

m

ISSN 2039-6651  
Anno 2014\_Numero 23

# m

# Miscellanea

# INGV

**MED-SUV 1<sup>th</sup> Year Meeting**

Nicolosi (Catania) 7 | 9 July 2014

# 23



Istituto Nazionale di  
Geofisica e Vulcanologia

## **Editorial Board**

Andrea Tertulliani - Editor in Chief (INGV - RM1)

Luigi Cucci (INGV - RM1)

Nicola Pagliuca (INGV - RM1)

Umberto Sciacca (INGV - RM1)

Alessandro Settimi (INGV - RM2)

Aldo Winkler (INGV - RM2)

Salvatore Stramondo (INGV - CNT)

Gaetano Zonno (INGV - MI)

Viviana Castelli (INGV - BO)

Marcello Vichi (INGV - BO)

Sara Barsotti (INGV - PI)

Mario Castellano (INGV - NA)

Mauro Di Vito (INGV - NA)

Raffaele Azzaro (INGV - CT)

Rosa Anna Corsaro (INGV - CT)

Mario Mattia (INGV - CT)

Marcello Liotta (Seconda Università di Napoli, INGV - PA)

## **Segreteria di Redazione**

Francesca Di Stefano

Tel. +39 06 51860068

Fax +39 06 36915617

Rossella Celi

Tel. +39 095 7165851

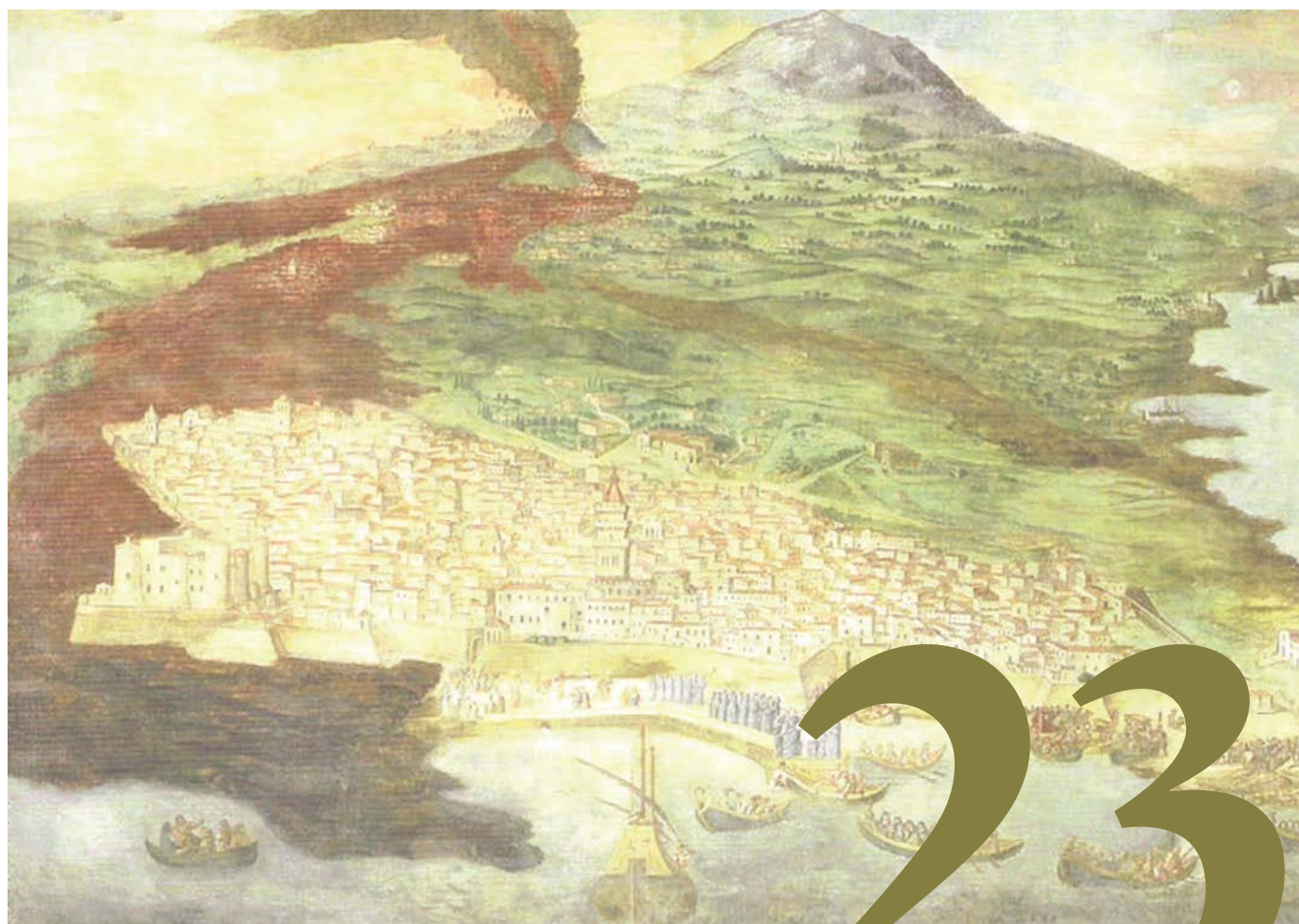
redazionecen@ingv.it

# Miscellanea INGV

**MED-SUV 1<sup>th</sup> YEAR MEETING**

**NICOLOSI (CATANIA) 7 | 9 JULY 2014**

Editors: Giuseppe Puglisi, Letizia Spampinato, Danilo Reitano, Salvatore Mangiagli



# 23



Istituto Nazionale di  
Geofisica e Vulcanologia



## Organizing Team

Giuseppe Puglisi	Director of Research, Project Leader
Letizia Spampinato	Researcher, Leader of Organizing Committee and Project Management Team
Alfio Amantia	Technician, Member of the Organizing Committee, Logistics
Stefano Branca	Senior Researcher, Member of the Organizing Committee, Field Trip
Francesco Calvagna	Assistant, Member of the Organizing Committee
Massimo Cantarero	Technician, Member of the Organizing Committee, Logistics
Massimo Cascone	Technician, Member of the Organizing Committee, Editorial Office, Front Desk
Rossella Celi	Technologist, Member of the Organizing Committee, Editorial Coordinator
Salvatore Consoli	Technician, Member of the Organizing Committee, Field Trip
