Curriculum vitae et studiorum

- *Current position*: Professor in Numerical Analysis
- *Affilitation*: Department of Civil, Environmental and Architectural Engineering, University of Padova, Padova, Italy
- Tel.: +39 049 8275577
- E-mail: massimiliano.ferronato@unipd.it

Qualifications:

- **Master Degree in Civil Engineering** obtained at the Univeersity of Padova, Italy, on July 15, 1998
- **PhD in Numerical Geomechanics** obtained at the Technology University of Delft, The Netherlands, on March 24, 2003

Table of contents

1. Scientific and professional activity 2
   1.1 Scientific interests 3
   1.2 Organization and participation to international conferences 4
   1.3 Scientific awards 8
   1.4 Editorial activity 8
   1.5 Technological transfer 8
   1.6 Management and participation to research projects 8
2. Teaching activity 10
   2.1 Mentoring activity 12
3. Scientific publications 13
   3.1 Publications on peer-reviewed international journals 13
   3.2 Publications on international books 18
   3.3 Publications on proceedings of international conferences 18
   3.4 Books 24

1. Scientific and professional activity

Massimiliano Ferronato graduated in Civil Engineering, Structural qualification, at the University of Padova in 1998 with 110 points over 110 cum laude and with a special mention for the curriculum of study. After the Master Degree, he worked until December 1998 as a consultant for the engineering company MED Ingegneria S.r.l.. In 1999 he attended a Qualifying Master at the University of Padova getting the specialization in Maritime and Coastal Engineering with a defense of the thesis entitled: "Numerical modeling of the morphological evolution of a littoral: sensitivity analysis to the concomitance of waves and the "acqua alta" phenomenon with practical application". On March 24, 2003, he got the PhD degree in Numerical Geomechanics at the Technology University of Delft (The Netherlands) defending a thesis entitled: "Rock expansion and compaction at the marker scale in gas producing reservoirs" with Prof. Arnold Verruijt, PE (Technology University of Delft) and Prof. Giuseppe Gambolati, PE (University of Padova) as advisors. In 2003 he got a Post-Doc fellowship at the Department of Mathematical Methods and Models for Scientific Application (DMMMSA) of the University of Padova. In 2008, he was appointed Assistant Professor in Numerical Analysis at the School of Engineering of the University of Padova. In 2012 he obtained the National Scientific Qualification as Associate Professor in Numerical Analysis. Since 2015, he is Associate Professor at the Department of Civil, Environmental and Architectural Engineering of the University of Padova. In 2017 he obtained the National Scientific Qualification as Professor in Numerical Analysis. Since 2020, he is Professor of Numerical Analysis at the Department of Civil, Environmental and Architectural Engineering of the University of Padova.

Detailed professional curriculum:

September 1998 – December 1998: consultant for the private company MED Ingegneria S.r.l., working in modeling activities for hydraulic, maritime, coastal and environmental engineering

January 1999 – October 1999: mandatory civil service, equivalent to the national army service, at the sanitary agency Azienda ULSS no. 15 (Alta Padovana)

November 1999 – July 2001: research fellowship at the University of Padova – Department of Mathematical Methods and Models for Scientific Applications (DMMMSA) – on the project: *"Modeling analysis of the deformation mechanisms of the rock matrix detected in gas reservoirs by the radioactive marker technique, with application to deep boreholes in the Adriatic offshore"*

August 2001 – July 2003: research fellowship at the University of Padova – Department of Mathematical Methods and Models for Scientific Applications (DMMMSA) – on the project: *"Geological CO2 sequestration: development of numerical models and application to the Eastern Po Valley reservoirs"*

August 2003 – July 2005: Post-Doc fellowship at the University of Padova – Department of Mathematical Methods and Models for Scientific Applications (DMMMSA) – on the project: *"Geological CO2 sequestration: development of numerical models and application to the Eastern Po Valley reservoirs"*

August 2005 – March 2008: Post-Doc fellowship at the University of Padova – Department of Mathematical Methods and Models for Scientific Applications (DMMMSA) – on the project: *"Numerical analysis of the safety of anthropic CO2 sequestration in saline aquifers of the Po Plain"*

April 2008 – April 2015: Assistant Professor of Numerical Analysis at the University of Padova, School of Engineering, in the Department of Mathematical Methods and Models for Scientific Applications (DMMMSA) until December 2011 and in the Department of Civil, Environmental and Architectural Engineering (DICEA) since January 2012

May 2015 – September 2020: Associate Professor of Numerical Analysis at the University of Padova in the Department of Civil, Environmental and Architectural Engineering (DICEA). In March 2017, he obtains the National Scientific Qualification as Full Professor in Numerical Analysis

October 2020 – today: Professor of Numerical Analysis at the University of Padova in the Department of Civil, Environmental and Architectural Engineering (DICEA)

1.1 Scientific interests

The main scientific interests concern the analysis and development of mathematical and numerical models for the solution of the partial differential equations (PDE) governing the deformation and flow processes in saturated and partially saturated porous media, with specific applications in the field of subsurface hydrology and petroleum engineering. In particular, much care has been devoted to the numerical issues related to the development of novel computer methods for the robust and efficient solution of the linear systems of equations arising from such models.
The most significant scientific contributions concern the topics that follow:

1. Analysis, development and implementation of numerical models based on finite elements, mixed finite elements, virtual elements, finite volumes and meshless techniques for the simulation of the main geomechanical, fluid-dynamical and thermal processes, both coupled and uncoupled, in the subsurface, related to the exploitation of underground resources located in deep aquifers and reservoirs. Accuracy, convergence and numerical stability have been investigated, with particular reference to the issue of coupling between processes occurring at different time and space scales.
2. Development of interface finite elements for the simulation of the mechanics of faults and fractures in the subsurface, with application to the effects associated with the exploitation of subsurface resources, such as water or hydrocarbons. Analysis of the non-linear problem and development of stable and accurate numerical methods for the simulation of the processes at the scale of interest.
3. Development and implementation of novel preconditioners, for both scalar and parallel computers, for the robust and efficient solution of the ill-conditioned, large and sparse linear systems arising from the discretization of the models described above. The preconditioners are used to accelerate iterative methods based on the projection onto Krylov subspaces. The main contributions concern two types of preconditioners: (a) block preconditioners, based on Schur complement approximations, for the solution of saddle-point problems arising from the finite element and mixed finite element discretization of the PDEs governing the coupled processes of deformation and flow in porous media; (b) preconditioners for symmetric positive definite matrices, based on the use of sparse approximate inverses, for large size applications on massively parallel computers.
4. Development and implementation of machine learning techniques based on the use od Physics-Informed Neural Networks for the approximation of continuous solutions in coupled poroelasticity problems, parameter estimation in subsurface hydrology applications and diffusion predictions in epidemiological models.
5. Use of the models described above in important engineering applications, such as the land subsidence prediction due to groundwater or hydrocarbon extraction, fluid injection in the subsurface for storage or mitigation purposes, the calibration of simulation parameters through Data Assimilation techniques.

He is author and co-author of more than 100 papers published on international scientific journals with peer-review, and more than 80 communications published on proceedings of international conferences. He is a SIAM member (Society of Industrial and Applied Mathematics) and has been Invited and Keynote Speaker in several international conferences, presenting advancements on the preconditioning of linear systems and the development of coupled flow-deformation models with mixed finite element techniques. On May 2024, according to the Scopus and Web of Science databases, he has the following citation record:

- No. of publications: 166 (Scopus), 124 (WoS)
- No. of citations: 2839 (Scopus), 2310 (WoS)
- H-index: 29 (Scopus), 25 (WoS)

1.2 Organization and participation to international conferences

He attended several international conferences, either as Keynote or Invited Speaker, or Contributed Speaker.

Keynote Speaker:

- *"The International Congress on Plasticity, Damage, and Fracture"*, Panama City (Panama), January 3-9, 2024, with a presentation entitled: "Nonlinear models for frictional contact mechanics and flow in fractured geomaterials: Discretizations, solvers and applications"
- *"numerIcal aNalysis, porous media and waTer ResoUrceS: a fruItful cOntamiNation (INTRUSION 2023)"*, Bari (Italy), July 3-5, 2023, with a presentation entitled: "Numerical models for frictional contact mechanics and flow in fractured porous media"
- *"The Third International Computational Science and Engineering Conference (ICSEC19)"*, Doha (Qatar), October 21-22, 2019, with a presentation entitled: "A class of block preconditioned iterative methods for coupled poromechanics"
- *"High Performance Computing in Science & Engineering (HPCSE)"*, Hotel Solan, Beskydy Mountains (Czech Republic), May 27-30, 2013, with a presentation entitled: "Recent developments on parallel preconditioners for sparse linear systems"

Invited Speaker:

- *"17th International Conference on Computational Plasticity. Fundamentals and Applications (COMPLAS)"*, Barcelona (Spain), September 5-7, 2023
- *"The International Congress on Industrial and Applied Mathematics (ICIAM)"*, Tokyo (Japan), August 20-25, 2023
- *"SIAM Conference on Mathematical and Computational Issues in the Geosciences"*, Bergen (Norway), June 19-22, 2023
- *"8th European Conference on Computational Methods in Applied Sciences and Engineering"*, Oslo (Norway), June 5-9, 2022
- *"SIAM Conference on Mathematical and Computational Issues in the Geosciences"*, Milan (Italy), June 21-24, 2021
- *"Large-Scale Scientific Computations"*, Sozopol (Bulgaria), June 7-11, 2021
- *"Numerical Linear Algebra for PDEs and Large Scale Optimization"*, Padova (Italy), February 17-18, 2020
- *"Sustainable Industrial Processing Summit & Exhibition"*, Paphos (Cyprus), October 23-27, 2019
- *"European Numerical Mathematics and Advanced Application Conference"*, Egmond aan Zee (The Netherlands), September 30 – October 4, 2019
- *"International Conference on Preconditioning Techniques for Scientific and Industrial Applications"*, Minneapolis, MN (USA), July 1-3, 2019
- *"Annual Meeting of the InterPore Society"*, Valencia (Spain), May 6-10, 2019
- *"Modern Mathematical Methods for Geoscience Applications"*, workshop at TU Delft, Institute of Computational Science and Engineering (DCSE), Delft (The Netherlands), March 18, 2019
- *"SIAM Conference on Mathematical and Computational Issues in the Geosciences"*, Houston, TX (USA), March 11-14, 2019
- *"International Conference on Coupled Processes in Fractured Geological Media: Observation, Modeling, and Application (CouFrac)"*, Wuhan (China), November 12-14, 2018
- *"The Computational Mathematics Aspects of Porous Media and Fluid Flow"*, Leiden (The Netherlands), May 22-25, 2018

- *"Annual Meeting of the InterPore Society"*, New Orleans, LA (USA), May 14-17, 2018
- *"SIAM Conference on Applied Linear Algebra"*, Hong Kong (China), May 4-8, 2018
- *"15th Conference of the International Association for Computer Methods and Advances in Geomechanics"*, Wuhan (China), October 19-23, 2017
- *"European Conference on Numerical Mathematics"*, Voss (Norway), September 25-29, 2017
- *"SIAM Conference on Mathematical and Computational Issues in the Geosciences"*, Erlangen (Germany), September 11-14, 2017
- *"21st International Conference on Computational Methods in Water Resources"*, Toronto, ON (Canada), June 20-24, 2016
- *"Annual Meeting of the InterPore Society"*, Cincinnati, OH (USA), May 9-12, 2016
- *"The International Congress on Industrial and Applied Mathematics"*, Beijing (China), August 10-14, 2015
- *"SIAM Conference on Mathematical and Computational Issues in the Geosciences"*, Stanford, CA (USA), June 29 – July 2, 2015
- *"Annual Meeting of the International Association of Applied Mathematics and Mechanics"*, Lecce (Italy), March 23-27, 2015
- *"Sparse Days Meeting"*, workshop at Cerfacs, Toulouse (France), June 5-6, 2014
- *"5th Biot Conference on Poromechanics"*, Vienna (Austria), July 10-12, 2013
- *"SIAM Conference on Applied Linear Algebra"*, Valencia (Spain), June 18-22, 2012
- *"SIAM Conference on Mathematical and Computational Issues in the Geosciences"*, Long Beach, CA (USA), March 21-24, 2011
- *"SIAM Conference on Computational Science & Engineering"*, Orange County, CA (USA), February 19-23, 2007

