



Professor Alberto Guadagnini

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Born

October 26, 1964; Verona (Italy)

Education and Professional Career

- 2017- Director of the Department of Civil and Environmental Engineering, Politecnico di Milano, Milano, Italy.
- 2018 Visiting Professor: Peter the Great St. Petersburg Polytechnic University, Russian Federation.
- 2013- Adjunct Professor (Dept. of Hydrology and Water Resources - Dept. of Hydrology and Atmospheric Sciences, The University of Arizona, Tucson, Arizona USA).
- 2010-2016 Visiting Professor: Department of Hydrology and Water Resources, The University of Arizona, Tucson, Arizona 85721, USA (Nov. 2010 - Mar. 2011; 2012, 2013, 2014, 2015, 2016).
- 2011-2012 Visiting Professor: Department of Environmental Sciences and Energy Research, Weizmann Institute of Science, Rehovot, 76100 Israel.
- 2010 Professeur Invité: University of Strasbourg, Strasbourg, France.
- 2003- Professor (Hydraulics and Fluid Mechanics), Politecnico di Milano, Milano, Italy.
- 1998-2003 Associate Professor, Politecnico di Milano, Milano, Italy.
- 1996-1998 Visiting Professor, Department of Hydrology and Water Resources, The University of Arizona, Tucson, Arizona 85721, USA.
- 1992-1998 Assistant Professor of Hydraulic Engineering, Politecnico di Milano, Milano, Italy.
- 1993 Doctoral Degree in Hydraulic Engineering, Politecnico di Milano, Milano, Italy
- 1989 Graduation, Civil Engineering (Hydraulics), Politecnico di Milano, Milano, Italy

Measures of Broad Impact and Selected Activities

- 2020- Chief Executive Editor: *Hydrology and Earth System Sciences* (EGU).
- 2020- Chair of the Committee on Groundwater Hydraulics and Management (IAHR).
- 2019-2020 President of the Committee of the *Witherspoon Lecture Award* (AGU).
- 2017- Director of the Department of Civil and Environmental Engineering (103 Faculty, 43 Non-Teaching staff), Politecnico di Milano, Milano, Italy.
- 2016- Chair of Communication Committee of InterPore (International Society for Porous Media).
- 2018 Independent external evaluator for the promotion evaluation committee of the University of Dundee (Scotland, UK).
- 2016- Faculty Advisor: Society of Petroleum Engineers (SPE) Student Chapter at Politecnico di Milano, Italy.
- 2015-2018 Member of the Committee of the *Witherspoon Lecture Award* (AGU).
- 2014-2019 Executive Editor: *Hydrology and Earth System Sciences* (EGU).
- 2013-2018 Head of the Doctoral Program in *Environmental and Infrastructure Engineering*, Politecnico di Milano, Italy.
- 2011 Outside reviewer for the Promotion and Tenure Review evaluation panel of the Department of Hydrology and Water Resources, The University of Arizona (Tucson, Arizona, USA).

