

Curriculum Vitae

Daniele Giordano

Personal data:

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Present position:

- Research position (GEO/08 Geochemistry and Volcanology) at the Earth Sciences department of the University of Turin;
 - Research associate at the National Institute of Geophysics and Volcanology (INGV) - Pisa, Italy;
 - Research associate at the Geosciences & Georesources Institute (IGG) of National Research Council (CNR) - Pisa, Italy
- **From November 2012 – Abilitation, National Scientific Abilitation from the Ministry of University of Italian Research (MIUR), as both associate and full Professor for the Geochemistry and Volcanology (GEO/08) disciplinary field.**

EDUCATION

- 15 July 2002. PhD degree at the Institute of Mineralogy Petrology and Geochemistry (IMPG) of the Ludwig Maximilian University (LMU) of Munich (Germany). The thesis titled: "Experimental Determinations and Modelling of the Viscosity of Multicomponent Natural Silicate Melts: Volcanological Implications", was devoted to the characterization of the rheological and calorimetric properties of dry and hydrous natural multicomponent silicate melts, collected from active volcanic areas (e.g. Phlegrean Fields; Vesuvius; Tenerife; Povocao; Stromboli; Nyiragongo; Etna; Unzen). The thesis was developed under the supervision of professor D.B. Dingwell in collaboration with P. Papale of the National Institute of Geophysics and Volcanology (INGV), Italy and C. Romano of the Dept. of Geological Sciences of the Third University of Rome;
- 21 march 1997. Laurea (master degree) in Geological Sciences at the Department of Earth Sciences of the University of Pisa with marks 103/110. The thesis entitled: "The 1631 Vesuvius eruption: mineralogical and petrographic study and simulation of the ascent of magma along the eruptive conduit" (L'eruzione del Vesuvio del 1631: studio mineralogico e petrografico e simulazione dell'ascesa del magma lungo il condotto eruttivo) was developed within the Volcanic Simulation Groups (GSV) of the University of Pisa, having as supervisors Prof. M. Rosi and Dr. P. Papale.

WORK EXPERIENCE

Research grants and awards

- December 2011. Permanent research position at the University of Turin, National Selection;
- December 2010 - December 2013. Affiliated researcher at Geosciences and Georesources Institute (IGG) of the National Research Council (CNR), Pisa, Italy;
- March 2010 - December 2011. Ramon y Cajal research grant award (5 years position), developed at the Institut of Earth Sciences "Jaume Almera" of the "Consejo Superior de Investigaciones Cientificas", Barcelona, Spain;
- March 2007 - March 2010. Contract research assignment at the Dept. of Geological Sciences of the Third University of Rome for the creation of an experimental volcanology laboratory (supported by the "Funds of Basic Research" Italian project FIRB AIRPLANE 2007-2010);
- June 2004-November 2005. Izaak Walton Killam research grant award at the Dept. of Earth & Ocean Sciences (EOS) of the University of British Columbia, Vancouver B.C. – Canada;
- From may 2003 to march 2007. Research collaboration assignment at the Dept. of Geological Sciences of the Third University of Rome;
- September 2002 – February 2003. Postdoc fellowship within the International Quality Network: Georisk (IQN-Georisk) program, supported by the German Academic Exchange Service (DAAD).
- 1 September 2000 – 30 November 2001. GNV (National Volcanology Group, Italy) study grant in the context of the GNV project n° 27, whose responsible was Dr. P. Papale;
- March 1999 – August 2000. Development of the EU ENV4-CT98-0703 (TMR) grant;
- August 1998 – February 1999. Development of the FMRX-CT96-0063 (TMR) grant;
- June 1998 – August 1998. Development of a EU (TMR) LSF grant;
- 01 February- 31 May 1998. Research contract within the context of "The geomorphological cartography of Victoria Land – Antartica" supported by Dr. Carlo Baroni.

Professional research assignments

- 01-06-2007/29-06-2007. Research assignment for the "Rheological characterization of natural products" at the Geological Sciences Dept. of the Third University of Rome;
- 15 April – 15 July 2004. Research contract with Dr. Roberto Moretti of the Vesuvian Observatory, Naples, Italy – INGV on the theme: "Employment of the polymeric model for the parameterization of the rheological properties of silicate melts";
- 15 August – 15 October 2003. Research contract with Dr. Paolo Papale (INGV – Pisa) on the theme: "Modelling of the viscosity of magmatic liquids with variable amount of dissolved water in the region of eruptive conditions";
- 01 April – 30 June 2003. Research contract within the context of "MULTIMO" (Multi-disciplinary Monitoring, Modelling and Forecasting of Volcanic Hazard) project – European Commission;
- Collaboration with Prof. M. Rosi of the Dept. of Earth Sciences of the University of Pisa has been carried out in the last 5 years through research assignments covering a 23 months period (08-November 2001 08-March-2002; 01-02-2001/01-04-2001; 11-05-2000/11-07-2000; 03-06-1999/03-12-1999; 05-10-1998/05-12-1998).

PRESENT RESEARCH (main scientific and technical interests):

a) Scientific field:

Experimental Volcanology and Petrology and Physics of Volcanism.

