

Laura Moreno Martínez

Curriculum vitae



Personal Information

First name Laura
Family name Moreno Martínez
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Data of birth 16 October 1990
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Current position

01/09/2024 - present **Assistant Professor**
Department of Applied Mathematics, EPS, University of Alicante, Spain

Previous positions

18/09/2024 - 31/08/2024 **Post-doctoral researcher**
Institute of Structural Analysis, Faculty of Architecture, Civil Engineering and Environmental Sciences, Technical University of Braunschweig, Germany
Developing particle techniques to model the constitutional evolution of building materials and structures with respect to aging.

01/10/2021 - 15/09/2023 **Post-doctoral researcher**
Department of Mathematics "Tullio Levi Civita", Università degli Studi di Padova, Italy
Studying and implementing Full Order Models using finite elements and particle techniques for multiphysics coupled simulations.

01/09/2016 - 22/09/2021 **Pre-doctoral researcher**
CIMNE, Universitat Politècnica de Catalunya, Barcelona, Spain
Developing mathematical and numerical methods to simulate viscoelastic fluid flows with high elasticity in a finite element framework, including thermal effects. These models are implemented in a high-performance computing environment using object-oriented Fortran.

01/12/2015 - 31/08/2016 **Solutions Assistant (SA-N1)**
EVERIS, Barcelona, Spain
Providing technical support for a high-tech database system

01/09/2014 - 28/02/2015 **Research Assistant**
Department of Applied Mathematics, Unidersidade de Santiago de Compostela, Santiago de Compostela, Spain
Study and numerical simulation of electromagnetic processes with hysteresis.

Education

23/09/2021 - 22/09/2021 **Doctor of Philosophy (Ph.D.) in Structural Analysis**
Department of Civil Engineering, Universitat Politècnica de Catalunya, Barcelona, Spain
Title: *Numerical modelling of viscoelastic flows based on a log-conformation formulation.*
Supervisors: Ramon Codina i Rovira and Joan Baiges Aznar.
Qualification: Excellent *cum laude*.

- 01/09/2013 - 25/07/2015 **M.Sc. Industrial Mathematics**
 Department of Applied Mathematics, Universidade de Santiago de Compostela,
 Spain
*Numerical methods in the finite element framework to compute different physical
 problems related to industry processes.*
- 01/09/2008 - 05/07/2013 **M.Sc. Mathematics (5 years degree)**
 Universidad de Alicante, Spain

Fellowships and awards

- 2023 - 2024 Post-doc fellowship awarded for the GRK/2 project, TUBS.
- 2021 - 2023 Post-doc fellowship awarded in UNIPD.
- 2017 - 2021 PhD thesis mark with honors (Excellent Cum Laude)
- 2017 - 2021 4-years Spanish government PhD scholarship. FPI: DPI2015-67857-R.

Participation in research projects

a) National and International projects:

1. **GRK 2075.** (Research Training Group) Modelling the constitutional evolution of building materials and structures with respect to aging. Funding by German Research Foundation. Participation: 18/10/2023 to 30/09/2024.
2. **REACT.** Digital Twins Of Civil Structures And Protection Systems In A Climate Change Perspective. PI: Antonia Larese. Founded by: TUM-IAS, Munich, Germany. From 01/10/2021 to 30/09/2024. (80.000€) Participation: 01/10/2022 to 15/09/2023
3. **SID2020-NEMESIS.** Numerical Methods for the Simulation of the impact of extreme hazards on Structures and landscape Founded by: University of Padova PI: Antonia Larese. From 18/11/2020 to 31/12/2022. (39.376,70 €) Participation: 01/10/2021 to 15/09/2023
4. **ELASTIC-FLOW.** Aumento de la eficiencia en procesos de mezcla y transmisión de calor utilizando fluidos viscoelásticos en régimen laminar y turbulento. Funded by Spanish Ministry. PI: Ramon Codina and Joan Baiges. Reference: DPI2015-67857-R. From 01/01/2016 to 31/12/2018. (125.840,00 €). Participation: 01/09/2016 to 22/09/2021
5. **FORJACEMIC.** Investigación de nuevos procesos y aleaciones de aceros microaleados para la forja en caliente de cigüeñales de automoción. Funded by CIE-GALFOR (Innterconecta). PI: Alfred Bermúdez. From 22/10/2013 to 31/12/2014. Participation: 01/09/2014 to 28/02/2015.