- 2011- Editorial Board, *Stochastic Environmental Research and Risk Assessment*.
- 2011-2020 Vice Chair of the Committee on Groundwater Hydraulics and Management (IAHR).
- 2009-2014 Editor, *Hydrology and Earth System Sciences* (EGU)
- 2009- Editorial Board, *Advances in Water Resources* (Elsevier).
- 2008 Scientific Committee of the H+ observatory (France).
- 2007-2010 Head of the Doctoral Program in *Water Engineering*, Politecnico di Milano.
- 2004-2008 Associate Editor, *Vadose Zone Journal* (Soil Science Society of America).
- 2004- Associate Editor, *Water Resources Research* (AGU).
- 2002- Technical Committee for Hydrological Sciences Section - Sub-Division on Groundwater Hydrology (EGS - EGU).
- 2001- Expert, Research Proposal Evaluation Panels: European Union (European Research Council - ERC); European Union (FP5-FP6); Swiss National Science Foundation (Switzerland); Israeli Science Foundation (Israel); National Science Foundation (USA); Ontario Research Funds (Canada); Ministry of Science, Technology and Space (Israel); German-Israeli Foundation for Scientific Research and Development; Università Italo-Francese; Alliance nationale de recherche pour l'environnement (AllEnvi, France); Italian Ministry of University and Research; Italian research assessment VQR 2011-2014 (ANVUR).
- 2000-2004 Associate Editor, *Reviews of Geophysics* (AGU).
- 1999- Roles undertaken in various EU framework projects (Coordinator, W-SAHARA (EVK1-1999-CT-00041; total amount funded: 1.2 million €); Project leader / Supervisory Board member, ITN IMVUL (PITN-GA-2008-212298), Horizon2020 *FracRisk* (Grant Agreement No. 636811); served as PI/scientist-in-charge of several National research projects. I have also undertaken the role of PI of several projects funded from the industry (e.g., Eni s.p.a.) and the Environmental Protection Agency of Italy, for a total of 16 research and development projects since 2009.
- 1998- Reviewer for top journals in hydrology (*Hydrology and Earth System Sciences*, *Water Resources Research*, *Geophysical Research Letters*, *Advances in Water Resources*, *Journal of Contaminant Hydrology*, *Transport in Porous Media*, *Vadose Zone Journal*, *Journal of Hydrology*), environment (*Science for the Total Environment*, *Water*, *Computational Geosciences*) and physics (*Physical Review E*).

Awards and Honors

- 2018 *Chaire Gutenberg and Prix Gutenberg 2018* (Award by *Cercle Gutenberg* and *Région Grand-Est*, France, for research on *Climate change and water cycle in Upper Rhine Basin*).
- 2018 InterPore (International Society for Porous Media) Rosette.
- 2018 Outstanding contribution in Reviewing, *Journal of Hydrology*.
- 2017 *Water Resources Research 2016 Editor's Choice Award* (paper Menafoglio, A., A. Guadagnini, and P. Secchi (2016), Stochastic Simulation of Soil Particle-Size Curves in Heterogeneous Aquifer Systems through a Bayes space approach).
- 2017 Outstanding contribution in Reviewing, *Journal of Computational Physics*.
- 2014 Plenary Speaker - Gordon Research Conference on Permeable Media.
- 2013; 2017 Excellence in Reviewing, *Advances in Water Resources*.
- 2008- *Corresponding Fellow* of the Istituto Lombardo, Accademia di Scienze e Lettere.

The following awards were won by A. Guadagnini's PhDs for research conducted under A. Guadagnini supervision/co-supervision

- 2014; 2017 Gustavo Sclocchi Award, awarded by EAGE, SPE (Italian Section) and Italian Petroleum and Mining Industry Association for best thesis in geosciences (2014: PhD thesis *Uncertainty assessment of three-phase relative permeability models* of Ehsan Ranaee; 2016: MSc thesis *Quantitative analysis of blowout risk and mitigation actions for*

deepwater wells of Alessandro Caia; 2017: PhD thesis Constant and variable density flow in porous media under multiple sources of uncertainty of Aronne Dell'Oca).
2014; 2016 Eni Award 2014 *Debut in Research* (PhD thesis *Characterization of permeability of natural and reconstructed porous media* of Martina Siena).

Memberships and Affiliations

American Geophysical Union (since 1990); European Geosciences Union (since 2010); Society of Petroleum Engineers (since 2016); International Society for Porous Media - InterPore (since 2015); Gruppo Italiano di Idraulica (Italia, since 1993); International Association for Hydro-Environment Engineering and Research (IAHR); National Council of Engineers (Italy, since 1992).

