Ricardo **Reyes**

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Mechanical engineer with a PhD in Civil Engineering, specialized in developing numerical methods for time-dependent problems, computational fluid dynamics, and computational mechanics. Experienced in scientific computing, algorithm development, model reduction, and data-driven simulations for engineering applications.

Work experience

EAWAG, Swiss Federal Institute of Aquatic Science and Technology
Dübendorf, Switzerland

Scientist, Urban Water Management — *Jun. 2024 - Jun. 2025*

- Developed an urban water cycle model capable of simulating different scenarios, household behaviors, and policies.
- Contributed to the UrbanTwin project to support decision-making aligned with the Swiss Energy Strategy 2050.
- Applied simulation tools for scenario analysis and policy evaluation.

EPFL, École Polytechnique Fédérale de Lausanne
Lausanne, Switzerland

Postdoctoral Researcher, Chair of Computational Mathematics and Simulation Science — *Feb. 2021 - Aug. 2023*

- Developed reduced-order model methods for time-dependent parametric problems and stress/fatigue analysis.
- Implemented model reduction methods in Python using the FEniCS finite element library.
- Applied the developed methods to large-scale wind turbine simulations in a InnoSuisse project for large-scale wind turbine applications.

Universitat Politècnica de Catalunya
Barcelona, Spain

Doctoral Researcher — *Mar. 2014 - Mar. 2020*

- Formulated stabilized model reduction approaches for CFD and solid mechanics using finite element methods.
- Developed hyper-reduction strategies based on adaptive mesh refinement techniques.
- Implemented numerical methods in FORTRAN and C++ for incompressible Navier–Stokes problems, including thermal coupled and fluid–structure interaction problems.
- Applied methods on HPC platforms using MPI, PETSc, SLEPc, HDF5, and XDMF.

Universidad Nacional de Colombia
Bogota, Colombia

Graduate Reasercher — *Aug. 2011 - Dec. 2012*

- Conducted fatigue analysis for truck suspension supports, estimating dynamic loads and component strength.
- Performed turbulence analysis for industrial pump inlet flows.
- Optimized fiberglass lamppost designs to reduce stress.

Education

Universitat Politècnica de Catalunya, BarcelonaTech
Barcelona, Spain

Ph.D. in Civil Engineering — *2020*

- Thesis: Stabilized reduced order models for low speed flows

Universidad Nacional de Colombia
Bogota, Colombia

B.Eng. in Mechanical Engineering — *2010*

Skills

Programming	FORTRAN, Python, C/C++, MPI, LaTeX, Vim, Git, Docker
Libraries & Software	HDF5, FEniCS, PETSc, SLEPc, ParaView, Matplotlib
Languages	Spanish (Native), English (C1), French (B1), Polish (A2)

Publications

Journal Publications

[1] The Frequency Reduced-Basis method: Reduced order models for time-dependent problems using the Laplace transform
Ricardo Reyes
2025. DOI: arXiv:2502.19120

[2] Reduced order modeling of parametrized pulsatile blood flows: Hematocrit percentage and heart rate
Catalina Farías, Camilo Bayona-Roa, Ernesto Castillo, Roberto C. Cabrales, Ricardo Reyes
International Journal of Engineering Science. 193: p. 103943, 2023. DOI: 10.1016/j.ijengsci.2023.103943

[3] Reduced order modeling for parametrized generalized Newtonian fluid flows
R. Reyes, O. Ruz, C. Bayona-Roa, E. Castillo, A. Tello
Journal of Computational Physics. 484: p. 112086, 2023. DOI: 10.1016/j.jcp.2023.112086

[4] A posteriori error estimates in a finite element VMS-based reduced order model for the incompressible Navier-Stokes equations
Ramon Codina, Ricardo Reyes, Joan Baiges
Mechanics Research Communications. P. 103599, 2021. DOI: 10.1016/j.mechrescom.2020.103599

[5] Element boundary terms in reduced order models for flow problems: Domain decomposition and adaptive coarse mesh hyper-reduction
Ricardo Reyes, Ramon Codina
Computer Methods in Applied Mechanics and Engineering. 368: p. 113159, 2020. DOI: 10.1016/j.cma.2020.113159

[6] Projection-based reduced order models for flow problems: A variational multiscale approach
Ricardo Reyes, Ramon Codina
Computer Methods in Applied Mechanics and Engineering. 363: p. 112844, 2020. DOI: 10.1016/j.cma.2020.112844

[7] Reduced order models for thermally coupled low Mach flows
Ricardo Reyes, Ramon Codina, Joan Baiges, Sergio Idelsohn
Advanced Modeling and Simulation in Engineering Sciences. 5: 28, 2018. DOI: 10.1186/s40323-018-0122-7