Topics:

- Experimental characterisation and modelling of the rheological (viscous to brittle) and thermodynamic properties of single and multi-phase silicate melts of interests for the volcanology, petrology, metallurgy and glass industry. Application to understanding sin- and post-eruptive (e.g., welding, remobilization, flow of lava) processes and eruption dynamics processes by numerical simulation approach;
- High, intermediate and low (P – T) experimental petrology by the employment of various techniques (e.g., piston cylinder, CSPV (Coal seal Pressure Vessel) with argon (TZM) and water (Nimonic) pressuring gases) devoted to the understanding of pre-eruptive storage and syn-eruptive magma ascent conditions;
- Spectroscopic analysis (FTIR, micro-Raman) of silicate melts for the comprehension of structural variations that produce the significant variation of physical properties and quantification of volatile content in natural glasses; experimental glasses and glass inclusions. Modelling of the relationships between physical properties and spectroscopic features for both anhydrous and volatile bearing melts;
- Fluid-dynamic modelling for the simulation of magma ascent along eruptive volcanic conduit and application to volcanic hazard forecast;
- Archaeomagnetic dating techniques and cartographic mapping of volcanic areas;

b) Implementation of Experimental Volcanology and Petrology laboratories.

- 2017 – Creation of a petrological laboratory facility at the Institute of Geosciences (Instituto de Geociencias, IGc) of the University of Sao Paulo, Sao Paulo, Brazil. A TZM facility was created under the PVE project funded by CAPES - Brazil, under the "Science without borders (Ciencias sem fronteiras) program", with title: "*Implantação de métodos experimentais para a compreensão de processos magmáticos na crosta superior: aplicação ao vulcanismo ácido da Província Magmática Paraná*" for the implementation of the experimental petrologies laboratories both at USP and University of Turin (UniTo).
- 2012 – present. **Responsible of the GeomatLab – the Laboratory of Volcanological and Petrological Experimentation - Department of Earth Sciences - University of Turin.** Newly implemented devices are a rotational high-temperature rheometer implemented with Differential Thermal Analysis (DTA); hydrothermal syntheses TZM and NiMoNiC steel pressure vessel device; He-pycnometer physical properties analyzer;
- 2007 – 2010. Creation of an experimental volcanology laboratory to study the rheological, calorimetric and volumetric properties of single and multiphase silicate melt materials of geological interest at the Geological Sciences department of the Third University of Rome. The laboratory setup required setting up of the following apparatuses:
 - High temperature (concentric cylinder) and low temperature (uniaxial press) rheometers;
 - Differential Scanning Calorimetry (DSC) for the high and low temperature determination of specific heat and other physical properties;
 - Thermomechanical analyser (TMA) for the dilatometric and micropenetration investigation of volumetric and rheological properties of single and multi-phase silicate melts;
 - Hydrothermal cell for the investigation of a) viscoelastic deformation of natural materials under varying H₂O pressure conditions; b) degassing and crystallization processes for materials of geological and industrial interest;
 - High temperature furnaces for the syntheses of silicate materials;
 - Karl Fisher titration (KFT) device for the evaluation of the dissolved H₂O content in silicate glasses;

Known Languages:

Italian: native; English: excellent knowledge; Portuguese & Spanish: good knowledge; German: basic

TEACHING ACTIVITY

- From march 2017. A) Developing part of the Geochemistry course at the University of Turin relative to the measuring and modelling of thermodynamic properties and establishing relationships with physical properties;
- Since 2012 to 2016. Lecturer at the University of Turin for the courses: B) Physical properties of magmas and the physics of volcanism (master degree level); C) Since 2013 to present. Rheology of geomaterial (doctorate school);
- Since october 2014 to march 2015 (on behalf of Dr C. Cigolini). D) Seismic and volcanic risk (master degree level);
- March - April 2004, cycle of lectures (8 hours) on behalf of Prof. M. Rosi within the course of Physics of Vulcanism. The lectures were held at the Dept. of Earth Sciences of the Pisa University;
- March 2003, cycle of lectures (8 hours) on behalf of Prof. M. Rosi within the course of Physics of Vulcanism. The lectures were held at the Dept. of Earth Sciences of the Pisa University.

Tutor of the following PhD Theses, post-doc research activity, research guests

PhD's

- 2016 – 2019. **Serena Pia De Cristofaro** (Earth Sciences Department - XXXI PhD cycle of the University of Turin); Title: *Volcanology of the acidic in the Parana Magmatic Province, Brazil: an integrated study using field, paleomagnetic and experimental petrology and volcanology methods.*
- 2014 – 2016. **Stephan Kolzenburg** (Earth Sciences Department - XXIX PhD cycle of the University of Turin) Title: Development and application of rheological laws for the emplacement of low viscosity lava flows; an integration of field, remote sensing and experimental methodologies (supervisor).;
- 2010 - **Alessandro Vona** (Third University of Rome, Geological Sciences department) Title: Multiphase rheology of alkaline italian magmas (co-supervisor).;
- 2009 - **Paola Ardia** (Earth Sciences Department - ETH Zentrum, Zurich, Switzerland) Title: Centrifuge assisted falling sphere viscometry of rhyolitic melts (co-supervisor).;

