The CL4EP Software: a new useful tool to recognize volcanic unrest and help decision makers

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In densely populated volcanic areas, it is of fundamental importance recognizing an impending eruption. Geophysical and geochemical signals are useful precursors of a volcanic unrest, especially if correlation with crisis periods or unrest phases has already been undertaken. Geochemical precursors, such as increasing temperature and $[CO_2]$ in crater fumaroles, helium isotope, together with seismicity and deformation can be taken as references. Correlating data acquired by the monitoring networks and identifying "thresholds" for each precursor it is possible to recognize different "critical levels" by "CL4EP Software" (Critical Level 4 Emergency Planning). The software has been developed in ASP. NET Web Forms with C # framework 4.0, with access to external systems such as databases. The primary .NET technology involved is ADO.NET. Use Entity framework 6.1. It involves the use of Web Forms for smart client interaction, and ASP.NET technologies for browser- interaction. CL4EP Software may provide a exhaustive picture of the ongoing volcanic activity to the decision makers indicating, in real time, the critical levels that ranges from ordinary to very high, associated with probability values approaching to an eruption. The case study here presented regards Vulcano Island (Eolian Island, Italy) that is in a quiescent state with episodic occurrences of "crisis", characterized by increasing of crater fumaroles temperature and chemical and isotopic changes, indicating an increasing output of magmatic gas. The critical levels were selected analyzing past crises from 1924 to 2009. Possible threshold values were defined for: CO_2 concentration and temperature at La Fossa crater fumaroles, diffuse soil CO_2 flux at La Fossa (in a selected target area), ground deformation at NE and Forgia Vecchia sectors and number of seismic events below the Fossa Cone. Each critical level, associated with an increasing probability of eruption, may be used to activate a different response based on the occurring phenomena scenario.