

Assessment of Groundwater Quality and Seasonal Variability of Trace Elements in Coastal Groundwater of Puri District, India

P. PRUSTY^{1*}, S. H. FAROOQ¹ AND H. V. ZIMIK¹

¹School of Earth, Ocean and Climate Sciences, IIT

Bhubaneswar, Argul-752050, India

(*correspondence: pp25@iitbbs.ac.in)

Coastal areas are the densely populated regions of the world where in addition to higher salinity, a number of contaminants make the groundwater unsuitable for drinking. A study has been carried out in the heavily populated coastal areas of Puri district (Odisha, India) to determine (i) the groundwater quality and (ii) seasonal variability in trace element contaminations in the coastal groundwater. Sixty groundwater samples were collected from tube wells located in coastal areas during post-monsoon and pre-monsoon seasons. In addition to various physico-chemical parameters, groundwater samples were analysed for major and trace element concentrations using ICP-OES and Ion Chromatograph. Based on their TDS content, 52% of collected samples were found unsuitable for drinking purposes (TDS>1000 mg/l) in both seasons [1]. Significant concentrations of trace elements such as Ba (0.01-0.77 mg/l), Fe (0.01-75.7 mg/l), Mn (0.01-14.0 mg/l), Sr (0.1-5.0 mg/l), Br (0.01-27.9 mg/l), F (0.01-17.0 mg/l), and NO₃ (0.47-99.8 mg/l) have been detected in almost all the samples. Water Quality Index (WQI), calculated by using trace and major elemental concentrations shows that 25% and 28% of samples are not suitable for drinking (WQI>300) during post-monsoon and pre-monsoon seasons, respectively. Fluoride and Mn are the major contaminants present with significant seasonal variations in their concentrations. Fluoride concentrations higher than the WHO prescribed limit (1.5 mg/l) have been observed in 19% of samples. Similarly, higher Mn concentrations (>0.4 mg/l) have been found in 38% of samples. Higher Na and Cl concentrations with a large spatial variation (as a function of distance from the coast) and limited temporal variability suggest the influence of seawater in controlling the groundwater quality. Higher Br concentrations (>1 mg/l) are found in 50% of samples further confirms seawater influence [2]. In addition to salinity, seasonal variability in trace element concentrations and associated health hazards make the important parameters while accessing the groundwater quality in coastal areas.

[1] Davis & De Wiest (1966) Hydrogeology, Wiley. [2] Nair et al. (2016) Water Science, 30 (1), 41–50.