Postdoc's

- July 2015 – July 2016. **Dr. Liza Polo**. FAPESP PROJECT. Title: "Os efeitos da descompressão isotérmica na evolução petrológica e textural de magmas ácidos da Província Magmática Paraná: petrologia experimental e implicações sobre a dinâmica de erupção." Dr. Liza Polo was supervised in Italy by Daniele Giordano and in Brazil from Prof. Valdecir de Assis Janasi. The project was supported by the "Projeto Temático FAPESP (processo: 2012/06082-6)".
- July 2018 to present. **Dr Gonzalez-Garcia** – On a topic correlated to the "Understanding the relationship of physical and structural properties of magmas and volcanic products and implication to eruption dynamics"

Research quests

- October 2013 – October 2014. Sabbatical of **Prof. J.K. Russell** of the Earth & Ocean Sciences (EOS) Department of the University of British Columbia, Vancouver B.C., Canada, developing a project on the "Modelling of thermodynamic and transport properties of silicate melts" (Giordano et al., 2015; Giordano and Russell, 2016; Russell and Giordano, 2016 in the publication list).
- June-August 2018. Visiting of **Prof. M. Roverato** of the Yachay Tech University, Ecuador for a study on a research entitled: "Understanding the relationships between the monogenetic and polygenetic volcanism at the Canary Islands (Spain) and others active volcanic systems"

Institutional responsibilities

- since 2013. Member of the Doctoral research committee of Innovative Sciences and Technologies of the University of Turin.
- since 2013. Responsible of the **GeomatLab** – the Laboratory of Volcanological and Petrological Experimentation - Department of Earth Sciences - University of Turin.

PROJECTS and FELLOWSHIPS:

ITALIAN INSTITUTIONS

A) VARIOUS

- P.1. The role of thermodynamic and transport properties on the evolution of magmatic and volcanic processes (PI: Daniele Giordano);
- P.2. The physical properties of silicate melts and magmas as measured at equilibrium vs disequilibrium conditions and the effect on the evolution of magmatic and volcanic processes (PI: Daniele Giordano, 2018 - 2020)
- P.3. National funds for basic research (2017 – 2020).
- P.4. Investigating the effects of the deformation regimes, the transport properties and the thermodynamic properties on the evolution of geological and industrial processes (PI: Daniele Giordano, 2017 - 2019)
- P.4. The role of thermodynamic and transport properties on the evolution of magmatic and volcanic processes (PI: Daniele Giordano, 2016 -2019);
- P.5. Postdoc research funds – University of Turin (2018 – 2019). The physical properties of silicate melts and magmas and relationships with vibrational properties

- P.6. Local research funds research funds – University of Turin (2015): Physical and thermodynamic properties investigation textural features evolution during crystallization and degassing processes of natural single- and multi-phase materials: implication for magmatic systems (PI: Daniele Giordano);
- P.7. Local research funds research funds – University of Turin (2014): Physical properties investigation and 3D imaging of textural features evolution during crystallization and degassing processes of volcanic products and multiphase experimental volcanic analogues (PI: Daniele Giordano);
- P. 8. "Cassa di Risparmio di Torino (CRT)" (2014) project: Realizzazione di un Laboratorio per lo studio delle proprietà fisiche dei geomateriali (GeomatLab) (PI: Daniele Giordano);
- P. 9. Elettra Synchrotron facility, Trieste, Italy (European Commission Funds - 20140491): 3D imaging and analysis of crystallization processes and textural evolution of basaltic magmas (PI: Daniele Giordano);
- P. 10. Local research funds research funds – University of Turin (2013): Petrology, geodynamics and mineralogenesis at convergent margins (PI: Daniele Castelli);
- P. 11. Local research funds research funds – University of Turin (2012): Integrated field, laboratory and remote sensing applications investigation to determine rheological models of the emplacement of low-viscosity lavafloes in active volcanic areas (PI: Daniele Giordano);
- P. 12. Elettra Synchrotron facility, Trieste, Italy (European Commission Funds - 20140491): 4D observation of crystallization kinetics and textural evolution in silicate melts (PI: Dr Fabio Arzilli);
- P. 13. Progetto Dipartimento Protezione Civile (DPC) (2015). An alternative eruptive scenario at Vesuvius - the issue of fast-moving lava flows from eccentric vents (PI: C. Principe);

B) MIUR (Italian Ministry of University and Research)

PRIN (National Interest Research Project - *Progetti di Ricerca di Interesse Nazionale*) and **FIRB** (Italian Funds of Basic Research *Fondi Italiani per la Ricerca di Base*) projects supported by the Italian Ministry of Education and Research (MIUR):

- PRIN 2008-2010 – Physical and chemical properties of volatile-bearing silicate melts: experiments, modelling and application to volcano degassing;
- FIRB 2007-2010 - Progetto AIRPLANE – "Laboratorio di Vulcanologia Sperimentale" - Experimental Volcanology Laboratory

C) GNV (National Group of Volcanology) - DPC (Department Civil Protection)

