Fabrizio GHERARDI

Fabrizio Gherardi (MSc, PhD) has over twenty years of applied research experience in aqueous geochemistry and water/rock/gas interactions, including the application of multiphase/multicomponent geochemical and reactive transport models.

His current research activities focus on water/gas/rock interactions in various types of subsurface environments, including volcano-hydrothermal systems, geothermal reservoirs, oil & gas reservoirs, sites for geological confinement of greenhouse gases, and on the investigation of continuous geochemical signals in seismically active areas

PERSONAL INFORMATION

Nationality:	Italian
Current position:	Senior Researcher at the National Research Council of Italy (CNR)
Affiliation:	National Research Council of Italy (CNR) Institute of Geosciences and Earth-Resources (IGG)
Address (work):	Area Ricerca del CNR - Via G.Moruzzi 1 – 56124 Pisa – Italy
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RESEARCH INTERESTS

Gas-water-rock interaction
Isotope hydrology
Noble gases
Hydrothermal/geothermal systems
Diagenesis
Geological confinement of greenhouse gases
Geological storage of energy
Groundwater quality and contaminant hydrology
Groundwater dynamics
Fluids in seismically active areas
Oil & Gas

RESEARCH METHODS

Chemical and stable isotope composition of geofluids
Mineralogical, chemical and stable isotope composition of solid matrices
Geochemical modeling
Thermo-hydraulic modeling
Reactive transport modeling
Continuous monitoring of geochemical signals

EDUCATION

AA 1999/2000 **Ph.D. Geochemistry** (Hydrothermal systems, Geothermal energy), 4-years fixed-term Doctoral Course of the University of Pisa, Italy

AA 1994/1995 **M.S. Earth Sciences** (Hydrothermal systems, Geothermal energy), University of Pisa, Italy

EXPERIENCE

2009 – present **Researcher**, **permanent position**, Institute of Geosciences and Earth-Resources (IGG) of the National Research Council of Italy (CNR)

2012 – 2013 **Senior Researcher** (Geological confinement of CO_2, Geochemical and reactive transport modeling), the Loire Valley Institute for Advanced Studies "Le Studium", Orléans, France (on temporary leave from CNR-IGG), in residence at BRGM, Orléans, France

2004 – 2009 **Researcher, temporary position** (Geological confinement of CO_2, Geothermal/hydrothermal systems, Geochemical and reactive transport modeling), Institute of Geosciences and Earth-Resources (IGG) of the National Research Council of Italy (CNR)

2003 **Postdoctoral fellowship** (Environmental geochemistry), Institute of Geosciences and Earth-Resources (IGG) of the National Research Council of Italy (CNR)

2001 – 2002 **Postdoctoral fellowship** (Environmental geochemistry), Institute of Geochemistry and Isotope Geochronology (IGGI) of the National Research Council of Italy (CNR)

ASSIGNMENTS/AWARDS (5 SELECTED)

2023 **Invited professor**, Jilin University, Changchun (China) – Chair of the Geothermal Geochemistry course delivered during the Spring Semester 2023 at the College of New Energy and Environment

2012 – 2013 **Le Studium fellowship** from the Loire Valley Institute for Advanced Studies "Le Studium", Orléans, France (CCUS research)

2010 **UNESCO international expert on stable isotope techniques applied to hydrological investigations**, Vietnam (Isotope Hydrology lecturing + fieldwork in Vietnam)

2009 **Invited professor**, Paris Sud University, Paris (France) (Geothermal and CCUS lecturing)

2008 **Invited scientist**, BRGM, Orléans (France), ANR Carnot Program (CCUS research)

SCIENTIFIC RESPONSIBILITY (5 SELECTED PROJECTS

2022 *Attività di modellistica numerica geochimica e di trasporto reattivo applicata alla CCS* – Eni contract n.3500055642 – Geochemical and reactive transport modeling best practices for the feasibility study of a CCUS pilot site in Italy - Position: **Responsible of the CNR-IGG Research Unit**

