ARTHUR BAUVILLE
NUMERICAL MODELING OF TECTONIC PROCESSES

WORK ADRESS

国立研究開発法人 海洋研究開発機構

数理科学・先端技術研究分野

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EMPLOYMENT

07/2017 – Present –Researcher, Center for mathematics and Advanced Technology, Japan Agency for Marine-Earth Sciences and Technology (**JAMSTEC**), Yokohama, Japan

01/2016 – 06/2017 – External researcher, Department of Mathematics and Advanced Technology, Japan Agency for Marine-Earth Sciences and Technology (**JAMSTEC**), Yokohama, Japan

12/2014 – 12/2015 – Post/doctoral researcher, Geosciences Institute, **University of Mainz**, Germany

EDUCATION

11/2010 – 11/2014 – PhD in Earth Sciences, Institute of Earth Sciences, **University of Lausanne,** Switzerland

Thesis: Tectonics of the Helvetic Nappe System (W Switzerland): Control of Strain Localization and basement-cover deformation – insights from models based on continuum mechanics

Thesis advisor: S. M. Schmalholz

2008 - 2010 – MSc, ISTerre – Institute of Earth Sciences, **University of Grenoble**, France

Thesis: Structure of the Panzhihua intrusion and its contact aureole (China),

advisors, N. T. Arndt and A. Pêcher

2009 – Summer internship at the Space Sciences Laboratory, **University of California, Berkeley**, USA

2006 - 2008 – BSc, **University of Tours**, France

AQUIRED FUNDS

2019 - 0.8 M円 (1 student/2 months): JSPS summer program grant.

Project: Numerical modeling of triangle zones formation in accretionary prisms

2017 - 3.9 M円: Kakenhi - young researcher No. 18K13643.

Project: Numerical simulations for the formation of dynamic decollement and subduction plate interface

2017 - 9 M円: JSPS Postdoctoral Fellowship for Research in Japan (Standard) grant.

Project: Numerical simulations for the formation of dynamic decollement and subduction plate interface

(note: I had to refuse the grant because I was hired as a tenure-track researcher in JAMSTEC)

2016 - 1.5 M円: A research grant from JAMSTEC in 総合海洋掘削科学研究開発部会.

Project: Development of the simulation tools for evaluating long-term tectonic stability.

2015 - 7 M円: Swiss National Science Foundation early PostDoc Mobility Grant No. 161927.

Project: Stress and strain localization at the interface between tectonic plates with application to the Japanese subduction zones.

PUBLICATIONS

(submitted) **Bauville, A.**, & Yamato, P., **2020**, Pressure-to-depth conversion models for metamorphic rocks: derivation and applications, *Geochemistry, Geophysics, Geosystems.*

Humair, F., **Bauville, A.**, Epard, J. L., & Schmalholz, S. M., **2020**, Interaction of folding and thrusting during fold-and-thrust-belt evolution: Insights from numerical simulations and application to the Swiss Jura and Canadian Foothills, *Tectonophysics*, DOI: [10.1016/j.tecto.2020.228474](https://doi.org/10.1016/j.tecto.2020.228474)

Spitz, R., **Bauville, A.**, Epard, J. L., Kaus, B. J., Popov, A. A., & Schmalholz, S. M., **2020**, Control of 3D tectonic inheritance on fold-and-thrust belts: insights from 3D numerical models and application to the Helvetic nappe system. *Solid Earth,* DOI: [10.5194/se-2019-173](https://doi.org/10.5194/se-2019-173)

Bauville, A., Furuichi, M., & Gerbault, M., **2020**, Control of fault weakening on the structural styles of underthrusting-dominated non-cohesive accretionary wedges. *JGR: Solid Earth*, 125(3), DOI: [10.1029/2019JB019220](https://doi.org/10.1029/2019JB019220)

Bauville, A., & Baumann, T. S., **2019**, geomIO: An Open−Source MATLAB Toolbox to Create the Initial Configuration of 2−D/3−D Thermo−Mechanical Simulations From 2−D Vector Drawings. *Geochemistry, Geophysics, Geosystems*, 20(3), 1665-1675. DOI: [10.1029/2018GC008057](https://doi.org/10.1029/2018GC008057)

Koge, H., Yamada, Y., Ohde, A., **Bauville, A.**, Yamaguchi, A., & Ashi, J., **2018**, Dynamic formation process of thick deformation zone on the shallow plate boundary fault of the Japan Trench: insight from analog experiments of half-graben subduction. *Progress in Earth and Planetary Science*, 5(1), 69. DOI: [10.1186/s40645-018-0230-5](https://doi.org/10.1186/s40645-018-0230-5)

Furuichi, M., Nishiura, D., Kuwano, O., **Bauville, A.**, Hori, T., & Sakaguchi, H., **2018**, Arcuate stress state in accretionary prisms from real-scale numerical sandbox experiments. *Scientific reports*, 8(1), 1-11. DOI: [10.1038/s41598-018-26534-x](https://doi.org/10.1038/s41598-018-26534-x)

