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Evaluating explosive eruption risk at European volcanoes: Contributions from the EU-funded EXPLORIS project

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The potential for great losses of life and economic disruption in violent eruptions has emerged as a reality with the recent rapid growth of human settlements in the vicinity of many explosive volcanoes around the world. EXPLORIS (acronym of the EU-funded project "Explosive Eruption Risk and Decision Support for EU Populations Threatened by Volcanoes") and the former CASUALRUPT project (acronym of the EC project entitled "Human and Structural Vulnerability Assessment for Emergency Planning in a Future Eruption of Vesuvius using Volcanic Simulation and Casualty Modelling") are probably the first major multi-disciplinary projects to develop quantitative methods for making risk assessments and developing evidence-based planning for disaster management at explosive-erupting volcanoes. Vesuvius is a prime example, as a future eruption could have a catastrophic impact on the sprawling mega-city around the Bay of Naples, and is amongst the most serious natural disaster threats the EU faces in the foreseeable future. Acknowledging scientific uncertainty and the need to measure it has emerged recently in many disparate scientific fields as "evidence science" and developing new methods of formally incorporating it and the widely differing views of scientists into decision making was one of the main goals of EXPLORIS. New 3-D numerical models of explosive processes using supercomputers were also ground-breaking in the studies of volcanic impacts in the built environment which were based on more accurate and comprehensive vulnerability functions and databases of buildings and their human occupants. The probabilistic risk and decision tools developed in EXPLORIS provide a new paradigm in volcanology that unifies many disciplines engaged in mitigation and crisis management at Vesuvius and the three island volcanoes also studied (La Soufriere,Guadeloupe; Teide, Tenerife; and Sete Cidades,Azores).