Contributed Speaker:

- *"Annual Meeting of the InterPore Society"*, Edinburgh, Scotland (UK), May 22-25, 2023
- *"Fractured media: numerical methods for fluid flow and mechanics – FRAME2020+2"*, Torino (Italy), May 17-20, 2022
- *"22nd International Conference on Computational Methods in Water Resources"*, Saint-Malo (France), June 3-7, 2018
- *"The 22nd International Conference on Modelling and Simulation"*, Hobart (Australia), December 3-8, 2017
- *"International Conference on Preconditioning Techniques for Scientific and Industrial Applications"*, Vancouver, BC (Canada), July 31 – August 2, 2017
- *"6th Biot Conference on Poromechanics"*, Paris (France), July 9-13, 2017
- *"The International Conference on Computational Science"*, Reykjavik (Iceland), June 1-3, 2015
- *"14th Conference of the International Association for Computer Methods and Advances in Geomechanics"*, Kyoto (Japan), September 22-25, 2014
- *"Copper Mountain Conference on Iterative Methods"*, Copper Mountain, CO (USA), April 6-11, 2014
- *"International Conference on Approximation Methods and Numerical Modelling in Environment and Natural Resources"*, Granada (Spain), April 22-25, 2013

- *"SIAM Conference on Computational Science & Engineering"*, Boston, MA (USA), February 25 – March 1, 2013
- *"1st Frontiers in Computational Physics Conference"*, Boulder, CO (USA), December 16-20, 2012
- *"10th International Conference on Numerical Analysis and Applied Mathematics"*, Kos (Greece), September 19-25, 2012
- *"9th International Conference on Numerical Analysis and Applied Mathematics"*, Halkidiki (Greece), September 19-25, 2011
- *"13th Conference of the International Association for Computer Methods and Advances in Geomechanics"*, Melbourne (Australia), May 9-13, 2011
- *"8th International Symposium on Land Subsidence"*, Queretaro (Mexico), October 17-22, 2010
- *"44th US Rock Mechanics Symposium"*, Salt Lake City, UT (USA), June 27-30, 2010
- *"ModelCaRe: Calibration and Reliability in Groundwater Modeling"*, Wuhan (China), September 20-23, 2009
- *"International Conference on Computational Engineering and Science – Meshless Methods"*, Lubijana (Slovenia), August 31 – September 2, 2009
- *"4th Biot Conference on Poromechanics"*, New York City, NY (USA), June 8-10, 2009
- *"1st International Symposium on Computational Geomechanics"*, Juan Les Pines (France), April 29 – May 1, 2009
- *"17th International Conference on Computational Methods in Water Resources"*, San Francisco, CA (USA), July 6-10, 2008
- *"5th International Conference on Engineering Computational Technology"*, Las Palmas de Gran Canaria (Spain), September 12-15, 2006
- *"16th International Conference on Computational Methods in Water Resources"*, Copenhagen (Denmark), June 19-24, 2006
- *"American Society of Civil Engineers (ASCE) GeoCongress"*, Atlanta, GA (USA), February 26 – March 1, 2006
- *"3rd International Conference on Numerical Analysis and Applied Mathematics"*, Rhodes (Greece), September 16-20, 2005
- *"3rd Biot Conference on Poromechanics"*, Oklahoma City, OK (USA), May 24-27, 2005
- *"Schlumberger Information System Global Forum"*, Paris (France), September 15-16, 2004
- *"Reservoir Storage of CO2"*, workshop at the University of Bergen, Department of Mathematics, Bergen (Norway), November 6-7, 2003
- *"International Conference on Computational Engineering and Science"*, Reno, NV (USA), July 31 – August 2, 2002
- *"14th International Conference on Computational Methods in Water Resources"*, Delft (The Netherlands), June 23-28, 2002
- *"10th Conference of the International Association for Computer Methods and Advances in Geomechanics"*, Tucson, AZ (USA), January 7-12, 2001

From the organization point of view, he has been involved in several activities, either as Member of the Organizing Committee, or Organizer of Mini-Symposia.

Member of the Organizing Committee:

- *"SIAM Conference on Mathematical and Computational Issues in the Geosciences"*, Padova (Italy), June 17-23, 2013 (Chair of the Local Organizing Committee)
- *"Annual Meeting of the InterPore Society"*, Padova (Italy), May 18-21, 2015 (Member of the Local Organizing Committee)
- *"16th Conference of the International Association for Computer Methods and Advances in Geomechanics"*, Torino (Italy), August 31-September 2, 2022 (Member of the Local Organizing Committee)

Member of the International Scientific Advisory Board:

- *"Fourth EAGE WIPIC Workshop: Reservoir Management in Carbonates"*, Doha (Qatar), March 21-23, 2022

Mini-Symposium Organizer:

- "Physics-based machine learning for engineering simulations and digital twin" (Invited Session) within the *"First International Conference on Emerging Technologies in Computational Science for Industry, Sustainability and Innovation – M2P 2023"*, Taormina (Italy), May 30-June 1, 2023
- "Quantification and reduction of uncertainty in geomechanical numerical models" within the *"16th International Conference of the International Association for Computer Methods and Advances in Geomechanics"*, Torino (Italy), August 31-September 2, 2022
- "Preconditioning of PDEs for next-generation computers" within the *"International Conference on Preconditioning Techniques for Scientific and Industrial Applications"*, Minneapolis, MN (USA), July 1-3, 2019
- "Efficient Solvers for Coupled Multiphysics Problems" within the *"SIAM Conference on Computational Science and Engineering"*, Spokane, WA (USA), February 25 – March 1, 2019
- "Preconditioners for ill-conditioned linear systems in large scale scientific computing" within the *"SIAM Conference on Applied Linear Algebra"*, Hong Kong (China), May 4-8, 2018
- "Uncertainty Quantification and Data Assimilation: Computational challenges in large-scale geoscience models" within the *"SIAM Conference on Mathematical and Computational Issues in the Geosciences"*, Erlangen (Germany), September 11-14, 2017
- "Computational Poromechanics" within the *"SIAM Conference on Computational Science & Engineering"*, Atlanta, GA (USA), February 27 – March 3, 2017
- "Preconditioning techniques for non-symmetric or symmetric indefinite matrices" within the *"SIAM Conference on Applied Linear Algebra"*, Atlanta, GA (USA), October 26-30, 2015
- "Modelling the mechanics of faults and fractures" within the *"SIAM Conference on Mathematical and Computational Issues in the Geosciences"*, Stanford, CA (USA), June 29 – July 2, 2015
- "Preconditioning for Sparse Linear Systems on GPUs" within the *"SIAM Conference on Parallel Processing for Scientific Computing"*, Portland, OR (USA), February 17-21, 2014
- "Efficient Preconditioners for Real World Applications" within the *"SIAM Conference on Applied Linear Algebra"*, Valencia (Spain), June 18-22, 2012
- "Iterative Solvers for Environmental Simulations" and "Coupled Thermo-Poro-Mechanical Modeling" within the *"SIAM Conference on Mathematical and Computational Issues in the Geosciences"*, Long Beach, CA (USA), March 21-24, 2011

In the next future, he will be Keynote Speaker at the international conference *"Annual meeting of the Interpore Brazilian chapter"*, Salinopolis (Brazil), August 12-14, 2024, with a presentation entitled: "Unexpected fault activation in underground gas storage: Mathematical model and mechanisms", Invited Speaker at the international conference *"9th European Conference on Computational Methods in Applied Sciences and Engineering"*, Lisbon (Portugal), June 3-7, 2024, and at the international conference *"International*

Conference on Preconditioning Techniques for Scientific and Industrial Applications", Atlanta, GA (USA), June 10-12, 2024, and Mini-Symposium Organizer of the session entitled "Efficient linear solvers for block-structured multi-physics simulations" within the *"SIAM Conference on Applied Linear Algebra"*, Paris (France), May 13-17, 2024.

1.3 Scientific awards

In 2017 he was the recipient of the Excellent Regional Contribution Award given by the International Association for Computer Methods in Geomechanics (IACMAG), from the president Prof. John Carter and the honorary president Prof. Chandrakant Desai, with the following motivation: *"for outstanding contributions to the development and application of novel computer methods and solvers in the field of the geomechanics of underground reservoirs and coupled Biot models"*.

1.4 Editorial activity

In 2012 he was Leading Guest Editor of a Special Issue of the scientific journal *"Journal of Applied Mathematics"* entitled "Preconditioning Techniques for Large Sparse Linear Systems".

He usually serves as a Reviewer for several renowned scientific journals, such as:

- *SIAM Journal on Scientific Computing*
- *SIAM Journal on Matrix Analysis and Applications*
- *Computer Methods in Applied Mechanics and Engineering*
- *Computers and Mathematics with Applications*
- *Journal of Computational and Applied Mathematics*
- *International Journal for Numerical Methods in Engineering*
- *International Journal for Numerical and Analytical Methods in Geomechanics*
- *Numerical Algorithms*
- *Parallel Computing*
- *Computational Geosciences*
- *Mathematical Geosciences*

1.5 Technological transfer

He has been founding member of the private company denoted as "M3E S.r.l." (Mathematical Methods and Models for Engineering), spin-off of the University of Padova, which has as a main mission the development, implementation and commercialization of software libraries for sequential and parallel computational platforms, with both shared and distributed memory.

1.6 Management and participation to research projects

He has been involved in several national and international research projects, funded on the basis of a competing context. He was Principal Investigator of the projects:

- *"RESTORE: REconstruct subsurface heterogeneities and quantify Sediment needs TO improve the REsilience of Venice saltmarshes"*, PRIN project 2022, funded by the Italian Ministry of Research, duration: 24 months (Unit Principal Investigator)
- *"SCAIP: Scalable Approximate Inverse Preconditioners"*, ISCRA project 2016, duration: 9 months

- *"PARPREC: Parallel Preconditioners for Advanced Engineering Applications"*, ISCRA project 2013, duration: 12 months
- *"OPTIDASS: Optimization and Data Assimilation techniques for hydro-geomechanical characterization"*, ISCRA project 2012, duration: 9 months

As Member of the Research Unit, he has been involved in the following projects funded on a competing basis:

- *"RESERVOIR: Sustainable Groundwater Resources Management by Integrating Earth Observation Derived Monitoring and Flow Modeling Results"*, PRIMA project 2020, GA no. 1924, funded by the European Union, duration: 36 months
- *"IMPROWARE: Innovative Means to Protect Water Resources in the Mediterranean Coastal Areas through Re-injection of Treated Water"*, SWIM project 2012, funded by the European Union, duration: 36 months
- *"WARBO: Water Re-Born - Artificial Recharge: Innovative Technologies for the Sustainable Management of Water"*, LIFE+ project 2012, funded by the European Union, duration: 30 months
- *"SPREAD: Scalable Preconditioners for Advanced Applications"*, ISCRA project 2011, duration: 9 months
- *"GEORISK: Processi Geologici, Morfologici ed Idrologici: Monitoraggio, Modellazione ed Impatto nell'Italia Nord-Orientale"*, strategic project 2010, funded by the University of Padova, duration: 36 months
- *"SCALPREC: Scalable Preconditioners for Large Scale Problems"*, ISCRA project 2010, duration: 9 months
- *"PARPSEA: Parallel Preconditioners for Large Size Engineering Applications"*, ISCRA project 2009, duration: 12 months
- *"Sviluppo ed Analisi di Modelli Matematici e di Metodi Numerici per Equazioni alle Derivate Parziali per le Applicazioni a Problemi Ambientali ed Industriali"*, PRIN project 2007, funded by the Italian Ministry of Education and Research, duration: 24 months
- *"Sviluppo di Metodi Numerici e Algoritmi per Applicazioni a Problemi di Fluidodinamica Ambientale"*, PRIN project 2004, funded by the Italian Ministry of Education and Research, duration: 24 months

Moreover, he has been, or currently is, Principal Investigator of the following national and international research projects, funded by public or private agencies:

