Development of a scenario builder tool for volcanic risk assessment and application to Mount Cameroun

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One of the objectives of the MIAVITA project is to develop a conceptual frame for the risk assessment of inhabited areas exposed to various volcanic hazards. The present communication aims at presenting a scenario-building tool that would take into account the succession of volcanic, seismic, gravity and hydro-geological events and, consequently, analyse the impact of such events on people, physical elements (e.g. buildings, agriculture) and various functional systems composing the exposed community.

As several scenario software tools are available in the field of seismic risk, such an approach proves less straightforward in the case of volcanic risk: the main difficulty resides in the crossover of several types of geological phenomena and exposed elements, each combination of them usually relying on specific damage mechanisms. Therefore, before building a risk assessment tool, the first step comprises the careful definition of all damaging phenomena, damage mechanisms and exposed elements that may be potentially involved in a volcanic eruption. For the analysis of complex systems of components, the object-oriented paradigm is a convenient approach and enables to clearly represent the hazard phenomena and the vulnerable elements as a set of well-structured *classes* that are assigned specific *attributes* (i.e. properties) and *methods* (i.e. functions): such an approach has been previously used in the frame of a seismic risk analysis (Cavalieri et al., 2012) and has been adapted to the case of volcanic, by adding new hazard classes and damage mechanism corresponding to the specificities of volcanic risk. The definition of classes of objects is then used to draw UML (Unified Modified Language) diagrams that represent the successive steps of a risk scenario computation, from the definition of the hazard phenomena to the estimation of physical and functional damage of the exposed elements.

A software tool developed by Cavalieri et al. (2012) in the frame of the SYNER-G FP7 project has been used as the “core engine” for the MIAVITA scenario-builder tool: the changes that were implemented enable to compute the impact of several volcanic events on a wide range of exposed elements (e.g. buildings, lifelines, road network, cultivated areas, emergency centres…). A non-negligible feature relies also in the ability to build a scenario composed from different successive volcanic events (e.g. tephra fall, pyroclastic density current, debris flow, lahar…), thus adding a temporal dimension in the computation. A few probable scenarios have been elicited for the Mount Cameroun area and they were implemented in the risk assessment tool in order to get a robust and quantitative estimation of

the impacts of different volcanic events. Using sets of fragility curves previously compiled by Jenkins & Spence (2009), the software tool yields probabilistic results for some indicators such as the number of casualties or collapsed buildings, the area of damaged cultivated fields or the connectivity loss in the road network.

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