Salvatore Mangiagli	Technologist, Member of the Organizing Committee, Web Master and pre-editing on line
Danilo Reitano	Technologist, Member of the Organizing Committee, Web Master
Benedetto Saraceno	Technician, Member of the Organizing Committee, Informatics
Rosanna Velardita	Researcher, Member of the Organizing Committee, Front Desk

## Pre-editorial Supporting Team

Simona Di Salvo, Antonella Catalano, Luca Pirrè La Terra (Servizio Civile Nazionale)

## Acknowledgements

Tommaso Caltabiano and Gillian Foulger are acknowledged for their contribution to this volume.

## Con la collaborazione di

Comune di Nicolosi



**PARCO DELL'ETNA**

### Revisione e normazione ortoeditoriale

Francesca Di Stefano    Centro Editoriale Nazionale INGV  
Rossella Celi            Centro Editoriale Nazionale INGV

### Immagine di frontespizio

La lava dell'eruzione del 1669 circonda Catania. Affresco di Giacinto Platania  
(testimone oculare dell'evento), conservato nella cattedrale di Catania.

## Partners

INGV	Istituto Nazionale di Geofisica e Vulcanologia
CNR	Consiglio Nazionale delle Ricerche
AMRA	Analisi e Monitoraggio del Rischio Ambientale Scarl
DPC	Presidenza del Consiglio dei Ministri - Dipartimento della Protezione Civile
DLR	Deutsches Zentrum fuer Luft - und Raumfahrt EV
LMU	Ludwig-Maximilians-Universitaet Muenchen
GFZ	Helmholtz - Zentrum Potsdam Deutsches GeoForschungsZentrum
UDUR	University of Durham
UNIVBRIS	University of Bristol
CNRS	Centre National de la Recherche Scientifique
BRGM	Bureau de Recherches Geologiques et Minieres
ESA	European Space Agency
CSIC	Agencia Estatal Consejo Superior de Investigaciones Cientificas
UGR	Universidad de Granada
UAc	Universidade dos Açores
UoM	Universita Ta Malta
Surveylab	Survey Lab
MATEC	Marwan Technology
T2	Terradue UK LTD
Western	The University of Western Ontario
USGS-HVO	United States Geological Survey
UMIL	Università degli Studi di Milano
DELTA G	DELTA G SRL
UBP-LMV	Université Blaise Pascal Clermont-Ferrand II





