the Penha Garcia syncline (Sequeira et al., 1999). The thermal water is used for balneology and supplies a thermal Spa through boreholes discharging about 36 l/s. The syncline of Penha Garcia has NW-SE axis and is fractured by a NE-SW fault, where the valley of Ponsul river is developed. The natural discharge of the thermal aquifer occur at the SE edge of the syncline.

The Monfortinho thermal water has temperature around 30 °C, pH of 5.45, very low mineralization, with electric conductivity about 35 uS/cm; the main dissolved specie is the SiO₂ that reaches 24 mg/L, corresponding to 53% of the total dissolved solids. The chemical facies is of Na-HCO₃ type.

The d18O and d2H diagram indicates that Monfortinho water is derived from the local meteoric waters. The δ18O and δ2H content also pointed out a recharge area of the thermal aquifer above 400 m of elevation, with a isotopic gradient value of -0.15‰ d18O/100m. This elevation corresponds to the top of the eastern block of the syncline, suggesting that Ponsul fault is a negative barrier to groundwater flow and the thermal aquifer is developed only in eastern block of the syncline. The groundwater flows at about 600-700 m depth along the syncline base toward SE.

The average rainfall in the region is 790 mm/year and the estimated recharge is about 17% (Carvalho, 2001) of the precipitation, corresponding to 134 mm/year and 4x10⁵ m³/ano of hydrothermal resource.

References:

- Carvalho, JM (2001). A Hidrogeologia das águas minerais naturais de Monfortinho. *Geonovas, Rev. Assoc. Portg. Geólogos*, Lisboa, v15, pp. 61-70 (in portuguese).
- Sequeira, AF, Cunha, PP, Ribeiro, ML (1999). *Notícia Explicativa da Folha 25-B Salvaterra do Extremo*. Departamento de Geologia, Instituto Geológico e Mineiro, 47 pp. (in portuguese).