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Radon activity concentration changes in borehole water

I. Smetanova (1), K. Holý (2), I. Túnyi (1), M. Müllerová (2), and A. Polášková (2)

(1) Slovak Academy of Sciences, Geophysical Institute, Bratislava, Slovakia (geofivas@savba.sk), (2) Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava, Slovakia (holy@fmph.uniba.sk)

The 222Rn activity concentration in ground water from four boreholes was investigated since January 2006 to June 2008. The boreholes are situated at the area of the Astronomical and Geophysical Observatory in Modra-Piesok (the Little Carpathians Mts, 40km NW from Bratislava). Three boreholes V-1 (10m), V-2 (40m) and V-3 (10m) have been drilled in Lower Triassic quartzite. The borehole HG-8 (50m) has been drilled in granodiorite of Modra massif in which the quartzite is folded. This borehole serves as a water source for the observatory and it is irregularly pumped. Water sampling was executed three times a week. Simultaneously the state of water level was measured. The 222Rn activity concentration in borehole water was determined using a scintillation cell of Lucas type. Radon activity concentration changes in borehole water were studied in relation to the water level changes, precipitation amount and height of a snow cover. Temporal and spatial differences in radon concentration were observed. Significant short-term variations were noticed in all boreholes. The radon concentration decrease did not always follow the radioactive decay law. Precipitation caused the changes of water level and strongly affected the values of 222Rn activity concentration in V-1 and V-3 boreholes in comparison to V-2 and HG-8. The measured activities in boreholes ranged approximately 1-240 kBq/m3 with exception of V-3 in which the radon concentration reached up to 30 kBq/m3 only. Radon is probably transported into borehole water from underlying granodiorite of Modra massif, but with the different intensity in each borehole.