# Index

<b>Preface</b>	15
<b>WP1   Posters</b>	17
<b>Principles of MED-SUV Data Policy</b> Agata Sangianantoni, Giuseppe Puglisi, Letizia Spampinato	19
<b>Management of European Research Projects: the Case of MED-SUV</b> Letizia Spampinato, Giuseppe Puglisi, Agata Sangianantoni, Sofia Mariano, Gianluca Carà	20
<b>WP2   Talks</b>	21
<b>New Monitoring and Observing Systems: WP2 Status Overview</b> Christian Minet	23
<b>WP2 - Task 1 New Satellite-Based Monitoring Systems</b> Christian Minet, Marcello de Michele	24
<b>A New Data Logger for Volcano Monitoring</b> Massimo Orazi, Rosario Peluso, Marcello Martini, Antonio Caputo, Flora Giudicepietro	25
<b>FBG Strain Sensor Development and Test</b> Nicolò Beverini, Massimo Calamai, Daniele Carbone, Francesco Francesconi, Salvatore Gambino, Renzo Grassi, Alfio Alex Messina, Enrico Maccioni, Mauro Morganti, Fiodor Sorrentino	26
<b>Assessing and Improving the Measuring Capability of the Etna_NETVIS Camera Network for Lava Flow Rapid Mapping</b> Maria Marsella, Peppe Junior Valentino D'Aranno, Carla Nardinocchi, Silvia Scifoni, Marianna Scutti, Alberico Sonnessa, Emilio Biale, Francesco Ciancitto, Mauro Coltelli, Emilio Pecora, Michele Prestifilippo, Cristina Proietti	27
<b>WP3   Talks</b>	29
<b>The Use of Long-Term Earth Observation (EO) Data Products within the MED-SUV Project: the Task 3.1 on EO Data Processing Fine Tuning</b> Antonio Pepe, Susi Pepe, Sven Borgstrom, Giuseppe Solaro, Francesco Guglielmino, Malvina Silvestri	31
<b>In Situ Data Processing: a Step Towards the Data Integration And Interoperability Environment</b> Fawzi Doumaz	32
<b>MED-SUV project: First Results and Ongoing Activities of WP 3 –Task 3.3 Data integration</b> José Fernández, Michael Burton, Francesco Guglielmino, Maria Marsella, Simona Scollo, Claudia Spinetti, Kristin Tiampo	33
<b>The MED-SUV Multidisciplinary Interoperability Infrastructure</b> Stefano Nativi, Paolo Mazzetti, Fabrizio Papeschi, Roberto Cossu, Pierre Philippe Mathieu, Danilo Reitano	34

