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# Noise Reduction in Radon Monitoring Data Using Kalman Filter and Application of Results in Earthquake Precursory Process Research

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Abstract

Monitoring the concentration of radon gas is an established method for geophysical analyses and research, particularly in earthquake studies. A continuous radon monitoring station was implemented in Jooshan hot-spring, Kerman province, south east Iran. The location was carefully chosen as a widely reported earthquake-prone zone. A common issue during monitoring of radon gas concentration is the possibility of noise disturbance by different environmental and instrumental parameters. A systematic mathematical analysis aiming at reducing such noises from data is reported here; for the first time, the Kalman filter (KF) has been used for radon gas concentration monitoring. The filtering is incorporated based on several seismic parameters of the area under study. A novel anomaly defined as "radon concentration spike crossing" is also introduced and successfully used in the study. Furthermore, for the first time, a mathematical pattern of a relationship between the radius of potential precursory phenomena and the distance between epicenter and the monitoring station is reported and statistically analyzed.

**Key words:** radon anomaly, Kalman filter (KF), noise reduction, effective precursory (EP) ratio, seismic activity.