CURRICULUM VITAE ET STUDIORUM: Dr. Tommaso Giovanardi

Personal data: Born in Montecchio Emilia (RE), 04/04/1985
Present Position: Associate Professor
Address: Via G. Campi 103, 41125, Modena. Phone: +39 0592058496
Email: tommaso.giovanardi@unimore.it

EDUCATION

- **October 2009** Degree in Geologic Sciences (110/110 cum laude) at the University of Modena and Reggio Emilia with a thesis entitled 'Aspetti petrogenetici dei processi di contaminazione nel complesso mafico-ultramafico di Niquelandia', under the supervision of Prof. Maurizio Mazzucchelli
- **December 2012** Ph. D. in Earth Sciences at University of Pavia with a thesis entitled ''Petrological, geochemical and geochronological constraints on the geodynamic evolution of the basic-ultrabasic sequence of Finero (western Southern Alps)' under the supervision of Prof. Riccardo Vannucci.

PREVIOUS POSITIONS AND FELLOSHIPS

- **From February 2014 to January 2017.** Postdoctoral position at Universidade de São Paulo, Geosciences Department.
- **From May 2017 to May 2018.** Postdoctoral position at University of Modena and Reggio Emilia.
- **From April 2020 to April 2021.** Postdoctoral position at University of Modena and Reggio Emilia.
- **From May 2021 to April 2024. RTD-B** position at University of Modena and Reggio Emilia.

MEMBERSHIPS AND APPOINTMENTS

- Member of the Società Italiana di Mineralogia e Petrografia (SIMP).

ORGANISATION OF SCIENTIFIC MEETINGS AND SCHOOLS

- Conveener of session S19 'Melt/fluid-rock interaction and migration from the mantle to the surface' of the congress SIMP-SGI-SOGEI 2018, Catania (Italia) from 12th to 14th September 2018.
- Conveener of session S10 'Metasomatic and refertilization processes in lithospheric mantle: unraveling the heterogeneities in mantle sources and related geodynamic systems' of the congress SIMP-SGI-SOGEI 2019, Parma (Italia) from 16th to 19th September 2019.
- Conveener of session S49 'Application of cutting edge techniques in global geochemistry: isotopic reservoirs from deep earth, food traceability and CO_2 storage' SIMP-SGI congress 2022, Torino (Italy) from 19th to 21th September 2022.

FUNDING AND PROJECTS

- Project PRIN 2009 (Italy), Title: 'Mantle processes and tectono-magmatic evolution in extensional environments.' Coordinator: Prof. Giovanni Piccardo (Università degli Studi di Genova). My affiliation: Università degli Studi di Pavia (Proposer: Prof. Riccardo Tribuzio).

- Project FAPESP 2011/50307-0 (Brazil), Title: 'Petrologia e geoquimica de rochas maficas-ultramaficas em areas selecionadas: implicaçoes tectoniacas e metalogeneticas', Proposer and coordinator: Prof. Vicente A.V. Girardi.
- PNRA project 2013, line B (Italy), title: 'Stabilità delle fasi idrate nel mantello litosferico dei grandi sistemi di rift continentale: un approccio petrologico sperimentale su noduli e lave'. Chief proposer Prof.ssa Costanza Bonadiman (Università degli Studi di Ferrara); my affiliation: I.G.G.-C.N.R. Pavia (proposer: Dr. Alberto Zanetti).
- Proposer and beneficiary of the FAPESP Project 2013/19519-6 (Brazil): post-doctorate grant at the Universidade de São Paulo, Geosciences Department, from 01/February/2014 to 01/February/2016 and renewed up to 01/February/2017. Annual personal research funds amounting to 1/3 of the annual salary. Title: 'Geochemistry and modelling of basic intrusions in the Cana Brava and Niquelândia Mafic-Ultramafic Complexes.'. Supervisor: Prof. Vicente A.V. Girardi.
- Project PRIN 2015 (Italy), Title: 'Geochemical and isotopic budget of highly metasomatised sub-continental mantle in the Africa and Europe geodynamic systems: modern and fossil analogues'. Coordinator: Prof. Sandro Conticelli (Università degli Studi di Firenze); My affiliation: Università degli Studi di Modena e Reggio Emilia (Proposer: Prof. Maurizio Mazzucchelli).
- PRIN project 2017 (Italia), Prot. 20178LPCPW _ 007, titolo: Micro to Macro - How to unravel the nature of the Large Magmatic Events'. Coordinator: Prof. Massimo Coltorti (Università degli Studi di Ferrara); Affiliation: Università degli Studi di Modena e Reggio Emilia (Proponente: Prof.ssa Anna Cipriani).
- FAR Dipartimentale 2021, University of Modena.
- PRIN project 2022 (Italia), Prot. 2022BC2Z5F, titolo: HABITS - Life-histories of prehistoric human groups in South America: a tale on environmental adaptations and subsistence economies. PI: Dr. Tommaso Giovanardi (Università degli Studi di Modena e Reggio Emilia) in sostitution of former PI, Dr. Gregorio Oxilia (Università di Bologna); Unit of: Università degli Studi di Modena e Reggio Emilia.

