

Victor BOUSSANGE

Engineer in Energy & Environmental Systems

Ph.D in Environmental Sciences

github.com/vboussange

https://vboussange.github.io

+33 6 95 57 52 90 @ bvictor@ethz.ch

Zürich, Switzerland i Born 1995 (age 28) | France Citizen



EDUCATION

October 2022	Ph.D in Environmental Sciences, SWISS FEDERAL INSTITUTE FOR FOREST, SNOW AND LANDSCAPE (WSL SWISS FEDERAL INSTITUTE OF TECHNOLOGY ZURICH, ETH), Switzerland
September 2018	<i>"Forward and inverse modelling of eco-evolutionary dynamics in ecological and economic systems"</i> . Under the guidance of Prof. Dr. Loïc Pellissier. eco-evolutionary dynamics mathematical modeling scientific machine learning complex systems
June 2017 September 2016	Full year academic exchange, UNIVERSITY OF NEW SOUTH WALES (UNSW SYDNEY), Australia
June 2017 February 2017	Master thesis in theoretical geomechanics, UNSW SYDNEY CSIRO, Australia <i>"Numerical continuation and bifurcation analysis for unconventional geomechanics"</i> . Under the guidance of Dr. Thomas Poulet. numerical continuation bifurcation analysis
August 2018 September 2013	B.S./ M.S. in Energy and Environmental Engineering, INSTITUT NATIONAL DES SCIENCES APPLIQUÉES DE LYON (INSA LYON), France Two-year undergraduate intensive course in mathematics and physics. Ranking : 21/650 students. Three-year undergraduate engineering course in Energy and Environmental Systems, focused on Advanced Energy Systems and Efficiency. fluid mechanics thermodynamics networks and optimisation energy markets

PROFESSIONAL APPOINTMENTS

April 2023	Postdoctoral researcher, SWISS FEDERAL INSTITUTE FOR FOREST, SNOW AND LANDSCAPE (WSL) SWISS FEDERAL INSTITUTE OF TECHNOLOGY ZURICH (ETHZ), Switzerland
November 2022	Ecosystems and landscape evolution group, under the guidance of L. Pellissier. ecological modelling attribution of changes in biodiversity to global change
August 2018 March 2018	R&D intern, COMPAGNIE NATIONAL DU RHÔNE (CNR), France Development of an Energy Management System based on various optimisation techniques for optimal production of renewable resources. Applications to EU sponsored projects : Jupiter1000 (power-to-gas) Move in pure (vehicle-to-grid) Marie-Galante island (micro-grid) software development mathematical optimisation energy trading

PUBLICATIONS

Peer-reviewed

- **Boussange, V.** & Pellissier, L., *Eco-evolutionary model on spatial graphs reveals how habitat structure affects phenotypic differentiation*. Commun Biol 5, 668 (2022). [bioRxiv]

Preprints

- **Boussange, V.**, Lischke, H., Sornette, D., Pellissier, L., *Processes analogous to ecological interactions and dispersal shape the dynamics of economic activities*. [arXiv] (2023), 23 pages. In review at Journal of the Royal Society Interface.
- **Boussange, V.**, Vilimelis-Aceituno, P., Pellissier, L., *Mini-batching ecological data to improve ecosystem models with machine learning* [bioRxiv] (2022), 46 pages. In review at PLOS Computational Biology.
- **Boussange, V.**, Becker, S., Jentzen, A., Kuckuck, B., Pellissier, L., *Deep learning approximations for non-local nonlinear PDEs with Neumann boundary conditions*. [arXiv] (2022), 59 pages. In review at Partial Differential Equations and Applications.

Proceedings

- Poulet, T., Alevizos, S., Veveakis, M., **Boussange, V.**, Regenauer-Lieb, K., *Episodic mineralising fluid injection through chemical shear zones*, ASEG Extended Abstracts (2018), 5 pages.

Unpublished work

- Skeels, A., Boschman, L.M., McFadden, I., Joyce, E.M., Hagen, O., Jiménez Robles, O., Bach, W., **Boussange, V.**, Keggin, T., Jetz, W., Pellissier, L., *Paleoenvironments shaped biotic exchange across Wallace's Line*. In review at Science.
- **Boussange, V.**, Karger, D., Malle, J. T., Midolo, D., *Attribution of changes in biodiversity to global change*. (in alphabetical order)

