María Martínez Barbeito

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Profile

Physicist (PhD) with experience in power grid dynamics and energy systems. Strong background in data analysis and programming for modelling complex systems, with both academic and applied experience. Collaborative, adaptable, and motivated to contribute to the renewable energy transition.

Education

PhD in Physics Nov 2019 – Sep 2024
University of the Balearic Islands *Mallorca (Spain)*

- PhD thesis: Studied power grid dynamics and stability in scenarios with a high penetration of renewable energies.

MSc in Physics of Complex Systems Sep 2018 – Oct 2019
University of the Balearic Islands *Mallorca (Spain)*

- Relevant courses: Complex Networks, Dynamical Systems, Stochastic Simulation Methods.
- MSc thesis: Studied systemic risk and financial stability in banking systems through an agent-based model implemented in Fortran. In particular, analyzed vulnerability and resilience to external shocks.

BSc in Physics Sep 2013 – Jul 2018
University of Santiago de Compostela *Santiago de Compostela (Spain)*

- Relevant courses: Computational Physics, Experimental Techniques, Complex Systems.
- Completed a one-year academic exchange at the University of Granada.
- BSc thesis: Reviewed several complex network models and analyzed their effect on a social behaviour model implemented in Matlab.

Research Experience

PhD Researcher Nov 2019 – Sep 2024
Institute for Cross-Disciplinary Physics and Complex Systems (IFISC) *Mallorca (Spain)*

- Investigated power grid behavior under different energy transition scenarios, focusing on frequency dynamics and stability.
- Developed digital twins, analyzed diverse datasets, and published results in peer-reviewed journals.
- Presented at international conferences and workshops, and engaged in science dissemination.
- Collaborated with other researchers, including a 3-month stay at HES-SO (Switzerland).
- Worked on multiple research projects in parallel, including:
  - **Dynamical model for power grid frequency fluctuations** (2019 – 2023)
    - Developed a digital twin of the high-voltage power grid, reproducing real frequency statistics.
    - Conducted extensive studies on various energy transition scenarios running simulations in Fortran and analyzing the results with Python.
  - **Data analysis of frequency fluctuations** (2021)
    - Analyzed grid frequency and power data before and after the closure of a coal plant.
    - Used Python for data analysis and visualization.
  - **VPP4Islands – European project** (2021 – 2024)
    - Implemented the digital twin in Python, worked with diverse datasets, and conducted studies related to the transition to smart and green energy, including the use of batteries.
    - Collaborated with multiple teams and contributed to the production and writing of reports.

- **European transmission grid stability** (2023 – 2024)
  - Analyzed the stability of the Continental European grid using linear stability theory, identifying critical lines in power transmission from distant areas.
  - Used Fortran and Matlab for simulations, and Python for analysis and visualization.

Professional Experience

Junior Integrations Analyst Aug 2025 – Present
Axis Data *Mallorca (Spain)*

- Coordinate system integrations from design to deployment in Agile teams.
- Bridge technical teams and stakeholders in a hybrid project manager/product owner role.

Substitute Teacher (two short-term positions) Mar 2025 – Jun 2025
Balearic public education system *Mallorca (Spain)*

- Taught vocational and secondary-level courses, adapting quickly to new subjects and supporting diverse student learning needs.

Software and Mathematical Models Developer Nov 2024 – Feb 2025
ieco.io *Remote*

- Used Python for optimization of mathematical models for partial shading in self-consumption photovoltaic systems, reducing computational cost with measurable impact on accuracy.

Skills

- Programming: **Fortran** (advanced), **Python** (advanced), **Matlab** (intermediate), **Git** (basic)
- Software & Tools: **Microsoft Office** (advanced), **LaTeX** (advanced), **HTML** (basic)

Abilities

- Strong communication and organizational skills
- Quick learner, team-oriented, highly adaptable

Languages

- Spanish and Galician – Native
- English – Advanced
- Catalan – Intermediate (B1 certificate)

Additional Information

Publications – *full list on Google Scholar*

- M. Martínez-Barbeito, D. Gomila, P. Colet, J. Fritzsch, & P. Jacquod. (2025). Transmission grid stability with large interregional power flows. *Physical Review Research*, vol. 7, no 1, p. 013137.
- M. Martínez-Barbeito, D. Gomila, & P. Colet. (2023). Dynamical Model for Power Grid Frequency Fluctuations: Application to Islands with High Penetration of Wind Generation. *IEEE Transactions on Sustainable Energy*, p. 1-10.

Advisory Board Member (2022–2024) and **Chair** (2023–2024), *Young Researchers of the Complex Systems Society (CSS)* – Organized events and promoted collaboration among early-career researchers.