b) Private consulting:

1. **ENIPROGETTI.** Development of a mathematical and numerical model for the sensitivity analysis of the model of the physical channel to the material parameters and to the geometry of the perforation well. Founded by ENI s.p.a. Ref. 2500042110 PI: Mario Putti From 03/05/2022 to 20/10/2022 (50.000 €)
2. Numerical analysis to estimate the optical quality degradation generated by the future European Solar Telescope (EST) over WHT (William Hershell Telescope) at Observatorio del Roque de Los Muchachos (ORM). PI: Ramon Codina and Joan Baiges. Participation from 01/03/2020 to 31/08/2020.
3. Proyecto de consultoría con el metro de Montreal, EWE+ para el diseño de pantallas ignífugas en el metro de Montreal. Numerical analysis to determine the aerodynamic loads on the tunnel Mont-Royal wall separation. PI: Ramon Codina and Joan Baiges. Participation from 01/03/2020 to 31/08/2020.

Memberships of scientific societies

- Since 2023 Member of the Istituto Nazionale di Alta Matematica "Francesco Severi" (INDAM) - Gruppo Nazionale per il Calcolo Scientifico (GNCS)
- Since 2019 Member of the Spanish Association for Numerical Methods in Engineering (SEMNI).
- Since 2011 Member of National Association of Mathematic's Students (ANEM).

Publications

1. **Moreno L.**, Wuechner R. & Laese A. (2025) A mixed stabilized MPM formulation for incompressible hyperelastic materials using Variational Subgrid-Scales. *Computer Methods in Applied Mechanics and Engineering*, 435, 117621. **Remark:** Responsible for the development, implementation, validation, and writing of the paper
2. Codina R., Baiges J., Castañar I., Martínez-Suárez I., **Moreno L.** & Parada S. (2023) An embedded strategy for large scale incompressible flow simulations in moving domains. *Journal of Computational Physics*, 488, 112181. Impact Factor: 4.645 (JCR) Q1. GS Citations: 1. **Remark:** In charge for some numerical computations, and the modelization of the problem to solve.
3. **Moreno L.**, Castañar I., Codina R., Baiges J. & Cattoni D. (2023) Numerical simulation of Fluid-Structure Interaction problems with viscoelastic fluids using a log-conformation reformulation. *Computer Methods in Applied Mechanics and Engineering*, 410, 115986. Impact factor 6.756 (JCR) Q1. GS Citations: 2. **Remark:** Study of the fluid-structure interaction problems considering viscoelastic fluid flows with high elasticity. In charge of the theoretical part, numerical aspects, and all the numerical computations.
4. **Moreno L.**, Codina R. & Baiges J. (2021) Numerical simulation of non-isothermal viscoelastic fluid flows using a VMS stabilized Finite Element formulation. *Journal of Non-Newtonian Fluids Mechanics*, 296, 104640. Impact factor 2.82 (JCR) Q2. GS Citations: 8. **Remark:** Study from a physical point of view about the thermal coupling with viscoelastic fluid flow. In charge of all the implementations and the computational simulations.
5. Castillo E., **Moreno L.**, Codina R. & Baiges J. (2021) Stabilised Variational Multi-Scale Finite Element Formulations for Viscoelastic Fluids. *Archives of Computational Methods in Engineering*, 28, 1987-2019. Impact factor 8.171 (JCR) Q1. GS Citations: 12. **Remark:** Review about solving the viscoelastic fluid flow problem using the variational multiscale approach. In charge of writing about the work developed in others works.
6. Codina R. & **Moreno L.** (2021) Analysis of a stabilized finite element approximation for a linearized logarithm reformulation of the viscoelastic flow problem. *ESAIM. Mathematical Modelling and Numerical Analysis*, 55, 279-300. Impact factor 1.992 (JCR) Q1. GS Citations: 2. **Remark:** Numerical analysis of the formulations developed in previous works. In charge of the main demonstrations proved in the paper.
7. **Moreno L.**, Codina R. & Baiges J. (2020). Solution of transient viscoelastic flow problems approximated by a term-by-term VMS stabilized finite element formulation using time-dependent subgrid-scales. *Computer Methods in Applied Mechanics and Engineering*, 367, 113074. Impact factor 5.763 (JCR) Q1. GS Citations: 19. **Remark:** Development temporal sub-grid scales for the viscoelastic fluid flow formulation to avoid instabilities. In charge of the development, implementation and all the computations.
8. **Moreno L.**, Codina R., Baiges J. & Castillo E. (2019). Logarithmic conformation reformulation in viscoelastic flow problems approximated by a VMS-type stabilized finite element formulation. *Computer Methods in Applied Mechanics and Engineering*, 354, 706-731. Impact factor 5.763 (JCR) Q1. GS Citations: 24. **Remark:** Development of strategies for solving fluid flows with high elasticity numerically. In charge of the developed formulation, implementation and numerical examples.

