

# ROBOVOLC

## A Robot for Volcano Exploration



### Abstract

The main objective of this project is the development and trial of an automatic robotic system to explore and perform measurements in a volcanic environment.

A major aim of the proposed robot will be that of minimising the risk for volcanologists who are involved in work close to volcanic vents during eruptive phenomena.

Observations and measurements of the variables relating to volcanic activity are of greatest interest during paroxysmal phases of eruptions, which unfortunately are also the time of greatest risk for humans.

Technical objectives of the project are :

- 1) The design, implementation and trial of a prototype robot suitable for autonomous and/or semi-autonomous exploration of natural and extremely rough unstructured environments.
- 2) The design, implementation and trial of a small measurement system for lava and volcanic gas analysis and sample.

## Project goal

- Enhance knowledge of the volcanic process to contribute to eruption forecasting
- Reduce the risk for volcanologists operating in proximity to volcanic vents
- Improve volcanic risk assessment

## Project objectives

Development and trial of an automatic robotic system capable of:

- approaching an active volcanic vent
- collecting samples of the volcanic products erupted
- measuring physical and chemical data on the eruptive process
- surveying close to vent openings

## Operational Goals

- Development of a tele-operated robot able to approach to active volcanic vents.
- Development of a small measurement system for lava and volcanic gas analysis and sample collecting.



## The Robot

- Suitable for autonomous / semi-autonomous exploration of natural irregular and extremely rough unstructured environments.
- Resistant to the high temperatures and contaminated atmosphere and to the impact of volcanic bombs and blocks.

## The measurement system

- Sampling of volcanic gas, molten lava or rocks near the active vents
- Analysis of volcanic gas
- Measurement of gas and lava temperatures
- Measurement of physical parameters of the volcanic jets
- Measurement of physical parameters of the lava stream
- Determination of the volcanic vents morphology and topography



# Innovation

The main innovative aspect of this project is the possibility of taking measurements during volcanic eruptions and the development of a robotic system for the exploration of one of the most difficult environments on the surface of the Earth. Measurement activities and sampling near active eruptive vents are normally not possible because of the extremely dangerous operative conditions due to both the unpredictability of volcanic activity and the very harsh environmental conditions. Up to date only a few observations close to active vents have been reported. They are related to unusually safe conditions or unscrupulous persons that run strong risks and sometime suffer serious personal injuries. However, only gas and lava sampling close to eruptive vents has been reported, probably due to the difficulties to operate with complex instrumentation.

Close to active eruptive vents the measurement and sampling processes are fundamental in volcanology and progress has been mainly in three fields: magmatic gas geochemistry, physical modelling of magma degassing, and stability assessment of the craters and domes. Even if several volcanological and geophysical topics will benefit from these data, we highlight the main contribution of the robot-aided fieldwork to the above mentioned topics.

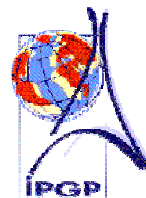
## The consortium

The project Robovolc involves six partners distributed among Academic, research centers and Industrial:

- Università degli Studi di Catania, Dipartimento Elettrico Elettronico e Sistemistico (ITALY)
- Istituto Internazionale di Vulcanologia CNR (ITALY)
- Institute de Physique du Globe de Paris (FRANCE)
- University of Portsmouth (UK)
- ROBOSOFT (FRANCE)
- BAE SYSTEMS - Advanced Technology Centres - Sowerby (U.K.)

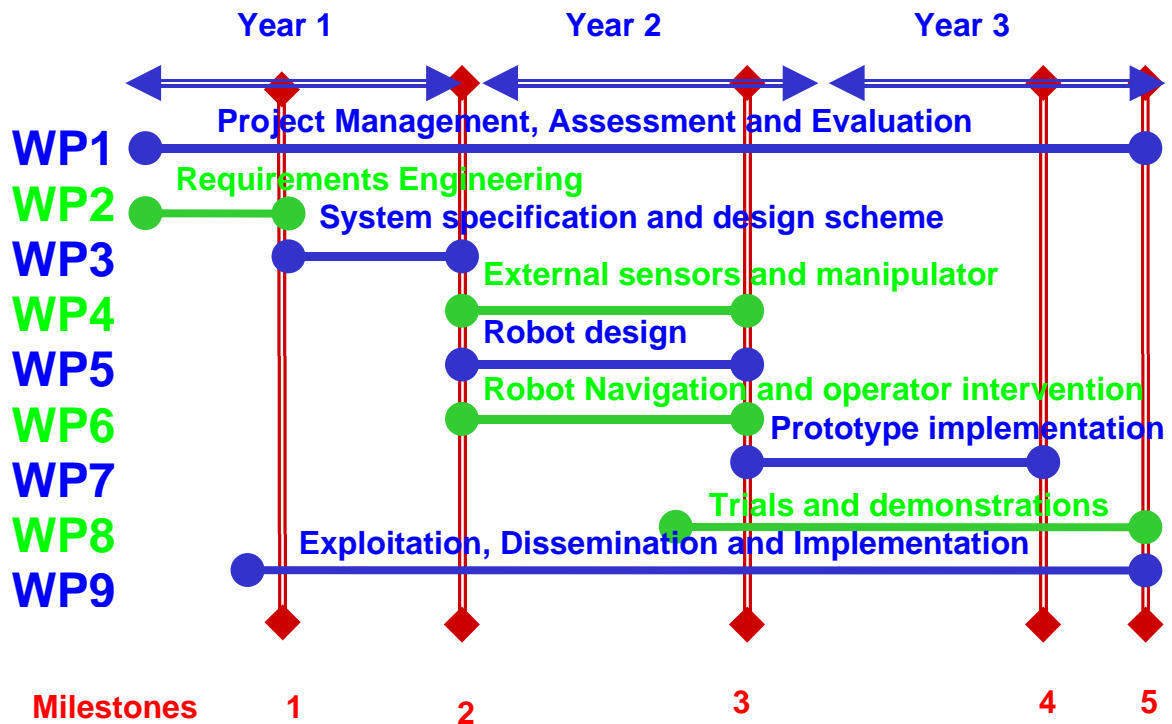


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# Description of work

Project Workplan is divided in nine different Workpackages. Project duration is 36 months. The activities started on March 2000.



## Key Milestones

- MS1 Common understanding of the user requirements and outline specification
- MS2 Consortium agree detailed specification and design scheme
- MS3 Consortium agree designs
- MS4 Results of tests agree with specification
- MS5 Demonstration in volcanic environment

## Further Information

For any further information please contact the project co-ordinator:

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Other related information :

- IST Website: <http://www.cordis.lu/ist/home.html>
- Environment and Demining: <http://www.cordis.lu/ist/ka1/environment/home.html>

