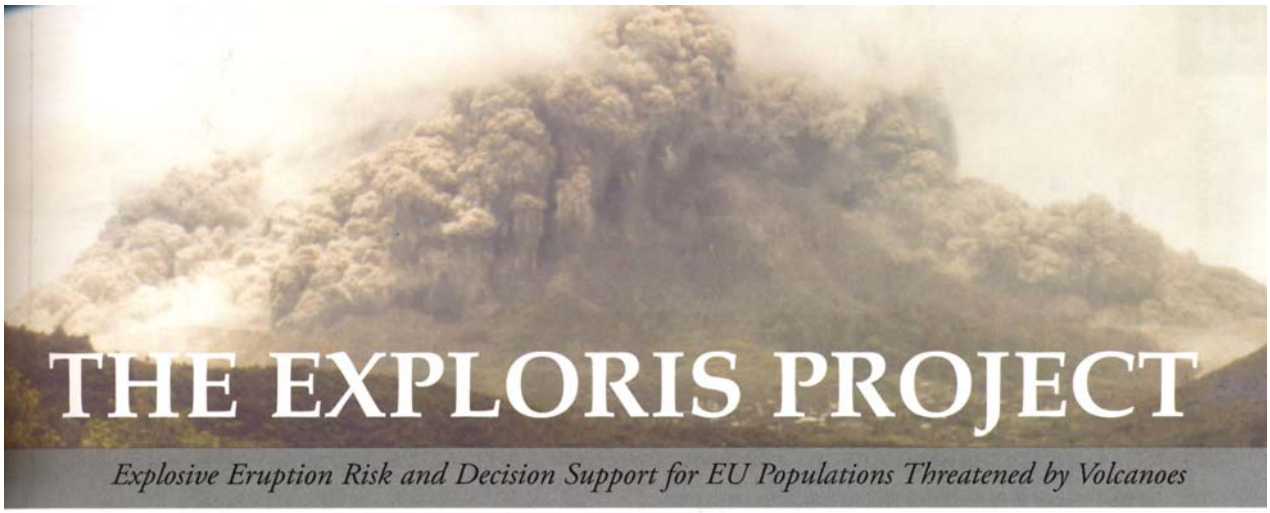

THE EXPLORIS PROJECT

Explosive Eruption Risk and Decision Support for EU Populations Threatened by Volcanoes

EXPLORIS partners and scientific responsibles (in parenthesis):

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2) CINECA, Italy, (Dr Giovanni Erbacci);

3) University of Cambridge, United Kingdom (Dr Peter Baxter);

4) Università degli Studi di Napoli Federico II, Italy (Professor Giulio Zuccaro);

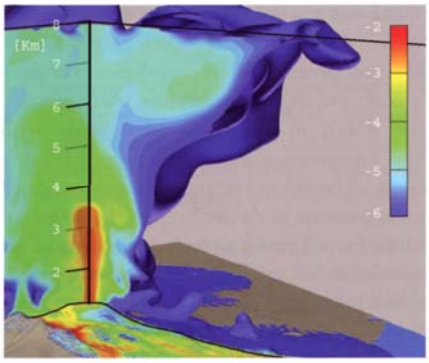
5) University of Luton, United Kingdom (Dr Paul Cole);

6) Aspinall and Ass., United Kingdom (Dr Willy Aspinall);

7) Consejo Superior de Investigaciones Cientificas, Spain (Professor Joan Martì);

8) Institute de Physique du Globe de Paris, France (Dr Jean Christophe Komorowski);

9) Universidade dos Azores, Portugal (Professor Teresa Ferreira).