- Progetto Dipartimento Protezione Civile (DPC) (2015). (PI: C. Romano);
- DPC project 2014 - 2015. An alternative eruptive scenario at Vesuvius - the issue of fast-moving lava flows from eccentric vents (PI: C. Principe);
- DPC project 2013 - 2014; PI: C. Romano;
- GNV project 2005-2007. Subproject V3_6 – Etna, Task 2, UR12;
- GNV project 2005-2007. Subproject V3_2 – Campi Flegrei, Task 6, UR17;
- GNV project 2005-2007. Subproject V3_4 – Vesuvio, Task 1, UR05;
- Triennial GNV 2001-2003/17 project "Simulation of eruptive scenarios at Phlegrean Fields on the basis of field, laboratory, and experimental studies, and implications of volcanic hazard";;
- Triennial GNV 2001-2003/9 project "Numerical and textural studies of magma fragmentation in explosive eruptions";;
- GNV project – Nyiragongo "Physico-chemical investigation of volcanic products erupted during the January 2002 eruption, and simulation of possible lava flow paths, aimed at volcanic hazard mitigation"

D) CNR (National Research Council, Italy) - IGG (Geosciences and Georesources Institute)

- **Bilateral Project** (Georgia - Italy)(2014-2015): Geo-archaeology in Georgia and Geomagnetic Secular Variation Curve (SVC) development for Caucasus area. (PI: Claudia Principe);
- **Bilateral Project** (CSIC, Spain – CNR, Italy)(2010IT0037)(2010-2012): Time clustering, frequency, localization and extension of lavafloes at Teide and Vesuvius: a comparative and multidisciplinary investigation of emplacement features and mapping of the associated risk (PI: Claudia Principe);
- **Bilateral Project** (University of Georgia, Georgia – CNR, Italy) (2011-2013): The contribution of Georgia to a Geomagnetic Secular Variation Curve (SVC) for Caucasus and Circum-Mediterranean area (PI: Claudia Principe);
- **Bilateral Project** (ANAS, Azerbaijan – CNR, Italy)(2011-2013): Archaeomagnetic ages of archeological fired structures in Azerbaijan (PI: Daniele Giordano);

GERMAN INSTITUTIONS

- **Giordano D.** Invited Visiting fellow (19/11/2018-22/12/2018; 27/02/2019-01/04/2019; may-june 2019) at the CAS (Center for Advanced Studies) - Ludwig Maximilians University (Munich) within a project titled: "Magma to Tephra: Ash in the Earth System" coordinated by Prof. Dr Donald B. Dingwell.

BRAZILIAN INSTITUTIONS

- Giordano D. January-February 2019. Invitation as research collaborator at the Geosciences Institute of the University of Sao Paulo, Brazil on a research titled: "Volcanism of the Paraná Magmatic Province" coordinated by Prof. Valdecir Janasi de Assis.
- As "PVE (Pesquisador Visitante Especial)", Daniele Giordano being Visiting Professor to which the project was associated to, obtainment of a the 3-years (2015 - 2017) project funded by CAPES - Brazil, under the "Science without borders (Ciencias sim fronteras) program", with title: "*Implantação de métodos experimentais para a compreensão de processos magmáticos na crosta superior: aplicação ao vulcanismo ácido da Província Magmática Paraná*" for the implementation of the experimental petrologies laboratories both at USP and University of Turin (UniTo).
- FAPESP (2014) project with title: visit at the USP for a period of 2 months from august 7th to october 7th;
- Research collaborator for the 5 - years (2012-2016) FAPESP project titled: The Parana'-Etendeka Magmatic Province in Brazil: temporal and petrologic relationships between the tholeiiti and alkaline magmatism and geodynamics implications. (Responsible Prof. Excelso Ruberti of the "Istituto de Geociencias", USP, Sao Paulo, Brazil);

SPANISH INSTITUTIONS

- **Complementary Action** (Acción Complementaria de política científica-tecnológica) (Referencia: CGL2010-11983-E) - Convocatoria 2010. Rheological properties of Teide magmas and implications for hazard assessment of Tenerife island (Canaries) (PI: Daniele Giordano until december 2011);
- **Bilateral project** (Proyecto conjuntos CSIC, spagna – CNR, italia)(2010IT0037): Time clustering, frequency, localization and extension of lavafloes at Teide and Vesuvius: a comparative and multidisciplinary investigation of emplacement features and mapping of the associated risk (PI: Daniele Giordano until december 2011);

EUROPEAN COMMISSION

- "Exploris": (Explosive Eruption Risk and Decision Support for EU Populations Threatened by Volcanoes) - progetto: EVR1-CT-2002-40026;
- "MULTIMO" (Multi-disciplinary Monitoring, Modelling and Forecasting of Volcanic Hazard) European Commission project;

National Sciences and Engineering Research Council (NSERC) of Canada:

- NSERC Grant (Research Tools and Instruments grants are for fostering and enhancing the discovery innovation and training capability of university researchers in natural sciences). Title: High-T Apparatuses to Study Feedback between Porosity, Permeability, Magma Rheology and Volcanic Eruption Style. EOS, UBC, Vancouver - Canada.