SELECTED INVITED PRESENTATIONS

The 17th of December 2014 I was invited to give a seminar to the Università degli Studi di Torino (Italy) for the PhD school in Earth Sciences titled: 'Layered complexes of central Brazil (Goiás state): intrusion and contamination processes and ages'.

The 24th of September 2015 I was invited to give a seminar to the Università degli Studi di Modena e Reggio Emilia (Italy) for the geology bachelor geochemistry course titled: Complessi stratiformi mafici-ultramafici: il caso di studio delle intrusioni del Goiás (Brasile)'.

The 18th of February 2016 I was invited to give a seminar to the Università degli Studi di Torino (Italy) for the PhD school in Earth Sciences titled: 'The Finero area: mantle metasomatism and magmatic events to constrain the Triassic-Jurassic evolution of the Southern Alps (Italy).'.

The 28th of September 2016 I was invited to give a seminar to the Università degli Studi di Modena e Reggio Emilia (Italy) for the geology bachelor geochemistry course titled: Mafic-ultramafic layered complexes of Goiás (Brasil): intrusion age and growth processes.

The 29th of September 2016 I was invited to give a seminar to the Università degli Studi di Modena e Reggio Emilia (Italy) for the geology bachelor geochemistry course titled: Contamination processes during melt intrusion in the lower crust: evidences from the Cana Brava, Niquelandia and Barro Alto complexes (Brasil).

The 2nd of October 2017 I was invited to give a seminar to the Università degli Studi di Modena e Reggio Emilia (Italy) for the geology bachelor geochemistry course titled: The Finero area: mantle metasomatism in the Southern Alps (Italy).

AWARDS

- Award SIMP for best PhD thesis, 2013.
- Award for the distinction in sciences 2013 from the Università degli Studi di Modena e Reggio Emilia.
- Award SIMP 'Angelo Bianchi' 2019 for young researcher.
- Award for the distinction in sciences 2019 from the Università degli Studi di Modena e Reggio Emilia.
- **2020:** National Scientific Enabling (ASN) for the position of Associate Professor in the sector **04/A1.**

TEACHING ACTIVITIES

- Teacher of the course: *Rilevamento delle rocce cristalline* at the master of science in Georischi, Geoscienze e Georisorse, University of Modena and Reggio Emilia (from the academic years 2021/2022 to actual).
- Teacher of the course: *Petrografia* at the bachelor of science in Scienze Geologiche, University of Bologna (from the academic year 2018/2019).

BRIEF DESCRIPTION OF THE RESEARCH ACTIVITY

My scientific career, up untill now, is focused on geochemical and petrological studies of melt-rock interactions and evolution of mantle-derived melts. During my Ph.D., I have worked on mantle refertilization and melt-rock interaction in sub-continental lithospheric mantle conditions. The studies were focused on the fossil mantle sequence of Finero (western Alps, Southern Alps), providing constraints on the refertilization events that affected the mantle rocks. The study determinated i) the mode of melt migration, ii) their ages, iii) the nature of the melts and iv) their relationships and significance in the geodynamic evolution of Southern Alps. I have also investigated the age of intrusion of the mafic complex which outcrops in the Finero area in tectonic contact with the mantle sequence and its relationships with the refertilization events in the mantle.

