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Postdoc advisors:  
Prof. M. P. Lamb  
Earth Surface Dynamics  
Prof. V. C. Tsai  
Seismology, Glaciology

#### RESEARCH INTERESTS:

Geomorphology; glaciology; bedrock erosion; landscape evolution; interaction between cryosphere and other Earth systems

#### CURRENT POSITION:

12.2017-11.2019 Swiss National Science Foundation Mobility Postdoctoral Fellow (1.5 years) and Caltech Postdoctoral Fellow (0.5 year) at the California Institute of Technology.

#### EDUCATION:

Ph.D. 04.2011-09.2017 Earth Sciences, Simon Fraser University. Title: Numerical investigations of subglacial hydrology as direct and indirect driver of glacial erosion. Supervisor: Prof. Gwenn Flowers; Co-advisers: Prof. J. G. Venditti and Prof. M. Koppes.  
M.Sc. 09.2008-10.2010 Earth Sciences, Major in Geology and Geochemistry, ETH-Zürich (Swiss Federal Institute of Technology in Zürich). Title: The influence of hydrology on spatial patterns of glacial erosion. Supervisor: Prof. Frédéric Herman.  
B.Sc. 09.2005-09.2008 Environmental Sciences and Engineering, EPF-Lausanne (Swiss Federal Institute of Technology in Lausanne).

#### APPROVED RESEARCH PROJECTS

09.2012 – 12.2016 Swiss National Cooperative for the Disposal of Radioactive Waste, collaboration to better understand the role of subglacial hydrology in glacial erosion and inform on the future Swiss nuclear waste burial site (\$75 000 CDN over four years).  
12.2017-08.2019 Swiss National Science Foundation Early Mobility Postdoctoral Fellowship (115 000 CHF for 1.5 years, SNSF funding was effective from 01.12.2017 to 31.05.2018 and 01.09.2018 to 31.08.2019).

#### PROJECTS IN REVIEW

08.2020 – 07.2023 co-Investigator: NSF Arctic Natural Sciences, Collaborative Research: Initiation, Propagation, and Termination: Understanding coupled hydrologic and glacier dynamic instabilities from the surge of Turner Glacier. NSF proposal; PI: Dr. Ellyn Enderlin; co-PIs: Dr Dylan Mykesell and Dr. Tim Bartholomäus. Role: Research Scientist with Dr. Bartholomäus at the University of Idaho, Moscow (Budget for Uol: 671 486 USD over 3 years).  
02.2020 – 06.2021 Quantification of glacial erosion and sediment yields via simultaneous recording of sub- and pro-glacial water and sediment fluxes at Bridge glacier, Coast Ranges, BC. Swiss National Science Foundation, Postdoc Mobility (Budget: 112 750 CHF over 1.5 years). Project to be conducted with Prof. Koppes in the Department of Geography at UBC.

### PEER-REVIEWED PUBLICATIONS

- Beaud, F., G.E. Flowers, J.G. Venditti, 2018, Modeling sediment transport in ice-walled subglacial channels and its implications for esker formation and proglacial sediment yields, *Journal of Geophysical Research – Earth Surface*, 123(12), p. 3206-3227 <https://doi.org/10.1029/2018JF004779>.<sup>1</sup>
- Beaud, F., J.G. Venditti, G.E. Flowers, M. Koppes, 2018, Excavation of subglacial bedrock channels by seasonal meltwater flow, *Earth Surface Processes and Landforms*, Vol. 43, Issue 9, p. 1960—1972, doi:10.1002/esp.4367.<sup>2</sup>
- Beaud, F., G. E. Flowers, J. G. Venditti, 2016, Efficacy of bedrock erosion by subglacial meltwater flow, *Earth Surface Dynamics*, Vol. 4, p. 125—145, <https://doi.org/10.5194/esurf-4-125-2016>.<sup>3</sup>
- Beaud, F., G. E. Flowers, S. Pimentel, 2014 Seasonal-scale abrasion and quarrying patterns from a two-dimensional ice-flow model coupled to distributed and channelized subglacial drainage, *Geomorphology*, Vol. 219, p. 176-191, <https://doi.org/10.1016/j.geomorph.2014.04.036>.
- Herman F., F. Beaud, J.-D. Champagnac, J.-M. Lemieux, P. Sternai, 2011, Glacial hydrology and erosion patterns: A mechanism for carving glacial valleys, *Earth and Planetary Science Letters*, Vol. 310, Issues 3-4, p. 498-508, <https://doi.org/10.1016/j.epsl.2011.08.022>.<sup>4</sup>

