Victor BOUSSANGE
Engineer in Energy & Environmental Systems
Ph.D in Environmental Sciences

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   Zürich, Switzerland   i Born 1995 (age 29) | France Citizen

🏛 EDUCATION

October 2022 — September 2018	**Ph.D in Environmental Sciences**, SWISS FEDERAL INSTITUTE FOR FOREST, SNOW AND LANDSCAPE (WSL | SWISS FEDERAL INSTITUTE OF TECHNOLOGY ZURICH, ETH), Switzerland *"Forward and inverse modelling of eco-evolutionary dynamics in ecological and economic systems"*. 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 *"Numerical continuation and bifurcation analysis for unconventional geomechanics"*. 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

February 2024 — October 2023	**Postdoctoral researcher**, SWISS FEDERAL INSTITUTE FOR FOREST, SNOW AND LANDSCAPE (WSL), Switzerland Dynamic Macroecology group with Niklaus E. Zimmermann. `global change biodiversity` `novel methods for conservation` `teaching and supervision`
April 2023 — November 2022	**Postdoctoral researcher**, SWISS FEDERAL INSTITUTE OF TECHNOLOGY ZURICH (ETHZ) | SWISS FEDERAL INSTITUTE FOR FOREST, SNOW AND LANDSCAPE (WSL), Switzerland Ecosystems and landscape evolution group with Loïc Pellissier. `inverse modelling` `ecological modelling` `teaching and supervision`
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`

$ FUNDINGS

March 2023	WSL Biodiversity Center Innovative Workshop grant, **10,000CHF**.

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📘 PUBLICATIONS

Peer-reviewed

> Alsos, I.G., **Boussange, V.**, Rijal, D.P., Beaulieu, M., Brown, A.G., Herzschuh, U., Svenning, J.C., Pellissier, L., *Using ancient sedimentary DNA to forecast ecosystem trajectories under climate change*. Phil. Trans. R. Soc. B (2024).

> **Boussange, V.**, Becker, S., Jentzen, A., Kuckuck, B., Pellissier, L., *Deep learning approximations for nonlocal nonlinear PDEs with Neumann boundary conditions*. Accepted in Partial Differential Equations and Applications, 59 pages (2023). [arXiv]

> Skeels, A., Boschman, L. M., McFadden, I. R., Joyce, E.M., Hagen, O., Jiménez Robles, O., Bach, W., **Boussange, V.**, Keggin, T., Jetz, W., Pellissier, L., *Paleoenvironments shaped the exchange of terrestrial vertebrates across Wallace's Line*. Science 381, 86-92 (2023).

> **Boussange, V.**, *Forward and inverse modelling of eco-evolutionary dynamics in ecological and economic systems*, PhD thesis. ETH Zurich (2022).

> **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., *Partitioning ecological time series to improve process-based models with machine learning* [bioRxiv] (2022), 46 pages. In review at Methods in Ecology and Evolution.

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

> **Boussange, V.**, Karger, D., Malle, J. T., Midolo, D., *Assessing the combined effect of habitat and climate change on biodiversity*. (in alphabetical order)

