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Implications of geochemical precursory Signals vis a vis Earthquakes.

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Temporal variation of gaseous radon and helium concentrations emanating from thermal springs at Bakreswar ($23^0$52'30"N ; $87^0$02'30"E), W.Bengal, India are found to be very sensitive to seismo-tectonic activity. The monitoring springs appear through the intersections of intensive faults and fissures and characterized by the presence of deep seated fluids. Intending for earthquake research, a multi-parameter automatic monitoring station has been set up at the spring site for continuous measurement of radon, helium, nitrogen and methane time series. The gas bubbles emerging out of the spring vents are trapped underwater with an inverted funnel and fed to the equipments after passing through the gas driers. During the past few years several significant and extraordinary fluctuations of radon and helium concentrations as also gamma from radon progenies have been observed ahead of some major earthquakes. Of the several prominent observations made, unusually steep increase of helium and radon concentrations before the great Tsunami (Sumatra) on December 26, 2004, pronounced pre-monitory signatures of a major quake (M=8.7) occurred on March 28, 2005 at Indonesia at a depth of 30 km. followed by precursors of the Pakistan quake (M=7.6) rocked on October 08, 2005 are especially noteworthy. Gaseous anomalies in spring outflows may be ascribed to be the manifestation of stress-strain evolution within the solid earth during the earthquake preparatory process. This, in turn, causes the enhancement of fluid-rock interactions bringing about release of adsorbed and trapped volatiles from the fluid reservoirs and embedding rocks leading to excessive discharge of gaseous elements. The real time data were processed employing appropriate linear

and nonlinear statistical approaches to decipher the effects of external seismic perturbations owing to earthquake or volcanism. The results of statistical analysis express that the earthquake initiation process makes the earth system rather more organized as against its seismically normal stage.