### UNPUBLISHED WORK

#### In preparation:

- Beaud, F., V. C. Tsai, M. P. Lamb, Extracting physical information about subglacial water flow and sediment transport from patterns of subglacial noise production. Targeted journal: *Geophysical Research Letters*.
- Beaud, F., A Comprehensive review of glacial erosion—history, landforms, processes, measurements, and dating methods. Targeted journal: *Reviews of Geophysics*.

### CONFERENCE PRESENTATIONS AND SEMINARS

#### Invited conference abstract:

- Beaud, F., G.E. Flowers, J.G. Venditti. Implications of sediment transport by subglacial water flow for interpreting contemporary glacial erosion rates. Abstract No. EGU2017-18137 presented at the annual meeting of the EGU, Vienna, Austria, 23-28 April 2017.

#### Published conference abstracts:

- Beaud, F., V. C. Tsai, M. P. Lamb, Investigation of subglacial water flow and sediment transport combining numerical modeling and seismic noise monitoring. Abstract No. 80A2939, Oral presentation, IGS International Symposium on Glacial Erosion and Sedimentation, Madison, Wisconsin, May 12<sup>th</sup> to 17<sup>th</sup> 2019. ([Presentation](#))
- Beaud, F., M. P. Lamb, T. Ulizio, Laboratory experiments of subglacial water flow, SoCal Geomorphology Symposium, Scripps Institution of Oceanography, UC San Diego, San Diego, May 4<sup>th</sup> 2019. ([Poster](#))

<sup>1</sup> This article is the object of a commentary article by Neil Arnold in the *Journal of Geophysical Research—Earth Surface*, <https://doi.org/10.1029/2019JF005001>.

<sup>2</sup> This article was the highlight of ESP&L papers in the bi-annual newsletter of the British Society for Geomorphology ([BSG December 2018 newsletter](#))

<sup>3</sup> This article was chosen as a highlight article by the editorial board of *Earth Surface Dynamics* ([https://www.earth-surface-dynamics.net/highlight\\_articles.html](https://www.earth-surface-dynamics.net/highlight_articles.html)).

<sup>4</sup> This article was the object of a press release by the Agence Télégraphique Suisse (Swiss National News Agency) and the study was featured in two Swiss newspapers, *Le Temps* (on 2012/03/22) and *Walliser Bote* (on 2012/03/23).