- *"Attività di aggiornamento dei modelli di previsione della subsidenza relativi ai campi di Anemone e Regina mediante assimilazione di misure in fase post-produttiva"*, odl no. 4310625560 within the open contract no. 2500042422 funded by Eni S.p.A., duration: 11 months (from January 22, 2024 to December 31, 2024), amount: 29200 EUR

- *"Studi geomeccanici su iniezione di CO2 in Porto Corsini Mare Ovest"*, odl no. 4310508033 within the open contract no. 2500042421 funded by Eni S.p.A., duration: 3,5 mesi (from May 15, 2022 to August 31, 2022), amount: 60000 EUR

- *"Realizzazione di studi di modellazione delle variazioni altimetriche e studi e controllo subsidenza"*, contract no. 5000004245 funded by Stogit S.p.A., duration: 36 months (from July 1, 2021 to June 30, 2024), amount: 468812 EUR

- *"FC-MAELSTROM – Fully Coupled Massively pArallEL SimulaToR for geOlogical forMations"*, subaward agreement R&D # 62014408-136108 with Stanford University, duration: 4 years (from January 1, 2019 to December 31, 2022), amount: 309888 USD

- *"Safe operational bandwidth of gas storage reservoirs"*, funded by the Minister of Economic Affairs and Climate Policy of The Netherlands, duration: 6 months (from December 1, 2017 to June 1, 2018), amount: 108884 EUR

- *"Studio e modellazione del fenomeno geodinamico della subsidenza"*, contract no. 2500029113 funded by Eni S.p.A., duration: 48 months (from September 15, 2017 to September 14, 2021), amount: 234455 EUR

- *"Numerical simulations of large-scale lab-models to study earth fissure generation in subsiding basins"*, funded by the Key Laboratory of Earth Fissures Geological Disaster, Ministry of Land and Resources (Geological Survey of Jiangsu Province, People Republic of China), duration: 24 months (from September 1, 2017 to August 31, 2019), amount: 265000 CNY

- *"Modellazione agli elementi finiti dei processi di dinamica verticale (consolidazione naturale e sedimentazione) di strutture barenicole"*, prot. 25/16/AC_CO60 funded by CORILA – Consorzio per il coordinamento delle ricerche inerenti al sistema lagunare di Venezia, duration: 12 months (from January 1, 2016 to December 31, 2016), amount: 60000 EUR

- *"Realizzazione di studi di modellazione delle variazioni altimetriche e studi e controllo subsidenza"*, contract no. 5000002406 funded by Stogit S.p.A., duration: 68 months (from November 1, 2015 to June 30, 2021), amount: 381373 EUR

He has been also Member of the Research Unit of several other projects funded by private agencies, such as:

- *"Sviluppo e implementazione per macchine seriali e parallele a memoria condivisa di una libreria di solutori iterativi e precondizionatori per codici a elementi finiti di simulazioni di bacino"*, funded by Eni S.p.A. in 2011
- *"ZEPT (Zero Emission Porto Tolle): Modellazione geomeccanica della segregazione geologica di CO2"*, funded by Enel S.p.A. in 2010/11
- *"Modellazione agli elementi finiti di processi geomeccanici dovuti allo stoccaggio di gas"*, funded by SnamProgetti S.p.A. in 2007/08
- *"Modellistica agli elementi finiti per la simulazione della subsidenza antropica dovuta alla coltivazione di giacimenti a gas"*, funded by Eni S.p.A. in 2003

2. Teaching activity

Since the academic year 2004/05, Massimiliano Ferronato has been teaching basic courses of Numerical Analysis in the School of Engineering of the University of Padova. From 2008, he joined the Board of Doctorates in the PhD School of Civil and Environmental Engineering of the University of Padova, with the responsibility of an advanced course in Numerical Methods. In 2015 he published the textbook entitled "Lezioni di Metodi Numerici per l'Ingegneria", ed. Liberia Progetto, Padova, written in collaboration with Prof. Giuseppe Gambolati and currently used as reference textbook in the University of Padova courses that follow:

- "Numerical Analysis" for the Bachelor Degree in Civil Engineering and Environmental Engineering,
- "Numerical Methods for Engineering" for the Bachelor Degree in Civil Engineering and Mechatronic Engineering,
- "Numerical Methods for Differential Equations" for the Master Degree in Mathematical Engineering,
- "Numerical Methods for High Performance Computing" for the Master Degree in Mathematical Engineering,
- "Computer Science" for the Master Degree in Architectural Engineering.

From 2023 he is Director of the PhD School in Civil, Environmental and Architectural Engineering.

Detailed teaching curriculum:

Academic year 2003/04: teaching support for Prof. Mario Putti in the class of "Numerical Analysis and Programming" for Civil Engineering and Environmental Engineering (Bachelor Degree) at the University of Padova

Academic year 2004/05: teaching support for Profs. Giuseppe Gambolati and Mario Putti in the classes of "Numerical Methods for Engineering" for Civil Engineering and Environmental Engineering (Master Degree) at the University of Padova. He holds by contract for the class of "Numerical Analysis" for Mechanical Engineering (Bachelor Degree) at the University of Padova

Academic year 2005/06 and 2006/07: teaching support for Profs. Giuseppe Gambolati and Mario Putti in the classes of "Numerical Methods for Engineering" for Civil Engineering and Environmental Engineering (Master Degree) at the University of Padova

Academic year 2007/08: teaching support for Prof. Giuseppe Gambolati in the classes of "Numerical Methods for Engineering" for Civil Engineering and Environmental Engineering (Master Degree) at the University of Padova. He holds the class of "Numerical Analysis and Programming" for Civil Engineering and Environmental Engineering (Bachelor Degree) at the University of Padova. He is member of the Board of Doctorates of the PhD School in Civil and Environmental Engineering at the University of Padova, where he holds an advanced course of "Numerical Methods"

Academic year 2008/09, 2009/10 and 2010/11: teaching support for Profs. Giuseppe Gambolati and Luca Bergamaschi in the classes of "Numerical Methods for Engineering" for Civil Engineering (Bachelor Degree) and "Numerical Analysis" for Innovation Engineering (Master Degree) at the University of Padova. He holds the class of "Numerical Analysis" for Energy Resources Engineering (Bachelor Degree) at the University of Padova. He is member of the Board of Doctorates of the PhD School in Civil and Environmental Engineering at the University of Padova, where he holds an advanced course of "Numerical Methods"

Academic year 2011/12, 2012/13, 2013/14 and 2014/15: teaching support for Prof. Giuseppe Gambolati in the classes of "Numerical Methods for Engineering" for Civil Engineering (Bachelor Degree) at the University of Padova. He holds the class of "Numerical Analysis" for Innovation Engineering (Master Degree) at the University of Padova. He is member of the Board of Doctorates of the PhD School in Civil and Environmental Engineering at the University of Padova, where he holds an advanced course of "Numerical Methods"

Academic year 2015/16: he holds the classes of "Numerical Methods for Engineering" for Civil Engineering (Bachelor Degree) and "Numerical Methods for Differential Equations" for Mathematical Engineering (Master Degree). He is member of the Board of Doctorates of the PhD School in Civil and Environmental Engineering at the University of Padova, where he holds an advanced course of "Numerical Methods"

Academic year 2016/17: he holds the classes of "Numerical Analysis" and "Numerical Methods for Engineering" for Civil Engineering (Bachelor Degree) and "Numerical Methods for Differential Equations" for Mathematical Engineering (Master Degree). He is member of the Board of Doctorates of the PhD School in Civil and Environmental Engineering at the University of Padova, where he holds an advanced course of "Numerical Methods"

Academic year 2017/18: he holds the classes of "Numerical Analysis" and "Numerical Methods for Engineering" for Civil Engineering (Bachelor Degree) and "Numerical Methods for Engineering" for Mechatronic Engineering (Bachelor Degree). He is Vice-Director of the Board of Doctorates of the PhD School in Civil, Environmental and Architectural Engineering at the University of Padova, where he holds an advanced course of "Numerical Methods"

Academic year 2018/19 and 2019/20: he holds the classes of "Numerical Analysis" for Civil Engineering and Environmental Engineering (Bachelor Degree), "Numerical Methods for Engineering" for Civil Engineering (Bachelor Degree) and "Numerical Methods for Engineering" for Mechatronic Engineering (Bachelor Degree). He is Vice-Director of the Board of Doctorates of the PhD School in Civil, Environmental and Architectural Engineering at the University of Padova, where he holds an advanced course of "Numerical Methods"

Academic year 2020/21, 2021/22 and 2022/23: he holds the classes of "Numerical Analysis" for Civil Engineering and Environmental Engineering (Bachelor Degree), "Numerical Methods for Engineering" for Civil Engineering (Bachelor Degree) and "Numerical Methods for Engineering" for Innovation Engineering (Bachelor Degree). He is Vice-Director of the Board of Doctorates of the PhD School in Civil, Environmental and Architectural Engineering at the University of Padova

Since Academic year 2023/24: he holds the classes of "Numerical Analysis" for Civil Engineering and Environmental Engineering (Bachelor Degree), "Numerical Methods for Engineering" for Civil Engineering (Bachelor Degree) and "Numerical Methods for Engineering" for Innovation Engineering (Bachelor Degree). He is Director of the Board of Doctorates of the PhD School in Civil, Environmental and Architectural Engineering at the University of Padova, where he holds an advanced course of "Elements of Tensor and Numerical Algebra"

2.1 Mentoring activity

Massimiliano Ferronato has been advisor and co-advisor of several Bachelor and Master Theses in Civil Engineering, Mechanical Engineering, Mechatronic Engineering and Mathematical Engineering. Moreover, he has been advisor or co-advisor of the following PhD Theses:

- Carlo Janna, "Modellazione del comportamento meccanico delle faglie regionali per il confinamento geologico della CO2 antropica", Italian XX Cycle
- Nicola Castelletto, "Thermoporoelastic modelling of deep aquifer injection and pumping by Mixed Finite Elements and Finite Volumes", Italian XXII Cycle
- Andrea Franceschini, "Numerical models for the large-scale simulation of fault and fracture mechanics", Italian XXX Cycle
- Victor Antonio Paludetto Magri, "Robust and scalable preconditioners for the solution of real-world sparse linear systems", Italian XXXI Cycle
- Matteo Frigo, "Efficient solvers for numerical models in coupled poromechanics", Italian XXXIII Cycle
- Stefano Nardean, "Preconditioning for Lagrange multipliers-based reservoir flow simulation", at Hamad Bin Khalifa University, Doha, Qatar
- Laura Gazzola, "Numerical algorithms and methods for the simulation of flow and deformation processes in energy resources engineering", XXXV Cycle

Currently, he is advisor or co-advisor of the following PhD students:

- Caterina Millevoi, XXXVI Cycle
- Selena Baldan, XXXVII Cycle
- Daniele Moretto, XXXIX Cycle

Furthermore, he has been nominated member of the PhD Defense Committee for the doctoral graduation of the following students:

- Yiming Bu, "A class of linear solvers based on multilevel and supernodal factorization", advisor: prof. A. Veldman (University of Groningen, The Netherlands), 2018

- Gabriela Berenice Diaz Cortes, "POD-based deflation method for reservoir simulation", advisor: prof. C. Vuik (TU Delft, The Netherlands), 2019
- Thomas Roy, "Preconditioning for thermal reservoir simulation", advisor: prof. A.J. Wathen (Oxford University, UK), 2019
- Ana Clara Ordonez Egas, "Scalable linear solver for thermos-hydro-mechanics with a second gradient of dilation regularization problems", advisor: prof. M. Dayde (Université Fédérale de Toulouse Midi-Pyrénées, France), 2022

3. Scientific publications

3.1 Publications on peer-reviewed international journals

1. G. Gambolati, P. Teatini, D. Baù, M. Ferronato. *Importance of poroelastic coupling in dynamically active aquifers of the Po river basin, Italy.* **Water Resources Research**, 36, pp. 2443-2459, 2000.

2. G. Gambolati, M. Ferronato, P. Teatini, R. Deidda, G. Lecca. *Finite element analysis of land subsidence above depleted reservoirs with the pore pressure gradient and total stress formulations.* **International Journal of Numerical and Analytical Methods in Geomechanics**, 25, pp. 307-327, 2001.