<b>WP3   Posters</b>	35
<b>A New Web-GIS for SAR Remote Sensing Data Management, Distribution and Sharing</b> Marco Aliotta, Carmelo Cassisi, Chiara Cocorullo, Francesco Guglielmino, Placido Montalto	37
<b>Seismological Data at Mt. Etna</b> Salvatore Alparone, Marcello D'Agostino, Giuseppe Di Grazia, Ferruccio Ferrari, Salvatore Spampinato	39
<b>Detect Etna Volcanic Plumes Through the Analysis of the GPS Signal to Noise Ratio Data</b> Massimo Aranzulla, Flavio Cannavò, Giuseppe Puglisi, Simona Scollo	40
<b>Volcanic SO<sub>2</sub> Flux Comparison by Satellite and Ground-Based Measurements During the Mt. Etna 2011-2013 Lava Fountain Episodes</b> Stefano Corradini, Giuseppe Salerno, Michael Burton, Luca Merucci	41
<b>Prototype of a GSAC Server for the Mt. Etna GPS Data Sharing</b> Massimo Rossi, Giuseppe Puglisi	42
<b>Joint Use of Long Water Pipe Tiltmeters and Sea Level Gauges for Monitoring Ground Deformation at Campi Flegrei Caldera</b> Roberto Scarpa, Paolo Capuano, Umberto Tammaro, Roger Bilham	43
<b>Observations and Simulations During the 12 August 2011 Etna Lava Fountain Event</b> Simona Scollo, Antonella Boselli, Mauro Coltelli, Giuseppe Leto, Gianluca Pisani, Michele Prestifilippo, Nicola Spinelli, Xuan Wang, Ricardo Zanmar Sanchez	44
<b>GPS Time Series at Campi Flegrei Caldera (2000-2013)</b> Prospero De Martino, Umberto Tammaro, Francesco Obrizzo	45
<b>WP4   Talks</b>	47
<b>Dynamic of Campi Flegrei Hydrothermal System from Geochemical and Geophysical Signals</b> Giovanni Chiodini, Jean Vandemeulebrouck, Stefano Caliro, Luca D'Auria, Prospero De Martino, Annarita Mangiacapra, Zaccaria Petrillo	49
<b>Laboratory Experiments and Continuous Water Level Monitoring at Geothermal Springs and Wells in the Campi Flegrei Area to Understand Pressure Transients in Fluid Reservoirs</b> Heiko Woith, Annarita Mangiacapra, Giovanni Chiodini, Marco Pilz, Thomas Walter	50
<b>RICEN: Repeated Induced Earthquakes and Noise. Seismic Campaigns at Solfatara</b> Gaetano Festa, Aldo Zollo, Marcello Serra, Grazia De Landro, Francesca Bianco, Pier Paolo Bruno, Vincenzo Di Fiore, Stefano Maraio, Imperia Nazzaro, Marco Pilz, Philippe Roux, Jean Vandemeulebrouck, Heiko Woith	51
<b>Fluid Circulation at Somma-Vesuvius Volcanic Complex Inferred by Electrical Resistivity Tomography, Self-Potential, Temperature and Soil Degassing</b> Anthony Finizola, Tullio Ricci, Matthieu Poret, Eric Delcher, Aline Peltier, Raphaël Antoine, Julien Bernard, Guillaume Boudoire, Elodie Brothelande, Giovanni Fanizza, Yannick Fargier, Lydie Gailler, Erwan Gueguen, Rachel Gusset, Alfredo Matera, Cécile Mezon, Sabatino Piscitelli, Angélie Portal, Enzo Rizzo, Matteo Rossi, Giuseppe Calamita, Eliana Bellucci Sessa, Rosella Nave	52
<b>Relations between Electrical Resistivity, Carbon Dioxide Flux, and Self-Potential in the Shallow Hydrothermal System of Solfatara (Phlegrean Fields)</b> Jean Vandemeulebrouck, Sventlana Byrdina, Giovanni Chiodini, Carlo Cardellini, Aurelie Legaz, Christian Cammerlinck	54
<b>Advances on Modelling Subsurfaces Dynamics at Restless Volcanoes</b> Joachim Gottsmann, Karen Strehlow, A. Cocco, B. Hemmings, Fiona Whitaker, Henry Odbert, Alison Rust, A. Jasim	55



<b>WP4   Posters</b>	57
<b>Automatic Procedure for Quasi-Real Time Seismic Data Processing at Campi Flegrei Caldera (Italy)</b>	
Paolo Capuano, Enza De Lauro, Salvatore De Martino, Mariarosaria Falanga	59
<b>Geophysical Signatures of Magma Chamber Processes at Campi Flegrei</b>	
Chiara Paola Montagna, Antonella Longo, Paolo Papale	60
<b>Mingling Dynamics in Magma Chambers at Campi Flegrei</b>	
Chiara Paola Montagna, Paolo Papale, Antonella Longo	62
<b>A Perturbative Approach for the Modelling of Short-Term Fluid-Driven Ground Deformation Episodes on Volcanoes: the Case of Campi Flegrei Caldera (Italy)</b>	
Zaccaria Petrillo, Luca D'Auria, Annarita Mangiacapra, Giovanni Chiodini, Stefano Caliro	63
<b>Dense Microarray Measurements for Ambient Noise Tomography at Solfatara (Italy)</b>	
Marco Pilz, Stefano Parolai, Gaetano Festa, Heiko Woith	64
<b>Detection of ULP Deformation Signals at Campi Flegrei</b>	
Roberto Scarpa, Antonella Amoruso, Roger Bilham, Paolo Capuano, Luca Crescentini, Bellina Di Lieto, Antonio Errico, Alan Linde, Selwyn Sacks	65
<b>2D and 3D Resistivity Models of the Solfatara-Pisciarelli Area by AudioMT data</b>	
Agata Siniscalchi, Michela Carlucci, Luca D'Auria, Zaccaria Petrillo, Gerardo Romano	66
<b>WP5   Talks</b>	67
<b>MED-SUV Project: First Results and Ongoing Activities of WP 5 – Task 5.1 Characterization of the Threatening Phenomena from Space and Ground</b>	
Susanna Falsaperla, Tiziana Apuani, Mauro Coltelli, Franck Donnadieu, Horst Langer, Eugenio Privitera, Giuseppe Puglisi	69
<b>TOMO-ETNA MED-SUV. ISES an Active Seismic and Passive Seismic Experiment at Mt. Etna Volcano. An Integrated Marine and On-Land Geophysical Survey</b>	
Jesus Ibáñez, Domenico Patané, Francisco Carrión, Luciano Zuccarello, Janire Prudencio, Ornella Cocina, Alejandro Díaz-Moreno, Mauro Coltelli, Lucia Urbano, Luciano Scarfi, Francesca Bianco, Araceli García-Yeguas, Birger Lhür, Danilo Cavallaro, Marco Carlino	70
<b>MED-SUV Project: First Results and Ongoing Activities of WP 5 – Task 5.4 Models and Software</b>	
José Fernández, Pierre Briole, Marco Aloisi, Eleonora Rivalta, Alessandro Bonforte, Flavio Cannavò	72
<b>WP5   Posters</b>	73
<b>The Mt. Etna Data Mining Software</b>	
Marco Aliotta, Andrea Cannata, Carmelo Cassisi, Marcello D'Agostino, Giuseppe Di Grazia, Ferruccio Ferrari, Horst Langer, Alfio Messina, Placido Montalto, Danilo Reitano, Salvatore Spampinato	75
<b>The Rock Engineering System (RES) Applied to Landslide Susceptibility Zonation of the Northeastern Flank of Etna: Methodological Approach and First Outcomes</b>	
Tiziana Apuani, Claudia Corazzato	76
<b>Etna volcanic SO<sub>2</sub> Plume Dispersion over the Maltese Islands</b>	
Francelle Azzopardi, Giuseppe Salerno, Simona Scollo, Tommaso Caltabiano, Raymond Ellul	78
<b>Seismic Anisotropy at Mt. Etna: Massive Measurements Strategy and Background State</b>	
Francesca Bianco, Lucia Zaccarelli, Edoardo del Pezzo, Domenico Patané	79