During my post-doc grant at the Universidade de São Paulo, I investigated the ages and the growth of three mafic-ultramafic complexes outcropping in the Brasilia Belt (Goias, center Brazil). The study was focused on field, petrological and geochemical evidence which indicate that the mantle-derived complexes melts intruded under deformative conditions and were contaminated during their crystallization by rocks of the upper basements incorporated within the complexes. An extensive U-Pb SHRIMP zircon analysis dataset was compiled to ending the long time debate on the complexes ages of intrusion. During the last year of my post-doc in Brazil I have also developed Lu-Hf and U-Pb isotopic analytical methods for in situ analysis on zircons and apatites at the laboratories of the Centro Interdipartimentale Grandi Strumenti (C.I.G.S.) of the Università di Modena e Reggio Emilia. The development of isotopic analysis was conducted within the collaboration between the universities of Modena and São Paulo. An article was published to illustrate a new excel spreadsheet which was constructed for the Lu-Hf data reduction.

Currently, I am working on the last recognized melt intrusions in the Finero mantle peridotite at the Università di Modena e Reggio Emilia. During this study I am also developing Sr in situ isotopes analysis on mineral phases (in particular plagioclase, apatite and amphibole). Thanks to a long-time collaboration, I also attended to the isotopic laboratories of the Universitaire Européen de la Mer (IUEM) of the Université de Bretagne Occidentale (Brest) to learn the chromatographic separation of Pb and Sm-Nd isotopes with the aim to reproduce these procedures in the Italian laboratory.

Separately from my major research tracks, I am working on mantle xenoliths from the Patagonia region with the aim of investigate the features and processes in a back-arc mantle and on diabase dykes from the Amazonian craton which could permit to study the evolution of a sub-continental mantle during global processes of super-continent formations and break-up.

LIST OF SCIENTIFIC PUBLICATIONS ON INTERNATIONAL JOURNALS WITH IF.