Main research collaborators:

- Prof. J.K. Russell – EOS – UBC , Vancouver B.C., Canada;
- Prof. D.B. Dingwell and Prof. Cristina De Campos – Dept. Of Earth & Environmental Sciences of the LMU Munich, Germany;
- Professor Valdecir de Assis Janasi, Prof. Silvio Vlach, Dr Liza Polo - Institute of GeoSciences, University of Sao Paulo, Brazil;
- Dr. C. Principe, Sonia La Felice, CNR - IGG, Pisa;
- Prof. J. Marti and Dr. C. Soriano – Earth Sciences dept."Jaume Almera" – Barcelona, Spain;
- Dr. C. Romano, A Vona - Geological Sciences department of the Third University of Rome;
- Dr. A. Di Muro – Laboratoire PMMP, UMR, University of Paris, France;
- Dr P. Papale, Dr M. Bisson, Dr. and Dr. M. Favalli INGV, Pisa, Italy;
- Prof. M.W. Schmidt, Prof. P. Ulmer, ETH Zurich, Switzerland;
- Prof. R. Moretti , Dr. M. Piochi – Vesuvian Volcanology Observatory (Osservatorio Vesuviano), INGV, Napoli;
- Prof. M. Nowak – Geological Sciences dept., University of Tübingen, Germany;

EDITORIAL ACTIVITY - Reviewer for the following international ISI journals, editorial company and research institutions:

- American Mineralogist;
- Bulletin of Volcanology;
- Chemical Geology;
- Contribution Mineralogy and Petrology;
- Earth Planetary Sciences Letters;
- Geochimica et Cosmochimica Acta;
- Journal of Volcanology and Geothermal Research;
- Journal of Geophysical Research;
- Lithos;
- Mineralogical Magazine;
- Nature Geoscience;
- Physics and Chemistry of Minerals;
- Quaderni di Geofisica - Rivista dell'Istituto Nazionale di Geofisica e Vulcanologia (INGV);
- Springer Book Serie

Reviewer for the following research institutions:

- National Science Foundation (NSF, USA);
- University and Research Ministry (MIUR, Italy);
- Deutsche Forschung Gesellschaft (DFG, Germany);
- Royal Society of New Zealand (Marsden Fund);
- MIUR (Italian Ministry of University and Research);

Member of the Editorial board for:

- International Journal of Earth & Environmental Sciences

List of publications (ISI Journals-Google scholar citations)(Isiwebofknowledge *h-index* = 23; Google scholar *h-index* = 28):

Link to my citation page: <https://scholar.google.it/citations?hl=it&user=EiRIKoMAAAAJ>

