

Research experience

- Since Aug. 2022* **Assistant professor**
Institute of Sustainable Energy, School of Engineering,
HES-SO Valais//Wallis.
- Oct. 2020 – Aug. 2022* **Post-doctoral scholar**
Center for Control, Dynamical Systems, and Computation (CCDC),
University of California at Santa Barbara (UCSB).
Supervised by Prof. Francesco Bullo.
- Oct. – Dec. 2020* **Visiting scholar**
Mathematics Department, University of Fribourg (Switzerland).
Invited by Prof. Christian Mazza.
- Mar. – Jul. 2020* **Post-doctoral scholar**
Aug. – Dec. 2018 Institut für Automatik, ETH Zürich.
Supervised by Prof. Florian Dörfler.
- Jun. 2018 – Feb. 2020* **Post-doctoral scholar**
HES-SO Valais//Wallis.
Supervised by Prof. Philippe Jacquod.
- Jul. – Aug. 2019* **Visiting scholar**
Center for Nonlinear Studies, Los Alamos National Laboratory.
Supervised by Dr. Andrey Lokhov and Dr. Marc Vuffray.

Education

- Sep. – Nov. 2017* **Visiting PhD student**
Institut für Automatik, ETH Zürich.
Supervised by Prof. Florian Dörfler.
- Dec. 2014 – May 2018* **PhD in Mathematics – Loop Flows in the Kuramoto Model**
University of Geneva & HES-SO Valais//Wallis.
Supervised by Prof. Yvan Velenik and Prof. Philippe Jacquod.
[archive-ouverte.unige.ch/unige:106921]
- Sep. 2014* **Master thesis**
University of Geneva.
The Topological Approach to Phase Transitions.
Supervised by Prof. David Cimasoni and Prof. Yvan Velenik.
- Sep. 2012 – Sep. 2014* **Master of Science in Mathematics**
University of Geneva.
Focus in Topology and Probabilities.
- Sep. 2008 – Sep. 2011* **Bachelor of Science in Mathematics**
University of Geneva.
Focus in Topology and Probabilities.

Supervision of junior researchers

Since Oct. 2023 **Jim Délitroz**

J. Délitroz is doing his PhD under my supervision, co-supervised by Prof. Dörfler (ETHZ). His work focuses on multitability of the power flow equations.

Jun. 2019 – Jul. 2020 **Glory M. Givi**

Sep. 2022 – Dec. 2023 Co-supervision of G. M. Givi during part of her PhD. Her work aims at quantifying the robustness of opinions in a group of interacting agents.

Jan. – Dec. 2019 **André Reggio**

Co-supervision of A. Reggio during his first year of PhD. His work focused on some generalization of the Kuramoto model, referred to as *Kuramoto model with Bounded Confidence*.

Teaching

Since Sep. 2022 **Professor of mathematics for engineers at HES-SO, Sion**

Classes: Analysis 1, Linear Algebra 1, Mathematics for Engineers 2, Analysis 2, Applied Mathematics, Signal Processing and Information Theory.

May 2018 **Guest lecturer at University of Geneva**

Class: Graph Spectral Theory, by Prof. Anders Karlsson.

Editorial service

Since Oct. 2024 **Journal of Physics: Complexity**

[<https://iopscience.iop.org/journal/2632-072X>]

Organization of conferences

Nov. 2 – 7, 2025 **BIRS Workshop**

Bridging the inter-disciplinary gap in the mathematical modeling of social phenomena: Gathering scientists from the quantitative sciences and from the social science with the objective to launch innovative collaborations.

Co-organizers: Giulia De Pasquale (TU Eindhoven), Yibei Chen (MIT), and Florian Dörfler (ETH Zurich).

[<https://www.birs.ca/events/2025/5-day-workshops/25w5341>]

Oct. 27, 2020 **CCS 2021 - Satellite Symposium**

Data-based diagnosis of networked dynamical systems: Covering the analysis of networks and disturbances therein relying on measurements.

