Instrument for the physical characterization of tephra fallout

INVENTORS: Emanuele Marchetti
Dario Delle Donne
Giacomo Ulivieri

PATENT STATUS: Granted

PRIORITY NUMBER: 102016000111417

PUBLICATION: 10/04/2019

PUBLISHED AS: ITA

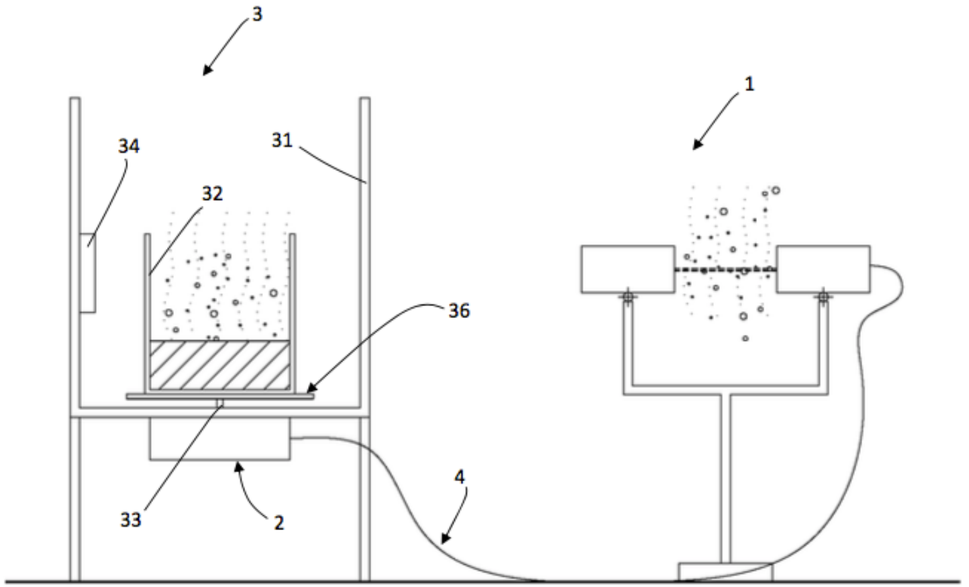
Invention

During a volcanic eruption it is important to quickly evaluate the quantity and grain size of the emitted material, to obtain more reliable dispersion models of volcanic ash. The invention, which responds to this need, consists of an optical barrier and a basket, which allow to evaluate the particle size and terminal velocity of individual particles and the accumulation rate of the deposit.

The apparatus consists into an optical barrier based on a laser switched ON and OFF at several tens of KHz and a central unit acquiring the dual state (ON/OFF) data to measure terminal velocity and grain size of particles crossing the beam. Measurements are eventually transmitted remotely in the forms of aggregate information. Grain size (between 90 µm and 2 mm) and terminal velocity (between 0.1 and 10 m/s) of single particles crossing the beam are calculated from the amplitude and duration of obscuration peaks. Material is also accumulated in a removable collector, where weight (accuracy of 1 g) and level (accuracy of 0.2 mm) are measured. Data acquisition, processing and transmission are in real time at regular time intervals. The automatic measurement and analysis wants to reduce response time of decision making agencies involved in volcano monitoring.

Drawings & pictures

Apparatus being tested and deployed permanently on Etna volcano



Sketch of the apparatus

Industrial applications

The patented technology allows teh real time detection and physical characterization of tephra fallout, providing automatically grain size, terminal velocity and accumulation rate. The technology is of interest to volcano monitoring and air traffic security.

Possible industrial applications are therefore expected for Civil Protection, research institutes involved in volcano monitoring and air traffic (ICAO, Volcanic Ash Advisories Centers).

Possible developments

The patent is available under an exclusive/non-exclusive license or sale. The license are available for the entire remaining term of the patent titles.

Future development of the apparatus concern the optimization of automatic processing (results clustering) and firmware (calibration of single units) and improvement of the accuracy and reliability of the weight sensor.

The research group is available for new research activities in collaboration and on behalf of third parties, technical insights, scientific advice, also aimed at raising the TRL of technology.

The global TRL of the invention is 5.

For more information:

Tech Transfer Office of the University of Florence

Headquarters: Piazza S. Marco 4 – 50121 Firenze

Web site: www.unifi.it

E-mail: brevetti@unifi.it

For more information:

Ufficio Regionale di Trasferimento Tecnologico

Headquarters: Via Luigi Carlo Farini, 8 50121 Firenze (FI) Italy

E-mail: urtt@regione.toscana.it

UNIVERSITÀ DEGLI STUDI FIRENZE

REGIONE TOSCANA

urtt Ufficio Regionale di Trasferimento Tecnologico