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Short-term Rn-222 concentration changes in underground spaces with limited air exchange

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Authors conducted research on radon concentration in two underground structures located in the vicinity of Kletno (Sudety Mts., SW Poland), which are accessible for visitors. One of these structures is Niedźwiedzia (Bear) Cave, and the second one is the part of former uranium mine – Fluorite Adit. Both selected underground structures are characterized by almost constant temperature, changing within the range from +5 to +7˚C and also constant relative humidity, close to 100%. Both these parameters testify that air exchange with the atmosphere is very limited. Air exchange is limited particularly in Niedźwiedzia Cave, which microclimate is protected i.e. by applying of locks at the entrance and exit of tourist route. The measurements were conducted between 16.05.2008. and 15.11.2009., by the use of a new Polish equipment – SRDN-3 devices with semiconductor detector. SRDN-3 device records every hour radon concentration as well as atmospheric parameters - relative humidity and temperature. At the same time authors conducted measurements of basic parameters in the open atmosphere close to Niedźwiedzia Cave. Obtained results of atmospheric parameters measurements may be used for both underground structures; because they are located within the distance of about 1 km. Atmospheric parameters were measured by the use of automatic weather station VantagePro2. On the base of conducted research authors corroborate, that the differences of radon concentration in both underground structures reach three orders of magnitude during a year. In Niedźwiedzia Cave these values are in the range from below 88 Bq/m^3 (detection limit of the SRDN-3 device) up to 12 kBq/m^3. Related values in Fluorite Adit are between $<$ 88 Bq/m^3 and 35 kBq/m^3. It was observed also the different course of daily radon concentration changes in both structures. Additionally, authors registered that daily course of radon concentration changes differs due to season of the year. Such changes are observed in both structures. The reasons of these changes are probably connected with the way of air exchange between interior of the structure and the atmosphere. In both cases they are determined by atmospheric air temperature changes in relation with the temperature of the air inside the cave or adit. Authors have been still working on this problem. We can also say, that the character of daily radon concentration changes inside both examined structures differ from typical changes noted in dwelling houses.