1. Correia C.T., Sinigoi S., Girardi V.A.V., Mazzucchelli M., Tassinari C.C.G., Giovanardi T. (2012). The growth of large mafic intrusions: Comparing Niquelândia and Ivrea igneous complexes. Lithos, 155, 167-182. DOI: http://dx.doi.org/10.1016/j.lithos.2012.08.024
2. Giovanardi T., Morishita T., Zanetti A., Mazzucchelli M., Vannucci R. (2013). Igneous sapphirine as a product of melt-peridotite interactions in the Finero Phlogopite-Peridotite Massif, Western Italian Alps. European Journal of Mineralogy, 25 (1), 17-31. DOI: https://doi.org/10.1127/0935-1221/2013/0025-2251
3. Zanetti A., Mazzucchelli M., Sinigoi S., Giovanardi T., Peressini G., Fanning M. (2013). Insights into the Melt-Lower Crust Interplay in Subduction-related Setting and the Mesozoic Geodynamic Evolution of the Southern Alps: evidence from the Finero Mafic Complex (Ivrea-Verbano Zone). Journal of Petrology, 54, 2235-2265. DOI: https://doi.org/10.1093/petrology/egt046
4. Giovanardi T., Mazzucchelli M., Zanetti A., Langone A., Tiepolo M., Cipriani A. (2014). Occurrence of Phlogopite in the Finero Mafic Layered Complex. Central European Journal of Geosciences, 6(4), 588-613. DOI: https://doi.org/10.2478/s13533-012-0186-8
5. Zanetti A., Mazzucchelli M., Sinigoi S., Giovanardi T., Peressini G., Fanning M. (2014). Erratum Insights into the Melt-Lower Crust Interplay in Subduction-related Setting and the Mesozoic Geodynamic Evolution of the Southern Alps: evidence from the Finero Mafic Complex (Ivrea-Verbano Zone). Journal of Petrology, 55, 1239-1240, DOI: 10.1093/petrology/egu018.
6. Mazzucchelli M., Quick J.E., Sinigoi S., Zanetti A., Giovanardi T. (2014). Igneous evolutions across the Ivrea crustal section: The Permian Sesia Magmatic System and the Triassic Finero intrusion and mantle. Geological Filed Trips, 6 (2.2), DOI: 10.3301/GFT.2014.05.
7. Giovanardi T., Girardi V.A.V., Correia C.T., Sinigoi S., Tassinari C.C.G., Mazzucchelli M. (2015). U-Pb zircons SHRIMP data from the Cana Brava layered complex: new constraints for the mafic-ultramafic intrusions of Northern Goiás, Brazil. Open Geosciences, 7, 197-206. DOI: 10.1515/geo-2015-0015
8. Ponce A.D., Bertotto G.W., Zanetti A., Brunelli D., Giovanardi T., Aragón E., Bernardi M.I., Mazzucchelli M. (2015). Short-scale variability of the mantle beneath the extra-Andean backarc (Paso de Indios, Argentina): Evidences from spinel-facies mantle xenoliths. Open Geosciences, 7, 362-385. DOI: 10.1515/geo-2015-0023
9. Zanetti A., Giovanardi T., Langone A., Tiepolo M., Wu F.-Y., Dallai L., Mazzucchelli M. (2016). Origin and age of zircon-bearing chromitite layers from the Finero phlogopite peridotite (Ivrea–Verbano Zone, Western Alps) and geodynamic consequences. Lithos, 262, 58-74. DOI: http://dx.doi.org/10.1016/j.lithos.2016.06.015
10. Giovanardi T., Girardi V.A.V., Correia C.T., Sinigoi S., Tassinari C.C.G., Mazzucchelli M. (2017). The growth and contamination mechanism of the Cana Brava layered mafic-ultramafic complex: new field and geochemical evidences. Mineralogy and petrology, 111, 291-314. DOI: 10.1007/s00710-016-0472-0
11. Giovanardi T., Girardi V.A.V., Correia C.T., Sinigoi S., Tassinari C.C.G., Sato K., Cipriani A., Mazzucchelli M. (2017). New U-Pb SHRIMP-II zircon intrusion ages of the Cana Brava and Barro Alto layered complexes: constraints on the genesis and evolution of the Tonian Goias Stratiform Complex. Lithos, 282-283, 339-357. DOI: http://dx.doi.org/10.1016/j.lithos.2017.03.026
12. Langone A., Padrón-Navarta J.A., Ji W.-Q., Zanetti A., Mazzucchelli M., Tiepolo M., Giovanardi T., Bonazzi M. (2017). Ductile-brittle deformation effects on crystal-chemistry and U-Pb ages of magmatic and metasomatic zircons from a dyke of the Finero Mafic Complex (Ivrea-Verbano Zone). Lithos, 284-285, 493-511. DOI: http://dx.doi.org/10.1016/j.lithos.2017.04.020
13. Giovanardi T., Lugli F. (2017). The Hf-INATOR: a free data reduction spreadsheet for Lu/Hf isotope analysis. Earth Science Informatics, 10, 517-523. DOI:10.1007/s12145-017-0303-9
14. Giovanardi T., Freddo I., Mazzucchelli M. (2018). Filling the gap in the classification of phlogopite bearing ultramafic rocks. The journal of geology, 126, 361-370. DOI: 10.1086/697244