<b>Geophysical Multidisciplinary Investigation of the Structure of the Unstable Sector of Mt. Etna Volcano</b>	
Alessandro Bonforte, Ornella Cocina, Agata Siniscalchi, Graziella Barberi, Francesco Guglielmino, Gerardo Romano, Simona Sicali, Simona Tripaldi	81
<b>Insights into the Deep Plumbing System of Mt. Etna from the Petrology of Sub-Aphyric Primitive Magmas</b>	
Rosa Anna Corsaro, Nicole Metrich	82
<b>First Results of Long-Range Seismic Noise Correlation on Etna Top Stations</b>	
Mickael Delatre, Francesca Bianco	83
<b>Failed Eruptions: Examples Revealed by a Multidisciplinary Study at Mt. Etna in Spring 2007</b>	
Susanna Falsaperla, Boris Behncke, Horst Langer, Marco Neri, Giuseppe Giovanni Salerno, Salvatore Giammanco, Emilio Pecora, Emilio Biale	84
<b>Ongoing Development of Pattern Classification Techniques Applied to Volcanic Tremor Data at Mt. Etna</b>	
Horst Langer, Susanna Falsaperla, Salvatore Spampinato, Alfio Messina	85
<b>Multiparametric Experiment at the North-East Crater (Mt. Etna): Motivation, Planning and Time Schedule</b>	
Eugenio Privitera, Daniele Andronico, Talfan Barnie, Alessandro Bonforte, Michael Burton, Tommaso Caltabiano, Andrea Cannata, Daniele Carbone, Francesco Ciancitto, Antonio Chiarugi, Danilo Contrafatto, Stefano Corradini, Francesco D'Amato, Elisabetta Del Bello, Franck Donnadiou, Ferruccio Ferrari, Juan José Pena Fernández, Filippo Greco, Andrew Harris, Ulrich Küppers, Alessandro La Spina, Philippe Labazuy, Marcello Liotta, Luigi Lodato, Antonio Paonita, Roberto Maugeri, Luca Merucci, Sevrène Moune, Filippo Muré, Raphael Paris, Arianna Pesci, Manuel Queisser, Salvatore Rapisarda, Tullio Ricci, Giuseppe Salerno, Piergiorgio Scarlato, Mariangela Sciotto, Simona Scollo, Luciano Scuderi, Joern Sesterhenn, Letizia Spampinato, Laura Spina, Jacopo Taddeucci, Luciano Zuccarello	86
<b>Mt. Etna Test Cases for MED-SUV Project</b>	
Giuseppe Puglisi, Letizia Spampinato, Susanna Falsaperla, Pierre Briole, Patrick Allard, José Fernández	88
<b>SO<sub>2</sub> Flux at Mount Etna between 2005 and the 2011: Results and Perspectives</b>	
Giuseppe Salerno, Michael Burton, Tommaso Caltabiano, Vincenza Longo, Filippo Muré	89
<b>The Borehole Experiment: Investigation of Cortical Structures Through 3D Array Techniques</b>	
Luciano Zuccarello, Mario La Rocca, Ferruccio Ferrari, Danilo Contrafatto, Salvatore Rapisarda, Stefano Branca, Paola Cusano, Danilo Galluzzo, Alfio Messina, Mario Paratore, Simona Petrosino	90
<b>WP6   Talks</b>	91
<b>Short-Term Probabilistic Volcanic Hazard Assessment of Tephra Fallout at Campi Flegrei and Vesuvius</b>	
Jacopo Selva, Antonio Costa, Laura Sandri, Giovanni Macedonio, Warner Marzocchi	93
<b>Propagation of Source Grain-Size Uncertainty by Using a Lagrangian Volcanic Particle Dispersal Model</b>	
Mattia de' Michieli Vitturi, Antonio Spanu, Federica Pardini, Maria Vittoria Salvetti, Augusto Neri	95
<b>An Up-to-Date Methodology for the Quantitative Assessment of Lava Flow Hazards</b>	
Ciro Del Negro, Giuseppe Bilotta, Annalisa Cappello, Gaetano Ganci, Alexis Herault	96
<b>Capacity Building and Interaction with Decision-Makers</b>	
Rosella Nave, Laura Sandri, Roberto Isaia	98