3. M. Ferronato, G. Gambolati, P. Teatini. *Ill-conditioning of finite element poroelasticity equations.* **International Journal of Solids and Structures**, 38, pp. 5995-6014, 2001.

4. G. Gambolati, G. Pini, M. Ferronato. *Numerical performance of projection methods in finite element consolidation models.* **International Journal of Numerical and Analytical Methods in Geomechanics**, 25, pp. 1429-1447, 2001.

5. D. Baù, M. Ferronato, G. Gambolati, P. Teatini. *Land subsidence spreading factor of the Northern Adriatic gas fields, Italy.* **International Journal of Geomechanics**, 1, pp. 459-475, 2001.

6. M. Ferronato, G. Gambolati, P. Teatini, D. Baù. *Land surface uplift above overconsolidated compacting reservoirs.* **International Journal of Solids and Structures**, 38, pp. 8155-8169, 2001.

7. G. Gambolati, G. Pini, M. Ferronato. *Direct, partitioned and projected solution to finite element consolidation models.* **International Journal of Numerical and Analytical Methods in Geomechanics**, 26, pp. 1371-1383, 2002.

8. D. Baù, M. Ferronato, G. Gambolati, P. Teatini. *Basin-scale compressibility of the Northern Adriatic by the radioactive marker technique.* **Geotechnique**, 52, pp. 605-616, 2002.

9. G. Gambolati, G. Pini, M. Ferronato. *Scaling improves stability of preconditioned CG-like solvers for FE consolidation equations.* **International Journal for Numerical and Analytical Methods in Geomechanics**, 27, pp. 1043-1056, 2003.

10. A. Comerlati, M. Ferronato, G. Gambolati, M. Putti, P. Teatini. *Can CO_2 help save Venice from the sea?* **EOS Transactions of the American Geophysical Union**, 84, pp. 546, 552-553, 2003.

11. M. Ferronato, G. Gambolati, P. Teatini, D. Baù. *Interpretation of radioactive marker measurements to evaluate compaction in the Northern Adriatic gas fields.* **SPE Journal for Reservoir Evaluation and Engineering**, 6, pp. 401-411, 2003.

12. M. Ferronato, G. Gambolati, P. Teatini, D. Baù. *Radioactive marker measurements in heterogeneous reservoirs: numerical study.* **International Journal of Geomechanics**, 4, pp. 79-92, 2004.

13. D. Baù, M. Ferronato, G. Gambolati, P. Teatini. *Surface flow boundary conditions in modelling land subsidence due to fluid withdrawal.* **Groundwater**, 42, pp. 516-525, 2004.

14. A. Comerlati, M. Ferronato, G. Gambolati, M. Putti, P. Teatini. *Saving Venice by sea water*. **Journal of Geophysical Research**, 109, F03006, doi:10.1029/2004JF000119, 2004.

15. M. Ferronato, G. Gambolati, P. Teatini. *On the role of reservoir geometry in waterdrive hydrodynamics*. **Journal of Petroleum Science and Engineering**, 44, pp. 205-221, 2004.

16. P. Teatini, M. Ferronato, G. Gambolati, W. Bertoni, M. Gonella. *A century of land subsidence in Ravenna, Italy*. **Environmental Geology**, 47, pp. 831-846, 2005.

17. P. Teatini, M. Ferronato, G. Gambolati, M. Gonella. *Groundwater pumping and land subsidence in the Emilia-Romagna coastland, Italy: modeling the past occurrence and the future trend.* **Water Resources Research**, 42, W01406, doi:10.1029/2005WR004242, 2006.

18. G. Gambolati, P. Teatini, M. Ferronato. *Anthropogenic land subsidence.* **Earth Science Frontiers**, 13, pp. 160-178, 2006.

19. A. Comerlati, M. Ferronato, G. Gambolati, M. Putti, P. Teatini. *Fluid-dynamic and geomechanical effects of CO_2 injection below the Venice Lagoon*. **Environmental & Engineering Geosciences**, 12, pp. 211-226, 2006.

20. M. Ferronato, G. Gambolati, P. Teatini, D. Baù. *Stochastic poromechanical modeling of anthropogenic land subsidence.* **International Journal of Solids and Structures**, 43, pp. 3324-3336, 2006.

21. G. Gambolati, M. Ferronato, P. Teatini. *Reservoir compaction and land subsidence.* **Revue Europeenne de Genie Civil**, 10, pp. 731-762, 2006.

22. M. Ferronato, A. Mazzia, G. Pini, G. Gambolati. *Accuracy and performance of Meshless Local Petrov-Galerkin methods in 2-D elastostatic problems.* **JP Journal of Solids and Structures**, 1, pp. 35-59, 2007.

23. L. Bergamaschi, M. Ferronato, G. Gambolati. *Novel preconditioners for the iterative solution to FE-discretized coupled consolidation equations.* **Computer Methods in Applied Mechanics and Engineering**, 196, pp. 2647-2656, 2007.

24. M. Ferronato, A. Mazzia, G. Pini, G. Gambolati. *A meshless method for axi-symmetric poroelastic simulations: numerical study.* **International Journal of Numerical Methods in Engineering**, 70, pp. 1346-1365, 2007.

25. A. Mazzia, M. Ferronato, G. Pini, G. Gambolati. *A comparison of numerical integration rules for the Meshless Local Petrov-Galerkin method.* **Numerical Algorithms**, 45, pp. 61-74, 2007.

26. M. Ferronato, G. Gambolati, P. Teatini, C. Janna. *Casing influence in reservoir compaction measurement by radioactive markers in the Northern Adriatic, Italy.* **International Journal of Geomechanics**, 7, pp. 444-447, 2007.

27. M. Ferronato, G. Gambolati, P. Teatini, C. Janna. *Letter to the editor of Petroleum Science & Engineering: Comment on "Casing influence while measuring in situ reservoir compaction" by P. Macini, E. Mesini, V.A. Salomoni and B.A. Schrefler [J. Pet. Sci. Eng. 50 (2006), 40 54].* **Journal of Petroleum Science and Engineering**, 60, pp. 67-70, 2008.

28. N. Castelletto, M. Ferronato, G. Gambolati, M. Putti, P. Teatini. *Can Venice be raised by pumping water underground? A pilot project to help decide.* **Water Resources Research**, 44, W01408, doi: 10.1029/2007WR006177, 2008.

29. M. Ferronato, G. Gambolati, C. Janna, P. Teatini. *Numerical modeling of regional faults in land subsidence prediction above gas/oil reservoirs.* **International Journal for Numerical and Analytical Methods in Geomechanics**, 32, pp. 633-657, 2008.

30. M. Ferronato, G. Gambolati, M. Putti, P. Teatini. *A pilot project using seawater to uplift Venice anthropogenically.* **EOS Transactions of the American Geophysical Union**, 89, pp. 152, 2008.

31. M. Ferronato, C. Janna, G. Gambolati. *Mixed constraint preconditioning in computational contact mechanics.* **Computer Methods in Applied Mechanics and Engineering**, 197, pp. 3922-3931, 2008.

32. L. Bergamaschi, M. Ferronato, G. Gambolati. *Mixed constraint preconditioners for the iterative solution to FE coupled consolidation equations.* **Journal of Computational Physics**, 227, pp. 9885-9897, 2008.

33. M. Ferronato, G. Pini, G. Gambolati. *The role of preconditioning in the solution to FE coupled consolidation equations by Krylov subspace methods.* **International Journal for Numerical and Analytical Methods in Geomechanics**, 33, pp. 405-423, 2009.

34. C. Janna, M. Ferronato, G. Gambolati. *Multilevel incomplete factorizations for the iterative solution of non-linear FE problems.* **International Journal for Numerical Methods in Engineering**, 80, pp. 651-670, 2009.

35. G. Gambolati, P. Teatini, M. Ferronato, T. Strozzi, L. Tosi, M. Putti. *On the uniformity of anthropogenic Venice uplift.* **Terra Nova**, 21, pp. 467-473, 2009.

36. M. Ferronato, L. Bergamaschi, G. Gambolati. *Performance and robustness of block constraint preconditioners in FE coupled consolidation problems.* **International Journal for Numerical Methods in Engineering**, 81, pp. 381-402, 2010.

37. M. Ferronato, N. Castelletto, G. Gambolati. *A fully coupled 3-D mixed finite element model of Biot consolidation.* **Journal of Computational Physics**, 229, pp. 4813-4830, 2010.

38. M. Ferronato, G. Gambolati, C. Janna, P. Teatini. *Geomechanical issues of anthropogenic CO2 sequestration in exploited gas fields.* **Energy Conversion and Management**, 51, pp. 1918-1928, 2010.

39. C. Janna, M. Ferronato, G. Gambolati. *A Block FSAI-ILU parallel preconditioner for symmetric positive definite linear systems.* **SIAM Journal on Scientific Computing**, 32, pp. 2468-2484, 2010.

40. M. Ferronato, A. Mazzia, G. Pini. *A Finite Element enrichment technique by the Meshless Local Petrov-Galerkin method.* **CMES-Computer Modeling in Engineering and Sciences**, 62, pp. 205-222, 2010.

41. P. Teatini, M. Ferronato, G. Gambolati, D. Baù, M. Putti. *Anthropogenic Venice uplift by seawater pumping into a heterogeneous aquifer system.* **Water Resources Research**, 46, W11547, doi: 10.1029/2010WR009161, 2010.

42. N. Castelletto, M. Ferronato, G. Gambolati, C. Janna, P. Teatini. *Numerical modeling of rock/casing interaction in radioactive-marker boreholes of the Northern Adriatic basin, Italy.* **SPE Reservoir Evaluation & Engineering**, 13, pp. 906-913, 2010.

43. P. Teatini, G. Gambolati, M. Ferronato, A. (Tony) Settari, D. Walters. *Land uplift due to subsurface fluid injection.* **Journal of Geodynamics**, 51, pp. 1-16, 2011.

44. P. Teatini, N. Castelletto, M. Ferronato, G. Gambolati, C. Janna, E. Cairo, D. Marzorati, D. Colombo, A. Ferretti, A. Bagliani, F. Bottazzi. *Geomechanical response to seasonal gas storage in depleted reservoirs: a case study in the Po river basin, Italy.* **Journal of Geophysical Research**, 116, F02002, doi:10.1029/2010JF001793, 2011.

45. G. Gambolati, M. Ferronato, C. Janna. *Preconditioners in computational geomechanics: a survey.* **International Journal for Numerical and Analytical Methods in Geomechanics**, 35, pp. 980-996, 2011.

46. C. Janna, M. Ferronato. *Adaptive pattern research for Block FSAI preconditioning.* **SIAM Journal on Scientific Computing**, 33, pp. 3357-3380, 2011.

47. P. Teatini, N. Castelletto, M. Ferronato, G. Gambolati, L. Tosi. *A new hydrogeological model to predict anthropogenic uplift of Venice.* **Water Resources Research**, 47, W12507, doi:10.1029/2011WR010900, 2011.

48. M. Ferronato, C. Janna, G. Pini. *Parallel solution to ill-conditioned FE geomechanical problems.* **International Journal for Numerical and Analytical Methods in Geomechanics**, 36, pp. 422-437, 2012.

49. M. Ferronato, C. Janna, G. Pini. *Shifted FSAI preconditioners for the efficient parallel solution of non-linear groundwater flow models.* **International Journal for Numerical Methods in Engineering**, 89, pp. 1707-1719, 2012.

50. C. Janna, N. Castelletto, M. Ferronato, G. Gambolati, P. Teatini. *A geomechanical transversely isotropic model of the Po River basin using PSInSAR derived horizontal displacement.* **International Journal of Rock Mechanics & Mining Sciences**, 51, pp. 105-118, 2012.

51. N. Castelletto, M. Ferronato, G. Gambolati. *Thermo-hydro-mechanical modeling of fluid geological storage by Godunov-mixed methods.* **International Journal for Numerical Methods in Engineering**, 90, pp. 988-1009, 2012.

52. C. Janna, M. Ferronato, G. Gambolati. *Parallel inexact constraint preconditioning for ill-conditioned consolidation problems.* **Computational Geosciences**, 16, pp. 661-675, 2012.

