Indoor radon concentrations: The influence of geological factors in Italian study case

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The indoor radon exposition is internationally known as a health hazard. For this reason, many countries have introduced specific laws and regulations and radon-risk maps have been consequently produced. In Italy the radon exposure legislation regards only general workplaces (D. Lgs. n. 241/00) and only one national survey in the 90's has been currently conducted by APAT, ISS and ARPA regional agencies. This survey assessed the exposure to indoor radon concentration in national dwellings on large scale. In absence of guidelines, only few Italian Regions have prepared a surveying protocol using independent standards in order to identify "radon prone areas", inducing a bigger uncertainty on the definition of a national risk map. In the present work a standardized methodology for indoor radon measurements has been set up, with attention to the development of a passive measurement technique, validated through a comparison with other international laboratories. Data from a wide sampling (Lombardia, with the case studies of Milano Province and Milano city, Emilia Romagna, Toscana, Puglia) of radon indoor monitoring has been elaborated and georeferenced, using geo-statistical technique, to produced a map of annual average radon concentration and to verify the relapse of seasonal fluctuations on radon concentrations. Applying the recently introduced international approach, the elaborated maps has been integrated with geological knowledge of highest concentration macro-areas identified in order to better determine them. This study allowed to point out not negligible radon concentrations also in traditionally no–risk zone; moreover the application of the developed methodology will be useful to give advices to fill legislation gaps or to draft urban development plans.

Seismic constraints on the fine scale structure of Earth's mantle

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Seismic tomography is very successful in imaging the large scale structure of the deep Earth on wavelengths of a few hundred kilometers. On the other hand geochemical studies indicate heterogeneities on all scale lengths. Much of what we know about the small scale structure of the Earth's deep interior comes from studying high frequency reflections and conversions of seismic waves at boundaries. Besides this information the seismic recordings also contain extensive energy that is attributed to scattering of the high-frequency components of the seismic wavefield. This information can be used to probe the fine-scale (approximately 10 km and smaller) heterogeneities of the Earth's interior, and can help to solve questions such as the existence of melt, the location of geochemical reservoirs and the fate of subducted crustal and slab material Here we use observations of scattered energy related to seismic mantle waves to image the likely introduction of geochemical heterogeneities into the lower mantle in the vicinity of subduction zones. These data indicate that crustal material enters the lower mantle at least beneath some subduction zones. Using scattered energy sensitive to small-scale structure at the core-mantle boundary we are able to detect regions of increased scattering at this important boundary of the Earth. The region of the large low shear velocity province beneath Africa seems to contain strong heterogeneities leading to increased scattering form this region. Using geodynamical models in conjunction with these seismic results it might be possible to explain the location and origin of some of the Earth's small scale structure.