Conferences

- JUNE 2024 Laura Moreno, Antonia Larese and Roland Wüchner *Stabilized mixed formulation for an implicit Material Point Method for viscoplastic fluids.*, 9th European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS 2024), Lisbon, Portugal, 2-7 June 2024
- APR 2024 Laura Moreno, Antonia Larese and Roland Wüchner *How to simulate water hazard events.*, Congreso de estudiantes de Física (COEFIS XVI), La Laguna, Tenerife, Spain, 12-14 April 2024. Invited plenary speaker.
- MAR 2024 Laura Moreno, Nicolò Crescencio, Veronika Singer, Antonia Larese and Roland Wüchner *A stabilized mixed formulation for simulating incompressible materials in natural water hazards events using the Material Point Method.*, FE im Schnee, Kleinwalsertal, Germany, 17-20th March 2024
- FEB 2024 Laura Moreno, Nicolò Crescencio, Veronika Singer, Antonia Larese and Roland Wüchner. *A stabilized mixed formulation for incompressible materials in the Material Point Method for simulating gravitational natural hazards.* Norddeutsches Mechanikkolloquium & Gründungskolloquium, Institut für Akustik und Dynamik. Braunschweig, Germany, 10 February, 2024.
- OCT 2023 L. Moreno, A. Larese and R. Wüchner. *Stabilized mixed formulation for incompressible materials by using VMS in a Material Point Method framework* VIII International Conference in Particle Mechanics (Particles 2023) Milan, Italy, October 9 - 11, 2023.
- AUG 2023 L. Moreno, J. Baiges and R. Codina. *Numerical modelling of viscoelastic flows with high elasticity.*, 10th International Congress on Industrial and Applied Mathematics (ICIAM 2023) Waseda University, Tokyo, Japan, August 19 - 25, 2023.
- JUNE 2023 L. Moreno, V.Singer, N. Crescencio, A. Boerst and A. Larese. *Simulation of Coupled Multiphysics Problems in Large Deformation Regime.* SIAM Conference on Mathematical & Computational Issues in the Geosciences (GS23), Radisson Blu Royal Hotel, Bergen, Norway, June 19 - 22, 2023.
- SEP 2022 L. Moreno, A. Contri, A. Larese. *A VMS-Stabilized Mixed Formulation for Non-Linear Incompressible Solid Mechanics Problems Using the Implicit Material Point Method.* Congress on Numerical Methods in Engineering (CMN 2022), Las Palmas de Gran Canaria, Spain, September 12th – 15 th 2022
- JUN 2022 L. Moreno, A. Contri, A. Larese. *Stabilized mixed formulation for an implicit MPM for viscoplastic fluids by using a variational subgrid-scale framework.* 8th European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS 2022), Oslo, Norway, June 5th - 9th 2022.
- NOV 2021 L. Moreno, J. Baiges, R. Codina. *Computation of transient flow problems approximated by a VMS stabilized Finite Element formulation using time-dependent subgrid-scales for monolithic and fractional step schemes.* XLII Ibero-Latin-American Congress on Computational Methods in Engineering (CILAMCE-2021) — 3rd Pan American Congress on Computational Mechanics Computational Mechanics. Virtual Congress, Río de Janeiro, Brazil, November 9th-12th 2021.
- AUG 2021 L. Moreno, J. Baiges, R. Codina. *Simulation of transient viscoelastic flow problems approximated by a VMS stabilized FE formulation using time-dependent subrid-scales.* Poster presentation and short oral talk in 25th International Congress of Theoretical and Applied Mechanics (ICTAM 2020+1). Virtual Congress, Milano, Italy, August 22-27 2021.
- JUN 2021 L. Moreno, R. Codina, J. Baiges. *Thermal coupling simulations with a viscoelastic fluid flow.* Oral conference speaker in IX International Conference on Coupled Problems in Science and Engineering (COUPLED PROBLEMS 2021). Virtual congress, Chia Laguna, Sardinia (Italy), 13-16 June 2021.
- JAN 2021 L. Moreno, J. Baiges, R. Codina. *Solution of transient viscoelastic flow problems approximated by a VMS stabilized finite element formulation using time-dependent subrid-scales.*