## WP6 | Posters

99

### **Stakeholders Analysis: a Crucial Step for a Successful Volcanic Hazard Assessment, Disaster Preparedness and Mitigation Management Strategy**

Alfonso Brancato, Giuseppe Puglisi, Agata Sangianantoni, Letizia Spampinato

101

### **Lav@Hazard: a Web-Gis Framework for Forecasting Lava Flow Hazards**

Ciro Del Negro, Giuseppe Bilotta, Annalisa Cappello, Gaetana Ganci, Alexis Herval

102

### **The Future Eruptions of Mount Etna: Probabilistic Modelling and Lava Flow Hazard Maps**

Ciro Del Negro, Annalisa Cappello, Marco Neri, Giuseppe Bilotta, Alexis Herval, Gaetana Ganci

104

## The Mt. Etna Data Mining Software

Marco Aliotta, Andrea Cannata, Carmelo Cassisi, Marcello D'Agostino,  
Giuseppe Di Grazia, Ferruccio Ferrari, Horst Langer, Alfio Messina, Placido Montalto,  
Danilo Reitano, Salvatore Spampinato

*Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Catania - Osservatorio Etneo, Catania, Italy*

Mt. Etna is permanently active requiring a continuous data acquisition a multidisciplinary monitoring system where huge data masses accumulate and pose severe difficulties of interpretation. Therefore the INGV staff has developed a number of software tools for data mining, aiming at identifying structures in the data which can be related to the volcanic activity and furnish criteria for the definition of alert systems. We tackle the problem by applying methods of clustering and classification. We identify data groups by defining a measure of similarity or distance. Data groups may assume various shapes, once forming convex clouds once complex concave bodies. The tool "KKAanalysis" is a basket of clustering methods and forms the backbone of the tremor-based automatic alarm system of INGV-OE. It exploits both SOM and Fuzzy Clustering. Besides seismic data the concept has been applied to petrochemic data as well as in a combined analysis of gas-emission data and seismic data. The software "DBSCAN" focuses on density-based clustering that allows discovering clusters with arbitrary shape. Here, clusters are defined as dense regions of objects in the data space separated by regions of low density. In DBSCAN a cluster grows guaranteeing that the density within a group of objects exceeds some threshold. In the context of volcano monitoring the method is particularly promising in the recognition of ash particles as they have a rather irregular shape. The "MOTIF" software allows identifying typical wave forms in time series. It overcomes shortages of methods like cross-correlation, which entail a high computational effort. MOTIF on the other hand can recognize non-similarity of two patterns on a small number of data points without going through the whole length of the data vectors. The development includes modules for feature extraction and post-processing verifying the validity of the results obtained by the classifiers.