🔊 Talks

July 2024	Speaker, **PiecewiseInference.jl** : *inverse modelling for complex dynamics*, JuliaCon2024, Eindhoven, Netherlands
April 2024	Speaker, *A deep learning macroecological model to assess the combined effect of habitat loss and climate change on biodiversity*, EGU 2024, Vienna, Austria
April 2024	Workshop organizer and speaker, *Introduction to Julia for geoscience*, EGU 2024, Vienna, Austria
January 2024	Speaker, *A scalable machine learning approach to assess the combined effect of habitat loss and climate change on biodiversity*, IBS 2024, Prague, Czech Republic
April 2023	Speaker, **PiecewiseInference.jl** : *a machine learning framework for inverse ecosystem modelling*, EGU 2023, Vienna, Austria
March 2023	2-day workshop organizer and speaker, *Practical introduction to Julia for modelling and data analysis in biodiversity and earth sciences*, WSL biodiversity center, Birmensdorf, Switzerland
February 2023	Invited speaker, *Combining eco-evolutionary theory and machine learning to advance our understanding of living systems*, Seminar at the Laboratoire interdisciplinaire de physique (LiPhy), Grenoble, France
July 2022	Speaker, **HighDimPDE.jl** : *A Julia package for solving high-dimensional PDEs*, JuliaCon2022, online
June 2022	Speaker, *Interpretable machine learning for forecasting dynamical processes in ecosystems*, World Biodiversity Forum, Davos, Switzerland
June 2022	Invited speaker, *Investigating empirical patterns of biodiversity with mechanistic eco-evolutionary models*, Seminar at the Theoretical Ecology and Evolution group, Universität Bern, Switzerland
November 2021	Invited speaker, *Numerical approximations of solutions of highly dimensional, non-local nonlinear PDEs*, StAMBio seminar, St Andrews, UK
October 2021	Speaker, *Graph topology and habitat assortativity drive phenotypic differentiation in an eco-evolutionary model*, Conference on Complex Systems, Lyon, France
October 2021	Speaker, *Using graph-based metrics to assess the effect of landscape topography on diversification*, ECBC, Amsterdam, Netherlands
September 2021	Speaker, *Solving non-local nonlinear Partial Differential Equations in high dimensions with HighDimPDE.jl*, International Conference on Computational Methods in Systems Biology, Bordeaux, France
April 2021	*Responses of neutral and adaptive diversity to complex geographic population structure*, Mathematical Population Dynamics, Ecology and Evolution, CIRM Marseille, France

💻 Softwares

EcoEvoModelZoo.jl
2023
🔗 github.com/vboussange/EcoEvoModelZoo.jl   🔗 documentation
A zoo of eco-evolutionary models with high fitness.

`Julia`

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`

EvoId.jl
2019 - 2021
🔗 github.com/vboussange/EvoId.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, JAX, xarray, scikit-learn, pytorch

🎓 TEACHING AND SUPERVISION

July 2024 — February 2023	**701-1679-00L Landscape Modelling of Biodiversity : From Global Changes to Conservation, ETH ZÜRICH, D-USYS, Switzerland** Environmental Sciences Master course. Supervising a student group on the proposed project *Modelling the spread dynamics of invasive alien species*.
December 2023 — September 2023	**701-3001-00L Environmental Systems Data Science, ETH ZÜRICH, D-USYS, Switzerland** Undergraduate course. In charge of the unit *Supervised Deep Learning - Application*.
June 2020 — April 2020	**262-0100-00L Lab rotation, ETH ZÜRICH, D-BSSE, Switzerland** Supervision of Cecilia Valenzuela Agui in the frame of her MS in *Computational Biology and Bioinformatics*.
December 2020 — September 2020	**Taste of research internship, POLYTECH NICE-SOPHIA, France** Supervision of Nicolas Demolin for his research internship in the frame of his MS in *Applied Mathematics and Modeling*.

🌐 LANGUAGES

French	●●●●●		Spanish	●●●○○
English	●●●●●		German	●●●○○

🚲 HOBBIES

> Ski touring, ski mountaineering, alpinism, rock climbing. **Major achievements** : Descent of the North face of Mt Blanc with skis, may 2023 | North-South traverse of the Alps from Innsbruck to Venice with skis and bicycle, march 2023 | Haute Route Chamonix Zermatt, february 2022 | Crossing of the Grisons massif with skis, february 2021.

> Enduro mountainbiking, bikepacking. **Major achievements** : "From the first to the last droplet of the Rhone river", Furkapass to Marseille, 2018-2020 | Tour du Mont Blanc, 2019.

> Sailing. **Major achievements** : Refit of a 36-feet, 40 year-old sailing boat, sailed it from Germany to Norway, may-august 2023.

> Surfing.

Full adventure CV available at https://vboussange.github.io/pages/alpine_cv/.

66 REFERENCES

Prof. Dr. Loïc Pellissier	**Prof. Dr. Arnulf Jentzen**	**Dr. Thomas Poulet**
Landscape Ecology, ETH ZÜRICH	, UNIVERSITY OF MÜNSTER	*Deep Earth Imaging*, CSIRO
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