- Beaud, F. How do glaciers evacuate sediment?, SoCal Geomorphology Symposium, Caltech, Pasadena, May 5<sup>th</sup> 2018.
- Beaud, F., G.E. Flowers, J.G. Venditti. Numerical modelling of esker formation in semi-circular subglacial channels. Abstract No. EGU2017-18148 presented at the 2017 annual meeting of the EGU, Vienna, Austria, 23-28 April 2017<sup>5</sup>.
- Beaud, F., G.E. Flowers, J.G. Venditti, M. Koppes. Gradual excavation of tunnel valleys and inner gorges by subglacial meltwater erosion. Abstract No. 75994 presented at the 2015 fall meeting, AGU, San Francisco, California, 14-18 December.
- Beaud, F., G.E. Flowers, J.G. Venditti. Numerical modelling of bedrock erosion by sediment transporting subglacial water, IGS International Symposium on Hydrology of Ice sheets and Glaciers, Höfn, Iceland, 22-26 June 2015.
- Beaud, F., G.E. Flowers, S. Pimentel, 2013. Flow-band modeling of glacial erosion with a multi-morphology subglacial drainage system and process-based erosion laws. Abstract EP34A-07 presented at 2013 fall meeting, AGU, San Francisco, California, 9-13 December.
- Beaud, F., G.E. Flowers, 2013. Preliminary modelling of subglacial erosion using dual-morphology subglacial hydrology and process-based erosion laws. Abstract EGU2013-6584, presented at the 2013 annual meeting (Poster), EGU, Vienna, Austria, 7-12 April.
- Champagnac, J.-D., Delunel, R., Kubik, P., Mériaux, A.-S., Beaud, F. Postglacial erosion rates from the Western Alps inferred from cosmogenic nuclides measurements. Abstract no. EGU2013-7715 presented at the annual meeting of the EGU, Vienna, Austria, 7—13 April 2013.
- Beaud, F., G.E. Flowers. Sensitivity of modelled sliding and erosion rates to non-steady basal hydraulic conditions, IGS Symposium Glaciers and ice sheets in a warming climate, Fairbanks, AK, June 2012.
- Beaud, F., Herman F., Champagnac J.-D. On the role of glacial hydrology in overdeepening carving, XVIII INQUA Congress, 21<sup>st</sup>-27<sup>th</sup> July 2011, Bern, Switzerland (poster presented by F. Herman).
- Beaud, F., Herman F., Champagnac J.-D. The influence of hydrology on spatial patterns of glacial erosion, Swiss Geosciences Meeting, November 2010.
- Champagnac J.-D., Sternai, P., Herman F., Guralnik, B., Beaud, F. Fracture density as a controlling factor of postglacial fluvial incision rate, Granite Range, Alaska., Swiss Geosciences Meeting, November 2010.

### Seminar presentations:

- (Upcoming) Beaud, F., M. P. Lamb, T. Ulizio. A Laboratory Experiment of Ice Melt by Pressurized Turbulent Water Flow, Simon Fraser University EASC 25<sup>th</sup> Anniversary Seminar Series, Burnaby, BC, March 12<sup>th</sup> 2020.
- Beaud, F., M. P. Lamb, T. Ulizio. A Laboratory Experiment of Ice Melt by Pressurized Water Flow, Scripps Polar Seminar, SCRIPPS Institution for Oceanography, La Jolla, CA, October 24<sup>th</sup> 2019 ([pdf](#)).
- Beaud, F., G.E. Flowers, J.G. Venditti. Sediment transport and bedrock erosion caused by subglacial water flow: Implications for paleo-landforms and pro-glacial sediment yields, NASA Jet Propulsion Laboratory, Sea Level and Ice group seminar, February 27<sup>th</sup> 2019.
- Beaud, F., G.E. Flowers, J.G. Venditti. How do glaciers produce and evacuate sediment?, Environmental Sciences and Engineering Seminar, Caltech, January 9<sup>th</sup> 2019.
- Beaud, F., G.E. Flowers, J.G. Venditti, M. Koppes. Subglacial meltwater action: the missing mechanism of glacial erosion. April 14<sup>th</sup> 2016, Earth Science Department Seminar, SFU.
- Beaud, F., G.E. Flowers, J.G. Venditti, M. Koppes. Excavation of tunnel valleys and inner gorges by subglacial meltwater erosion. April 7<sup>th</sup> 2016, Invited presentation in Prof. Mark Jellinek's group, Department of Earth Ocean and Atmospheric Science, University of British Columbia, Vancouver BC.

<sup>5</sup> This poster was awarded an Outstanding Student Poster Award at the 2017 EGU annual meeting (<https://www.egu.eu/awards-medals/ospp-award/2017/flavien-beaud/>).