53. M. Ferronato, E. Chow, K.K. Phoon. *Editorial. Preconditioning techniques for sparse linear systems.* **Journal of Applied Mathematics**, 2012, Article ID 518165, 3 pages, 2012. Doi: 10.1155/2012/518165

54. M. Ferronato, C. Janna, G. Pini. *Efficient parallel solution to large-size sparse eigenproblems with block FSAI preconditioning.* **Numerical Linear Algebra with Applications**, 19, pp. 797-815, 2012.

55. M. Ferronato. *Preconditioning for sparse linear systems at the dawn of the 21st century: history, current developments, and future perspectives.* **ISRN Applied Mathematics**, 2012, Article ID 127647, 49 pages, 2012. Doi: 10.5402/2012/127647

56. A. Tavakoli, M. Ferronato. *On existence-uniqueness of the solution in a nonlinear Biot's model.* **Applied Mathematics & Information Sciences**, 7, pp. 333-341, 2013.

57. N. Castelletto, M. Ferronato, G. Gambolati, C. Janna, D. Marzorati, P. Teatini. *Can natural fluid pressure be safely exceeded in storing gas underground?* **Engineering Geology**, 153, pp. 35-44, 2013.

58. M. Ferronato, N. Castelletto, G. Gambolati, C. Janna, P. Teatini. *II cycle compressibility from satellite measurements.* **Geotechnique**, 63, pp. 479-486, 2013.

59. C. Janna, M. Ferronato, G. Gambolati. *Enhanced Block FSAI preconditioning using domain decomposition techniques*. **SIAM Journal on Scientific Computing**, 35, pp. S229-S249, 2013.

60. A. Lovison, F. Comola, P. Teatini, C. Janna, M. Ferronato, M. Putti, G. Gambolati. *Model calibration of a geomechanical problem with efficient global optimization.* **Dolomites Research Notes on Approximation**, 6, pp. 140-150, 2013.

61. M. Ferronato, C. Janna, G. Pini. *A generalized Block FSAI preconditioner for nonsymmetric linear systems*. **Journal of Computational and Applied Mathematics**, 256, pp. 230-241, 2014.

62. D. Baù, M. Ferronato, G. Gambolati, P. Teatini. *Ensemble smoothing of land subsidence measurements for reservoir geomechanical characterization.* **International Journal for Numerical and Analytical Methods in Geomechanics**, 39, pp. 207-228, 2015.

63. C. Janna, M. Ferronato, G. Gambolati. *The use of supernodes in factored sparse approximate inverse preconditioning.* **SIAM Journal on Scientific Computing**, 37, pp. C72-C94, 2015.

64. C. Janna, M. Ferronato, G. Gambolati, F. Sartoretto. *FSAIPACK: a software package for high performance Factored Sparse Approximate Inverse preconditioning.* **ACM Transactions on Mathematical Software**, 41, Article 10, 26 pages, 2015. Doi: 10.1145/2629475

65. C. Janna, N. Castelletto, M. Ferronato. *The effect of graph partitioning techniques on parallel Block FSAI preconditioning.* **Numerical Algorithms**, 68, pp. 813-836, 2015.

66. M. Ferronato, C. Janna, G. Gambolati. *A novel Factorized Sparse Approximate Inverse preconditioner with supernodes.* **Procedia Computer Science**, 51, pp. 266-275, 2015.

67. A. Franceschini, M. Ferronato, C. Janna, P. Teatini. *A novel Lagrangian approach for the stable numerical simulation of fault and fracture mechanics.* **Journal of Computational Physics**, 314, pp. 503-521, 2016.

68. C. Zoccarato, D. Baù, M. Ferronato, G. Gambolati, A. Alzraiee, P. Teatini. *Data assimilation of surface displacements to improve geomechanical parameters of gas storage reservoirs.* **Journal of Geophysical Research**, 121, pp. 1441-1441, 2016.

69. M. Ferronato, C. Janna, G. Pini. *Parallel Jacobi-Davidson with block FSAI preconditioning and controlled inner iterations.* **Numerical Linear Algebra with Applications**, 23, pp. 394-409, 2016.

70. C. Zoccarato, D. Baù, F. Bottazzi, M. Ferronato, G. Gambolati, S. Mantica, P. Teatini. *On the importance of the heterogeneity assumption in the characterization of reservoir geomechanical properties.* **Geophysical Journal International**, 207, pp. 47-58, 2016.

71. N. Castelletto, J.A. White, M. Ferronato. *Scalable algorithms for three-field Mixed Finite Element coupled poromechanics.* **Journal of Computational Physics**, 327, pp. 894-918, 2016.

72. D. Baù, A. Alzraiee, C. Zoccarato, G. Gambolati, M. Ferronato, P. Teatini. *Testing a data assimilation approach to reduce geomechanical uncertainties in modelling land subsidence.* **Environmental Geotechnics**, 3, pp. 386-396, 2016.

73. D. Pasetto, M. Ferronato, M. Putti. *A Reduced Order Model-based preconditioner for the efficient solution of transient diffusion equations.* **International Journal for Numerical Methods in Engineering**, 109, pp. 1159-1179, 2017.

74. A. Zanette, M. Ferronato, C. Janna. *Enriching the finite element method with meshfree particles in structural mechanics.* **International Journal for Numerical Methods in Engineering**, 110, pp. 675-700, 2017.

75. P. Teatini, G. Isotton, S. Nardean, M. Ferronato, A. Mazzia, C. Da Lio, L. Zaggia, D. Bellafiore, M. Zecchin, L. Baradello, F. Cellone, F. Corani, A. Gambaro, G. Libralato, E. Morabito, A. Volpi Ghiraldini, R. Broglia, S. Zaghi, L. Tosi. *Hydrogeological effects of dredging navigable canals through lagoon shallows. A case study in Venice.* **Hydrology and Earth System Sciences**, 21, pp. 5627-5646, 2017.

76. N. Spiezia, M. Ferronato, C. Janna, P. Teatini. *A two-invariant pseudoelastic model for reservoir compaction.* **International Journal for Numerical and Analytical Methods in Geomechanics**, 41, pp. 1870-1893, 2017.

77. A. Franceschini, V.A. Paludetto Magri, M. Ferronato, C. Janna. *A robust multilevel approximate inverse preconditioner for symmetric positive definite matrices.* **SIAM Journal on Matrix Analysis and Applications**, 39, pp. 123-147, 2018.

78. C. Zoccarato, M. Ferronato, P. Teatini. *Formation compaction vs land subsidence to constrain the geomechanical properties of hydrocarbon reservoirs.* **Geomechanics for the Energy and the Environment**, 13, pp. 14-24, 2018.

79. M. Ferronato, G. Pini. *A supernodal block factorized sparse approximate inverse for non-symmetric linear systems.* **Numerical Algorithms**, 78, pp. 333-354, 2018.

80. H.T. Honorio, C.R. Maliska, M. Ferronato, C. Janna. *A stabilized Element-based Finite Volume method for poroelastic problems.* **Journal of Computational Physics**, 364, pp. 49-72, 2018.

81. V.A. Paludetto Magri, A. Franceschini, M. Ferronato, C. Janna. *Multilevel approaches for FSAI preconditioning.* **Numerical Linear Algebra with Applications**, 25, e2183, 2018. Doi: 10.1002/nla.2183.

82. A. Franceschini, M. Ferronato, C. Janna, V.A. Paludetto Magri. *Recent advancements in preconditioning techniques for large size linear systems suited for High Performance Computing.* **Dolomites Research Notes on Approximation**, 11, pp. 11-22, 2018.

83. A. Franceschini, N. Castelletto, M. Ferronato. *Block preconditioning for fault/fracture mechanics saddle-point problems*. **Computer Methods for Applied Mechanics and Engineering**, 344, pp. 376-401, 2019.

84. M. Frigo, N. Castelletto, M. Ferronato. *A Relaxed Physical Factorization preconditioner for Mixed Finite Element coupled poromechanics*. **SIAM Journal on Scientific Computing**, 41, pp. B694-B720, 2019.

85. C. Zoccarato, M. Ferronato, A. Franceschini, C. Janna, P. Teatini. *Modeling fault activation due to fluid production: Bayesian update by seismic data.* **Computational Geosciences**, 23, pp. 705-722, 2019.

86. M. Ferronato, A. Franceschini, C. Janna, N. Castelletto, H.A. Tchelepi. *A general preconditioning framework for coupled multi-physics problems with application to contact- and poro-mechanics*. **Journal of Computational Physics**, 398, 108887, 2019.

87. G. Isotton, P. Teatini, M. Ferronato, C. Janna, N. Spiezia, S. Mantica, G. Volonté. *Robust numerical implementation of a 3D rate-dependent model for reservoir geomechanical simulations.* **International Journal for Numerical and Analytical Methods in Geomechanics**, 43, pp. 2752-2771, 2019.

88. M. Frigo, M. Ferronato, Z. Yang, S. Ye, D. Galloway, D. Carreon-Freyre, P. Teatini. *A parametric numerical analysis of factors controlling ground ruptures due to groundwater pumping.* **Water Resources Research**, 55, pp. 9500-9518, 2019.

89. A. Mazzia, M. Ferronato, P. Teatini, C. Zoccarato. *Virtual element method for the numerical simulation of long-term dynamics of transitional environments.* **Journal of Computational Physics**, 407, 109235, 2020.

90. L. Zhu, A. Franceschini, H. Gong, M. Ferronato, Z. Dai, Y. Ke, Y. Pan, X. Li, R. Wang, P. Teatini. *3D facies and geomechanical modelling of land subsidence in the Chaobai plain, Beijing.* **Water Resources Research**, 56, e2019WR027026, 2020.

91. C. Zoccarato, L. Gazzola, M. Ferronato, P. Teatini. *Generalized polynomial chaos expansion for fast and accurate uncertainty quantification in geomechanical modelling.* **Algorithms**, 13, 156, 2020.

92. S. Nardean, M. Ferronato, Y. Zhang, S. Ye, X. Gong, P. Teatini. *Understanding ground rupture due to groundwater over-pumping by a large lab experiment and advanced numerical modeling*. **Water Resources Research**, 57, e2020WR027553, 2021.

93. A. Franceschini, N. Castelletto, M. Ferronato. *Approximate inverse-based block preconditioners in poroelasticity.* **Computational Geosciences**, 25, pp. 701-714, 2021.

94. M. Frigo, N. Castelletto, M. Ferronato, J.A. White. *Efficient solvers for hybridized three-field mixed finite element coupled poromechanics*. **Computers and Mathematics with Applications**, 91, pp. 36-52, 2021.

95. S. Nardean, M. Ferronato, A.S. Abushaikha. *A novel block non-symmetric preconditioner for mixed-hybrid finite-element-based flow simulations,* **Journal of Computational Physics**, 442, 110513, 2021.

96. L. Gazzola, M. Ferronato, M. Frigo, C. Janna, P. Teatini, C. Zoccarato, M. Antonelli, A. Corradi, M.C. Dacome, S. Mantica. *A novel methodological approach for land subsidence prediction through Data Assimilation techniques*. **Computational Geosciences**, 25, pp. 1731-1750, 2021.

97. S. Nardean, M. Ferronato, A.S. Abushaikha. *A block preconditioner for two-phase flow in porous media by mixed hybrid finite elements*. **Computational and Mathematical Methods**, 3, e1207, 2021. Doi: 10.1002/cmm4.1207.

98. M. Frigo, N. Castelletto, M. Ferronato. *Enhanced Relaxed Physical Factorization preconditioner for coupled poromechanics*. **Computers and Mathematics with Applications**, 106, pp. 27-39, 2022.

99. A. Franceschini, M. Ferronato, M. Frigo, C. Janna. *A Reverse Augmented Constraint preconditioner for Lagrange multiplier methods in contact mechanics.* **Computer Methods in Applied Mechanics and Engineering**, 325, 114632, 2022.

100. M. Ferronato, A. Franceschini, M. Frigo. *On the development of efficient solvers for real-world coupled hydromechanical simulations.* **Frontiers in Mechanical Engineering**, 8, 837196, 2022.

