

Dr. Louis Quéno

PhD in snow science

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Date of birth: 18 Sept. 1990



Employment

- 05/2022– **Scientific staff member**, *WSL Institute for Snow and Avalanche Research SLF*, Davos, Switzerland.
- 06/2026 Operational snow hydrology service and modelling of snow redistribution at intermediate scales
- 05/2019– **Postdoc**, *WSL Institute for Snow and Avalanche Research SLF*, Davos, Switzerland.
- 04/2022 Operational snow hydrology service and modelling of snow redistribution at intermediate scales
- 09/2018– **Postdoc**, *WSL Institute for Snow and Avalanche Research SLF*, Davos, Switzerland.
- 04/2019 Modelling and monitoring ice layer formation due to water percolation through the snowpack

Education and research background

- 2014–2017 **PhD**, *CEN (Snow Studies Center), CNRM, Météo-France/CNRS*, Grenoble, France.
Potential of kilometeric-resolution meteorological forecasts for snowpack modelling in mountainous terrain
Supervisors : I. Dombrowski-Etchevers, V. Vionnet, F. Karbou
- 2013–2014 **Master**, *Ecole Centrale de Lyon / Université Claude Bernard Lyon 1*, Lyon, France.
Fluid mechanics and environment
- 2014 **Master internship**, *WSL Institute for Snow and Avalanche Research SLF*, Davos, Switzerland.
Setting up the meteorological model WRF for studying snow accumulation and ablation processes within the Dischma Experiment
Supervisor : R. Mott
- 2013 **Research internship**, *IRD (Research Institute for Development)*, La Paz, Bolivia.
Study of the radiative properties of clouds in tropical mountains, and their influence on the radiative budget of glacier Zongo (Andes Cordillera)
Supervisor : J.-E. Sicart
- 2012 **Research internship**, *CEN, CNRM, Météo-France/CNRS*, Grenoble, France.
Study of humidity analysis and forecast by model AROME in the Alps
Supervisors : I. Dombrowski-Etchevers, F. Karbou, Y. Durand
- 2010–2014 **Diploma of engineer**, *Ecole Centrale de Lyon*, Lyon, France.
Civil engineering and environment

Modelling background

- Programming skills : FORTRAN, Matlab, git (active use), Python, C++ (previous active use)
- Snow modelling knowledge and development [paper references]
 1. FSM2, JIM : developments and operational use for the Swiss snow hydrology service OSHD [9,10,11,13,15,17]
 2. FSM2 : development of wind- and gravity-induced snow redistribution [12,13,14]
 3. SNOWPACK : use and developments to improve deep ice layer formation [8]
 4. Crocus : use for snow cover modelling over the French Alps and Pyrenees [2,3,4,5,6,7], development of surface ice layer formation [5]

Student supervision

10/2020– **Master student**, *P. Morin*, WSL Institute for Snow and Avalanche Research SLF, Davos, Switzerland.
03/2021 Downscaling of wind fields in mountainous terrain for snowpack modelling

Research impact metrics

Google Scholar metrics, on 8 May 2025 :

- Citations : 484
- h-index : 11

Reviewing activity

The Cryosphere, Journal of Geophysical Research, Water Resources Research, Journal of Glaciology, Geoscientific Model Development, Hydrology and Earth System Sciences, Geophysical Research Letters