Research Experience

1. Research experience spans theoretical/numerical and experimental projects, motivated and funded through applications to real problems, and focused on subsurface flow dynamics of (variably) saturated soils, parameter estimation, inverse modeling, geostatistics, stochastic analyses of flow and transport in geo-chemically active subsurface environments, scaling in hydrology & geophysics, data assimilation, model reduction techniques for the solution of flow and transport problems, and uncertainty quantification in groundwater systems, from the pore- to the laboratory-, field- and basin-scale. Current research activities include (i) environmental protection of groundwater bodies; (ii) stochastic groundwater hydrology, (iii) delineation of wellhead and groundwater source protection regions, (iv) multiscale flow and solute transport in aquifers and reservoirs, (v) multiphase flows, enhanced oil recovery, and shale gas development, (vi) risk based corrective actions of subsurface energy development, (vii) environmental impacts of competitive use of groundwater.
2. A. Guadagnini has established and leads a highly active and diverse Groundwater Hydraulics and Hydrology research group, currently including three faculties, 4 PhDs, 4 post-doctoral fellows, consultants, and other visitors and temporary students.
3. Advised/co-advised and graduated about 15 PhDs; hosted >10 post-doctoral fellows and many visiting senior scientists.
4. Coordinator / Supervisory Board / PI / scientist-in-charge of several European Union and National projects and proposals.
5. Awarded exclusive research projects on protection of groundwater quantity and quality and conventional and unconventional subsurface energy resources by the industrial sector (e.g., Eni SpA, Geolog Int.) and by water and environmental public / private sector (Environmental Agencies and Water Companies).
6. Published more than 170 research papers in ISI rated journals (with also > 150 research papers in Conference proceedings). Total of >3700 citations; h-index: 34 (ISI).
7. Over the last 5 years, >15 invited/keynote/plenary presentations at international conferences and workshops, as well as lectures at universities and research institutions in Europe, North America, South America, and China (e.g., AGU, EGU, Gordon Research Conference, IAHR - International Association for Hydro-Environment Engineering and Research Jinan University, University of Strasbourg, University of Arizona, Heriot-Watt University, University of Edinburgh, University of Bogotà, Peter the Great St. Petersburg Polytechnic University, University College of London, and more).

Teaching

Teaching activity comprises tenure of numerous classes (Hydraulics, Fluid Mechanics, Groundwater Hydraulics) within the curricula of Civil, Environmental and Mechanical Engineering at the Politecnico di Milano. Currently he teaches classes of Fluid Mechanics and Transport Phenomena in Petroleum Reservoirs at the School of Industrial Engineering (Politecnico di Milano). He coordinates the course of Groundwater Hydraulics within the curriculum of the Doctoral Program of Environmental and Infrastructure Engineering (Politecnico di Milano).

A. Guadagnini has been member of the scientific-organizing committee / advisory board of international conferences, including: International Conference on Finite-Element Models, MODFLOW, and More 2004 Karlovy Vary, Czech Republic, 2004; Fifth European Conference on Geostatistics for Environmental Applications (GeoENV 2004), Neuchatel (Switzerland), 2004; Fifth International Conference on Calibration and Reliability in Groundwater Modelling (ModelCARE2005), The Hague, The Netherlands, 2005; Models - Repositories of Knowledge (ModelCARE2011), Leipzig, Germany, 2011; Gordon Research Conference on Flow and Transport in Permeable Media, Las Diablerets, Switzerland, 2012; 7th IAHR International Groundwater Symposium 2012 (Kuwait, 2012), EU Marie Curie ITN 'IMVUL' research network, a Conference "Groundwater Vulnerability - Emerging Issues and New Approaches" (Paris, France, 2012); 13th International Conference on Geostatistics for Environmental Applications (Parma, Italy, 2020); Interpore2020 (on-line; 2020); 16th International Conference of IACMAG - International Association for Computer Methods and Advances in Geomechanics (Torino, Italy, 2021); 25th International Congress of Theoretical and Applied Mechanics ICTAM Milano2020 (Milano, Italy, 2021).

He has been invited as keynote speaker at international conferences such as: Fourth European Conference on Geostatistics for Environmental Applications (GeoENV2002), Barcelona (Spain), 2002; International Conference of the Israel Society for Ecology and Environmental Quality Sciences, Israel, 2005; International conference ModelCARE2007: "Calibration and Reliability in Groundwater Modelling, Credibility of Modelling (Copenhagen, Denmark, 2007); 7th IAHR International Groundwater Symposium 2012 (Kuwait, 2012), EU Marie Curie ITN 'IMVUL' research network, a Conference "Groundwater Vulnerability - Emerging Issues and New Approaches" (Paris, France, 2012); Gordon research Conference on Flow & Transport in Permeable Media (2014, Bates College, Lewiston, Maine).