101. A. Franceschini, L. Gazzola, M. Ferronato. *A scalable preconditioning framework for stabilized contact mechanics with hydraulically active fractures*. **Journal of Computational Physics**, 463, 111276, 2022.

102. S. Nardean, M. Ferronato, A.S. Abushaikha. *Linear solvers for reservoir simulation problems: An overview and recent developments*. **Archives of Computational Methods in Engineering**, 29, pp. 4341-4378, 2022.

103. L. Gazzola, M. Ferronato, P. Teatini, C. Zoccarato, A. Corradi, M.C. Dacome, S. Mantica. *Reducing uncertainty on land subsidence modeling prediction by a sequential data-integration approach. Application to the Arlua off-shore reservoir in Italy.* **Geomechanics for the Energy and the Environment**, 33, 100434, 2023.

104. L. Bergamaschi, M. Ferronato, G. Isotton, C. Janna, A. Martinez. *Parallel matrix-free polynomial preconditioners with application to flow simulations in discrete fracture networks.* **Computers and Mathematics with Applications**, 146, pp. 60-70, 2023.

105. S. Nardean, M. Ferronato, A.S. Abushaikha. *Block constrained pressure residual preconditioning for two-phase flow in porous media by mixed hybrid finite elements.* **Computational Geosciences**, 28, pp. 253-272, 2024.

106. N. De Marchi, G. Xotta, M. Ferronato, V. Salomoni. *An efficient multi-field dynamic model for 3D wave propagation in saturated anisotropic porous media*. **Journal of Computational Physics**, 510, 113082, 2024.

107. C. Millevoi, N. Spiezia, M. Ferronato. *On Physics-Informed Neural Networks training for coupled hydro-poromechanical problems*. **Journal of Computational Physics**, submitted.

108. A. Franceschini, C. Zoccarato, S. Baldan, M. Frigo, M. Ferronato, C. Janna, G. Isotton, P. Teatini. *Unexpected fault activation in underground gas storage. Part I: Mathematical model and mechanisms.* **Computational Geosciences**, submitted.

109. S. Baldan, M. Ferronato, A. Franceschini, C. Janna, C. Zoccarato, M. Frigo, G. Isotton, C. Collettini, V. Rocca, F. Verga, P. Teatini. *Unexpected fault activation in underground gas storage. Part II: Definition of safe operational bandwidths.* **Geomechanics for the Energy and the Environment**, submitted.

110. C. Millevoi, D. Pasetto, M. Ferronato. *A Physics-Informed Neural Network approach for compartmental epidemiological models.* **PLOS Computational Biology**, submitted.

3.2 Publications on international books

1. M. Ferronato. *Finite element solution to coupled consolidation equations.* In F.B.J. Barends and P.M.P.C. Steijger (eds.), **Learned and Applied Soil Mechanics out of Delft**, pp. 101-106, 2002. A.A. Balkema Publ., Rotterdam.

2. G. Pini, G. Gambolati, M. Ferronato. *A comparison of solution methods for finite element Biot consolidation equations.* In K. Kovar and Z. Hrkal (eds.), **Calibration and Reliability in Groundwater Modelling: A Few Steps Closer to Reality**, pp. 45-51, 2003. IAHS Publication no. 277.

3. G. Gambolati, P. Teatini, M. Ferronato. *Anthropogenic land subsidence*. In M.G. Anderson (ed.), **The Encyclopedia of Hydrological Sciences** , pp. 2443-2460, 2005. John Wiley & Sons, London.

4. M. Ferronato, G. Gambolati, P. Teatini. *The role of aquifer heterogeneity in the anthropogenic uplift of Venice.* In Y. Wang et al. (eds.), **Calibration and Reliability in Groundwater Modelling: Managing Groundwater and the Environment**, pp. 252-257, 2011. IAHS Publication no. 341.

5. C. Janna, M. Ferronato, G. Gambolati. *Two-level block preconditioners for contact problems.* In G. Zavarise and P. Wriggers (eds.), **Trends in Computational Contact Mechanics**, Lecture Notes in Applied and Computational Mechanics, vol. 58, pp. 211-226, 2011. Springer-Verlag, Berlin Heidelberg.

6. C. Janna, M. Ferronato, G. Gambolati. *Approximate inverse preconditioning for the solution of large sparse linear systems*. In B.H.V. Topping and P. Ivanyi (eds.), **Computational Technology Review**, vol. 7, pp. 25-41, 2013. Saxe-Coburg Publication, Stirlingshire, UK.

7. M. Ferronato, H.T. Honorio, C. Janna, C.R. Maliska. *An oscillation-free finite volume method for poroelasticity.* In F.A. Radu et al. (eds.), **Numerical Mathematics and Advanced Applications**, Lecture Notes in Computational Science and Engineering, vol. 126, pp. 779-787, 2019. Springer Nature Switzerland.

8. M. Ferronato, M. Frigo, N. Castelletto, J.A. White. *Efficient solvers for a stabilized three-field mixed formulation of poroelasticity.* In F.J. Vermolen and C. Vuik (eds.), **Numerical Mathematics and Advanced Applications**, Lecture Notes in Computational Science and Engineering, vol. 139, pp. 419-427, 2021. Springer Nature Switzerland.

3.3 Publications on proceedings of international conferences

1. M. Ferronato, M. Gonella, P. Ruol, G. Tiani. *Sensitivity analysis of the influence of water levels on wave numerical models. An example for the Northern Adriatic Sea.* In A. Pozar-Domac (ed.), **Responsible Coastal Zone Management: the Challenge of the 21st Century**, pp. 2443-2459, 2000. Periodicum Biologorum, Zagreb.

2. M. Ferronato, G. Gambolati, P. Teatini. *Total stress and pressure gradient formulations in coupled poroelasticity problems.* In J.C. Roegiers et al. (eds.), **Proceedings of the International Symposium on Coupled Phenomena in Civil, Mining, and Petroleum Engineering**, vol. 1, pp. 101-109, 2000. Sanya, Hainan Island.

3. D. Baù, M. Ferronato, G. Gambolati, P. Teatini. *Local rock expansion in non-homogeneous productive gas/oil fields.* In C.S. Desai et al. (eds.), **Computer Methods and Advances in Geomechanics**, vol. 2, pp. 1295-1299, 2001. A.A. Balkema Publ., Rotterdam.

4. G. Gambolati, G. Pini, M. Ferronato. *Iterative solvers for finite element consolidation models.* In **Geophysical Research Abstracts**, vol. 3, 2001. European Geophysical Society, Nice.

5. A. Comerlati, M. Ferronato, G. Gambolati, M. Putti, P. Teatini. *Some preliminary Finite Element results of CO2 sequestration in a sedimentary basin.* In **Extended Abstracts of the 64th Europen Association of Geoscientists and Engineers Conference and Exhibition** (Cd-Rom), 2002. EAGE, Florence.

6. G. Pini, G. Gambolati, M. Ferronato. *Direct and iterative methods in Finite Element consolidation models.* In K. Kovar and Z. Hrkal (eds.), **Proceedings of the 4th International Conference on Calibration and Reliability in Groundwater Modelling**, vol. 1, pp. 101-104, 2002. Acta Universitatis Carolinae - Geologica 46 (2/3), Prague.

7. M. Ferronato, G. Gambolati, G. Pini. *Efficient scaling algorithms for projection solvers in the Finite Element solution to coupled consolidation.* In S.M. Hassanizadeh et al. (eds.), **Computational Methods in Water Resources XIV**, vol. 1, pp. 437-444, 2002. Elsevier Science, Amsterdam.

8. M. Ferronato, G. Gambolati, G. Pini. *Parallel block-diagonal preconditioning of Finite Element consolidation equations.* In S.N. Atluri and D.W. Pepper (eds.), **Advances in Computational Engineering and Sciences**, pp. 193-198, 2002. Tech Science Press, Encino (CA).

9. M. Ferronato, G. Gambolati, P. Teatini. *Poroelastic coupling in layered porous media.* In J.L. Auriault et al. (eds.), **Poromechanics II**, pp. 193-198, 2002. A.A. Balkema Publ., Rotterdam.

10. A. Comerlati, M. Ferronato, G. Gambolati, M. Putti, P. Teatini. *Upward migration of anthropogenic CO2 and vertical finite element mesh resolution in a layered sedimentary basin*. In **Proceedings of the Offshore Mediterranean Conference and Exhibition** (Cd-Rom), 2003. OMC, Ravenna.

11. M. Ferronato, G. Gambolati, P. Teatini. *Unloading-reloading uniaxial compressibility of deep reservoirs by marker measurements*. In S. Stiros and S. Pytharouli (eds.), **Proceedings of 11th International Symposium on Deformation Measurements**, pp. 341-346, 2003. Geodesy and Geodetic Applications Laboratory, Patras University.

12. M. Ferronato, G. Gambolati, P. Teatini, D. Baù. *Stochastic compressibility for land subsidence modeling*. In **Proceedings of 16th ASCE Engineering Mechanics Conference** (Cd-Rom), 2003. Seattle (WA).

13. A. Comerlati, M. Ferronato, G. Gambolati, M. Putti, P. Teatini. *CO_2 injection below the Venice Lagoon: a numerical study*. In C.T. Miller et al. (eds.), **Computational Methods in Water Resources XV**, vol. 1, pp. 827-838, 2004. Elsevier Science, Amsterdam.

14. A. Comerlati, M. Ferronato, G. Gambolati, M. Putti, P. Teatini. *A coupled model of anthropogenic Venice uplift*. In Y. Abousleiman et al. (eds.), **Poromechanics III**, pp. 317-321, 2005. A.A. Balkema Publ., Rotterdam.

15. M. Ferronato, G. Gambolati, G. Pini, P. Teatini. *Computational issues in anthropogenic land subsidence prediction*. In G. Barla and M. Barla (eds.), **Prediction, analysis and design in geomechanical applications: proc. of the 11th Int. Conf. on Computer Methods and Advances in Geomechanics**, vol. 4, pp. 297-306, 2005. Patron Editore, Bologna.

16. M. Ferronato, A. Mazzia, G. Pini, G. Gambolati. *Meshless Local Petrov-Galerkin Method and standard unstructured Finite Elements for the solution of 2-D elastic problems.* In T.E. Simos et al. (eds.), **Proceedings of the International Conference on Numerical Analysis and Applied Mathematics**, pp. 190-193, 2005. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim.

17. P. Teatini, M. Ferronato, G. Gambolati, W. Bertoni, M. Gonella, M. Morelli, P. Severi. *Land subsidence due to groundwater withdrawal in the Emilia-Romagna coastland, Italy*. In Z. Agen et al. (eds.), **Land Subsidence: proc. of the 7th Int. Symp. on Land Subsidence**, vol. 1, pp. 55-64, 2005. Shanghai Scientific and Technical Publishers, Shanghai.

18. M. Ferronato, G. Gambolati, P. Teatini. *Numerical modeling of land subsidence above faulted reservoirs by interface elements*. In Z. Agen et al. (eds.), **Land Subsidence: proc. of the 7th Int. Symp. on Land Subsidence**, vol. 2, pp. 777-785, 2005. Shanghai Scientific and Technical Publishers, Shanghai.

19. G. Gambolati, P. Teatini, M. Ferronato. *Basic conceptual guidelines for a sustainable gas/oil field development*. In Z. Agen et al. (eds.), **Land Subsidence: proc. of the 7th Int. Symp. on Land Subsidence**, vol. 2, pp. 919-924, 2005. Shanghai Scientific and Technical Publishers, Shanghai.

20. M. Ferronato, G. Gambolati, P. Teatini. *Modeling regional faults for land subsidence prediction.* In J. De Groot et al. (eds.), **Proceedings of ASCE GeoCongress**, Cd-Rom, 2006. Atlanta (GA).

21. M. Ferronato, G. Gambolati, M. Putti, P. Teatini. *A diffusion model for land subsidence.* In P.J. Binning et al. (eds.), **Proceedings of the XVI International Conference on Computational Mathods in Water Resources**, 2006. Copenhagen, Denmark.