- Oral conference speaker in 14th World Congress on Computational Mechanics (WCCM 2020). Virtual Congress, Paris, France, 11-15 January 2021.
- DEC 2019 Oral presentation in a CIMNE Coffee Talk, Barcelona, Spain. Title: *Simulating viscoelastic fluid flows with high Weissenberg number*.
- JUN 2019 L. Moreno, J. Baiges, R. Codina. *Simulation of non-isothermal viscoelastic fluid flow problem using a VMS stabilized Formulation*. Oral conference speaker in the VIII International Conference on Coupled Problems in Science and Engineering (COUPLED PROBLEMS 2019), Sitges, Spain.
- FEB 2018 Oral presentation in Lecture Series: Women researchers at CIMNE for the International Day of Women and Girls in Science, Barcelona, Spain. Title: *Heat transfer processes using viscoelastic fluids in laminar and turbulence regimes*.

Teaching

- 2024 - 2025 **Fundamentos Matemáticos en Ingeniería I**
Degree: Grado en Ingeniería Aeroespacial
Department of Applied Mathematics, University of Alicante, Spain
Language: Spanish
Teaching type: Lecture (theory and exercises) (120h)
- 2024 - 2025 **Matemáticas Básicas**
Degree: Grado en Ingeniería en Sonido e Imagen en Telecomunicación
Department of Applied Mathematics, University of Alicante, Spain
Language: Spanish
Teaching type: Lecture (theory and exercises) (30h)
- 2023 - 2024 **Particle Mechanics**
Master in Civil engineering
Institut für Dynamik und Statik, University of Braunschweig, Germany
Language: English
Teaching type: Lecture (theory and exercises) (10h)
- 2022 - 2023 **Calcolo Numerico**
Degree: Ingegneria Chimica e dei materiali
Dipartimento di Matematica, University of Padua, Italy
Language: Italian
Teaching type: Laboratorio numerico (24 h)
Description: Practical exercises of numerical calculus using the software MATLAB.
- 2022 - 2023 **Numerical methods for continuous systems.**
Master of mathematical engineering
Dipartimento di Ingegneria Civile, Edile e Ambientale, University of Padua, Italy
Language: English
Teaching type: Mentoring (12 h)
Description: Support in projects, practical exercises and elaboration of educative material.

Supervision

Master thesis co-supervisor (1): An Updated Lagrangian displacement-based formulation for free surface incompressible fluids using MPM (2021), Alessandro Contri.

Courses and workshops

1. *Kratos Workshop 2022*, in Deltares installations, Delft, Netherlands. Organized by Deltares company. November 9-10, 2022
2. *Workshop “Numerical Analysis of protected systems”*, in Geobruugg installations, Romanshorn, Switzerland and organized by Geobruugg company. 20/06/2022 - 22/06/2022
3. *Fortran Modernisation Workshop Programme* in Universitat Politècnica de Catalunya BarcelonaTech (Spain) and organized by NAG. 24/07/2017 - 26/07/2017
4. *X Foro de Interacción Matemática Industria* in Universidade de Santiago de Compostela, Spain. 21/11/2014

Language skills

Spanish: Native, **Catalan/Valencian:** Fluent, **English:** Fluent, **Italian:** Fluent, **German:** Beginner.

Software Competences

- **Languages:** Fortran, C++, Python.
- **Mathematical:** Maple, Matlab.
- **Parallel computing:** Open MP, MPI.
- **Simulation:** ANSYS Fluent, COMSOL Multiphysics, KRATOS Multiphysics.