Complex system for earthquakes forecast using gas emission observations

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Romanian National Institute of Earth Physics (NIEP) develops a gas emission monitoring network as part of a multidisciplinary activity. The goal is to help organizations specialized in emergency situations with short-term earthquakes forecast and information related to pollution and effects of climate change. In Romania, the important seismic area is Vrancea where there are seismic and multidisciplinary monitoring stations. The methods and monitoring solutions are general and they could be applied in any place. The main part of our system is related to CO₂, CO, radon, air ionization in correlation with earth radiation, air ionization, telluric currents, ULF radio waves disturbance, magnetic field, temperature in borehole, infrasound, acoustic waves and meteorological data. The monitoring stations are located on the faults in the curvature of the Carpathian Mountains. The first step is to determine the daily, seasonal and annual evolutions of gas emissions and ionization of the air for at least one year. We are looking for time intervals during which the seismic activity was reduced to determine the normal evolutions of the measured parameters. Then we can determine the effects of active seismic periods on gas emissions. We will apply several methods of analysis and will correlate the particularities of the geological structure in which the monitoring stations are located and the position of the epicenters of earthquakes. The present results are favorable to the analysis by integrating the values measured on variable time windows according to the case. Instantaneous values also include local effects that are not related to tectonic stress. Current measurements indicate the presence of CO at certain times of the day and at certain stations. This is not possible due to tectonic stress, but may be the result of pollution in short-distance cities and air currents that spread it.

Key words: gas emission, multidisciplinary analysis, radon concentration, air ionization, multi-parametric monitoring, earthquake forecast, earthquake precursors