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Geographical distribution of the annual mean radon concentrations in primary schools of Southern Serbia – application of geostatistical methods

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ABSTRACT

Between 2008 and 2011 a survey of radon (^{222}Rn) was performed in schools of several districts of Southern Serbia. Some results have been published previously (Žunić et al., 2010; Carpentieri et al., 2011; Žunić et al., 2013). This article concentrates on the geographical distribution of the measured Rn concentrations. Applying geostatistical methods we generate "school radon maps" of expected concentrations and of estimated probabilities that a concentration threshold is exceeded. The resulting maps show a clearly structured spatial pattern which appears related to the geological background. In particular in areas with vulcanite and granitoid rocks, elevated radon (Rn) concentrations can be expected. The "school radon map" can therefore be considered as proxy to a map of the geogenic radon potential, and allows identification of radon-prone areas, i.e. areas in which higher Rn radon concentrations can be expected for natural reasons.

It must be stressed that the "radon hazard", or potential risk, estimated this way, has to be distinguished from the actual radon risk, which is a function of exposure. This in turn may require (depending on the target variable which is supposed to measure risk) considering demographic and sociological reality, i.e. population density, distribution of building styles and living habits.

1. Introduction

1.1. The Serbian school radon survey

The Serbian indoor radon survey is based on measurements made in primary schools, performed in the framework of a research project by the Ministry of Education, Science and Technological Development of the Republic of Serbia. The first phase started in August 2008 and has so far included 340 schools in three districts (Districts of Jablanica, Districts of Pčinja and Districts of Zaječar) in South Serbia (Fig. 1).

The field activity of this phase was completed by the end of 2010. The assumptions which support the choice of schools as indicators of geographical distribution of indoor Rn are:

(1) Geographical distribution of schools reasonably is related – at least in rural regions – with distribution of the population;
(2) For the same location, Rn exposure in schools is indicative of (but not necessarily equal to) indoor Rn exposure in buildings where people spend most of their time, in general.

Apart from this, knowing Rn levels to which school children and teachers are exposed is by itself important information. Furthermore, schools are workplaces (for teachers) with public access (children) which will be subject to the forthcoming new Euratom Directive on Basic Safety Standards being approved by the European Union (European Commission, 2012).

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