Co-organizers: Laurent Pagnier (University of Arizona, Tucson) and Melvyn Tyloo (University of Geneva).

[www.delabaysrobin.site/ccs-satellite]

Feb. 2 – 5, 2020 **GeoCoW 2020**

Geometry of Complex Webs 2020: Interdisciplinary and international workshop covering a wide range of topics related to complex networks and their applications.

Co-organizers: Matthieu Jacquemet (HES-SO Valais-Wallis and University of Fribourg) and Christian Mazza (University of Fribourg).

[<https://sites.google.com/view/geocow2020/home>]

Grants and awards

2024 HES-SO Free project

TAPIS – Topology and Admittance Parameters Inference from Smart meters.

2023 SNSF Project funding

Existence and uniqueness of the power flows in AC electrical networks.

2020 SNSF PostDoc.Mobility

Multistability of the Dissipative Power Flow Equations.

2012 Excellence Master Fellowship

University of Geneva.

Preprints

- [Del25c] **R. Delabays**, Y. Zhang, F. Dörfler, and G. De Pasquale, *Data-driven control of hypergraphs: Leveraging THIS to damp noise in diffusive hypergraphs*, submitted (2025). [arxiv.org/abs/2511.08647]

Publications in peer-reviewed journals and conference proceedings

- [Nie25] J. Niehues, **R. Delabays**, A. Büttner, and F. Hellmann, *Small-signal stability of power systems with voltage droop*, IEEE Trans. Power Syst. Early Access (2025). [doi.org/10.1109/TPWRS.2025.3613855], [arxiv.org/abs/1124.10832]
- [Del25b] **R. Delabays** and P. Jacquod, *Route to chaos in multi-species ecosystems*, Chaos **35**, 091109 (2025). [doi.org/10.1063/5.0291485], [arxiv.org/abs/2503.16999]
- [Pag24] L. Pagnier, **R. Delabays**, and M. Tyloo, *Nontrivial Kron reduction for power grid modeling*, IEEE Powertech (2025). [arxiv.org/abs/2409.09519]
- [Kas25] N. Kastendiek, J. Niehues, **R. Delabays**, T. Gross, and F. Hellmann, *Phase and gain stability for adaptive dynamical networks*, Chaos **35**, 053142 (2025). [doi.org/10.1063/5.0249706], [arxiv.org/abs/2411.10387]
- [Del25a] **R. Delabays**, G. De Pasquale, F. Dörfler, and Y. Zhang, *Hypergraph reconstruction from dynamics*, Nat. Commun. **16**, 2691 (2025). [doi.org/10.1038/s41467-025-57664-2], [arxiv.org/abs/2402.00078]
- [Giv24] G. M. Givi, **R. Delabays**, M. Jacquemet, and P. Jacquod, *On the robustness of democratic electoral processes to computational propaganda*, Sci. Rep. **14**, 193 (2024). [doi.org/10.1038/s41598-023-50648-6], [arxiv.org/abs/2308.11569]
- [Del23b] **R. Delabays**, A. Y. Lokhov, M. Tyloo, and M. Vuffray, *Locating the source of forced oscillations in transmission power grids*, Phys. Rev. X Energy **2**, 023009 (2023). [doi.org/10.1103/PRXEnergy.2.023009], [arxiv.org/abs/2211.16064]
- [Del23a] **R. Delabays** and F. Bullo, *Semicontraction and Synchronization of Kuramoto-Sakaguchi Oscillator Networks*, IEEE Control Syst. Lett. **7**, 1566 (2023). [doi.org/10.1109/LCSYS.2023.3275169], [arxiv.org/abs/2303.10127]
- [Ngu23] T. T. Nguyen, R. C. Budzinski, F. W. Pasini, **R. Delabays**, J. Mináč, and L. E. Muller, *Broadcasting solutions on networked systems of phase oscillators*, Chaos Solitons Fractals **168**, 113166 (2023). [doi.org/10.1016/j.chaos.2023.113166], [arxiv.org/abs/2209.05970]
- [Del22b] **R. Delabays**, S. Jafarpour, and F. Bullo, *Multistability and anomalies in oscillator models of lossy power grids*, Nat. Commun. **13**, 5238 (2022). [doi.org/10.1038/s41467-022-32931-8], [arxiv.org/abs/2202.02439]
- [Del22a] **R. Delabays** and M. Tyloo, *Heavy-tailed distribution of the number of papers within scientific journals*, Quant. Sci. Studies **3**, 776 (2022). [doi.org/10.1162/qss_a_00201], [arxiv.org/abs/2011.05703]
- [Tyl21b] M. Tyloo, **R. Delabays**, and P. Jacquod, *Reconstructing network structures from partial measurements*, Chaos **31**, 103117 (2021). [doi.org/10.1063/5.0058739], [arxiv.org/abs/2007.16136]
- [Del21a] **R. Delabays**, L. Pagnier, and M. Tyloo, *Locating line and node disturbances in networks of diffusively coupled dynamical agents*, New J. Phys. **23**, 043037 (2021). [doi.org/10.1088/1367-2630/abf54b], [arxiv.org/abs/2003.08786]
- [Tyl21a] M. Tyloo and **R. Delabays**, *System size identification from sinusoidal probing in diffusive complex networks*, J. Phys. Complex. **2**, 025016 (2021). [doi.org/10.1088/2632-072X/abebd3], [arxiv.org/abs/2009.03824]

