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Radon signals in geological (natural) geogas and in a simultaneous enhanced confined mode simulation experiment

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A radon simulation experiment, based on the enhanced confined mode (ECM) concept, which was tested in the lab in Jerusalem, was relocated and re-established at a subsurface geophysical observatory located 400 km apart and at a depth of 150m. The temporal variation patterns of the local geological radon at the observatory are well known and subsurface temperature is very stable. Five gamma sensors are placed around the ECM canister containing radon in air. Lead shielding minimizes the influence of natural local gamma radiation on the ECM detectors. Simultaneous measurement of the variation of the local geological radon and the gamma radiation from radon in the ECM system indicates that:
1. Gamma radiation from radon in the ECM system varies. The latter is not due to mass transfer between the canister volume and the environment nor to temperature variations.
2. The temporal variation of radon contains annual, multi-day and daily signals, similar to those frequently observed in geological radon time series.
3. A correspondence exists between the variation patterns inside the canister and that of the geological radon in the tunnel air of the subsurface BGO site – at the scale of the annual, multi-day and daily signals. This implies that at BGO a common external driver influences the radiation pattern of the geological radon and from radon inside the isolated ECM canister.
4. The manifestation of the external driver on the daily signal inside the canister is superior to its manifestation in the air of the BGO. Two possibilities are raised at this stage to account for this difference: a) the different geometrical configurations of the sensed volume of air with radon of BGO and the ECM, and b) some distortion of the DR signal in the BGO air due to slight movements of its air mass.
5. Once activated at BGO the typical variation pattern of the experimental system exhibited in the lab (Jerusalem) changed to that occurring at BGO. This is interpreted to indicate that the overall style of the temporal patterns of radiation from radon is site dependent.
The outcome of this investigation conforms and further substantiates the recent suggestion that a component in solar radiation is driving the annual and daily periodic components in the variation of radon. New geophysical research potential is indicated.