Peer-reviewed publications

- [17] Magnusson, J., Cluzet, B., **Quéno, L.**, Mott, R., Oberrauch, M., Mazzotti, G., Marty, C., and Jonas, T. : Evaluating methods to estimate the water equivalent of new snow from daily snow depth recordings, *Cold Reg. Sci. Technol.*, p. 104435, doi: 10.1016/j.coldregions.2025.104435, 2025b
- [16] Magnusson, J., Bühler, Y., **Quéno, L.**, Cluzet, B., Mazzotti, G., Webster, C., Mott, R., and Jonas, T. : High-resolution hydrometeorological and snow data for the Dischma catchment in Switzerland, *Earth Syst. Sci. Data*, 17, 703–717, doi: 10.5194/essd-17-703-2025, 2025a
- [15] Cluzet, B., Magnusson, J., **Quéno, L.**, Mazzotti, G., Mott, R., and Jonas, T. : Exploring how Sentinel-1 wet-snow maps can inform fully distributed physically based snowpack models, *The Cryosphere*, 18, 5753–5767, doi: 10.5194/tc-18-5753-2024, 2024
- [14] Reynolds, D., **Quéno, L.**, Lehning, M., Jafari, M., Berg, J., Jonas, T., Haugeneder, M., and Mott, R. : Seasonal snow–atmosphere modeling : let’s do it, *The Cryosphere*, 18, 4315–4333, doi: 10.5194/tc-18-4315-2024, 2024
- [13] **Quéno, L.**, Mott, R., Morin, P., Cluzet, B., Mazzotti, G., and Jonas, T. : Snow redistribution in an intermediate-complexity snow hydrology modelling framework, *The Cryosphere*, 18, 3533–3557, doi: 10.5194/tc-18-3533-2024, 2024
- [12] Berg, J., Reynolds, D., **Quéno, L.**, Jonas, T., Lehning, M., and Mott, R. : A seasonal snowpack model forced with dynamically downscaled forcing data resolves hydrologically relevant accumulation patterns, *Front. Earth Sci.*, 12, doi: 10.3389/feart.2024.1393260, 2024
- [11] Mott, R., Winstral, A., Cluzet, B., Helbig, N., Magnusson, J., Mazzotti, G., **Quéno, L.**, Schirmer, M., Webster, C., and Jonas, T. : Operational snow-hydrological modeling for Switzerland, *Front. Earth Sci.*, 11, doi: 10.3389/feart.2023.1228158, 2023
- [10] Mazzotti, G., Webster, C., **Quéno, L.**, Cluzet, B., and Jonas, T. : Canopy structure, topography, and weather are equally important drivers of small-scale snow cover dynamics in sub-alpine forests, *Hydrol. Earth Syst. Sci.*, 27, 2099–2121, doi: 10.5194/hess-27-2099-2023, 2023
- [9] Helbig, N., Schirmer, M., Magnusson, J., Mäder, F., van Herwijnen, A., **Quéno, L.**, Bühler, Y., Deems, J. S., and Gascoin, S. : A seasonal algorithm of the snow-covered area fraction for mountainous terrain, *The Cryosphere*, 15, 4607–4624, doi: 10.5194/tc-15-4607-2021, 2021
- [8] **Quéno, L.**, Fierz, C., van Herwijnen, A., Longridge, D., and Wever, N. : Deep ice layer formation in an alpine snowpack : monitoring and modeling, *The Cryosphere*, 14, 3449–3464, doi: 10.5194/tc-14-3449-2020, 2020a
- [7] **Quéno, L.**, Karbou, F., Vionnet, V., and Dombrowski-Etchevers, I. : Satellite-derived products of solar and longwave irradiances used for snowpack modelling in mountainous terrain, *Hydrol. Earth Syst. Sci.*, 24, 2083–2104, doi: 10.5194/hess-24-2083-2020, 2020b
- [6] Vionnet, V., Six, D., Auger, L., Dumont, M., Lafaysse, M., **Quéno, L.**, Réveillet, M., Dombrowski-Etchevers, I., Thibert, E., and Vincent, C. : Sub-kilometer Precipitation Datasets for Snowpack and Glacier Modeling in Alpine Terrain, *Front. Earth Sci.*, 7, 182, doi: 10.3389/feart.2019.00182, 2019
- [5] **Quéno, L.**, Vionnet, V., Cabot, F., Vrécourt, D., and Dombrowski-Etchevers, I. : Forecasting and modelling ice layer formation on the snowpack due to freezing precipitation in the Pyrenees, *Cold Reg. Sci Technol.*, 146, 19–31, doi: 10.1016/j.coldregions.2017.11.007, 2018
- [4] Dombrowski-Etchevers, I., Vionnet, V., and **Quéno, L.** : Pertinence des prévisions météorologiques à l’échelle kilométrique pour la modélisation du manteau neigeux en montagne, *La Météorologie*, 99, 25–34, doi: 10.4267/2042/63587, 2017
- [3] Vionnet, V., Dombrowski-Etchevers, I., Lafaysse, M., **Quéno, L.**, Seity, Y., and Bazile, E. : Numerical weather

forecasts at kilometer scale in the French Alps : evaluation and applications for snowpack modelling, J. Hydrometeor., 17, 2591–2614, doi: 10.1175/JHM-D-15-0241.1, 2016

[2] **Quéno, L.**, Vionnet, V., Dombrowski-Etchevers, I., Lafaysse, M., Dumont, M., and Karbou, F. : Snowpack modelling in the Pyrenees driven by kilometeric-resolution meteorological forecasts, The Cryosphere, 10, 1571–1589, doi: 10.5194/tc-10-1571-2016, 2016

[1] Sicart, J. E., Espinoza, J. C., **Quéno, L.**, and Medina, M. : Radiative properties of clouds over a tropical Bolivian glacier : seasonal variations and relationship with regional atmospheric circulation, Int. J. Climatol., 36, 3116–3128, doi: 10.1002/joc.4540, 2016

Datasets

Quéno, L. : FSM2trans code, EnviDat, doi: 10.16904/envidat.509, 2024.

Quéno, L., Fierz, C., van Herwijnen, A., Longridge, D., Wever, N. : WFJ_ICE_LAYERS : Multi-instrument data for monitoring deep ice layer formation in an alpine snowpack, EnviDat, doi: 10.16904/envidat.170, 2020.