Selected invited presentations in 2015-2019: (i) 7th International Conference on Porous Media & Annual Meeting (18-21 May, Padova, Italy); (ii) Annual PMPM Meeting 2015 (International Centre for Mathematical Sciences, 9-11 February, Edinburgh, UK); (iii) Water and Fluid Frontiers (Giornata organizzata dal Gruppo Italiano di Idraulica, GII; 11-12 June, Cagliari, Italy); (iv) International Symposium on Sustainable Development in Water Resources and Ecological Environment (25-29 March, Guangzhou, China); (v) *EGU General Assembly 2016, Session HS3.2/NH1.26* - Spatio-temporal and/or geostatistical analysis of hydrological events, extremes, and related hazards (21 April, Vienna, Austria); (vi) 2016 AGU Fall meeting, Session H003: Advances, Breakthroughs, and Challenges in Hydrogeologic Sciences (12-16 December, San Francisco, USA); (vii) Technology Transfer in Oil and Gas Industry Conference, Research Institute of Petroleum Industry; Title: Modern screening approaches for the assessment of Enhanced Oil Recovery techniques; (viii) International Conference on Groundwater - ICGW2017, Bogotá, Colombia - Stochastic simulation of soil particle-size curves in heterogeneous aquifer systems through a Bayes space approach; (ix) FrontUQ2018 on Uncertainty Quantification in Subsurface Environments, Pavia, Italy - Probabilistic Assessment of Environmental Impacts of Hydraulic Fracturing Scenarios; (xi) Shaleology Forum, The Geological Society, London, UK - Risk Assessment using a Statistical Approach; (xii) JEMP2018, Nantes, France - Identification of non-Gaussian multi-scale heterogeneity patterns and implications on flow and transport in aquifer systems; (xiii) SPE Italy and Geolog Lecture Series, Milano, Italy - Protecting Groundwater Bodies in Shale Gas Development.

He has been given invited seminars/lectures in Europe (Italy, Spain, Switzerland, Germany, France), Israel and North America since 2000. He has been invited lecturer in the series of Hydrology Seminars at the Swiss Federal Institute of Technology (ETH Zurich, Switzerland) in 1999 and 2000. He has been regularly invited to give lectures and seminars at the Universitat Politècnica de Catalunya, Barcelona, Spain (Department of Geotechnical Engineering and Geosciences) since 2001.

He served in international panels/committees for PhD programs at the University of Arizona, USA (Dept. of Hydrology and Water Resources), in 1999 and 2000; Imperial College of Science, Technology and Medicine (Dept. of Civil and Environmental Engineering, UK) in 2000; Université de Liège (Hydrogéologie, GEOMAC, Belgium) in 2002; Université Louis Pasteur - CNRS, Strasbourg, in 2002, 2003, 2016; Technical University of Catalonia, Barcelona, 2006, 2007, 2008.

Served as: (a) outside reviewer for the Promotion and Tenure Review evaluation panel of the Department of Hydrology and Water Resources, The University of Arizona (Tucson, Arizona 85721, USA) in 2011; (b) independent external evaluator for the promotion evaluation committee of the University of Dundee (Scotland, UK) in 2018.

