The Study of Multi-Parametric and Multi-Station Gas-Geochemical Precursory Signals for Seismic Surveillance in Indian Subcontinent

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Among the natural calamities, earthquakes are the most destructive, in terms of loss of life and destruction of property. Research dealing with earthquake prediction has been the subject matter of extensive investigation in different scientific fields. The present paper deals with the analysis of continuous, online, round the clock monitoring of multi-parametric gas-geochemical data recorded at a network of geochemical monitoring laboratories that are scattered through out the country. Continuous helium and radon concentrations were simultaneously monitored for pre-seismic signatures at two thermal springs in India, separated at a distance of approximately 1500 km. One of these springs at Bakreswar (~69^0C), is close to the extinct volcanics of the Rajmahal Traps in West Bengal while the other spring at Tatta Pani (~45.1^0C), is located within the mountain folds of Jammu & Kashmir, situated in proximity to the Main Boundary Thrust (MBT) of lesser Himalayas. In this paper, we make a cross correlation study of the recorded geochemical data from these two springs. We find abnormal gas fluctuations observed at both the springs imaged to the same seismic tremor that follows. Based on the obtained sequence of data points we attempt to make a time series analysis to relate magnitude and epicentral distance locations, through statistical methods and empirical formulations relating the area of influence to earthquake scale. These geochemical observations taken at distant sites appear to be a potential tool to deal with the commonly debated question of earthquake prediction.

Keywords: Thermal spring, geochemical anomaly, time series analysis, earthquake