Awards

Outstanding Student Poster and PICO Award, Division Cryosphere, EGU General Assembly 2017

(www.egu.eu/awards-medals/ospp-award/2017/louis-ueno/)

Communications

Quéno L., Jonas, T., Mazzotti, G., and Magnusson, J. : Including snow redistribution in snow hydrology modelling : challenges and developments to make a research model operational at nation-scale , EGU General Assembly 2025, Vienna, Austria, 27 Apr–2 May 2025, EGU25-17090, doi: 10.5194/egusphere-egu25-17090. Talk.

Quéno L., Reynolds D., Dujardin J., Mott R., Jonas T. : What level of wind field input complexity is required to represent snow redistribution in an intermediate-complexity snow modelling framework ?, 4th International Conference on Snow Hydrology SnowHydro 2024, Grenoble, France, February 2024. Talk.

Quéno, L., Mott, R., Jonas, T. : Representing snow redistribution by wind and gravity within an intermediate-complexity snow-cover model : results and implications for operational snow hydrological simulations, XXVIII General Assembly of the International Union of Geodesy and Geophysics (IUGG), Berlin, Germany, July 2023, doi: 10.57757/IUGG23-2464. Talk.

Quéno L., Mott R., Jonas T. : Simulation of snow redistribution by wind with an intermediate-complexity snow cover model : preliminary results towards a nation-wide operational implementation, International Mountain Conference 2022, Innsbruck, Austria, September 2022. Talk.

Quéno L., Mott R., Jonas T. : Simulation of snow redistribution by wind with an intermediate-complexity snow cover model : preliminary results towards a nation-wide operational implementation, 3rd International Conference on Snow Hydrology SnowHydro 2022, online, February 2022. Poster.

Quéno L., Morin P., Mott R., Jonas T. : Local simulations of snow redistribution by wind with an intermediate-complexity snow cover model driven by different wind downscaling methods, EGU General Assembly 2021, online, April 2021, doi: 10.5194/egusphere-egu21-14629. Presenting Interactive Content (PICO).

Quéno L. : From snowfall to snowmelt : research and operational service of the SLF snow hydrology group, Swiss Young Researchers Network Seminar on Water, online, February 2021. Talk.

Quéno L., Fierz C., van Herwijnen A., Wever N. : Preferential water flow and ice layer formation in the snowpack : insights from measurements and SNOWPACK simulations at an alpine site, EGU General Assembly 2019, Vienna, Austria, April 2019. Presenting Interactive Content (PICO).

Quéno L., Vionnet V., Cabot F., Vrécourt D., Dombrowski-Etchevers I. : Forecasting and modelling ice layer formation on the snowpack due to freezing precipitation in the Pyrenees, EGU General Assembly 2017, Vienna, Austria, April 2017. Presenting Interactive Content (PICO).

Quéno L., Karbou F., Vionnet V. : Apport des produits satellitaires LANDSAF de rayonnements incidents pour la modélisation du manteau neigeux en zones de montagne, Journées Glaciologie – Nivologie – Eau en Montagne, Société Hydrotechnique de France, Grenoble, March 2017. Talk.

Quéno L., Vionnet V., Karbou F., Dombrowski-Etchevers I., Lafaysse M., Dumont M. : Using kilometeric-resolution meteorological forecasts and satellite-derived incoming radiations for snowpack modelling in complex terrain, 2nd INARCH workshop, Grenoble, October 2016. Talk.

Quéno L., Karbou F., Vionnet V., Dombrowski-Etchevers I. : Evaluation du rayonnement des modèles AROME et SAFRAN en zones de relief, Comparaison aux produits satellitaires du LandSAF et à des observations in-situ, Journées R&D de Météo-France, Toulouse, June 2016. Talk.

Quéno L., Vionnet V., Vrécourt D., Lafaysse M., Dombrowski-Etchevers I. : Précipitations surfondues et formation de couche de glace à la surface du manteau neigeux dans les Pyrénées, Journées Glaciologie – Nivologie – Eau en Montagne, Société Hydrotechnique de France, Grenoble, March 2016. Talk.

Quéno L., Vionnet V., Dombrowski-Etchevers I., Lafaysse M., Karbou F., Morin S. : Potential of the use of high-resolution meteorological forecasts for snowpack modelling in the Pyrenees, International Conference on Alpine Meteorology, Innsbruck, Austria, September 2015. Poster.

Quéno L., Vionnet V., Dombrowski-Etchevers I., Lafaysse M., Karbou F. : Apport des prévisions météorologiques haute résolution du modèle AROME pour la modélisation du manteau neigeux dans les Pyrénées, Journées Glaciologie – Nivologie – Hydrologie de Montagne, Société Hydrotechnique de France, Grenoble, March 2015. Talk.