1. **Giordano D.** (2019). Advances in the rheology of natural multiphase silicate melts and implications for magma transport and lava flow emplacement. *Ann. Geophys.*
2. Roverato M., **Giordano D.**, Giovanardi T., Juliani C. Polo L.A. (2019). The 2.0-1.88 Ga Paleoproterozoic evolution of the southern Amazonian Craton (Brazil): an interpretation inferred by lithofaciological, geochemical and geochronological data. *Gondwana Res.* 70, 1 – 24;
3. **Giordano D.** and Russell J.K. (2018). Toward a Structural Model for the Viscosity of Geological Melts. *Earth Planet. Sci. Lett.* 501, 202 – 212;
4. Kolzenburg S., **Giordano D.**, Di Muro A., Dingwell D.B. (2018). Equilibrium Viscosity and Disequilibrium Rheology of a high Magnesium Basalt from Piton De La Fournaise volcano, La Reunion, Indian Ocean, France. *Ann. Geophys.* 61, 2018; DOI: 10.4401/ag-7839
5. Kolzenburg S., **Giordano D.**, Hess K.U., Dingwell D.B. (2018). Shear rate-dependent Disequilibrium Rheology and Dynamics of Basalt Solidification. *Geophys. Res. Lett.* 10.1029/2018GL077779;
6. Kolzenburg S., Di Genova D., **Giordano D.**, Hess K.U., Dingwell D.B. (2018). The effect of oxygen fugacity on the rheological evolution of crystallizing basaltic melts. *Earth Planet. Sci. Lett.* 487, 21 – 32;
7. Principe C., Arrighi S., Devidze M., Le Goff M., Goguitchaichvili A., la Felice S., Paolillo A., **Giordano D.**, Morales J. (2018). Archaeomagnetism dating of Copper Age at Croce di Papa village and relations on Vesuvius and Phlegrean Fields volcanic activity. 349, 217 - 229;
8. Polo L.A., **Giordano D.**, Janasi V., Freitas-Guiaraes L. (2018). Effusive silicic volcanism in the Paraná Magmatic Province, South Brazil: Physico-chemical conditions of storage and eruption and considerations on the rheological behaviour during emplacement. *J. Volcanol. Geoth. Res.* 355, 115 - 135.
9. Polo L.A., Janasi V., **Giordano D.**, E. Canon Tapia, E. Lima, M. Roverato. (2018). Effusive silicic volcanism in the Paraná Magmatic Province, South Brazil: evidence for local fed lava flows and domes from detailed field work. *J. Volcanol. Geoth. Res.* 355, 204 – 218.
10. Polacci M., de' Michieli Vitturi M., Arzilli F., Burton M.R., Caricchi L., Carr B., Cerminara M., Cimarelli C., Clarke A.B., Colucci S., Costa A., Degruyter W., Druitt T., Engwell S., Esposti Ongaro T., **Giordano D.** et al. (2017). From magma ascent to ash generation: investigating volcanic conduit processes by integrating experiments, numerical modeling, and observations. *Annals of Geophysics* 60, 6, S0666, 2017; doi: 10.4401/ag-7449;
11. **Giordano D.** and Russell J.K. (2017) The heat capacity of hydrous multicomponent natural melts and glasses. *Chem. Geol.* 461, 96 -103 (<http://dx.doi.org/10.1016/j.chemgeo.2016.08.036>);
12. Russell J.K. and **Giordano D.** (2016). Modelling Configurational Entropy of Silicate Melts (2017). *Chem. Geol.* – 461, 140 – 151 (<http://dx.doi.org/10.1016/j.chemgeo.2016.07.019>);
13. Kolzenburg S., **Giordano D.**, Thordarson T., Höskuldsson A., Dingwell D.B. (2017). The rheological evolution of the 2014/15 eruption at Holuhraun, central Iceland. *Bull. Volcanol.* 79, 45 (DOI: 10.1007/s00445-017-1128-6);
14. Paolillo A, Principe C., Bisson M., Gianardi R., **Giordano D.**, La Felice S. (2016). Volcanological map of the Southwestern sector of Vesuvius volcano, Italy. *Journal of Maps* 12, 425 – 440;
15. Kolzenburg S., **Giordano D.**, Cimarelli C., Dingwell D.B. (2016) In situ thermal characterization of cooling/crystallizing lavas during rheology measurements and implications for lava flow emplacement. *Geoch. Cosmoch. Acta*, 195, 244 – 258;
16. Kolzenburg S, Favalli M, Fornaciai A, Isola I, Harris A, Nannipieri L, **Giordano D.** (2016) Rapid updating and improvement of airborne LIDAR DEMs through ground based SfM 3D modeling of volcanic features. *IEEE Transactions on Geoscience and Remote Sensing*, PP(99), 1-13, 2016, (<http://ieeexplore.ieee.org/abstract/document/7524016/>); DOI: 10.1109/TGRS.2016.2587798);
17. Arzilli F, Polacci M, Baker DR, Landi P, **Giordano D.**, Mancini L. (2016). A new tool for resolving crystal feldspars phases in X-ray microtomographic images of crystallized natural magmas and synthetic analogues. *Am. Mineral.* 101, 2301 - 2311 (<http://dx.doi.org/10.2138/am-2016-5788>);
18. Roverato M; **Giordano D.**; Echeverri-Misas C.M. Juliani C (2016). Paleoproterozoic felsic volcanism of the Tapajós Mineral Province, Southern Amazon Craton, Brazil. *J. Volcanol. Geoth. Res.* 310, 98 - 106;
19. **Giordano D.**, Nichols ARL, Potuzak M, Di Genova D, Romano C, Russell JK (2015). Heat capacity of hydrous trachybasalt from Mt Etna: comparison with $\text{CaAl}_2\text{Si}_2\text{O}_8$ (An) – $\text{CaMgSi}_2\text{O}_6$ (Di) as basaltic proxy compositions. *Contrib. Mineral. Petrol.* 170, 48 (<http://dx.doi.org/10.1007/s00410-015-1196-6>);
20. Di Genova D., Romano C., **Giordano D.**, Alletti M. (2014). Heat capacity, configurational heat capacity and fragility of hydrous magmas. *Geochim. Cosmochim. Acta* 142, 314 - 333;
21. Ardia P., Di Muro A., **Giordano D.**, Massare D., Sanchez-Valle C., Schmidt M.W. (2014) Densification mechanisms of haplogranite glasses as a function of water content and pressure based on density and Raman data. *Geochim. Cosmochim. Acta*, 138, 158 - 180;

22. Polacci M., Bouvet de Maisonneuve C., **Giordano D.**, Piochi M., Mancini L., Degruyter W., Bachmann O. (2014). Permeability measurements of Campi Flegrei pyroclastic products: An example from the Campanian Ignimbrite and Monte Nuovo eruptions. *J. Volcanol. Geoth. Res.* 272, 16 - 22;
23. Chevrel M.O., **Giordano D.**, Potuzak M., Courtial P., Dingwell D.B. (2013). Physical properties of CaAl₂Si₂O₈ - CaMgSi₂O₆ - FeO - Fe₂O₃ melts: Analogues for extra-terrestrial basalt. *Chem. Geol.* 346, 93 – 105;
24. Vona A., Romano C., **Giordano D.**, Russell J.K. (2013). The multiphase rheology of magmas from Monte Nuovo (Campi Flegrei, Italy). *Chem. Geol.* 346, 213 - 227;
25. Di Genova D., Romano C., Hess K.U., Vona A., Poe B.T., **Giordano D.**, Dingwell D.B., Behrens H. (2013). The rheology of peralkaline rhyolites from Pantelleria Island. *J. Volcanol. Geoth. Res.* 249, 201-216;
26. Vona A., Romano C., D.B. Dingwell, **Giordano D.** (2011). The rheology of crystal-bearing basaltic magmas from Stromboli and Etna. *Geochim. Cosmochim. Acta* 75, 3214-3236;
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More than 100 between reports of activity and abstracts published on the acts of national and international congresses.

Short description of the main research and professional activity; obtained results and personal skills.

