

# IMPROVED RADON MONITORING NETWORK FOR EARTHQUAKE PRECURSOR STUDIES IN SEISMIC AREAS

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## Abstract

Instruments for automatic detection and monitoring of radon have been under development for over a decade at the Science Institute, University of Iceland. The test area for the instruments has been the South Iceland Seismic Zone, where earlier radon programs had demonstrated radon anomalies in association with earthquakes (e.g. Hauksson, 1981, Jónsson and Einarsson, 1996). The new instruments are based on liquid scintillation counting by a photomultiplier tube (Theodórsson and Gudjonsson, 2003). In an early monitoring system 200 ml water samples from deep geothermal boreholes were sent to the lab twice a week for analysis. This program was run in 1999-2006 and demonstrated systematic variations in radon at six sites before, during and after the magnitude 6.5 earthquakes in June 2000 (Einarsson *et al.*, 2008). A new generation of automatic radon monitors has been designed and tested. Water from the boreholes is conducted through a silicon tube spiral at a rate of 30 ml/min. The spiral is located in a compartment where the radon atoms diffuse through the tube wall and are absorbed in a 15 ml scintillator in a vial. The vial is located above a vertical photomultiplier tube. A microprocessor electronic unit amplifies the pulses from the photomultiplier and sorts them in 4 counting windows according to size. The results are stored in an external USB memory or sent by a mobile phone every 24 hours to a central computer. Very high radon sensitivity is obtained by recording  $^{214}\text{Po}$  separately, after pulse time series analysis. 99% of  $^{214}\text{Po}$  alpha pulses (half-life 0.16 ms) come within 1.0 ms after the pulse of its mother nuclide,  $^{214}\text{Pb}$ . This procedure reduces the background to about 1 pulse per hour. The new instruments will be set up at the six monitoring sites in the SISZ within the next year.

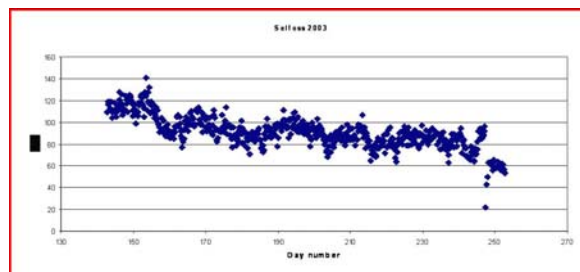


Figure 1: Time series of radon measured at a prototype station in Selfoss.

## References

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