

Reservoir Temperature Estimation of Geothermal Springs of Odisha, India

HORTHING V. ZIMIK*, S. H. FAROOQ AND P. PRUSTY

School of Earth, Ocean and Climate Sciences, Indian Institute
of Technology Bhubaneswar, Argul-752050, India

(*correspondence: hv11@iitbbs.ac.in)

There are about 340 geothermal springs in India, of which, 8 are located in the state of Odisha and belongs to Mahanadi geothermal province i.e. an Archaean/Precambrian geothermal province. These thermal springs were evaluated for their reservoir temperature. It is also investigated whether seasonal changes in spring water chemistry are so prominent that it may lead to different reservoir temperature calculations if spring water samples are collected in different seasons. For this purpose, spring water samples were collected from all 8 thermal springs during pre-monsoon, monsoon and post-monsoon seasons. In total, 48 spring water samples were collected. Various physical parameters including temperature were noted in the field. The temperature of the thermal spring water ranges from 28°C to 58°C. Collected thermal spring water samples were analyzed for major and trace ions in the laboratory. Anions plotted in the Cl-SO₄-HCO₃ diagram shows that waters from 3 of the thermal springs (Attri, Tarabalo and Deuljhor) fall in mature water field, whereas the remaining 5 thermal spring samples (Bankhol, Magarmuhan, Badaberena, Taptapani and Boden) shows immature characteristics [1]. The mature waters are fast ascending waters with mild or no mixing, thus, their chemical signatures can be used to determine the reservoir temperature. The reservoir temperature calculated based on silica geothermometry [2,3] shows that the reservoir temperature of these thermal springs ranges from 62-111°C. It has also been observed that the hydrochemistry of the mature spring water does not change appreciably in response to seasonal variations, and thus, the calculated reservoir temperature does not show much variation (less than 10°C). Further, unvarying hydrochemistry also suggests limited mixing of water coming from heated reservoir with the shallow groundwater.

Reference:

- [1] Giggenbach WF (1988) *Geochimica et Cosmochimica Acta*. **52**, 2749-2765. [2] Fournier RO (1977) *Geothermics* **5**, 41-50. [3] Arnorsson S (1976) *Geothermics* **12**, 119-128.