Bauville, A.. & Schmalholz, S. M., **2017**, Tectonic inheritance and kinematic strain localization as trigger for the formation of the Helvetic nappes, Switzerland. *Swiss Journal of Geosciences*, p. 1-12, DOI: [10.1007/s00015-017-0260-9](https://doi.org/10.1007/s00015-017-0260-9)

Picazo, S., Müntener, O., Manatschal, G., **Bauville, A.**, Karner, G., & Johnson, C., **2016**, Mapping the nature of mantle domains in Western and Central Europe based on clinopyroxene and spinel chemistry: Evidence for mantle modification during an extensional cycle. *Lithos*, v. 266, p. 233-263, DOI: [10.1016/j.lithos.2016.08.029](https://doi.org/10.1016/j.lithos.2016.08.029)

Kaus, B. J. P., Popov, A. A., Baumann, T. S., Püsök, A. E., **Bauville, A.**, Fernandez, N. & Collignon, M., **2016**, Forward and inverse modelling of lithospheric deformation on geological timescales. NIC Symposium 2016 - Proceedings. NIC Series. Vol. 48. edited by K. Binder, M. Müller, A. Schnurpfeil, p. 299-307.

Bauville, A. & Schmalholz, S. M., **2015**, Transition from thin-to thick-skinned tectonics and consequences for nappe formation: numerical simulations and applications to the Helvetic

nappe system, Switzerland. *Tectonophysics*, v. 665, p. 101-117, DOI: 10.1016/j.tecto.2015.09.030

Jaquet, Y., **Bauville, A.**, & Schmalholz, S. M., **2014**, Overthrusting versus folding: 2-D quantitative modeling and its application to the Helvetic and Jura fold and thrust belts, *Journal of Structural Geology*, v. 62, p. 25-37, DOI: [10.1016/j.jsg.2014.01.010](10.1016/j.jsg.2014.01.010)

Pêcher, A., Arndt, N., Jean, A., **Bauville, A.**, Ganino, C., & Athurion, C., **2013**, Structure of the Panzhihua intrusion and its Fe-Ti-V deposit, China, *Geoscience Frontiers*, v. 4-5, p. 571-581, DOI: [10.1016/j.gsf.2013.02.004](10.1016/j.gsf.2013.02.004).

Bauville, A., & Schmalholz, S. M., **2013**, Thermo-mechanical model for the finite strain gradient in kilometer-scale shear zones, *Geology*, v. 41, p. 567-570, DOI: [10.1130/G33953.1](10.1130/G33953.1).

Bauville, A., Epard, J-L., & Schmalholz, S. M., **2013**, A simple thermo-mechanical shear model applied to the Morcles fold nappe (Western Alps), *Tectonophysics*, v. 583, p. 76-87, DOI: 10.1016/j.tecto.2012.10.022.

Butterworth, A. L., Gainsforth, Z., **Bauville, A.**, Bonal, L., Brownlee, D. E., Fakra, S. C., Huss, G. R., Joswiak, D., Kunz, M., Marcus, M. A., Nagashima, K., Ogliore, R. C., Tamura, N., Telus, M., Tyliszczak, T. & Westphal, A. J., **2010**, A type IIA chondrule fragment from comet 81P/wild 2 in Stardust track C2052, 2, 74, *41st Lunar and Planetary Science Conference*, Bib. Code: [2010LPI....41.2446B](2010LPI....41.2446B).

CONFERENCE PRESENTATIONS

2020 – JAPAN GEOSCIENCE UNION MEETING

A. Bauville, P. Yamato, Pressure-to-depth conversion for metamorphic rocks: review and application

2019 – JAPAN GEOSCIENCE UNION MEETING

A. Bauville, M. Furuichi & M. Gerbault, Control of fault weakening on the structural styles of underthrusting-dominated non-cohesive tectonic wedges

2019 – EUROPEAN GEOSCIENCE UNION GENERAL ASSEMBLY

A. Bauville, M. Furuichi & M. Gerbault, The structural styles of underthrusting-dominated non-cohesive tectonic wedges

M. Furuichi, **A. Bauville,** D. Nishiura, O. Kuwano, T. Hori, H. Sakaguchi, The real-scale numerical sandbox experiments for understanding stress state in accretionary prisms

2018 – JAPAN GEOSCIENCE UNION MEETING

A. Bauville & M. Furuichi, Numerical simulations of the formation of a dynamic decollement

2017 – EUROPEAN GEOSCIENCE UNION GENERAL ASSEMBLY

A. Bauville & M. Furuichi, Numerical simulations of the formation of a decollement in homogeneous sediments

2017 – JAPAN GEOSCIENCE UNION MEETING

A. Bauville & M. Furuichi, Dynamic initiation of decollement in accretionary prisms.

2017 – EUROPEAN GEOSCIENCE UNION GENERAL ASSEMBLY

A. Bauville & M. Furuichi, Development and propagation of a subduction plate interface: insight from hydro-thermo-mechanical models.

