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Multi-Layer Description Model for Radon Concentration in Soil

Experimental data for radon concentration in soil sometimes show a kind of non-monotonic increase with the soil depth. For that kind of behavior, this study suggests a theoretical model that can be used to describe the data based on a multi-layer configuration for the soil. This is constructed from the general transport equation that includes both diffusion and advection. The model however has two challenges. First is that the exact solution of the transport equation is cumbersome to deal with for describing soils that involve more than two layers. Second is that some forms of approximate solutions may lead to a discontinuity between the different layers. In this study an efficient mathematical formulation is suggested that successfully reaches a form of approximate solutions which can cope with the two challenges. The model formulation is much simpler than the exact solution, and hence can be easily applied to include many layers with smooth transition from one layer to the next. Moreover, it successfully gives a good fitting with the experimental data. This model therefore helps in estimating the characteristics of radon distribution and transport in soils that require a multi-layer configuration.

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