Key and Recent Funded Research Projects

EU and Italian Government Research Projects

2000-2003. European Commission, FP5. A. Guadagnini was the Coordinator of the European Consortium W-SAHaRA (Stochastic Analysis of Well-Head Protection and Risk Assessment). W-SAHaRA was a European level consortium operating in the context of the probabilistic analysis of drinking wells protection. The consortium was funded by the European Union (Contract No. EVK1-1999-CT-00041), within the Fifth Framework Program (April 2000 - December 2003). It was formed by academic institutions and private/public sector organizations operating in the field of groundwater management and protection. The main motivation underlying the activity of W-SAHaRA was the need to recognize the importance of the heterogeneity of natural geological materials and its impact on the sustainable management and development of drinking well fields. Nations participating in W-SAHaRA were Italy (Politecnico di Milano, Municipality of Bologna - Environmental Unit, HERA SpA of Bologna, Azienda Generale Servizi Municipali of Verona SpA), United Kingdom (Imperial College of Science, Technology and Medicine), Germany (University of Tuebingen), France (Université Louis Pasteur de Strasbourg), The Netherlands (Delft University of Technology) and Switzerland (Swiss Federal Institute of Technology, ETH, Zurich). The total budget of the project was about 1.9 million Euro (1.2 million Euro funded by the European Commission).

He was Principal Investigator of the Research Unit of the Politecnico di Milano in the context of the Project "Statistical estimation of heterogeneity in complex randomly heterogeneous geologic media", funded by the Italian Ministry of Research and Education (years 2006 - 2008).

He was Principal Investigator of the Project "Mathematical modeling of the interactions between natural springs and groundwater for a sustainable use of the water resource", financed by the CARIPLO Foundation (years 2006 - 2008).

2008-2012. European Commission, FP7. Title: "*Towards improved groundwater vulnerability assessment*" (IMVUL), Marie Curie Initial Training Network (contract No. PITN-GA-2008-212298). IMVUL was a multi-partner ITN (http://earth.leeds.ac.uk/imvul/imvul_research.html) funded by the EU and coordinated by The University of Leeds. Partners involved in the consortium were: University of Leeds (UK), University of Edinburgh (UK), Politecnico di Milano (Italy), Weizmann Institute of Science (Israel), CNRS (France), CSIC (Spain), Norwegian Geological Survey (Norway), UPMC (France). Key topic and objective: Quantification of vulnerability issues in a series of case study aquifers. The objective is achieved upon relying on (i) a combination of laboratory experimental designs and experiments and on (ii) a series of mathematical and numerical modeling tools for simulating contaminant transport in the subsurface to be employed to investigate subsurface processes relevant to groundwater vulnerability, in terms of quality and quantity.

2013-2015. MIUR (Ministry of Education, Research and University of Italy). Title: "*Innovative methods for water resources management under hydro-climatic uncertainty scenarios*". The project involves 7 Research Units (6 Italian Universities and the National Research Council). Key topic and objective: embed interpretive scaling relationships of subsurface parameters within reduced order stochastic modeling procedures of steady-state groundwater flow.

2015-2018. European Commission, Horizon2020. Title: "*Furthering the Knowledge Base For Reducing the Environmental Footprint of Shale Gas Development*" (FracRisk). Role: Partner/Beneficiary.

Consortium: University of Edinburgh (UK), Institute of Petroleum Engineering, Heriot Watt University (UK), University of Gottingen (Germany), Politecnico di Milano (Italy), Uppsala University (Sweden), University of Vienna (Austria), Centre National de la Recherche Scientifique (France), University of Stuttgart (Germany), Environmental & Water Resource Engineering (Israel), Jung Geotherm (Germany), Bundesanstalt für Geowissenschaften und Rohstoffe (Germany), CSIC - National Research Council (Spain). Key topic and objective: improving understanding of the potential impact of shale gas exploration and exploitation by hydraulic fracturing, including probabilistic risk assessment of environmental matrices and development of decision-support tools for quantifying the environmental impacts.

2020-2023. European Commission, Horizon2020. Title: "Removal and Mitigation of Pollution from the Use of Pesticides: Prevention, Recycling and Resource Management (RECYCLE)". Project funded in the call H2020-MSCA-RISE-2019. Role: Coordinator. Key topic and objective: RECYCLE tackles two interlinked global issues: (i) potential shortages of pesticides as essential need for food security, and (ii) the decline of water quality due to excess pesticide input.