15. Giovanardi T., Mazzucchelli M., Lugli F., Girardi V.A.V., Correia C.T., Tassinari C.C.G., Cipriani A. (2018). Isotopic constraints on contamination processes in the Tonian Goiás Stratiform Complex. Lithos, 310-311, 136-152. DOI: https://doi.org/10.1016/j.lithos.2018.04.008
16. Roverato M., Giordano D., Giovanardi T., Juliani C., Polo L. (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 Research, 70, 1-24. DOI: https://doi.org/10.1016/j.gr.2018.12.005
17. Giovanardi T., Girardi V.A.V., Teixeira W., Mazzucchelli M. (2019). Mafic dyke swarms at 1882, 535 and 200 Ma in the Carajás region, Amazonian Craton: Sr-Nd isotopy, trace element geochemistry and inferences on their origin and geological settings. Journal of South American Earth Sciences, 92, 197-208. DOI: https://doi.org/10.1016/j.jsames.2019.02.017
18. Consuma G., Braga R., Giovanardi T., Bersani D., Konzett J., Lugli F., Mazzucchelli M., Tropper P. (2020). In situ Sr isotope analysis of mantle carbonates: Constraints on the evolution and sources of metasomatic carbon-bearing fluids in a paleo-collisional setting. Lithos, 354-355, 105334. DOI: https://doi.org/10.1016/j.lithos.2019.105334
19. Giovanardi T., Zanetti A., Dallai L., Morishita T., Hémond C., Mazzucchelli M. (2020). Evidence of subduction-related components in sapphirine-bearing gabbroic dykes (Finero phlogopite–peridotite): Insights into the source of the Triassic–Jurassic magmatism at the Europe–Africa boundary. Lithos, 356-357, 105366. https://doi.org/10.1016/j.lithos.2020.105366
20. Lugli F., Weber M., Giovanardi T., Arrighi S., Bortolini E., Figus C., Marciani G., Oxilia G., Romandini M., Silvestrini S., Jochum K.P., Benazzi S., Cipriani A. (2020). Fast offline data reduction of laser ablation MC-ICP-MS Sr isotope measurements via the interactive Excel-based spreadsheet 'SrDR'. Journal of Analytical Atomic Spectrometry, 35, 852-862. DOI: 10.1039/C9JA00424F
21. Bonazzi M., Langone A., Tumiati S., Dellarole E., Mazzucchelli M., Giovanardi T., Zanetti A. (2020). Mantle-derived corundum-bearing felsic dykes may survive only within the lower (refractory/inert) crust: evidence from zircon geochemistry and geochronology (Ivrea-Verbano Zone, Southern Alps, Italy). Geosciences, 10(8), 281, DOI: doi:10.3390/geosciences10080281
22. Nava A., Lugli F., Romandini M., Badino F., Evans D., Helbling A.H., Oxilia G., Arrighi S., Bortolini E., Delpiano D., Duches R., Figus C., Livraghi A., Marciani G., Silvestrini S., Cipriani A., Giovanardi T., Pini R., Tuniz C., Bernardini F., Dori I., Coppa A., Cristiani E., Dean C., Bondioli L., Peresani M., Müller W., Benazzi S. (2020). Early life of Neanderthals. Proceedings of the National Academy of Sciences of the United States of America, 117, 28719–28726. DOI: https://doi.org/10.1073
23. Bertotto G.W., Mazzucchelli M., Zanetti A., Ponce A.D., Giovanardi T., Brunelli D., Bernardi M.I., Hémond C., Cipriani A. (2021). Mantle heterogeneities produced by open-system melting and melt/rock reactions in Patagonian extra-Andean backarc mantle (Paso de Indios, Argentina). Journal of South American Earth Sciences, 106, 103002. DOI: https://doi.org/10.1016/j.jsames.2020.103002
24. Di Giuseppe, D., Perchiazzi, N., Brunelli, D., Giovanardi T., Nodari, L., Della Ventura, G., Malferrari, D., Maia, M., Gualtieri, A.F. (2021). Occurrence and characterization of tremolite asbestos from the Mid Atlantic Ridge. Scientific Reports, 11:6285 DOI: https://doi.org/10.1038/s41598-021-85576-w
25. Secchi, F., Naitza, S., Oggiano, G., Cuccuru, S., Puccini, A., Conte, A.M., Giovanardi, T., Mazzucchelli, M. (2021). Geology of late-Variscan Sàrrabus pluton (south-eastern Sardinia, Italy). Journal of Maps, 17-2, 591-606 DOI:10.1080/17445647.2021.1982032
26. Bertotto, G.W., Mazzucchelli, M., Giovanardi, T., Conceiçao, R.V., Zanetti, A., Schilling, M.E., Bernardi, M.I., Ponce, A.D., Jalowitzki, T., Gervasoni, F., Cipriani, A. (2022). Mantle Xenoliths from Huanul Volcano (Central-West Argentina): A Poorly Depleted Mantle Source under Southern Payenia. Geosciences 12, 157. https://doi.org/10.3390/geosciences12040157