- [Reg20] A. Reggio, **R. Delabays**, and P. Jacquod, *Clusterization and phase diagram of the bimodal Kuramoto model with bounded confidence*, Chaos **30**, 093134 (2020). [doi.org/10.1063/5.0020436], [arxiv.org/abs/2007.01214]
- [Del19c] **R. Delabays**, *Dynamical equivalence between Kuramoto models with first- and higher-order coupling*, Chaos **29**, 113129 (2019). [doi.org/10.1063/1.5118941], [arxiv.org/abs/1907.03699]
- [Del19b] **R. Delabays**, M. Tyloo, and P. Jacquod, *Rate of change of frequency under line contingencies in high voltage electric power networks with uncertainties*, Chaos **29**, 103130 (2019). [doi.org/10.1063/1.5115002], [arxiv.org/abs/1906.05698]
- [Tyl19] M. Tyloo, **R. Delabays**, and P. Jacquod, *Noise-induced desynchronization and stochastic escape from equilibrium in complex networks*, Phys. Rev. E **99**, 062213 (2019). [doi.org/10.1103/PhysRevE.99.062213], [arxiv.org/abs/1812.09497]
- [Cim19] D. Cimasoni and **R. Delabays**, *The topological hypothesis for discrete spin models*, J. Stat. Mech. **2019** (2019). [doi.org/10.1088/1742-5468/ab0c14], [arxiv.org/abs/1811.10263]
- [Del19a] **R. Delabays**, P. Jacquod, and F. Dörfler, *The Kuramoto Model on Oriented and Signed Graphs*, SIAM J. Appl. Dyn. Syst. **18**, 458 (2019). [doi.org/10.1137/18M1203055], [arxiv.org/abs/1807.11410]
- [Del17b] **R. Delabays**, M. Tyloo, and P. Jacquod, *The size of the sync basin revisited*, Chaos **27**, 103109 (2017). [doi.org/10.1063/1.4986156], [<http://arxiv.org/abs/1706.00344>]
- [Col17] T. Coletta, **R. Delabays**, and P. Jacquod, *Finite-size scaling in the Kuramoto model*, Phys. Rev. E **95**, 042207 (2017). [doi.org/10.1103/PhysRevE.95.042207], [arxiv.org/abs/1612.07031]
- [Del17a] **R. Delabays**, T. Coletta, and P. Jacquod, *Multistability of phase-locking in equal-frequency Kuramoto models on planar graphs*, J. Math. Phys. **58**, 032703 (2017). [doi.org/10.1063/1.4978697], [arxiv.org/abs/1609.02359]
- [Col16a] T. Coletta, **R. Delabays**, I. Adagideli, and P. Jacquod, *Topologically protected loop flows in high voltage AC power grids*, New J. Phys. **18**, 103042 (2016). [doi.org/10.1088/1367-2630/18/10/103042], [arxiv.org/abs/1605.07925]
- [Del16] **R. Delabays**, T. Coletta, and P. Jacquod, *Multistability of phase-locking and topological winding numbers in locally coupled Kuramoto models on single-loop networks*, J. Math. Phys. **57**, 032701 (2016). [doi.org/10.1063/1.4943296], [arxiv.org/abs/1512.04266]