TALKS

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| March 2023 | 2-day workshop organizer and speaker, <i>Practical introduction to Julia for modelling and data analysis in biodiversity and earth sciences</i> , WSL biodiversity center, Birmensdorf, Switzerland |
| July 2022 | Speaker, HighDimPDE.jl : A Julia package for solving high-dimensional PDEs, JuliaCon2022, online |
| June 2022 | Speaker, <i>Interpretable machine learning for forecasting dynamical processes in ecosystems</i> , World Biodiversity Forum, Davos, Switzerland |
| June 2022 | Invited speaker, <i>Investigating empirical patterns of biodiversity with mechanistic eco-evolutionary models</i> , Seminar at the Theoretical Ecology and Evolution group, Universität Bern, Switzerland |
| November 2021 | Invited speaker, <i>Numerical approximations of solutions of highly dimensional, non-local nonlinear PDEs</i> , StAMBio seminar, St Andrews, UK |
| October 2021 | Speaker, <i>Graph topology and habitat assortativity drive phenotypic differentiation in an eco-evolutionary model</i> , Conference on Complex Systems, Lyon, France |
| October 2021 | Speaker, <i>Using graph-based metrics to assess the effect of landscape topography on diversification</i> , ECBC, Amsterdam, Netherlands |
| September 2021 | Speaker, <i>Solving non-local nonlinear Partial Differential Equations in high dimensions with HighDimPDE.jl</i> , International Conference on Computational Methods in Systems Biology, Bordeaux, France |
| April 2021 | <i>Responses of neutral and adaptive diversity to complex geographic population structure</i> , Mathematical Population Dynamics, Ecology and Evolution, CIRM Marseille, France |

SOFTWARES

PIECEWISEINFERENCE.JL

2022

github.com/vboussange/PiecewiseInference.jl [documentation](#)

Suite for parameter inference and model selection with dynamical models characterised by complex dynamics.

Julia

PARAMETRICMODELS.JL

2022

github.com/vboussange/ParametricModels.jl [documentation](#)

Utilities for parametric and composite differential equation models.

Julia

HIGHDIMPDE.JL

2021

github.com/SciML/HighDimPDE.jl [documentation](#)

A Julia package that breaks down the curse of dimensionality in solving non local, non linear PDEs.

Julia

EVOLD.JL

2019 - 2021

github.com/vboussange/Evold.jl [documentation](#)

Evolutionary individual based modelling, mathematically grounded.

Julia

OPTIVPP

2018

[confidential](#)

Energy Management System for Virtual Power Plants.

Python

GAMS

Open Source contributions

Member of the SciML organisation (open source software for scientific machine learning) with many contributions to core packages, further contributions to CUDA.jl, Flux.jl, LightGraphs.jl.

</> PROGRAMMING

Programming languages	Julia, Python, C++, Java, Matlab, R, Bash, Mathematica, VBA, \LaTeX
Libraries	Flux.jl, DifferentialEquations.jl, DiffEqFlux.jl, CUDA.jl, LightGraphs.jl, TensorFlow, Keras, ArchGDAL, matplotlib

TEACHING AND SUPERVISION

December 2023	701-3001-00L Environmental Systems Data Science, ETH ZÜRICH, D-USYS, Switzerland
September 2020	Undergraduate course. In charge of the unit <i>Supervised Deep Learning - Application</i> .
June 2020	262-0100-00L Lab rotation, ETH ZÜRICH, D-BSSE, Switzerland
April 2020	Supervision of Cecilia Valenzuela Agui in the frame of her MS in <i>Computational Biology and Bioinformatics</i> .
December 2020	Taste of research internship, POLYTECH NICE-SOPHIA, France
September 2020	Supervision of Nicolas Demolin for his research internship in the frame of his MS in <i>Applied Mathematics and Modeling</i> .

LANGUAGES

French ● ● ● ● ●
English ● ● ● ● ●

Spanish ● ● ● ○ ○
German ● ● ○ ○ ○

HOBBIES

- > Ski touring, ski mountaineering. **Major achievements** : Haute Route Chamonix Zermatt in autonomy, 7 days, group leader, february 2022 | Graubünden Haute Route, 6 days, group leader, february 2021.
- > Alpinism. **Major achievements** : Spaghetti tour, 6 days, group leader, AD, 2021 | Mönch 4017m, Normal route, AD, 2020 | Piz Palü 3882m, traverse W-E from Rifugi dals Chamuotschs-Fortezza, PD 2c, 2020.

- > Rock climbing, alpine climbing. **Major achievements** : Sewenstock 2820m, “Amarone”, 10 pitches, 7 pitches in 6a+, 2021 | Hannibalturm 2920m, “Conquest of Paradise”, 6 pitches, 6b, 2020 | Brüggler, “Sonntagweg”, 7 pitches, 6a+, 2020.
- > Enduro mountainbiking, bikepacking. **Major achievements** : ”From the first to the last droplet of the Rhone river”, Furkapass to Marseille, 11 days, group leader, 2018-2020 | Tour du Mont Blanc, 5 days, group leader, 2019.
- > Surfing.

“ REFERENCES

Prof. Dr. Loïc Pellissier

Landscape Ecology, ETH ZÜRICH

@ loic.pellissier@usys.ethz.ch

☎ +41 44 632 32 03

Prof. Dr. Arnulf Jentzen

, UNIVERSITY OF MÜNSTER

@ ajentzen@uni-muenster.de

☎ +49 251 83-33792

Dr. Thomas Poulet

Deep Earth Imaging, CSIRO

@ thomas.poulet@csiro.au

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