University of Genova

Department of Earth, Environmental and Life Sciences

Doctorate Course in Earth and Environmental Science and Technology

Università degli Studi di Genova

STAT

Dottorato in Scienze e Tecnologie per l'Ambiente e il Territorio

Earth Science Curriculum

Research Theme n. 5

Titolo: Radioattività Geogenica per la Previsione del Rischio da Radiazioni Ionizzanti e del Radon "indoor"
Title: Geogenic Radioactivity for Predicting Ionizing Radiation Hazard and Indoor Radon

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Program description including the formation program abroad

Natural radioactivity is mainly due to the decay of the principal primordial radionuclides (^{238}U, ^{232}Th and ^{40}K) occurring in soils and rocks. The concentration of these isotopes can be rapidly determined through non-destructive gamma-spectrometry techniques, also allowing the evaluation of the absorbed gamma-ray dose, which may represent a hazard factor for human health. Among the several radiogenic isotopes, ^{222}Rn, produced by the ^{238}U decay, is considered the primary source of ionizing radiation exposure to the population and an indoor air pollutant causing harmful effects. Geologic and tectonic features (e.g., lithology, seismically active and not-active faults, fractured zones) control radon generation migration and transport in soil and surface emission. Therefore, identifying areas characterized by enhanced natural radioactivity is critical in hazard assessment.

On the other hand, indoor radon concentrations may also be controlled by anthropogenic and meteorological factors. The PhD project aims to investigate the use of gamma-ray spectrometry in combination with information on the lithology and factors affecting the radon mobility (e.g. permeability, porosity, faulting) to map the geogenic radon potential and set up an approach to evaluate the amount of radon delivered from the geogenic source to ground level. The main advantage of this approach is that it is independent of anthropogenic factors and site-specific ground-based radon measurements. The research activities will be carried out in the frame of the tutor's cooperation with institutions (ENEA, INGV) and scientists involved in international projects on environmental radiation protection.

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Tutor's publications

Bonorino, L., Beccaris, G., Bisi, P., Chiozzi, P., Cogorno, A., Filippi, E., Narizzano, R., Prandi, S., and Verdoya, M.: An approach to relate uranium to indoor radon: a case study from the western Ligurian Alps (Italy), EGU General Assembly 2023, Vienna, Austria, 24–28 Apr 2023, EGU23-12769, https://doi.org/10.5194/egusphere-egu23-12769, 2023.

M. Bochiolo, M. Verdoya, P. Chiozzi, V. Pasquale., 2012. Radiometric surveying for the assessment of radiation dose and radon specific exhalation in underground environment. *Journal of Applied Geophysics* 83, 100-106. IF 1.327

M. Verdoya, P. P. Chiozzi De Felice, V. Pasquale, M. Bochiolo, I. Genovesi, 2009. Natural gamma-ray spectrometry as a tool for radiation dose and radon hazard modelling. *Applied radiation and Isotopes*, 67, 964–968