Publications in peer-reviewed conference proceedings

- [Del22c] **R. Delabays**, L. Pagnier, and M. Tyloo, *Locating fast-varying line disturbances with the frequency mismatch*, IFAC-PapersOnLine **55**, 270 (2022). [doi.org/10.1016/j.ifacol.2022.07.271], [arxiv.org/abs/2202.08317]
- [Del21c] **R. Delabays** and M. Tyloo, *Network Inference using Sinusoidal Probing*, IFAC-PaperOnLine **54**, 696 (2021). [doi.org/10.1016/j.ifacol.2021.06.131], [arxiv.org/abs/2002.00490]
- [Col16b] T. Coletta, **R. Delabays**, L. Pagnier, and P. Jacquod, *Large Electric Load Fluctuations in Energy-efficient Buildings and how to Suppress them with Demand Side Management*, IEEE PES ISGT Conf. Europe (2016). [doi.org/10.1109/ISGTEurope.2016.7856328], [tinyurl.com/yd59ym5w]

Editorials

- [eDel24] **R. Delabays**, L. Pagnier, B. Schäfer, M. Tyloo, and D. Witthaut, *Focus on monitoring and control of complex supply systems*, Journal of Physics: Complexity, **5**, 040201 (2024). [doi.org/10.1088/2632-072X/acfadd]

Softwares

- [sDel24] **R. Delabays**, G. De Pasquale, and Y. Zhang, *THIS: Taylor-based Hypergraph Infernce using SINDy (v1.0)*, Zenodo (2024). [doi.org/10.5281/zenodo.10530470]
- [sDel22c] **R. Delabays**, A. Y. Lohkov, M. Tyloo, and M. Vuffray, *SALO: System-Agnostic Localization of Oscillations*, GitHub (2022). [<https://github.com/lanl-ansi/SALO>]
- [sDel22b] **R. Delabays**, *ADGenerator: Authors Distribution Generator (v1.1)*, Zenodo (2022). [doi.org/10.5281/zenodo.6030302]
- [sDel22a] **R. Delabays**, *DFNSolver: Dissipative Flow Networks Solver (v1.2)*, Zenodo (2022). [doi.org/10.5281/zenodo.5899407]

Talks and posters

All slides and posters can be found on www.DelabaysRobin.site.