2021-2024. European Commission, Horizon2020. Title: "Trapping and Removal of X-ray Contrast Medium agents from water resource and stream Sediments- New Concepts in Trapping, Recycling and Management (REMEDI)". Project funded in the call H2020-MSCA-ITN-2020. Role: Coordinator (Project admitted to funding; status: Grant Agreement No. 956384 completed). Key topic and objective: assessment of the dynamics of X-Ray contrasting media agents (CMA) migrating in sediments and porous media under uncertainty, including development of mechanistic and quantitative models for X-ray CMA-dynamics during phase transformation while migrating through heterogeneous porous media.

Industry Research Projects

2009-2011. Eni S.p.A. (division: exploration & product). Title: "*Modeling geochemical compaction within reactive fluxes at the basin scale*". Key topic and objective: development of model order reduction techniques and ensuing mathematical model for uncertainty analysis of coupled mechanical and geochemical compaction processes at the basin scale.

2011-2014. Eni S.p.A. Title: "*Water Alternating Gas Injection*". Key topic and objective: pore-scale simulations and theoretical upscaling of two- and three-phase flows in natural porous media for enhanced oil recovery through water alternating gas injection.

2011-2013. Eni S.p.A. Title: "*History matching for characterization of reservoir facies by stochastic inversion methodologies*". Key topic and objective: data assimilation and stochastic inverse modeling for the characterization of reservoirs in the presence of uncertain distribution of hydrofacies and hydraulic properties.

2012-2013. ARPA - Agenzia Regionale per la Prevenzione e l'Ambiente dell'Emilia Romagna- Direzione Tecnica (Regional Agency for Environmental Protection). Title: "*Identification of arsenic natural levels in deep aquifer systems for the classification of chemical status of groundwater bodies according to Directive 2000/60/CE*". Key topic and objective: experiments and geochemical modeling of the effects of Arsenic partitioning and dynamics on the assessment of groundwater background levels.

2012-2013. Eni S.p.A. (division: exploration & product). Title: "*Modeling of geochemical compaction processes at the basin scale*". Key topic and objective: developing of theoretical framework and algorithms for inverse modeling of mechanical and geochemical compaction at the basin scale for well field management.

2014. Eni S.p.A. (division: exploration & product). Title: "*Modeling of main processes governing generation and migration of non-hydrocarbon components in sedimentary basins*". Key topic

and objective: Identification of a modeling strategy and structure of effective models for the simulation of key processes governing generation and migration of non-hydrocarbon components in sedimentary basins.

2015. Eni S.p.A. (division: exploration & product). Title: "*Overpressure Modelling Workflow*". Key topic and objective: Application of one-dimensional effective models based on model complexity reduction to interpretation of field settings associated with geochemical and mechanical compaction.
- 2015-2016. Eni S.p.A. Title: "*Three-Dimensional Modeling of Flow coupled with geochemical and mechanical compaction in sedimentary basins subject to glaciation events (STREAM-3D)*". Key topic and objective: Formulation and characterization of a mathematical model for the simulation of coupled processes (fluid flow and geochemical/mechanical compaction) in sedimentary basins including the effects of glaciation and isostatic processes.
- 2015-2016. Eni S.p.A. Title: "*Modeling of main processes governing generation and migration of non-hydrocarbon components in sedimentary basins*". Key topic and objective: Extension of geochemical models with specific reference to carbonate/clay reactions, leading to field applications and estimate of CO₂ generation under realistic conditions.
- 2015-2016. Eni S.p.A. Title: "*Development of a prototype for calibration under uncertainty and global sensitivity analysis of sedimentological processes at the basin scale (CLAUSE)*". Key topic and objective: Global sensitivity analysis tools and model reduction techniques for stochastic inverse modeling of sedimentological processes driving basin scale structure. Application to the sedimentological modeling framework embedded in the computational system Dionisos.
- 2015-2017. Eni S.p.A. Title: "*Modeling of three-phase flows in porous media (MicroFlow)*". Key topic and objective: Pore- and core-scale characterization of two- and three-phase flows in porous media through integration of theoretical upscaling, numerical pore- and continuum- scale analyses, laboratory experiments, and development of semi-empirical models.
- 2016-2017. Eni S.p.A. Title: "*Modeling of main processes governing generation and migration of non-hydrocarbon components in sedimentary basins with application to realistic scenarios*". Key topic and objective: Quantification of CO₂ (H₂S/CO₂) generation from dissolution of carbonate rock matrix under scenario and parametric uncertainty with direct application to realistic scenarios.
- 2016-2018. Eni S.p.A. Title: "*Development of pilot code for three-dimensional modeling of flow under geochemical compaction in sedimentary basins subject to glaciation (STREAM-3D THMC)*". Key topic and objective: numerical implementation of a mathematical model for the simulation of coupled processes (fluid flow and geochemical/mechanical compaction) in sedimentary basins including the effects of glaciation.
- 2016-2018. Geolog S.r.l. Title: "*Feedback between mud losses and fractures during along wellbores in fractured formations*". Key topic and objective: conceptual and numerical modeling of flow processes and mud losses in porous and/or fractured reservoirs in exploration and development wellbores.
- 2017-2018. Eni S.p.A. Title: "*Validation of calibration and sensitivity analysis tools developed for the quantification of sedimentological processes at the basin scale under uncertainty (Dionisos-Link)*". Key topic and objective: Application to field cases of global sensitivity analysis tools and model reduction techniques for stochastic inverse modeling of sedimentological processes. Quantification of parametric and scenario uncertainties.
- 2017-2018. Lario Reti Holding S.p.A. Title: "Characterization of Arsenic concentrations in groundwater for effective planning and management of drinking well operations". Key topic and objective:

development of an approach aimed at defining a groundwater flow and transport model leading to the quantification of the contamination risk of target pumping wells in the presence of uncertain aquifer parameters and geochemical process.

2018. Eni S.p.A. Title: "*MicroFlow: Microscale Modeling of Multiphase Flow in Porous Media*". Key topic and objective: Development of a modeling-based approach and decision line to support and guide experimental activities at the pore- and core-scale.
- 2018-2020. Eni S.p.A. Title: "*Descriptive models for nanotracer dynamics in reservoirs*". Key topic and objective: improvement of current approaches and methods to the interpretation of partitioning tracer data associated with inter-well tracer tests keyed to (i) enhancing our understanding of connectivity features of a reservoir, (ii) properly assessing the spatial distribution of fluid saturation in the system, and (iii) integrating within a unique framework information associated with single- (i.e., tests based on the classical push-pull technique) and inter- well tracer tests.
- 2019-2020. Eni S.p.A. Title: "*Inversion of two-phase core flooding experiments assisted by 4D tomography*". Key topic and objective: stochastic inverse modeling of two-phase immiscible fluid flow in the presence of space-time distributed data collected through 4D tomography.
- 2019-2020. Eni S.p.A. Title "*Sensitivity analysis and Information Theory as a support to reservoir characterization through seismic inversion*". Key topic and objective: sensitivity analysis of seismic characterization of reservoirs through inversion under uncertainty; model benchmarking through information theory metrics.
- 2019-2020. Eni S.p.A. Title "*Calibration workflow for 3D Gravity Flow modeling*". Key topic and objective: Stochastic approaches leading to uncertainty quantification of models for sediment gravity flows.

List of Publications of Alberto Guadagnini

Book Chapters

1. Menafoglio, A., P. Secchi, and A. Guadagnini (2019), Geostatistical analysis in Bayes spaces: probability densities and compositional data, in: J. Mateu and R. Giraldo (Eds.), *Geostatistical Functional Data Analysis*, Wiley Book, 1-23, ISBN: 978-1-119-38784-8.
2. Nan, T., S.P. Neuman, M. Riva, and A. Guadagnini (2016), Analyzing randomly fluctuating hierarchical variables and extremes, in: J.H. Cushman and D.M. Tartakovsky (Eds.), *The Handbook of Groundwater Engineering*, Third Edition. CRC Press, Taylor & Francis Group, New York, 443-457. ISBN 9781498703048 - CAT# K24643.
3. Neuman, S.P., A. Guadagnini, M. Riva, and M. Siena (2013), Recent Advances in Statistical and scaling analysis of earth and environmental variables, in: P.K. Mishra and K.L. Kuhlman (Eds.), *Advances in Hydrogeology*. Springer Science+Business Media New York, 11-15. ISBN 978-1-4614-6478-5.

