



Changes in radon concentration in geothermal water in relation to earthquakes in South Iceland

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The relationship between radon and earthquakes has been studied in the South Iceland Seismic Zone since 1977 when the first equipment for this purpose was installed there. Discrete sampling every 1-3 weeks for up to 17 years at several stations rendered time series that can be compared with earthquakes activity of the area. Many earthquake-related radon anomalies were identified, represented by both positive and negative excursions from the mean values, and occurred mostly prior to the seismic events. Radon anomalies were observed before 30 of 98 significant seismic events, and 35% of all observed anomalies were related to seismicity. In one case an earthquake was preceded by anomalies at 5 stations.

A new program of radon monitoring by discrete sampling was initiated in 1999, one year before the largest earthquakes in this zone for a century. The two earthquakes ($M_{wg}=5$) of June 2000 took place within our network of radon monitoring stations. Four types of change could be identified in relation to the June 2000 earthquakes: 1) Pre-seismic decrease of radon at all stations. Anomalously low values were measured 101-167 days before the earthquakes. 2) Pre-seismic increase. Spikes appear in the time series at 6 stations 40-144 days prior to the earthquakes. These anomalies were large and unusual if compared to a 17 years history of radon monitoring in this area. 3) Co-seismic step, most likely related to the co-seismic change in ground water pressure observed over the whole area. 4) Post-seismic return of the radon values to the pre-seismic level about 3 months later.

We are developing and testing a new, automatic radon instrument that continuously monitors the radon concentration in the geothermal ground water. The instruments are situated at the drill hole stations. They take 4 radon readings each day, check the mean concentration values, and record system parameters. Four stations have been

installed so far but the seismic activity is at a low level in the area and no new cases of earthquake-related anomalies have been discovered. The new instruments represent a large improvement in our capability to detect anomalies.