Evaluation of physico-chemical characteristics of thermal spring water of Odisha, India

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The Indian state of Odisha has 8 thermal springs, namely, Attri, Tarabalo, Deulajhari, Taptapani, Bankhol, Badaberena, Magarmuhan and Boden. To observe the seasonal changes in physico-chemical characteristics, thermal spring water samples were collected during pre-monsoon, monsoon and post-monsoon seasons. The water discharging from these springs shows moderately acidic to moderately alkaline character (pH: 5.05–8.93) and the surface temperature ranges from 28 (Boden) to 58 ^{o}C (Tarabalo). Total dissolved solids (TDS) also shows a wide variation between 16.9 (Bankhol) and 595 mg/L (Deulajhari). The water mainly is distinguished into 3 types: Na-Cl, Na-HCO_3 and Ca-HCO_3 type. The thermal water from Attri, Tarabalo and Deuljhori belong to Na-Cl type. Higher Na and Cl concentration along with lower Mg, K and Li content indicate that the water is circulated through granite rocks. The higher F content (3.88 to 12.2 mg/L) in these thermal springs further conforms that water composition is evolved from the interaction with granitic rocks. Due to lower calcium concentrations, the water does not reach the solubility product of fluorite resulting in higher concentration [1]. In Bankhol and Magarmuhan, the discharging thermal water belongs to Ca–HCO_3 water type. The water from these thermal springs is poorly mineralized and has lower TDS values ranging between 16.9 and 20.9 mg/L. Shorter resident time in the subsurface coupled with heavy mixing with the shallow groundwater may cause the lowering of the TDS content [2]. The thermal spring water showing Na/Ca–HCO_3 type characteristics are a typical indicator of shallow groundwater. This suggests prominent mixing of shallow water which is believed to have been circulated within the alluvium or sedimentary formations with the ascending thermal water.

References:

[1] Ozsvath DL (2008) *Reviews in Environmental Science and Bio/Technology* **8**, 59-79. [2] Bulbul A (2015) *Geodinamica Acta* **27(1)**, 67–81.