

## Radon Precursory Anomalies for Some Earthquakes in N-W Himalaya, India

**\*Vivek Walia<sup>1</sup>, Hardev Singh Virk<sup>2</sup>, Tsanvao Frank Yang<sup>3</sup>,  
Monika Walia<sup>3</sup>, Bikramjit Singh Bajwa<sup>4</sup>**

1. National Center for Research on Earthquake Engineering, Taipei, Taiwan R.O.C
2. #360, Sector 71, SAS Nagar (Mohali)-160071, India
3. Department of Geosciences, National Taiwan University, Taiwan R.O.C.
4. Department of Physics, Guru Nanak Dev University, Amritsar-143005, India

Changes in subsurface radon concentration have been observed to precede earthquake occurrence and therefore radon has potential use in earthquake prediction studies. Radon monitoring has been carried out using emanometry technique at Palampur and Dalhousie stations in the Kangra valley of Himachal Pradesh (India) in the time window, June 1996 to September 1999. Discrete radon concentrations are recorded in soil-gas and groundwater at both the stations. Radon anomalies were correlated with microseismic events recorded along the Main Boundary Thrust (MBT) of N-W Himalaya in the grid (30-34°N, 74-78°E). The influence of meteorological parameters viz. temperature, rainfall, relative humidity and wind velocity on radon concentration is qualitatively evaluated. The radon exhalation showed positive correlation with temperature, rainfall, relative humidity and negative correlation with wind velocity. Both positive and negative radon anomalies were recorded. The study reveals the precursory nature of radon anomalies and their correlation with microseismic events in 62% of the cases. From the analysis it has been found that radon anomaly is not only influenced by seismic parameters but also by meteorological parameters and nature of carrier gases/fluids.

The N-W Himalaya was rocked by a few major and many minor earthquakes. Two major earthquakes in Garhwal Himalaya: Uttarkashi earthquake of magnitude  $M_s=7.0$  ( $m_b=6.6$ ) on October 19, 1991 in Bhagirathi valley and Chamoli earthquake of  $M_s=6.5$  ( $m_b=6.8$ ) on March 29, 1999 in Alaknanda valley and one in Himachal Himalaya i.e., Chamba earthquake of magnitude 5.1 on March 24, 1995 in Chamba region, were recorded during the last decade and correlated with radon anomalies. The helium anomaly for Chamoli earthquake was also recorded and Helium/Radon ratio model was tested on it. The precursory nature of radon and helium anomalies is a strong indicator in favour of geochemical precursors for earthquake prediction.