Three dimensional view of the distribution of volcanic ash in the atmosphere and along the volcano flanks as produced by the 3D transient and multiphase flow code PDAC developed in the ambience of the EU funded EXPLORIS project. The figure refers to a sub-plinian eruption of Vesuvius (Italy) and to 1,500 seconds after the collapse of the volcanic column. The colour bar refers to the ash volume concentration in the atmosphere, with the red colour indicating high concentration and the blue colour indicating low concentration (numbers indicate the log to the base 10 of the ash volume concentration)

Satellite image of Mount Vesuvius and nearby towns (by NASA). The area surrounding Mount Vesuvius is highly inhabited: the City of Naples, with about one million people, is just about 12km eastward from the crater and an additional half million people are living inside the Red Area that, according to the emergency plan, should be evacuated in advance of an eruption

EXPLORIS
Explosive Eruption Risk and Decision Support for EU Populations Threatened by Volcanoes

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Explosive research

Dr Augusto Neri, Director of the INGV Pisa Department, explains his work in modelling explosive risk at European volcanoes...

In recent decades, the population worldwide has become concentrated in large conurbations on volcanic islands at high risk from volcanic disasters. The most serious hazards are related to eruptive phenomena that characterise explosive volcanoes, such as the dispersal of ash and lapilli over wide regions all around the volcanic centre, and the occurrence of pyroclastic flows travelling at high speed and temperature along the volcano flanks.

The EU EXPLORIS project Explosive Eruption Risk and Decision Support for EU Populations Threatened by Volcanoes, funded under the fifth Framework, Energy, Environment and Sustainable Development Programme, is one of the first systematic attempts to quantify the explosive risk at the site of four European volcanoes: Vesuvius (Italy), La Soufrière, Guadaloupe (France), Sete Cidades, Azores (Portugal), and Teide, Canary Islands (Spain).

Risk is the probability of a specified loss and can be mathematically expressed as risk = hazard x vulnerability x value.

Hazard is the probability of an eruption within a given period of time. Vulnerability is the proportion of the value likely to be lost in the event. Value is the quantity of lives, properties or productive capacity at risk. However, despite its potential, this approach has rarely been applied in the assessment of volcanic risk in populated European regions. As a result, national disaster planning for volcanic eruptions has not included quantitative estimates of the anticipated impact and risk, or the likely effect of new mitigation measures that can be adopted.

The main objective of the EXPLORIS project is the quantitative analysis of explosive eruption risk through the development of volcanic risk tools – such as 3D supercomputer simulation codes, vulnerability functions, and probabilistic risk assessment protocols. In more detail, the specific objectives of the project are: 1) define quantitative volcanological scenarios for the most dangerous European volcanoes, 2) develop parallel 3D supercomputer models for the simulation of fallout dispersal and pyroclastic flows, 3) develop vulnerability relationships for buildings, infrastructures and inhabitants, 4) quantify the potential impact of the eruptive phenomena, 5) develop and apply probabilistic risk assessment protocols, 6) suggest potential mitigation measures, and 7) transfer the project findings to civil authorities in order to provide policy-relevant information. Most importantly, the adopted approach aims to combine knowledge deriving from different fields in order to provide a strategic multidisciplinary set of expertises.

EXPLORIS has now reached its final stage, and preliminary results were presented during an international workshop organised in Naples on 10th-13th May 2006. Civil protection authorities of four European countries and several International experts in volcanic hazard and risk attended the workshop. The major progress achieved was illustrated in the reconstruction of the eruptive records, and definition of scenarios, at the four project volcanoes, based on new field and historical investigations. In terms of volcano dynamics, a better understanding of the eruptive phenomena was reached through the development and application of new transient 3D codes for the simulation of ash fallout and pyroclastic flow propagation. For the first time, a complete set of vulnerability relationships and databases related to the variety of volcanic actions, including combination of effects, was defined and combined with hazard and exposure information. Another remarkable outcome of the project was the definition of probabilistic Event Trees for all project volcanoes, as well as the formulation of probabilistic hazard-vulnerability-casualty risk protocols. Finally, the advanced visualisation tools developed, able to combine simulation outputs with territorial and geographic data, appeared particularly effective in educating public officials and the general public about hazards and their impact on society.

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