- Beaud, F., G.E. Flowers, J.G. Venditti, M. Koppes. Excavation of tunnel valleys and inner gorges by subglacial meltwater erosion. March 1<sup>st</sup> 2016, Invited by Prof. Bernard Hallet, Glaciology group, Department of Earth and Space Sciences, University of Washington, Seattle WA.
- Beaud, F., G.E. Flowers, J.G. Venditti, S. Pimentel. Water and subglacial erosion. September 24<sup>th</sup> 2014, Invited presentation in Prof. Frederic Herman's group, Institute of Earth Surface Dynamics, University of Lausanne VD, Switzerland.
- Beaud, F., Herman F., Champagnac J.-D. The influence of hydrology on spatial patterns of glacial erosion, October 11<sup>th</sup> 2011, Earth Science Department Seminar Series, SFU.

### Other conference participations:

- Garcia, D\*, F. Beaud, T. Ulizio, M. P. Lamb, Water Flow Characteristics Through an Ice-Walled Channel With Evolving Shape, Summer Student Seminar Day, Pasadena, August 2019.
- Beaud, F, G.E. Flowers, J.G. Venditti, M. Koppes. Can eskers be simply explained? Annual Meeting of the Northwest Glaciologists, Vancouver, October 2017.
- Beaud, F, G.E. Flowers, J.G. Venditti, M. Koppes. Hop-o'-My-Thumb, glaciers and rock trails – a framework for sediment transport in R-channels. Annual Meeting of the Northwest Glaciologists, Seattle, October 2016.
- Beaud, F, G.E. Flowers, J.G. Venditti, M. Koppes. Erosion of N-channels, inner gorges and tunnel valleys by subglacial water flow. Annual Meeting of the Northwest Glaciologists, Portland, October 2015.
- Beaud, F, G.E. Flowers, J.G. Venditti. Bedrock erosion and sediment transport by subglacial meltwater, a theoretical framework. Annual Meeting of the Northwest Glaciologists, Fairbanks, October 2014.
- Beaud, F, G.E. Flowers, S. Pimentel. Short-term abrasion and quarrying patterns with a flow-band model. Annual Meeting of the Northwest Glaciologists, Vancouver, October 2013.
- Beaud, F, G.E. Flowers. Sensitivity of modelled sliding and erosion to subglacial hydrology, Annual Meeting of the Northwest Glaciologists, October 2012.
- Beaud, F., Herman F., Champagnac J.-D. The influence of hydrology on spatial patterns of glacial erosion, Annual Meeting of the Northwest Glaciologists, Portland, October 2011.

### GENERAL CONTRIBUTIONS TO SCIENCE

#### Acknowledgements in peer-reviewed papers for significant fieldwork contribution

- Crompton, J. W., Flowers, G. E., & Stead, D. (2018). Bedrock fracture characteristics as a possible control on the distribution of surge-type glaciers. *Journal of Geophysical Research: Earth Surface*, 123, 853–873, <https://doi.org/10.1002/2017JF004505>
- Crompton, J. W. and G. E. Flowers (2016), Correlations of suspended sediment size with bedrock lithology and glacier dynamics, *Annals of Glaciology*, 57(72), [doi: 10.1017/aog.2016.6](https://doi.org/10.1017/aog.2016.6)
- Crompton, J. W., G. E. Flowers, D. Kirste, B. Hagedorn and M. J. Sharp (2015), Clay mineral precipitation and low silica in glacier meltwaters explored through reaction-path modelling, *Journal of Glaciology*, Vol. 61, No. 230, 1061—1078, [doi: 10.3189/2015JoG15J051](https://doi.org/10.3189/2015JoG15J051)
- Wilson, N. J., G. E. Flowers, and L. Mingo (2014), Mapping and interpretation of bed-reflection power from a surge-type polythermal glacier, Yukon, Canada, *Annals of Glaciology*, 55(67), [doi: 10.3189/2014AoG67A101](https://doi.org/10.3189/2014AoG67A101)
- Wheler, B. A., A. H. MacDougall, G. E. Flowers, E. I. Petersen, P. H. Whitfield & K. E. Kohfeld (2014), Effects of Temperature Forcing Provenance and Extrapolation on the Performance of an Empirical Glacier-Melt Model, *Arctic, Antarctic, and Alpine Research*, 46:2, 379-393, doi: [10.1657/1938-4246-46.2.379](https://doi.org/10.1657/1938-4246-46.2.379)

