Carrara Alexandre

Borned May, 18th, 1991, in Creil, France

The Magmas and Volcanoes Laboratory – University of Clermont-Auvergne
Campus Universitaire des Cézeaux 6 Avenue Blaise Pascal TSA 60026, Aubiere, 63178, France

Email: carrara.alexandre.univ@gmail.com
Phone: +33 6 29 63 03 66
Website: https://alex-carrara.github.io

Employment history:

Nov. 22 – Nov. 24 Postdoctoral research fellow, The Magmas and Volcanoes Laboratory – University of Clermont-Auvergne, Campus Universitaire des Cézeaux , Aubiere, 63178, France

Nov. 20 – Oct. 22 Postdoctoral research associate, Department of Earth and Space Sciences – University of Washington, 4000 15th Ave NE, Seattle, WA 98195, USA

Feb. 20 – Apr. 20 Visiting researcher , Departamento de Geociencias, Universidad de los Andes, Cra 1 No 18A-12, Bogotá, Colombia

Oct. 16 – Dec. 19 Ph.D. student, Institute of Earth Sciences (ISTerre) – University of Savoie Mont Blanc, Chambery, France.

Feb. 16 – Jun. 16 Research Intern, Institute of Earth Sciences (ISTerre) – University of Savoie Mont Blanc, Chambery, France.

Apr. 15 – May 15 Research Intern, Institute of Earth Sciences (ISTerre) – University of Savoie Mont Blanc, Chambery, France.

Education:

2019 Ph.D. in Earth Sciences – Solid Earth, University of Grenoble, France
Dissertation title: *Numerical modeling of the physical processes causing the reawakening of a magmatic chamber and of the associated geophysical signals*
Supervisors: Dr. Alain Burgisser and Dr. Philippe Lesage

2016 M.Sc. in Earth Sciences – Solid Earth with high honors, University of Grenoble, France
Dissertation title: *Study of recent Colima volcano eruptive activity based on new SAR data from Sentinel-1A satellite.*
Supervisor: Dr. Virginie Pinel

2014 Bachelor's degree in Earth Sciences – University of Aix-Marseille, France

Publications:

Published:

Mourey, A. J., **Carrara, A.**, Shea, T., Costa, F., & Longpré, M. A., 2024, The influence of olivine settling on the formation of basaltic cumulates revealed by micro-tomography and numerical simulations. *Journal of Volcanology and Geothermal Research*, *449*, 108051. https://doi.org/10.1016/j.jvolgeores.2024.108051

Carrara, A., Burgisser, A., Bergantz, G.W., 2024. Numerical simulations of the mingling caused by a magma intruding a resident mush, *Volcanica*, 7 (1), 89-104. DOI:10.30909/vol.07.01.89104

Carrara, A., Lesage, P., Burgisser, A., Annen, C., Bergantz, G.W., 2022, The dispersive velocity of compressional waves in magmatic suspensions. *Geophysical Journal International.* doi.org/10.1093/gji/ggab432

Breard E. C. P., Dufek J., Fullard L., **Carrara A.**, 2020, The basal friction coefficient of granular flows with and without excess pore pressure: implications for pyroclastic density currents, water-rich debris flows, rock and submarine avalanches. *Journal of Geophysical Research Solid Earth, 549, 116539.* https://doi.org/10.1029/2020JB020203

Carrara, A., Burgisser, A., Bergantz, G.W., 2020. The architecture of intrusions in magmatic mush, *Earth and Planetary Science Letters*, 549, 116539. https://doi.org/10.1016/j.epsl.2020.116539

Burgisser, A., **Carrara, A.**, Annen, C., 2020. Numerical simulations of magmatic enclave deformation. *Journal of Volcanology and Geothermal Research,* 392, 106790. https://doi.org/10.1016/ j.jvolgeores.2020.106790

Carrara, A., Burgisser, A., Bergantz, G.W., 2019. Lubrication effects on magmatic mush dynamics. *Journal of Volcanology and Geothermal Research*, 380, 19–30. doi.org/10.1016/ j.jvolgeores.2019.05.008

Carrara, A., Pinel, V., Bascou, P., Chaljub, E., De la Cruz-Reyna, S., 2019. Post-emplacement dynamics of andesitic lava flows at Volcán de Colima, Mexico, revealed by radar and optical remote sensing data. *Journal of Volcanology and Geothermal Research,* 381, 1–15. doi:10.1006/ j.jvolgeores.2019.05.019

Lesage P., **Carrara A.**, Pinel V., Arámbula-Mendoza R., 2018, Absence of detectable precursory deformation and velocity variation before the large dome collapse of July 2015 at Volcán de Colima, Mexico. *Front. Earth Sci.*, 6:93. doi:10.3389/feart.2018.00093

Pinel V., **Carrara A.**, Maccaferri F., Rivalta E., Corbi F., 2017, A two-step model for dynamical dike propagation in two-dimensions: Application to the 2001 July Etna eruption, *Journal of Geophysical Research: Solid Earth*, *122*(2), 1107-1125.

In preparation:

Carrara, A., Bergantz, G.W., (in prep), The strain induced alignment of crystal in magma mush, To be submitted to *Geochemistry, Geophysics, Geosystems*.

Carrara, A., Bergantz, G.W., (in prep), The influence of shape preferential orientation on the rheology mush, To be submitted to *Geochemistry, Geophysics, Geosystems*.

Carrara, A., (in prep) The shear modulus of magma mush, To be submitted to *Journal of Volcanology and Geothermal Research.*

Other communications:

Conference abstracts*:*

Bergantz, G.W., **Carrara, A**., 2023, The Granular Nature of Volcanic and Magmatic Processes, AGU fall meeting 2023.

