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Strategies for Earthquake Disaster Reduction Using Soil Radon Monitoring in Taiwan

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Earthquakes constitute a severe source of human disasters all around the world. However, one has to note, following the reviews on earthquake prediction, that at the present day no detectable, systematic and reliable precursory phenomena precede large earthquakes. Indeed, even if some precursory phenomena have been identified subsequent to many earthquakes, there are no statistically based reliable data for the recognition of a method based on the search for precursors. So, it's necessary to make different prevention strategies to reduce the impact of disaster due to impending earthquakes in the region. The island of Taiwan is a product of the collision between the Philippine Sea plate and Eurasian plate which makes it a region of high seismicity. Active subduction zones occur south and east of Taiwan. Geochemical anomalies in soil gas and groundwater are commonly observed prior to impending earthquake and volcanic eruptions, attracting considerable attention in studies on precursory geochemical signals. Geochemical variations of soil-gas composition in the vicinity of geologic fault zone of Northeastern and Southwestern parts of Taiwan have been studied in detail recently. To carry out the investigation, temporal soil-gases variations are measured at continuous earthquake monitoring stations established along different faults. In present study, we have correlated observed soil-gas anomalies with some earthquakes magnitude ≥ 5 occurred in the region during the observation. The data is processed using a different kind of filters to reduce the noise level. It helps us to filter out the high-frequency noise and daily variation caused by different parameters. However, radon anomalies in all cases are not only controlled by seismic activity but also by meteorological parameters which make isolation of earthquake precursory signals complicated. Characteristics of temporal variability of soil-gas radon concentrations have also been examined using Singular Spectrum Analysis. Digital filter has been applied in eliminating the long term trend in the data and retains variations of less than 30 days**.** The radon variations exhibit dominant daily variations, which are controlled by atmospheric temperature inducted evaporation in surface water saturated soil (Capping Effect). The causal relationship is marked by a clear phase lag of 2-3 hours in the sense that peak in daily variation of radon succeeds the peak in temperature. Aperiodic variations in soil radon intensity in the range of 2-10 days are negatively correlated with temperature whereas positively correlated with pressure. To integrate our data with our working procedure, we use the popular and famous open source web application solution, AMP (Apache, MySQL, and PHP), creating a website that could effectively show and help us manage the real-time

database. Based on the anomalous signatures from particular monitoring stations we are in a state to identify the area for impending earthquakes for the proposed tectonic based model for earthquake forecasting in Taiwan.