Implications of radon and gamma rays anomalies in northern Taiwan

*Ching-Chou Fu[1], Lou-Chuang Lee[1], Tsanyao Frank Yang[2], Peng-Kang Wang[1], Tsung-Kwei Liu[2], Vivek Walia[3], Cheng-Hong Chen[2], Cheng-Horng Lin[1], Gioacchino Giuliani[4], Dimitar Ouzounov[5]

1. Institute of Earth Sciences, Academia Sinica, 2. Department of Geosciences, National Taiwan University, 3. National Center for Research on Earthquake Engineering, NARL, 4. Permanent Foundation G. Giuliani, L'Aquila, Italy, 5. Chapman University, One University Drive, Orange, CA, USA

Taiwan is tectonically situated in a terrain resulting from the oblique collision between the Philippine Sea plate (PHS) and the Eurasian plate (EU). The continuous observations of soil radon for earthquake studies at the Tapingti station (TPT) have been recorded and are compared with the data from gamma rays observations at the Taiwan Volcano Observation station(YMSG), located north to the TPT station. Some anomalous high radon concentrations and gamma-ray counts at certain times can be identified. It is noted that the significant increase of soil radon concentrations were observed and followed by the increase in gamma-ray counts several days before the earthquakes, which occurred in northeastern Taiwan. Many of these earthquakes are located within the subducting PHS beneath the EU to the north along the Ryukyu trench in northern Taiwan (e.g., M_L=6.3 April 20, 2015). It is suggested that the pre-earthquake activities may be associated with slow geodynamic processes at the subduction interface, leading to the PHS movement to trigger radon enhancements at TPT station. Furthermore, the further movement of PHS may be locked by EU and accumulate elastic stress resulting in the increase of gamma rays due to an increase in the porosity and fractures below the YMSG station. The continuous monitoring on the multiple parameters can improve our understanding of the relationship between the observed radon and gamma-ray variations and the regional crustal stress/strain in the area.

Keywords: radon, gamma ray, earthquake, subduction