Carrara, A., Bergantz, G.W., 2023, The origin and micromechanics of the preferential orientation of crystals in mush, Goldschmidt 2023 conference.

Carrara, A., Bergantz, G.W., Cantor, D., Breard, E. C. P., 2021, The Influence of Crystal Shape and Ordering on the Mechanical Response of a Mush during Strain, AGU fall meeting 2021.

Poveda, E.,Molina, I., **Carrara, A.**, Montagna, C., Burgisser, A., 2021, Simulations of Long-Period Screw-Type Seismic Signals from Tungurahua Volcano (Ecuador) from a Fluid-Dynamic Model, AGU fall meeting 2021.

Carrara, A., Burgisser, A., Bergantz, G.W., 2020. The architecture of intrusions in magmatic mush, EGU meeting 2020.

Breard, E.C.P., Dufek, J., **Carrara, A**., Winner, A., The rheology of granular flows with pore fluid pressure-implication for pyroclastic flows and debris flows, AGU fall meeting 2019.

Carrara, A., Burgisser, A. Bergantz, G. W., Dynamical effects of lubrication forces on the transport of magma in mush systems, AGU fall meeting 2018.

Pinel, V., **Carrara A.**, De la Cruz-Reyna. S., 2017, Post emplacement dynamics of lava flow Volcàn de Colima, Mexico, revealed by radar and optical remote sensing data, 2017 IAVCEI general assembly.

Carrara, A. Burgisser A., 2017, Numerical modeling of the reawakening of magma reservoirs, 2017 IAVCEI general assembly.

Pinel, V., Solikhin, S, **Carrara, A**, De la Cruz-Reyna. S, 2017, Application of SAR Data to Eruptive Deposits Mapping and Characterization at Andesitic Stratovolcanoes: Case Study of Merapi, Indonesia and Colima Volcano, Mexico., Fringe 2017 Workshop

Pinel, V., **Carrara. A**, Maccaferri F., Rivalta, E. Corbi, F., 2016, 2D dynamical magma propagation modeling: application to the 2001 Mount Etna eruption, EGU General Assembly Conference 2016, EPSC2016-3569

Outreach:

Carrara, A., 2022. Comment les réservoirs magmatiques se remplissent-ils ? (in french), Le rayon https://jeunes.sfpnet.fr/2022/11/08/comment-les-reservoirs-magmatiques-se-remplissent-ils/

Invited presentations and workshops:

-Institute of Geophysics, Czech Academy of Sciences, Prague, Czech Republic (2024).
-Department of mathematics, University of Clermont-Auvergne, France (2024).
-ISTerre, University Savoie Mont-Blanc, Chambéry, France (2023).
-ETHZ, Zurïch, Switzerland (2022).
-Department of Earth and Space Sciences, University of Washington, Seattle, USA (2022).
-ISTerre, University Savoie Mont-Blanc, Chambéry, France (2021).
-Laboratoty Magmas and Volcanoes, University Clermont-Auvergne, Aubière, France (2021).
-Department of geosciences, Universidad de los Andes, Bogotá, Colombia (2020).
-Department of civil engeenering, Universidad de los Andes, Bogotá, Colombia (2020).

Teaching:

- Geological mapping – Master degree – University Savoie Mont-Blanc – 2017 – 16h of classes
- Scientific programming – Bachelor degree – University Savoie Mont-Blanc – 2018 – 20h
- Numerical modeling – Bachelor degree – University Savoie Mont-Blanc – 2018 & 2019 – 8h
- Applied mathematics – Bachelor degree – University Savoie Mont-Blanc – 2019 – 12h
- Advised 11 undergraduate students during their numerical modeling projects (heat and wave propagation modeling) – University Savoie Mont-Blanc – 2018 & 2019 – ~24h for each student
- Advised the Master 1 research internship of Emile Grandhomme: *Numerical modeling of debris avalanches* (2023) – University of Clermont-Auvergne

Fundings and Awards:

- MERB scholarship (100k€): French research minister scholarship funds for financial support during my PhD
- AO7bis – Labex OSUG for student International mobility (2.5k€)
- Two student international mobility grants from the doctoral school TUE (both 1k€)
- Prix Géophysique 2021 (best thesis award – 1k€) from the CNFGG (French National Comity of Geodesy and Geophysics)
- ClerVolc postdoctoral fellowship (~100k€: Salary + 10k€ research allowance): 2 years postdoctoral fellowship from the ClerVolc laboratory of excellence (Labex) at the University of Clermont-Auvergne
- CNRS International Emerging Actions (10k€), Collaboration with the Institute of Geophysics at the Czech Academy of Sciences (C. Annen, P. Závada, Z. Kratinová, M. Machek, O. Krýza).

Skills:

- Numerical modeling (multiphase flows, seismic wave propagation, ground deformations): Discrete Element Method (spherical and non-spherical), Finite Volume Method, Finite Element Method, Finite Difference Method.
- Programming languages: Python, C/C++, Fortran, Matlab, HTML.
- Geophysics: InSAR, Signal processing, Multispectral remote sensing.
- Laboratory experiment of multiphase flow: Fluidization, Dam break.
- Languages: French, English, Spanish

References:

- Dr. Alain Burgisser, CNRS, University of Savoie Mont Blanc. alain.burgisser@univ-smb.fr
- Prof. George W. Bergantz, University of Washington. bergantz@uw.edu
- Dr. Virginie Pinel, IRD, University of Savoie Mont Blanc. virginie.pinel@univ-smb.fr
- Dr. Catherine Annen, Institute of Geophysics, Czech Academy of Sciences. annen@ig.cas.cz