\* Supervised student author

- Schoof, C., C. A. Rada, N. J. Wilson, G. E. Flowers and M. Haseloff (2014), Oscillatory subglacial drainage in the absence of surface melt, *The Cryosphere*, Vol. 8, No. 3, p. 959–976, [10.5194/tc-8-959-2014](https://doi.org/10.5194/tc-8-959-2014)
- Wilson, N. J., G. E. Flowers, and L. Mingo (2013), Comparison of thermal structure and evolution between neighboring subarctic glaciers, *Journal of Geophysical Research: Earth Surf.*, 118, 1443–1459, doi:10.1002/jgrf.20096

#### THESES:

- Beaud, F. : Numerical investigations of subglacial hydrology as direct and indirect driver of glacial erosion, Ph.D. thesis, Simon Fraser University, September 2017; Senior Supervisor: Prof. G. E. Flowers; Co-supervisors: Prof. J. V. Venditti and Prof. M. Koppes (<http://summit.sfu.ca/item/17419>).
- Beaud, F. : The influence of hydrology on spatial patterns of glacial erosion, MSc thesis, ETHZürich, September 2010; Senior Supervisor: Prof. F. Herman; Co-supervisors: J.-D. Champagnac.

#### MENTORING:

- 06.2019-08.2019      Supervision of a summer research undergraduate student at Caltech, Denise Garcia. Project duration: 17.06.2019 until 22.08.2019. Help student write a research proposal and guide them through a research project, write interim reports and give a final presentation.
- 04.2011-09.2014      Supervision of undergrad field assistants while conducting field work during summer months

#### TEACHING:

- Ongoing              Participation in Caltech Project for Effective Teaching to obtain a Certificate of Interest in University Teaching (Attended and reported on 4 out of 6 workshops)
- 07.2019              Attended the ABC of Course Design at Caltech provided by the Center for Teaching, Learning, and Outreach (4-hour course).
- 2017                  TA; Physical Geology, SFU, Instructor: Dr. Reed Staples (one term)
- 2016                  TA; Physical Geology, SFU, Instructor: Cindy Hansen (one term)
- 2016                  TA; Physical Geology, SFU, Instructor: Kevin Cameron (one term)
- 2012                  TA; Quaternary Geology, SFU, including 3-day field trip in the Channel Scablands, WA, USA, Instructor: Prof. John Clague (one term)
- 2011                  TA; Geohazard, SFU, Instructor: Prof. Gwenn Flowers (one term)

#### PEER REVIEWS:

- 2019                  Journal article (1), *Quaternary Science Reviews*
- 2017                  Journal article (1), *Earth and Planetary Science Letters*
- 2016 & 2019        Journal articles (4), *Geophysical Research Letters*

#### ACTIVE MEMBERSHIP:

International Glaciological society

#### CONFERENCE ORGANIZATION:

- 04.2018              First Annual SoCal Geomorphology Symposium, Caltech (1 day)
- 10.2013              Annual Meeting of the Pacific Northwest Glaciologists, SFU (2 days)

#### PRIZES AND AWARDS:

- 06.2017              Outstanding Student Poster and PICO award at the 2017 General Assembly of the European Geosciences Union, Vienna. Poster title: Numerical modelling of esker formation in semi-circular subglacial channels ([link to award page](#)).

- 2013 SFU Graduate Fellowship Award (\$6500 CDN)
- 06.2012 Second place in the 'Funniest and most creative poster video' competition at the IGS International symposium on Glaciers and Ice Sheets in a Warming Climate, Fairbanks, Alaska, June 25—29 2012 ([link to video](#)).
- 2012 SFU Graduate Fellowship Award (\$6500 CDN)
- 2012 Travel grant to attend the International Glaciological Society International Symposium in Fairbanks, Alaska.