The expertise of the candidate is in the fields of experimental volcanology, geochemistry and petrology and application to the physics of volcanism and physical and thermodynamic properties of magmas. The candidate has used, during his research career, methodologies classically used in petrological and geochemical studies (high pressure (P) and high temperature (T) apparatus for the preparation of investigation materials) as well as high and low T technology to the investigation of the mechanical behaviour and the transport properties of pure liquids and multiphase materials of relevance for the geosciences, material sciences and metallurgy. The candidate has developed and is at present involved in projects whose objective is that of evaluating the thermodynamical (e.g., enthalpic and volume) properties of magmas to understand the process of magma degassing and the phase equilibria relationships in complex systems. On another hand the candidate is interested in understanding the effect of physical properties evolution on the syn-eruptive (magma flow, magma fragmentation) or post-eruptive processes (e.g., welding, remobilization) and he has been using numerical codes to describe magma flow dynamics along volcanic conduits. In the last years, part of his research time has been focused on understanding the relationship between the structure and the physical properties of magmas by investigating their spectroscopic features. This variegated scientific approach to the problems of the earth sciences are multidisciplinary and demonstrates the versatile character of the research career of the candidate.

Post-“Laurea” activity

The interest of the candidate to the problems and the processes related to understanding the different mechanisms which bring to the different eruptive style observed at volcanoes has been first undertaken during his bachelor thesis work (Laurea), under the supervision of Prof. M. Rosi and Dr. Papale of the Earth Sciences Department of the University of Pisa. During his thesis, entitled: "The 1631 Vesuvius eruption: mineralogical and petrographic study and simulation of the ascent of magma along the eruptive conduit", Dr Giordano investigated the mineralogy, petrography and textural properties of the products ejected during the 1631 Vesuvius subplinian eruption. The peculiar features of the magmas of 1631 eruptive event (e.g., crystal content of up to 58 vol% and the low vesicularity of about 35 vol%) required the development of a parametrical investigation to understand the mechanisms that brought such highly crystalline magmas to fragment. It is in this period that, for the first time, the criterium of fragile fragmentation proposed by Dingwell (1996) was first used in the numerical simulation studies as later published by Papale (1999). The final results obtained during the thesis showed that by using the fragile fragmentation criterium a good correspondence between the observed textural and petrographic features of the Vesuvius 1631 products and those of the "simulated" products could be found. In addition, it has been noted that a more precise characterization of the liquid viscosity of natural magmas was necessary. Therefore, and in order to provide accurate numerical simulations, useful for Civil Protection purposes, the post-Laurea research activity of the candidate was oriented to the experimental investigation of the liquid magma viscosity of products erupted from Italian volcanoes.

During the period from June 1998 – August 2000, the candidate obtained, within the context of European Commission (EU) Training and Mobility of Researcher (TMR) program, a number of research grants (LSF, TMR) (Prof. D. Dingwell) and professional research assignments (Prof. M. Rosi) to investigate the role of composition and water content on the rheological properties of magmas coming from active volcanic areas. The experimental characterisation of the dry and hydrous viscosity of magmas from important volcanic systems such as the Vesuvius, Phlegrean Fields and Etna (Italy), the Canary Islands (Spain), the Unzen (Japan) and the Azores Islands (Portugal) was undertaken. The results of this research provided the basis to: A) evaluate the temperature conditions which bring to the formation of the "welded" and "rheomorphic" deposits observed at Montaña Blanca (Teide, Tenerife) (Giordano et al., 2000); B) parametrise the effect of water on the viscosity of basaltic products at Etna and discuss the possible geological scenarios that produced plinian basaltic eruptions (Giordano and Dingwell, 2003 – Bull Volc).

Thanks to the obtainment of a GNV (National Volcanology Group, Italy) study grant (September 2000 - November 2001) and under the supervision of Dr. P. Papale, the candidate could investigate the viscosity of the eruptive products of the Agnano Monte Spina, the Campanian Ignimbrite and the Monte Nuovo Phlegrean Fields eruptions. These data (Romano et al., 2003 – Chem Geol; Giordano et al., 2004 – Chem Geol) were used as input data to run numerical simulations useful to comprehend the differences of eruptive style between the trachytic and rhyolitic alkaline magmas and the different conditions producing them (Polacci et al., 2004 - JVGR). These results also allow to relate chemico-structural features of silicate melts to the eruptive style observed for different volcanic centres.

In the period November 2001 – July 2002 the candidate wrote his PhD thesis and started to collaborate with Prof. J.K. Russell (Earth and Ocean Sciences (EOS) department of the University of British Columbia (UBC) – Vancouver, Canada) on the numerical modelling of the viscosity of silicate melts (Russell et al., 2002 -EJM; Russell et al., 2003 – Am. Mineral.). In this contribution, Russell and the coauthors have shown that the parameters constitutive of the equations used to describe the temperature dependence of the viscosity are strongly intercorrelated, being strongly dependent on the distribution of data and the silicate melt composition. In the same period, the collaboration with Dr. J. Gottsmann brought to the calibration of an empirical model useful to predict, at specific eruptive conditions, the rheological properties at the glass transition (i.e., the physical barrier which determine the transition between a viscous to a brittle field which is of great importance to the characterization of the fragile fragmentation process of the magmatic liquids)(Gottsmann et al., 2002 - EPSL). This calibration was possible thanks to the comparison of viscosimetric and calorimetric measurements performed on the same samples. In a

successive publication (Dingwell et al., 2004 - EPSL) it was also shown that, on specific samples, the calorimetric analysis is the only method which might allow the estimation of the rheological properties.