- Feb. 5 – 9, 2024** Champéry Power Conference 2024.
Talk: *Locating the source of forced oscillations in transmission power grids.*
- Dec. 13 – 15, 2023** IEEE CDC 2023, Singapore.
Talk: *Semicontraction and Synchronization of Kuramoto-Sakaguchi Oscillator Networks.*
- Jul. 17 – 20, 2023** IC2S2 2023, Copenhagen, Denmark.
Poster: Heavy-tailed distribution of the number of papers within scientific journals.
- Jul. 10 – 14, 2023** NetSci 2023, Vienna, Austria.
Talk: *Locating the source of forced oscillations in transmission power grids.*
- Sep. 13 – 15, 2022** SIAM Network Science Workshop 2022, Online.
Talk: *Complex networks of lossy oscillators: Multistability, anomalies, and loop flows in power grids.*
- Jul. 13 – 15, 2022** Autonomous Energy Systems Workshop, NREL, Golden (CO), USA.
Poster: *Locating the source of forced oscillations: A system-agnostic approach.*
- Jul. 5 – 7, 2022** NecSys22, Zurich, Switzerland.
Poster: *Locating fast-varying line disturbances with the frequency mismatch.*
- Apr. 27, 2022** CNLS Seminar, Los Alamos National Laboratory (NM), USA.
Talk: *From undirected to directed diffusive networks of dynamical agents.*
- Apr. 20, 2022** SFI Seminar, Santa Fe Institute (NM), USA.
Talk: *From undirected to directed diffusive networks of dynamical agents.*
- Oct. 25 – 29, 2021** Conference on Complex Systems 2021, Lyon, France.
Talk: *Flow Network Problems on the n-torus with Asymmetric Couplings.*
- Jul. 5 – 10, 2021** Networks 2021, Online.
Talk: *Reconstructing Network Structures from Partial Measurements.*
- Jan. 11 – 15, 2021** Grid Science Conference, Online.
Poster: *Reconstructing Network Structure from Partial Measurements.*
- Nov. 4 – 8, 2019** Network Dynamics in the Social, Economic, and Financial Sciences, Torino, Italy.
Talk: *Robustness of Elections Results Against External Influence.*
- Sep. 23 – 26, 2019** International Workshop on Complex Systems and Networks 2019, Berlin, Germany.
Talk: *Rate of Change of Frequency under Line Contingencies.*

- Feb. 3 – 8, 2019** Future Electric Power Systems, Champéry, Switzerland.
Poster: *Bounding the Desynchronization Time in Electrical Grids under Fluctuating Sources.*
- Jan. 18, 2019** CCDC Seminar, UC Santa Barbara (CA), USA.
Talk: *Bounding the Destabilization Time in Networks of Coupled Noisy Oscillators.*
- Jan. 7 – 11, 2019** Grid Science Conference, Santa Fe (NM), USA.
Poster: *Bounding the Desynchronization Time in Electrical Grids under Fluctuating Sources.*
- Sep. 3 – 7, 2018** Dynamics Days Europe, Loughborough, United Kingdom.
Talk: *Multistability in Electric Power Grids on Meshed, Complex Networks.*
- Jan. 29 – 31, 2018** 661. WE-Heraeus Seminar, Bad Honnef, Germany.
Poster: *The Size of the Sync Basin Revisited.*
- Sep. 3 – 8, 2017** International School on Energy Systems, Kloster Seeon, Germany.
Poster: *Topologically Protected Loop Flows in High Voltage AC Power Grids.*
- Feb. 5 – 9, 2017** Future Electric Power Systems, Champéry, Switzerland.
Talk: *Loop Flows and the Number of Power Flow Solutions in Meshed Electric Power Grids.*
- Jan. 8 – 13, 2017** Grid Science Conference, Santa Fe (NM), USA.
Poster: *Multistability of Phase-Locking and Vortices in Locally Coupled Kuramoto Models.*
- Jun. 6 – 10, 2016** Dynamics Days, Corfu, Greece.
Talk: *Multistability of Phase-Locking and Topological Winding Numbers in Locally Coupled Kuramoto Models.*

Outreach activities

- Mar. 21, 2024** Journées Culturelles de la Planta, Sion, Switzerland.
Lecture course to high school students: *Les rouages du calcul de l'empreinte énergétique.*
- Sep. 12 – 15, 2023** Colloque de la Commission Romande de Mathématiques, Champéry, Switzerland.
Lecture course to high school mathematics teachers: *Graphes et réseaux électriques.*
- Apr. 4 – 5, 2019** Journées Culturelles de la Planta, Sion, Switzerland.
Lecture course to high school students: *Les statistiques comme outil de manipulation... Comment tricher sans mentir ?.*
- Mar. 30, 2017** Journées Culturelles de la Planta, Sion, Switzerland.
Lecture course to high school students: *La Transition Énergétique.*