#### FIELDWORK EXPERIENCE:

- 04.2011-09.2014: Glaciology field work: mass balance measurements, ice-penetrating radar surveys, photogrammetric surveys, programming, setting up and maintaining weather stations and GPS networks, monitoring water and sediment fluxes, Donjek Range, Yukon, Canada, 4 seasons of field campaigns totaling over 30 weeks and 10 trips.
- 2014, 2016: Wilderness First Aid Training Certification (50-hour training class each year)
- 06-07.2010: Geomorphology and sample gathering for thermochronology and cosmogenic nuclide, St Elias Range, Alaska, USA; 3 weeks; Trip leader: Dr. Jean-Daniel Champagnac.
- 2009: Structural geology: South Tirol (Italy) and Tessin (Switzerland). Master field trip (10 days, mapping of structures and main characteristics of the Periadriatic Fault); Trip leader: Prof. N. Mancktelow.
- 2009: Glacial and periglacial geomorphodynamic: Eastern Alps of Switzerland, Engadin. Master field trip, 1 week; Trip leader: Prof. W. Haeberli.
- 2009: Tectonic geomorphology: Northern Apennines (Italy). Master field trip, 10 days, Interpretation of landscape (river terraces, growth strata) in order to reconstruct tectonic uplift history; Trip leader: Prof S. Willett.

#### OUTREACH:

- Ongoing Outreach video: collaboration with the Caltech media team to create a video explaining the experiment I am building in the lab and its general importance.
- Ongoing Community outreach: collaboration with the Patagonia® store in Pasadena, CA, USA, to create an outreach event about glaciers and glacial landscapes.
- 2019 Middle school outreach as part of a Polar Field Work Lecture series by the Center for Teaching, Learning and Outreach at Caltech (2 one-hour lectures).
- 2018 "Chasing Glaciers: an International Quest for Answers", Lecture for the Caltech International Education Week, where I discussed how my international career path has helped me grow and develop new ideas, Caltech (one hour [lecture](#)).
- 2018 Lab tours for Caltech Up-Close, Caltech, hosted two tours (1 hour each).
- 2018 Hosted a film crew as part of Will Smith YouTube channel project 'The Jump' to explain the process of bedrock erosion by rivers, Caltech (1 day of preparation and filming).
- 2017 Outreach for Science Alive at SFU, science summer camps for children, 2 one-hour lectures.
- 2017 Participation in the 3-minute thesis competition at SFU.

#### LABORATORY EXPERIENCE:

- 12.2017-present Designing, building and running an experiment to emulate subglacial water flow.
- 09.2010-02.2011 Rock preparation at ETHZ for thermochronologic dating: crushing, sieving, mineral separation with a Wifley table and heavy liquids, picking of apatite for fission track.

RELEVANT COURSES:

05.2012: International Summer School in Glaciology, McCarthy, Alaska. Hosted by the Geophysical Institute of the University of Alaska Fairbanks; 10 days (Dr. Regine Hock).

PERSONAL SKILLS

Language: French: Native speaker

English: Fluent

German: Intermediate (B1)

Digital: Programming: Matlab (strong), Fortran 90, C++, Python

Drawing: Adobe Illustrator, Inkscape, AutoCAD, Paraview

Office: LaTeX, Microsoft Office, Excel and PowerPoint, Apple Keynote

Fieldwork: Leading glacier and high mountain environment travel

Programming and installing dataloggers and numerous sensors (Campbell Scientific, Onset)

Ice penetrating radar survey

Helicopter safety

COMMUNITY SERVICE:

09.2012-10.2016: President, Secretary and Graduate Student Representative, alternatively, of the Graduate Student Earth Sciences Caucus at SFU.

09.2009-09.2011: Vice-President then Entertainment Assistant of the Association of French Speaking students (ETH-Zürich and University of Zürich)

09.2006-09.2008: President of the Mountaineering Club (EPF-Lausanne)

09.2005-09.2006: Sports and Animation Manager, AGEPoly (Association Générale des Étudiants, EPFLausanne)