27. Secchi, F., Giovanardi, T., Naitza, S., Casalini, M., Kohút, M., Conte, A.M., Oggiano, G. (2022). Multiple crustal and mantle inputs in post-collisional magmatism: Evidence from late-Variscan S`arrabus pluton (SE Sardinia, Italy). Lithos 420–421, 106697.
28. Giovanardi, T., da Costa, P.C.C., Girardi, V.A.V., Weska, R.K., Vasconcelos, P.M., Thiede, D.S., Mazzucchelli, M., Cipriani, A. (2022). Age, geochemistry and mantle source of the Alto Diamantino basalts: Insights on NW Paraná Magmatic Province. Lithos 426-427, 106797.
29. Dilaria, S., Secco, M., Ghiotto, A.R., Furlan, G., Giovanardi, T., Zorzi, F., Bonetto, J. (2023). Early exploitation of Neapolitan pozzolan (pulvis puteolana) in the Roman theatre of Aquileia, Northern Italy. Scientific Reports 13:4110 https://doi.org/10.1038/s41598-023-30692-y
30. Cipriani, A., Giovanardi, T., Mazzucchelli, Lugli, F., Sforna, M.C., Gualtieri, A.F.,Di Giuseppe, D., Gaeta, M., Brunelli, D. (2023). Origin of a carbonate-bearing fluorapatite from Tertiary volcanics of the Veneto Volcanic Province, Italy. Mineralogy and Petrology https://doi.org/10.1007/s00710-023-00831-4
31. Ogunyele, A.C., Bonazzi, M., Giovanardi, T., Mazzucchelli, M., Salters, V.J.M., Decarlis, A., Sanfilippo, A., Zanetti, A. (2024). Transition from orogenic-like to anorogenic magmatism in the Southern Alps during the Early Mesozoic: Evidence from elemental and Nd-Sr-Hf-Pb isotope geochemistry of alkali-rich dykes from the Finero Phlogopite Peridotite, Ivrea–Verbano Zone. Gondwana Research 29, 201 - 219 https://doi.org/10.1016/j.gr.2023.12.011
32. Braga, L.G., Jalowitzki, T., Gervasoni, F., de Freitas, R.A., Mazzucchelli, M., Giovanardi, T., Dalla Costa, M.M., Santos, R.V., Rocha, M.P., Fuck, R.A., Lorenzoni, G.R., Bertotto, G.W. (2024). Destruction of the lithosphere beneath the SW margin of the São Francisco Craton evidenced by refertilized and deformed mantle xenoliths. Journal of Petrology, 65(9), egae087
33. Gualtieri, A.F., Marchetti Dori, S., Malferrari, D., Giovanardi, T., Fantini, R., Colombo, F., Sisti, M., Arletti, R., Gamberini, M.C., Braschi, E., Orlando, A., Mugnaioli, E. (2024). When detection and quantification of mineral fibres in natural raw materials are at their limit – the case of a clay from the Gomsiqe–Puka mining area (Albania). Eur. J. Mineral., 36, 749–765, https://doi.org/10.5194/ejm-36-749-2024.
34. Santos, A.A., Jalowitzki, T., Gervasoni, F., Mazzucchelli, M., Giovanardi, T., Schilling, M.E., Varas-Reus, M.I., Orihashi, Y., Lorenzoni, G.M.R., Hirata, D., Bertotto, G.W. (2024). Mesoproterozoic depleted spinel peridotites metasomatized by high-K hydrous melt in the Patagonian back-arc. Chemical Geology 670 (2024) 122412. https://doi.org/10.1016/j.chemgeo.2024.122412

Updated on 20/09/2024