2016 – GEOMOD

A. Bauville & M. Furuichi, Hydro-thermo-mechanical numerical simulations for the control of sea floor topography on interplate strength in subduction zones.

2016 – JAPAN GEOSCIENCE UNION MEETING

A. Bauville, Strain localization in accretionary prisms.

2016 – EUROPEAN GEOSCIENCE UNION GENERAL ASSEMBLY

T. Baumann & **A. Bauville**, geomIO: A tool for geodynamicists to turn 2D cross-sections into 3D geometries.

F. Humair, J.-L. Epard, **A. Bauville**, M. Jaboyedoff, D. Pana, B. Kaus, & S. Schmalholz , Fold-related-fracturing at the Livingstone River anticline (AB; Canada) by coupling field surveying and numerical modelling.

F. Humair, **A. Bauville**, J.-L. Epard, and S. Schmalholz , Detachment folds versus thrust-folds: numerical modelling and applications to the Swiss Jura Mountains and the Canadian Foothills.

S. Picazo, O. Müntener, G. Manatschal, and **A. Bauville**, Large-scale pattern of mantle evolution through rifting in hyper-extended margins.

L. Candioti, **A. Bauville**, S. Picazo, G. Mohn, and B. Kaus , Control of hyper-extended passive margin architecture on subduction initiation with application to the Alps and present-day North Atlantic ocean.

2015 – XIVth International Workshop on Mantle and Lithosphere Dynamics

A. Bauville, T. Baumann, & B. Kaus, 3D geodynamic models of alpine type collisions and details of a new method to create 3D input geometries for particles-in-cell based codes

2015 – European Geoscience Union General Assembly

A. Bauville, B. Kaus & M. Handy, 3D numerical modeling of the Alpine collision.

F. Humair, **A. Bauville**, J-L. Epard & S. M. Schmalholz, Transition between folding and thrusting: numerical simulations and applications to the Swiss Jura Mountains and the Canadian Foothills.

A. Bauville & S. M. Schmalholz, Transition from thin- to thick-skinned tectonics and consequences for nappe formation: numerical simulations and applications to the Helvetic nappe system, Switzerland.

A. Bauville & S. M. Schmalholz, Tectonic nappe emplacement on low-angle shear zones triggered by kinematic strain localization.

2014 – Swiss Geoscience Meeting

A. Bauville & S. M. Schmalholz, Thin- vs thick-skinned tectonics, nappe formation and shear localization: numerical simulations and applications to the Helvetic Alps and Jura mountains.

2014 – EUROPEAN **G**EOSCIENCE **U**NION **G**ENERAL **A**SSEMBLY

A. Bauville, T. Duretz, P. Yamato a& S. M. Schmalholz, Two-phase aggregates under simple shear: assessing numerical issues.

A. Bauville & S. M. Schmalholz, 2D thermo-mechanical modeling of basement-cover deformation with application to the Western Alps.

TEACHING EXPERIENCE

COURSE

2013 – Co-organizer and teacher, Introduction to experimental data analysis with Matlab, for the Western Switzerland doctoral school of Earth and Surface processes (ESPP-CUSO).

TEACHING ASSISTANT – FIELD CAMPS

2011 to 2013 – Tectonics field camp, grad. level, Uni. Lausanne.

2011 to 2013 - Structural geology field camp, grad. level, Uni. Lausanne

2011 and 2013– Basic method in Geologic mapping, undergrad. level, Uni. Lausanne.

2011– Geological mapping field course, undergrad. level, Uni. Lausanne.

TEACHING ASSISTANT - GRADUATE LEVEL

2015 – Geodynamics lecture, Uni. Mainz.

2013 – Introduction to the Finite Element Method, ETH Zürich.

2012 to 2013 - Computational tectonics with application to the Alps, Uni. Lausanne

2010 to 2012 – Finite Elements in Modeling for Geoscientist, Uni. Lausanne.

TEACHING ASSISTANT - UNDERGRADUATE LEVEL

2015 – Introduction to numerical methods, Uni. Mainz

2010 to 2014 – Introduction to quantitative methods in the Earth Sciences, Uni. Lausanne

2010 to 2014 – Geodynamics, Uni. Lausanne

2011 to 2013 – Tectonics, Uni. Lausanne.

2013 – Structural geology, Uni. Lausanne.

2012 – Physics modelling in environmental sciences, Uni. Lausanne

2012 – Matlab as a language of scientific computation, Uni. Lausanne

2011 – Introduction to Earth Sciences, Uni. Lausanne.

TECHNICAL SKILLS

NUMERICAL METHODS

Finite element, finite difference.

PROGRAMMING LANGUAGES

Matlab, C, openMP, Maple, Javascript, Python, HTML5.

GEOLOGICAL SKILLS

Geological mapping, interpretation of tectonic structures, rock mechanics.

LANGUAGES

FRENCH: Native.

ENGLISH: Full professional proficiency.

JAPANESE: Basic conversation and reading skills (~JLPT level 5).

REFERENCES

PROF. STEFAN M. SCHMALHOLZ

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