22. L. Bergamaschi, M. Ferronato, G. Gambolati. *Efficient preconditioners for Krylov subspace methods in the solution of coupled consolidation problems.* In B.H.V. Topping et al. (eds.), **Proceedings of the Fifth International Conference on Engineering Computational Technology**, Civil-Comp Press, Stirlingshire (UK), paper 84, 2006.

23. N. Castelletto, M. Ferronato, G. Gambolati, C. Janna, P. Teatini. *Modelling geomechanical effects of the well case on radioactive marker measurements of the Northern Adriatic, Italy.* In **Proceedings of 2007 Offshore Mediterranean Conference and Exhibition**, Cd-Rom, 2007. Ravenna.

24. M. Ferronato, G. Gambolati, M. Putti, P. Teatini, G. Brancolini, P. Campostrini. *A pilot project of anthropogenic Venice uplift by deep seawater injection.* In G. Di Silvio and S. Lanzoni (eds.), **Harmonizing the Demands of Art and Nature in Hydraulics: Proceedings of the 32nd Congress of IAHR**, Cd-Rom, Venice (Italy), 2007.

25. M. Ferronato, G. Pini, G. Gambolati, C. Janna. *Symmetric and unsymmetric block preconditioning for the iterative solution to FE coupled consolidation.* In T.E. Simos et al. (eds.), **Numerical Analysis and Applied Mathematics, International Conference**, pp. 216-219, 2007. American Institute of Physics, Melville (NY).

26. C. Janna, M. Ferronato, G. Gambolati. *Block preconditioning for the FE solution to contact problems.* In T.E. Simos et al. (eds.), **Numerical Analysis and Applied Mathematics, International Conference**, pp. 284-287, 2007. American Institute of Physics, Melville (NY).

27. M. Ferronato, G. Gambolati, P. Teatini, M. Gonella, C. Bariani, G. Martelli. *Modelling possible structural instabilities of the Po River embankment, Italy, due to groundwater pumping in the Ferrara Province.* In L. Oxley and D. Kulasiri (eds.), **Proceedings of the International Congress on Modelling and Simulation MODSIM07**, pp. 1224-1230, 2007. CD-ROM, ISBN: 978-0-9758400-4-7.

28. C. Janna, M. Ferronato, G. Gambolati. *Multilevel incomplete factorizations for nonlinear FE problems in geomechanics.* In H. Murakawa et al. (eds.), **Advances in Computational & Experimental Engineering and Sciences (Proceedings of ICCES08)**, pp. 611-616, 2008. TechScience Press, ISBN: 978-0-9717880-5-3.

29. M. Ferronato, G. Gambolati, C. Janna. *Efficient block preconditioners for the numerical modelling of geological faults.* In D. N. Singh (ed.), **Proceedings of the 12th International Conference of the International Association of Computer Methods and Advances in Geomechanics**, pp. 244-250, 2008.

30. N. Castelletto, M. Ferronato, G. Gambolati, C. Janna, I. Salce, P. Teatini. *Geomechanical effects of gas storage in depleted gas fields.* In A. Majdi and A. Ghazvinian (eds.), **New Horizons in Rock Mechanics, Developments and Applications, Proc. ISRM Int. Symp. 2008 - 5th Asian Rock Mechanics Symposium**, Vol. 2, pp. 1015-1021, 2008.

31. G. Gambolati, M. Ferronato, C. Janna. *Preconditioners for finite element consolidation.* In W.H. Chen and S.N. Atluri (eds.), **Advances in Computational & Experimental Engineering and Sciences (Proceedings of ICCES09)**, pp. 26-32, 2009. TechScience Press, ISBN: 978-0-9717880-9-1.

32. C. Janna, M. Ferronato, G. Gambolati. *Efficient multilevel preconditioners for large size geomechanical simulations.* In S. Pietruszczak et al. (eds.), **Computational Geomechanics (ComGeo I)**, pp. 359-369, 2009. IC2E International Centre for Computational Engineering, Rhodes, Greece.

33. M. Ferronato, G. Gambolati, C. Janna, P. Teatini. *Poromechanical modeling of CO2 sequestration in exploited gas fields.* In H.I. Ling et al. (eds.), **Poromechanics IV**, pp. 171-176, 2009. DEStech Publication, Lancaster, PA.

34. M. Ferronato, G. Gambolati, P. Teatini. *Venice uplift by seawater injection in a randomly heterogeneous aquifer.* In Y. Wang et al. (eds.), **Calibration and Reliability in Groundwater Modeling "Managing Groundwater and the Environment"**, pp. 495-498, 2009. China University of Geosciences Press, Wuhan, China.

35. N. Castelletto, M. Ferronato, G. Gambolati. *3-D modeling of coupled subsurface flow-stress by mixed finite element.* In J. Carrera (ed.), **Proceedings of the XVII International Conference on Water Resources**, paper no. 10, 2010. CIMNE, Barcelona, Spain.

36. P. Teatini, M. Ferronato, G. Gambolati, D. Baù, M. Putti. *Stochastic analysis of the Venice uplift due to seawater injection into deep aquifers.* In J. Carrera (ed.), **Proceedings of the XVII International Conference on Water Resources**, paper no. 153, 2010. CIMNE, Barcelona, Spain.

37. N. Castelletto, M. Ferronato, G. Gambolati, C. Janna, P. Teatini, D. Marzorati, E. Cairo, D. Colombo, A. Ferretti, A. Bagliani, S. Mantica. *3D geomechanics in UGS projects. A comprehensive study in northern Italy.* In **Proceedings of the 44th US Rock Mechanics Symposium**, paper no. 185, 2010. American Rock Mechanics Association, Salt Lake City (UT).

38. C. Janna, M. Ferronato, G. Gambolati. *A novel hybrid FSAI-ILU preconditioner for the efficient parallel solution of large size sparse linear systems.* In B.H.V. Topping et al. (eds.), **Proceedings of the Seventh International Conference on Engineering Computational Technology**, paper no. 3, 2010, doi:10.4203/ccp.94.3. Civil-Comp Press, Stirlingshire (UK).

39. P. Teatini, G. Gambolati, N. Castelletto, M. Ferronato, C. Janna, E. Cairo, D. Marzorati, D. Colombo, A. Ferretti, A. Bagliani, F. Bottazzi, F. Rocca. *Monitoring and modelling of 3-D ground movements induced by seasonal gas storage in deep reservoirs.* In **Land Subsidence, Associated Hazards and the Role of Natural Resources Development**, pp. 68-75, 2010. IAHS Publication no. 339.

40. N. Castelletto, M. Ferronato, G. Gambolati, C. Janna, P. Teatini. *Thermo-poro-elastic effects in the anthropogenic uplift of Venice by deep seawater injection.* In **Land Subsidence, Associated Hazards and the Role of Natural Resources Development**, pp. 96-101, 2010. IAHS Publication no. 339.

41. C. Janna, M. Ferronato, G. Gambolati, P. Teatini. *Simulation of ground failure due to groundwater pumping.* In **Land Subsidence, Associated Hazards and the Role of Natural Resources Development**, pp. 133-135, 2010. IAHS Publication no. 339.

42. N. Castelletto, M. Ferronato, G. Gambolati, C. Janna, P. Teatini, D. Marzorati, E. Cairo, D. Colombo, A. Ferretti, A. Bagliani, F. Bottazzi. *Sustainable underground gas storage activities in a Po plain gas field, northern Italy.* In **Proceedings of 2011 Offshore Mediterranean Conference and Exhibition** Cd-Rom, Ravenna (Italy), 2011.

43. M. Ferronato, C. Janna, G. Gambolati. *Parallel preconditioners for saddle-point problems.* In P. Ivànyi and B.H.V. Topping (eds.), **Proceedings of the Second International Conference on Parallel, Distributed, Grid and Cloud Computing for Engineering**, paper no. 37, 2011, doi:10.4203/ccp.95.37. Civil-Comp Press, Stirlingshire (UK).

44. N. Castelletto, P. Teatini, M. Ferronato, G. Gambolati, L. Tosi. *Mixed finite element analysis of a trial embankment at the coastland of Venice, Italy.* In S. Pietruszczak and G.N. Pande (eds.), **Computational Geomechanics (ComGeo II)**, pp. 829-838, 2011. IC2E International Centre for Computational Engineering, Rhodes, Greece.

45. M. Ferronato, C. Janna, G. Gambolati. *A novel parallel preconditioner for ill-conditioned FE consolidation problems.* In N. Khalili and M. Oeser (eds.), **Computer Methods for Geomechanics: Frontiers and New Applications**, Vol. 1, pp. 72-76, 2011. Centre for Infrastructure Engineering and Safety, Sydney, Australia.

46. N. Castelletto, M. Ferronato, G. Gambolati. *A 3-D mixed thermo-hydro-mechanical model of soil consolidation.* In **Proceedings of the 4th International Conference GeoProc2011: Cross Boundaries Through THMC Integration**, Cd-Rom, Perth (Australia), 2011.

47. M. Ferronato, C. Janna, G. Pini, G. Gambolati. *A parallel Jacobi-Davidson algorithm with Block FSAI preconditioning.* In T.E. Simos et al. (eds.), **Numerical Analysis and Applied Mathematics**, pp. 1694-1697, doi: 10.1063/1.3636935, 2011. American Institute of Physics Conf. Proc. 1389, Melville (NY).

48. C. Janna, M. Ferronato, G. Gambolati. *A parallel adaptive block FSAI preconditioner for Finite Element geomechanical models.* In F.L. Gaol and Q.V. Nguyen (eds.), **Proceedings of the 2011 2nd International Congress on Computer Applications and Computational Science**, pp. 331-338, 2012. Advances in Intellingent and Soft Computing, vol. 2, Springer, Heidelberg (Germany).

49. M. Ferronato, N. Castelletto, C. Janna. *Block FSAI performance with graph partitioning in large size subsurface problems.* In A.J. Valocchi (ed.), **Proceedings of the XIX International Conference on Computational Methods in Water Resources**, pp. 176-183, 2012. University of Illinois at Urbana-Champaign, IL.

50. N. Castelletto, P. Teatini, C. Janna, G. Gambolati, M. Ferronato, M. Politi. *CO2 geological sequestration: a numerical study of a multi-compartment reservoir in the northern Adriatic sea, Italy.* In A.J. Valocchi (ed.), **Proceedings of the XIX International Conference on Computational Methods in Water Resources**, pp. 303-310, 2012. University of Illinois at Urbana-Champaign, IL.

51. M. Ferronato, C. Janna, G. Pini, G. Gambolati. *Generalizing block FSAI preconditioning to unsymmetric indefinite matrices.* In T.E. Simos et al. (eds.), **Numerical Analysis and Applied Mathematics ICNAAM 2012**, pp. 2166-2169, 2012. American Institute of Physics, vol. 1479, doi: 10.1063/1.4756621.

52. M. Ferronato, C. Janna, G. Gambolati. *A parallel Domain Decomposition-Block FSAI preconditioner for geomechanical applications.* In B. Amaziane et al. (eds.), **Proceedings of the 5th International Conference on Approximation Methods and Numerical Modelling in Environment and Natural Resources**, 2013. Editorial Universidad de Granada, Granada, Spain.

53. M. Ferronato, N. Castelletto, G. Gambolati. *A coupled poroelasticity model by Mixed Finite Elements for aquifer recharge simulations.* In C. Hellmich et al. (eds.), **Poromechanics V**, pp. 1229-1236, 2013. American Society of Civil Engineers, USA.

54. N. Castelletto, M. Ferronato, G. Gambolati, C. Janna, P. Teatini. *Compartmentalization effects in geologic CO2 sequestration. A case study in an offshore reservoir in Italy.* In C. Hellmich et al. (eds.), **Poromechanics V**, pp. 1265-1270, 2013. American Society of Civil Engineers, USA.

55. M. Ferronato, C. Janna, G. Gambolati, F. Sartoretto. *High Performance Computing preconditioners for the efficient solution of geomechanical models.* In F. Oka et al. (eds.), **Computer Methods and Recent Advances in Geomechanics**, pp. 153-158, 2014. CRC Press, Taylor and Francis group, London, UK.