2021 *Modellazione geochimica di CO2 in sistemi geologici multifase* - Eni contract n.30060676, attività 2 – Geochemical modeling of multiphase systems in gas-depleted reservoirs: code development and numerical simulations - Position: **Responsible of the CNR-IGG Research Unit**

2019 – 2020 *Modellazione geochimica di carbonati* – Eni contract n.30055470 - Position: **Responsible of the CNR-IGG Research Unit**

2019 – 2023 MODGRE – *MODelling conventional and unconventional Geothermal REsources in Italy and China* – Collaborative project co-financed by Jilin University (China) and CNR-IGG (Italy)) - Position: **Responsible of the CNR-IGG Research Unit**

2016 – 2017 STABINTER - *STABility of INTERstratified clay minerals*. Collaborative project co-financed by Bureau des Recherches Géologiques et Minières (BRGM, France) e CNR-IGG (Italy) - Position: **Responsible of the CNR-IGG Research Unit**

SELECTED RESEARCH PROJECTS (participation)

2016 – 2020 GEMEX – "Cooperation in Geothermal energy research Europe-Mexico for development of Enhanced Geothermal Systems and Superhot geothermal Systems" – ID 727550 – Financed in the frame of H2020–LCA-23-2016

2014 – 2017 DESCRAMBLE – "Drilling in dEep, Super-CRitical AMBient of continentaL Europe" – ID 640573 – Financed in the frame of H2020-LCE-2014-1

10 SELECTED PUBLICATIONS

2022 Feng G., Xu T., Zhao Y., Gherardi F. (2022). Heat mining from super-hot horizons of the Larderello geothermal field, Italy. Renewable Energy 197, 371-383

2021 Blanc P, Gherardi F, Vieillard P, Marty NCM, Gailhanou H, Gaboreau S, Letat B, Geloni C, Gaucher EC, Madé B (2021). Thermodynamics for clay minerals: Calculation tools and application to the case of illite/smectite interstratified minerals. Applied Geochemistry 130, 104986

2021 Xu T, Liang X, Xia Y, Jiang Z, Gherardi F (2021). Performance evaluation of the Habanero enhanced geothermal system, Australia: Optimization based on tracer and induced microseismicity data. Renewable Energy 181, 1197-1208

2018 Gherardi F., Pierotti L. (2018). The suitability of the Pieve Fosciana hydrothermal system (Italy) as a detection site for geochemical seismic precursors. Applied Geochemistry 92, 166-179

2017 Feng G., Xu T., Gherardi F., Jiang Z., Bellani S. Geothermal assessment of the Pisa plain, Italy: Coupled thermal and hydraulic modeling. Renewable Energy 111, 416-427

2013 Magro G., Gherardi F., Bayon F.E.B. (2013). Noble and reactive gases of Palinpinon geothermal field (Philippines): Origin, reservoir processes and geodynamic implications. Chemical Geology 339, 4-15

2012 Gherardi F, Audigane P, Gaucher EC (2012). Predicting long-term geochemical alteration of wellbore cement in a generic geological CO2 confinement site: Tackling a difficult reactive transport modeling challenge. Journal of Hydrology 420-421, 340-359

2012 Chiodini G., Caliro S., De Martino P., Avino R., Gherardi F. (2012). Early signals of new volcanic unrest at Campi Flegrei caldera? Insights from geochemical data and physical simulations. Geology doi:10.1130/G33251.1

2007 Gherardi F., Xu T., Pruess K. (2007). Numerical modeling of self-limiting and self-enhancing caprock alteration induced by CO2 storage in a depleted gas reservoir. Chemical Geology 244, 103-129

2005 Gherardi F., Panichi C., Gonfiantini R., Magro G., Scandiffio G. (2005). Isotope systematics of C-bearing gas compounds in the geothermal fluids of Larderello, Italy. Geothermics 34, 442-470