Papers in refereed international journals

1. Sole-Mari, G., M. Riva, D. Fernandez-Garcia, X. Sanchez-Vila, and A. Guadagnini (2021), Solute transport in bounded porous media characterized by Generalized Sub-Gaussian log-conductivity distributions, *Adv. Water Resour.*, in press.
2. Bianchi Janetti, E., M. Riva, and A. Guadagnini (2021), Natural springs protection and probabilistic risk assessment under uncertain conditions, *Sci. Total Environ.*, 751, 141430, 1-13. <https://doi.org/10.1016/j.scitotenv.2020.141430>.
3. Baioni, E., G.M. Porta, M. Mousavi Nezhad, and A. Guadagnini (2020), Assessment of turbulence effects on effective solute diffusivity close to a sediment-free fluid interface, *Stoch. Environ. Res. Risk Assess.*, in press. <https://doi.org/10.1007/s00477-020-01877-y>.
4. Dell'Oca, A., A. Guadagnini, and M. Riva (2020), Quantification of the information content of Darcy fluxes associated with hydraulic conductivity fields evaluated at diverse scales, *Adv. Water Resour.*, 145, 103730, 1-12. <https://doi.org/10.1016/j.advwatres.2020.103730>.
5. Dell'Oca, A., A. Guadagnini, and M. Riva (2020), Copula density-driven Metrics for Sensitivity Analysis: Theory and application to Flow and Transport in porous media, *Adv. Water Resour.*, 145, 103714, 1-11. <https://doi.org/10.1016/j.advwatres.2020.103714>.
6. Xia, C-A, D. Pasetto, B.X. Hu, M. Putti, and A. Guadagnini (2020), Integration of moment equations in a reduced-order modeling strategy for Monte Carlo simulations of groundwater flow, *J. Hydrol.*, 590, 125257, 1-14. <https://doi.org/10.1016/j.jhydrol.2020.125257>.
7. Siena, M., A. Guadagnini, A. Bouissonnié, P. Ackerer, D. Daval, and M. Riva (2020), Generalized Sub-Gaussian processes: theory and application to hydrogeological and geochemical data, *Water Resour. Res.*, 56, e2020WR027436, 1-20. <https://doi.org/10.1029/2020WR027436>.
8. Guadagnini, L., A. Menafoglio, X. Sanchez-Vila, and A. Guadagnini (2020), Probabilistic assessment of spatial heterogeneity of natural background concentrations in large-scale groundwater bodies through Functional Geostatistics, *Sci. Total Environ.*, 740, 140139, <https://doi.org/10.1016/j.scitotenv.2020.140139>.
9. Dell'Oca, A., M. Riva, and A. Guadagnini (2020), Interpretation of Multi-scale Permeability Data through an Information Theory Perspective, *Hydrol. Earth Syst. Sci.*, 24, 3097-3109. <https://doi.org/10.5194/hess-24-3097-2020>.
10. Nan, T., J. Wu, A. Guadagnini, X. Zeng, and X. Liang (2020), Random Walk evaluation of Green's functions for groundwater flow in heterogeneous aquifers, *J. Hydrol.*, 588, 1-13. <https://doi.org/10.1016/j.jhydrol.2020.125029>.
11. Dell'Oca, A., M. Riva, and A. Guadagnini (2020), Global Sensitivity Analysis for Multiple Interpretive Models with Uncertain Parameters, *Water Resour. Res.*, 56, 1-20, e2019WR025754. <https://doi.org/10.1029/2019WR025754>.
12. Russian, A., M. Riva, E.R. Russo, M. Chiaramonte, and A. Guadagnini (2019), Stochastic inverse modeling and global sensitivity analysis to assist interpretation of drilling mud losses in fractured formations, *Stoch. Environ. Res. Risk Assess.*, 33, 1681-1697, <https://doi.org/10.1007/s00477-019-01729-4>.
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