Apart from the publications above mentioned the PhD thesis had as primary objective that of providing the first non-Arrhenian viscosity model to predict the viscosity and its derivative properties (e.g., fragility) of multicomponent anhydrous silicate melts, starting from compositional dependent structural-related parameters as published into two additional contributions (Giordano and Dingwell, 2003 – EPSL; Giordano and Dingwell, 2003 – JPCM). The thesis, entitled: "Experimental Determinations and Modelling of the Viscosity of Multicomponent Natural Silicate Melts: Volcanological Implications" is a compendium of most of the above mentioned papers and is published online at the following LMU website: http://edoc.ub.uni-muenchen.de/744/1/Giordano_Daniele.pdf

Post-doctoral activity

In the period september 2002 - june 2003 the candidate obtained a 6 months postdoc scholarship at the LMU, Munich, within the International Quality Network (IQN) – Georisk research in Volcanology and Seismology, sponsored by the German Academic Exchange (DAAD), whose responsible was Prof. Heiner Igel and a 3 months research contract under the supervision of Prof. Dingwell. In the period 2001 -2003, Dr Giordano was involved, as a research collaborator, in the GNV 2001-03/17; GNV 2001-03/9 and GNV-Nyiragongo project. During this period the candidate performed studies on the calorimetric properties of natural hydrous melts which allowed to quantitatively define the correlations existing between characteristic temperatures (i.e., the eruptive, the emplacement and the minimum welding temperatures) of relevance to evaluate the wideness of the time-temperature window for viscous flow and welding of pyroclastic density current deposits and the effect of thermal history on them (Giordano et al., 2005 - JVGR). The study involved also the numerical investigation of heat transfer during magma ascent along a volcanic dike and the estimation of textural features of both natural and laboratory specimens. The combination of dynamic cooling rate and isothermal viscosity measurements, together with the numerical simulations and the textural investigation of experimental and natural products allowed to establish which main factors governed the observed different lavaflow typology at Nyiragongo (Giordano et al., 2007 - GRL).

In the period from march 2003 to the february 2007 the candidate obtained via a national announcement competition a Research Collaboration assignment (46 months) at the Geological Sciences department of the Third University of Rome, under the supervision of Dr C. Romano. The research assignment was devoted to the study of the multiphase rheology of magmas from the Phlegrean Fields, the Vesuvius and Etna volcanic areas (Italy) in order to refine previous experimental investigations on pure liquid melts. In the same period and in order to both develop a more accurate experimental characterization of the multiphase rheology of natural magmas for the above mentioned Italian volcanic systems and others and continue the research on the modelling of the viscosity of natural and simplified synthetic multicomponent melts, applied and obtained the "Izaak Walton Killam biennial postdoc research grant" to support his research at the EOS – UBC, Canada. The results of this period of activity have been published in 10 papers (Giordano et al., 2004 - GCA; Russell and Giordano, 2005 – GCA; Giordano et al., 2006 – Chem Geol; Giordano and Russell, 2007 – JPCM; Robert et al., 2008 – Am. Mineralogist; Caricchi et al., 2008 – Chem Geol; Giordano et al., 2008 – EPSL; Piochi et al., 2008 – G3; Giordano et al., 2008 – Chem Geol; Robert et al., 2008 – Chem Geol.), but more have yet to be published. These papers provide insights on: A) the effect of composition and volatile content on the rheological properties and its derivatives of multicomponent magmas; B) the effect of crystals and the rate of deformation on the rheological properties of multiphase materials from the Monte Nuovo (Phlegrean Fields, Italy); C) the effect of the presence of vesicles dispersed in natural melts; D) the effect of a certain pressure of water (PH₂O) on the transition between a viscous and brittle behaviour for melts containing dispersed vesicles and variable degree of strain. For the works developed in collaboration with Prof. Russell and his master student (G. Robert) we needed also to build up a new experimental device (hydrothermal cell - Robert et al., 2008 – Am. Mineral.) which would allow to deform samples under PH₂O.

From march 2007 to present, the candidate obtained a contract research position, to create, at the Geological Sciences department of the University of Rome under the supervision of Prof. F. Barberi and Dr C. Romano, an "experimental volcanology laboratory" to study the rheological and thermodynamic (enthalpic and volume) properties of pure liquids and multiphase natural materials. The laboratory is now operative and studies on the subliquidus rheology and the crystallization kinetic of magmas (under controlled oxygen fugacity) on the basaltic magmas erupted on the 15th march 2007 paroxysmal activity at Stromboli volcano (Italy) are in progress (see recent presentation at congresses).

Apart from the main funded projects the candidate, was involved in the investigation of the relationship between the structure of silicate melts and the physical properties of magmas. These studies were performed in collaboration with Prof. A. Di Muro (IPGP, Paris, France) and allowed the development of an accurate analytical procedure for the determination of H₂O in complex multicomponent aluminosilicate glasses via the combination of micro-Raman and FTIR spectroscopic analysis and the evaluation of the effect of redox state on the topology of Raman spectra (Di Muro et al., 2009; Mercier et al., 2009). These papers constitute an advanced research of previous studies (Di Muro et al., 2006), which investigated the effect of composition and thermal history of volcanic glasses on the water content.

Research activity after 2009 ... from publications records