56. C. Zoccarato, M. Ferronato, G. Gambolati, C. Janna, P. Teatini, A. Alzraiee, D. Baù. *Data assimilation of SAR-based measurements for geomechanical characterization.* In F. Oka et al. (eds.), **Computer Methods and Recent Advances in Geomechanics**, pp. 1229-1234, 2014. CRC Press, Taylor and Francis group, London, UK.

57. M. Ferronato, C. Janna, G. Gambolati. *A novel Factorized Sparse Approximate Inverse preconditioner with supernodes.* In **Procedia Computer Science**, 51, pp. 266-275, 2015.

58. A. Zanette, M. Ferronato, C. Janna. *Enriching the Finite Element Method with meshfree techniques in structural mechanics.* In **Procedia of Applied Mathematics and Mechanics**, 15, pp. 691-692, 2015.

59. A. Franceschini, P. Teatini, C. Janna, M. Ferronato, G. Gambolati, S. Ye, D. Carreon-Freyre. *Modeling ground rupture due to groundwater withdrawal: applications to test cases in China and Mexico.* In **Proceedings of the International Association of Hydrological Sciences**, 372, pp. 63-68, 2015.

60. C. Zoccarato, D. Baù, F. Bottazzi, M. Ferronato, G. Gambolati, S. Mantica, P. Teatini. *Estimate of a spatially variable reservoir compressibility by assimilation of ground surface displacement data.* In **Proceedings of the International Association of Hydrological Sciences**, 372, pp. 351-356, 2015.

61. G. Isotton, M. Ferronato, G. Gambolati, P. Teatini. *On the possible contribution of clayey inter-layers to delayed land subsidence above producing aquifers.* In **Proceedings of the International Association of Hydrological Sciences**, 372, pp. 519-523, 2015.

62. C. Zoccarato, M. Ferronato, G. Gambolati, P. Teatini, D. Baù. *Ensemble smoothing of land displacements and deep compaction for the geomechanical characterization of hydrocarbon reservoirs*. In **Proceedings of EUROCK 2016**, 29-31 August 2016, Cappadocia, Turkey.

63. M. Ferronato, V.A. Paludetto Magri, C. Janna, A. Franceschini. *M3E_LINSOL: A Scalable Linear Solver Package for Reservoir Simulations on Massively Parallel Computers.* In **Proceedings of the Society of Petroleum Engineers Reservoir Simulation Conference**, 2017. Doi:10.2118/182650-MS.

64. M. Ferronato, L. Gazzola, N. Castelletto, P. Teatini, L. Zhu. *A coupled Mixed Finite Element Biot model for land subsidence prediction in the Beijing area.* In M. Vandamme et al. (eds.), **Poromechanics VI**, pp. 182-189, 2017. American Society of Civil Engineers, USA.

65. M. Ferronato, A. Mazzia, P. Teatini, C. Zoccarato. *A Virtual Element Model for the prediction of long-term salt marsh dynamics*. In G. Syme et al. (eds.), **Proceedings of the 22nd International Conference on Modelling and Simulation**, pp. 305-311, 2017.

66. V.A. Paludetto Magri, M. Ferronato, A. Franceschini, C. Janna. *A novel AMG approach based on adaptive smoothing and prolongation for reservoir simulations*. In **Proceedings of the 16th European Conference on the Mathematics of Oil Recovery**, paper no. MoA201, 2018.

67. N. Castelletto, M. Ferronato, A. Franceschini, R.R. Settgast, J.A. White. *Fully-implicit solvers for coupled poromechanics of fractured reservoirs*. In **Proceedings of the 16th European Conference on the Mathematics of Oil Recovery**, paper no. MoA212, 2018.

68. L. Gazzola, M. Ferronato, M. Frigo, C. Janna, P. Teatini, C. Zoccarato, M. Antonelli, A. Corradi, M.C. Dacome, S. Mantica. *Unvertainty quantification and reduction through Data Assimilation approaches for the geomechanical modeling of hydrocarbon reservoirs.* In **Proceedings of the 53rd US Rock Mechanics Symposium**, paper no. 208, 2019. American Rock Mechanics Association, New York City (NY).

69. P. Teatini, M. Ferronato, A. Franceschini, C. Janna, C. Zoccarato, G. Isotton. *Gas storage in compartmentalized reservoirs: A numerical investigation on possible "unexpected" fault activation.* In **Proceedings of the 53rd US Rock Mechanics Symposium**, paper no. 1991, 2019. American Rock Mechanics Association, New York City (NY).

70. M. Ferronato, A. Franceschini, M. Frigo, P. Teatini, C. Zoccarato. *Numerical investigation of fault activation in underground gas storage reservoirs.* In F. Kongoli et al. (eds.), **Geomechanics and Applications for Sustainable Development**, vol. 7: Schrefler Int. Symp., pp. 151-159. Sustainable Industrial Processing Summit and Exhibition, FLOGEN, 2019.

71. S. Nardean, A.S. Abushaikha, M. Ferronato. *A block preconditioning framework for the efficient solution of flow simulations in hydrocarbon reservoirs*. In **Proceedings of the Third EAGE WIPIC Workshop: Reservoir Management in Carbonates**, pp. 1-5. European Association of Geoscientists & Engineers, 2019.

72. M. Ferronato, M. Frigo, L. Gazzola, P. Teatini, C. Zoccarato. *On the radioactive marker technique for in-situ compaction measurements: a critical review*. In **Proceedings of TISOLS: The Tenth International Symposium on Land Subsidence – Living with Subsidence**, pp. 83-87, https://doi.org/10.5194/piahs-382-83-2020, 2020. IAHS publication no. 382.

73. P. Teatini, C. Da Lio, L. Tosi, A. Bergamasco, S. Pasqual, P. Simonini, V. Girardi, P. Zorzan, C. Zoccarato, M. Ferronato, M. Roner, M. Marani, A. D'Alpaos, S. Cola, G. Zambon. *Characterizing marshland compressibility by an in-situ loading test: design and set-up of an experiment in the Venice Lagoon*. In **Proceedings of TISOLS: The Tenth International Symposium on Land Subsidence – Living with Subsidence**, pp. 345-351, https://doi.org/10.5194/piahs-382-345-2020, 2020. IAHS publication no. 382.

74. M. Frigo, M. Ferronato, L. Gazzola, P. Teatini, C. Zoccarato, M. Antonelli, A.A.I. Corradi, M.C. Dacome, M. De Simoni, S. Mantica. *Numerical simulation of land subsidence above an off-shore Adriatic hydrocarbon reservoir, Italy, by Data Assimilation techniques*. In **Proceedings of TISOLS: The Tenth International Symposium on Land Subsidence – Living with Subsidence**, pp. 449-455, https://doi.org/10.5194/piahs-382-449-2020, 2020. IAHS publication no. 382.

75. L. Gazzola, M. Ferronato, M. Frigo, P. Teatini, C. Zoccarato, A.A.I. Corradi, M.C. Dacome, E. Della Rossa, M. De Simoni, S. Mantica. *Blending measurements and numerical models: a novel methodological approach for land subsidence prediction with uncertainty quantification*. In **Proceedings of TISOLS: The Tenth International Symposium on Land Subsidence – Living with Subsidence**, pp. 457-462, https://doi.org/10.5194/piahs-382-457-2020, 2020. IAHS publication no. 382.

76. G. Isotton, P. Teatini, R. Stefanelli, M. Ferronato, C. Janna, M. Cerri, T. Gukov. *An engineering approach to quantify geomechanical safety factors in UGS programs*. In **Proceedings of TISOLS: The Tenth International Symposium on Land Subsidence – Living with Subsidence**, pp. 475-480, https://doi.org/10.5194/piahs-382-475-2020, 2020. IAHS publication no. 382.

77. Y. Li, M. Frigo, Y. Zhang, L. Zhu, M. Ferronato, C. Janna, X. Gong, J. Yu, P. Teatini, S. Ye. *A new software to model earth fissure caused by extensive aquifer exploitation and its application to the Guangming village case, China*. In **Proceedings of TISOLS: The Tenth International Symposium on Land Subsidence – Living with Subsidence**, pp. 511-514, https://doi.org/10.5194/piahs-382-511-2020, 2020. IAHS publication no. 382.

78. P. Teatini, C. Zoccarato, M. Ferronato, A. Franceschini, M. Frigo, C. Janna, G. Isotton. *About geomechanical safety for UGS activities in faulted reservoirs*. In **Proceedings of TISOLS: The Tenth International Symposium on Land Subsidence – Living with Subsidence**, pp. 539-545, https://doi.org/10.5194/piahs-382-539-2020, 2020. IAHS publication no. 382.

79. S. Nardean, M. Ferronato, A.S. Abushaikha. *A novel and efficient preconditioner for solving Lagrange multipliers-based discretization schemes for reservoir simulations*. In **Proceedings of the 17th European Conference on the Mathematics of Oil Recovery**, paper no. 166287, 2020.

80. L. Gazzola, M. Ferronato, M. Frigo, P. Teatini, C. Zoccarato. *Integration of Data Assimilation techniques in geomechanical modelling: Ensemble Smoother with Multiple Data Assimilation analysis*. In M. Barla et al. (Eds.), **Challenges and Innovations in Geomechanics – Proceedings of the 16th International Conference of IACMAG**, vol. 1, Lecture Notes in Civil Engineering no. 125, pp. 862-869, 2021. Springer Nature Switzerland.

81. C. Zoccarato, M. Ferronato, P. Teatini. *A surrogate model for fast land subsidence prediction and uncertainty quantification*. In M. Barla et al. (Eds.), **Challenges and Innovations in Geomechanics – Proceedings of the 16th International Conference of IACMAG**, vol. 1, Lecture Notes in Civil Engineering no. 125, pp. 943-950, 2021. Springer Nature Switzerland.

82. L. Gazzola, M. Ferronato, S. Berrone, S. Pieraccini, S. Scialò. *Numerical investigation on a block preconditioning strategy to improve the computational efficiency of DFN models.* In E. Nadal Soriano et al. (Eds.), **Proceedings of the YIC 2021 – VI ECCOMAS Young Investigators Conference**, pp. 346-354, 2021. Editorial Universitat Politecnica de Valencia.

83. S. Nardean, M. Ferronato, A.S. Abushaikha. *A blended CPR/block preconditioning approach for mixed discretization schemes in reservoir modeling*. In **Proceedings of the 18th European Conference on the Mathematics of Oil Recovery**, 2022. Doi: 10.3997/2214-4609.202244067.

84. N. De Marchi, M. Ferronato, G. Xotta, V.A. Salomoni. *A coupled multi-field dynamic model for anisotropic porous materials.* In A. Zingoni (Ed.), **Current Perspectives and New Directions in Mechanics, Modelling and Design of Structural Systems. Proceedings of The Eighth International Conference on Structural Engineering, Mechanics and Computation**, pp. 285-291, 2022. Doi: 10.1201/9781003348443-45.

85. M. Frigo, G. Isotton, C. Janna, N. Spiezia, M. Ferronato, A. Franceschini, A. Filippini, G. Scrofani. *A GPU-accelerated simulator for challenging extreme-scale geomechanical models.* In **Proceedings of the Society of Petroleum Engineers Reservoir Simulation Conference**, 2023. Doi: 10.2118/212198-MS.

86. L. Gazzola, M. Ferronato, P. Teatini, C. Zoccarato. *Land subsidence prediction over an off-shore reservoir in Italy by a sequential data-integration approach.* In **Proceedings of TISOLS: The Tenth International Symposium on Land Subsidence**, Delft (The Netherlands), April 17-21, 2023.

87. C. Millevoi, D. Pasetto, M. Ferronato. *Calibration of Time-Dependent Parameters in Compartmental Epidemiological Models Using Physics-Informed Neural Networks: An Application to the Italian Covid-19 Pandemic.* In 9th **International Conference on Infectious Disease Dynamics**, Bologna (Italy), November 28-December 1, 2023. Doi: 10.2139/ssrn.4655046

3.4 Books

1. M. Ferronato. **Rock expansion and compaction at the marker scale in gas producing reservoirs**. PhD Thesis, 159 pp., 2003. DUP Science Publ., Delft.

2. G. Gambolati, M. Ferronato. **Lezioni di Metodi Numerici per l'Ingegneria**. Terza Edizione. Libreria Progetto, Padova, 2022.