

Assessment of heavy metal contamination and their source distribution in waters around Oil and Natural gas drilling sites

DASARI BABU MALLESH^{1,2}, ARADHI KESHAV KRISHNA¹ AND DASARAM BANOTHU¹

¹CSIR-National Geophysical Research Institute, Hyderabad-500007, India

²Academy of Scientific and Innovative Research (AcSIR), Ghaziabad-201002, India

Presenting Author: dbabumallesh@gmail.com

In recent past Oil and Natural gas production has been an important economy booster. However, unconventional methods have risen the environmental health concern. In this study we present a preliminary results of heavy metal concentrations in water (surface and groundwater) samples around oil and natural gas drilling sites in East-West Godavari districts of A.P, India. A total of 36 samples (12 groundwater and 24 surface water) were collected, and analysed for their thirteen physicochemical constituents including ten toxic heavy metals and radiogenic elements (pH, EC, TDS, As, Cd, Cr, Cu, Mo, Ni, Pb, U, Th and Zn). Data thus, obtained was treated using multivariate statistical methods like principal component analysis (PCA)/factor analysis (FA), hierarchical cluster analysis (HCA) and correlation coefficient to find the common contamination source.

Results indicate the mean concentrations obtained for surface and ground water were 7.60 and 7.34 for pH; 4048 and 2964 mg/kg for TDS; 8.50 and 5.91 $\mu\text{S}/\text{cm}$ for EC; 11.5 and 10.7 $\mu\text{g}/\text{L}$ for As; 14.6 and 10.8 $\mu\text{g}/\text{L}$ for Cr; 0.60 and 0.70 $\mu\text{g}/\text{L}$ for Cd; 18.6 and 29.1 $\mu\text{g}/\text{L}$ for Cu; 3.00 and 4.20 $\mu\text{g}/\text{L}$ for Mo; 19.9 and 24.8 for Ni; 15.2 and 13.4 $\mu\text{g}/\text{L}$ for Pb; 4.60 and 3.10 $\mu\text{g}/\text{L}$ for Th; 1.00 and 8.30 $\mu\text{g}/\text{L}$ for U; 187 and 348 $\mu\text{g}/\text{L}$ for Zn respectively. FA identified four factors responsible for data structure explaining 86.23 % of total variance in surface water and four factors in groundwater explaining 91.6%, and allowed to group selected parameters according to common features. As, Cd, Cu, Mo, Pb and U were associated and controlled by mixed origin with similar contribution from anthropogenic and geogenic sources. This study indicates the necessity and usefulness of multivariate statistical techniques for evaluation and interpretation of the data with a view to get better information about the water quality and design some remedial techniques to prevent the pollution caused by hazardous heavy metals in future.

Keywords: Heavy metals, surfacewater, groundwater, contamination, multivariate analysis