

Anomalous transients in Radon emission, Earth's emitted TIR radiation and seismicity in North Italy

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Looking for a reduction of the seismic hazard in the short term (days to weeks) the use of a real-time integration of multi-parametric observations is expected to accelerate the process toward improved, and operationally more effective, systems for time-Dependent Assessment of Seismic Hazard (t-DASH) and earthquake forecast. A very preliminary step in this direction is the identification of those parameters (chemical, physical, biological, etc.) whose anomalous variations can be, to some extent, associated to the complex process of preparation of major earthquakes.

In this paper two parameters, claimed since long time, as possible indicators of an impending seismic activity have been analyzed: Thermal Infrared Radiation (TIR) and Radon (Rn) gas concentration.

The earthquake is the final effect of a long preparation process in which the increasing of the stress, produced by deep geodynamics, develops new micro fractures in the rocks with consequent variation of their chemical-physical characteristics. These variations, which occur as transient phenomena, can provide information about the status of crustal deformation and to the seismogenic process over a large zone. Anomalous transient increasing in radon concentrations are often reported as earthquake precursor phenomena.

Radon is a natural gas, produced in soil, by the radioactive decay of the radium element, produced in turn by uranium. Because radon is a gas and can leave the rocks and soils by escaping into fractures and openings in rocks and into the pore spaces between grains of soil.

The Thermal Infrared Radiation is measured by satellite techniques. Physical model exist which put in direct relation (through the ionization processes due to Radon decay) the increasing of Radon emission with near surface temperature variations. However Earth's Thermally emitted radiation is known to increase also by effect of local greenhouse effects related to abrupt releases of greenhouse gases (like CO₂, CH₄, etc.), which are often (like in the case of CO₂) earthquake precursors too.

The long-term time series of Radon and TIR data collected in Northern Italy will be analyzed by applying a RST methodology, implemented on the Radon data. To identify the possible anomalous value a new index based on ALICE index has been computed.