

LINDSEY NICHOLSON – CV

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PROFESSIONAL SUMMARY

A research scientist and teacher, specialising in glaciology and climate science, I enjoy carrying out research in multidisciplinary teams and like to use my knowledge and skills to engage students and members of the public in thinking about the environment around them and how we interact with it.

EDUCATION

Ph.D. Glaciology | University of St Andrews (2000-2004)

Thesis: *Modelling melt beneath supraglacial debris: implications for the climatic response of debris-covered glaciers. Supervised by Prof. D. Benn.*

B.Sc. Honours in Geography 1st class | University of Edinburgh (1996-2000)

Dissertation: *The geomorphological impact of climate change on glaciers in the Ngozumpa valley, Khumbu Himal, Nepal. Supervised by Prof. A. Dugmore.*

RESEARCH EMPLOYMENT

2009-2019 | Researcher/Glaciological group leader, University of Innsbruck, Austria

- Leader of 4 projects totalling €750k and collaborator on 4 additional projects.
- Until 2019 coordinator of the Upper Rofental Open Air Laboratory, and manager of the INTERACT Research Station Hintereis
- Supervision of five MSc students and one PhD student; supporting role for other internal and external PhD students.
- Research activities involve: glacier surface energy balance modelling; structure from motion photogrammetry of evolving glacier surfaces; cold lab experiments on sub-debris heat fluxes and melting; meteorological monitoring of mountain catchments; mass balance monitoring of Austrian glaciers; numerical modelling of glacier behaviour and response to climate forcing; micrometeorology over glacier and snow surfaces, ground penetrating radar measurements and determination of surface debris cover and glacier ice thickness.

- Teaching on University summer schools in glaciology and related topics.
- Outreach activities through national days, university programs, social media and blog contributions.

2007-2009 | Investigator/Leader Glaciology Group, CEAZA, Chile

- Leader of 5 researchers using direct measurements and satellite imagery to monitor mass and energy balance of glaciers to assess the glacial contribution to hydrological resources in Norte Chico, Chile. Responsible for the staff, research facilities, project tendering, finances and output delivery.
- Manager of a USD 1M commercial project to assess impact of mining activity on glaciers in the Pascua Lama project area, results of which are reported to the operator and Chilean water authority. 10 technical reports produced in 12 months.

2005-2007 | Postdoctoral Researcher, University of Alberta, Canada

- Responsible for glacier hydrochemistry laboratory and major ion analyses in a collaborative Arctic ice coring project involving Universities of Alberta, Calgary, Ottawa and the Geological Survey of Canada.
- Participated in construction and installation of ice core melting system.
- Informal supervisory role to graduate students on Arctic climate change issues.

2002-2004 | PhD student, University of St Andrews, UK

- Development of 1D numerical models of surface energy balance of debris-covered ice.
- Deployment of automatic weather stations and instrumentation to record the thermal properties of supraglacial debris to measure model input conditions.
- Determination of the role of latitude and climate on debris-covered glacier ablation.
- Six new ages on Himalayan glacial sediments using optically stimulated luminescence dating.

2000-2004 | Research assistant roles, University of St Andrews, UK

- Research assistant surveying and monitoring evolution of supraglacial lakes in an international project studying the thermal regime of ice-contact lakes involving Universities of St Andrews, Dundee, Milan and the Italian Glaciological Committee.
- Laboratory assistant in the optically stimulated luminescence laboratory of Drs Ruth Robinson/Joel Spencer.

TEACHING EXPERIENCE

LECTURER (2017 -): University of Innsbruck

- Computer practicals and lectures for Cryosphere in the Climate System MSc module
- Advanced themes in Climate and Cryosphere Literature Seminar MSc module

LECTURER AND MEMBER OF ACADEMIC BOARD (2013 -): Juneau Icefield Research Program, USA.

- Preparing and delivering lectures, whiteboard exercises, field experiments, practical exercises on glacier mass balance, glacier-climate interaction, applied glaciology
- Focus on experiential and interactive field-based learning.
- Academic Council member and developer of curriculum since 2016

LECTURER (2011- PRESENT): University Center in Svalbard (UNIS), Norway.

- Preparing and delivering lectures, computer practicals and fieldtrips for the 1 week glacier mass balance and energy balance component of an international post-graduate course (AG-325: Glaciology)

LECTURER (2015) International summer school, Innsbruck, Austria.

- Summer school on Surface-Atmosphere Exchange over Mountainous Terrain
- Lectures on exchanges over glacier surfaces and glacier-climate interaction

LECTURER (2012) International summer school, Obergurgl, Austria.

- Micro-DICE (ESF networking project) Summer school on microstructures of ice and snow
- Lectures on the glacier-climate interaction

LECTURER (2010): International summer school, Obergurgl, Austria.

- Summer school on Monsoon Variability, Teleconnections, and Impacts on Mid- to Low-Latitude Glaciers
- Lectures on the glacier boundary layer

GLACIOLOGY INSTRUCTOR (April/May 2009): UNESCO Glacier mass balance field school, Nepal.

- Training government hydrologists from the SE Asian region in theory and techniques of glacier mass balance and hydrological monitoring.

TEACHING FELLOW IN PHYSICAL GEOGRAPHY (2004-2005): University of St Andrews, UK.

- Developer, coordinator and teacher of two courses in Quaternary Environmental Reconstruction: Covering the broad range of techniques used in reconstructing Quaternary Environments and key research and commercial application of these methods.
- Lecturer in Glaciology: Glacial erosion, erosion processes and mechanics, erosional landforms, debris-covered glaciers and glacier mass balance
- Field work leader on glaciology field trip to Norway and geological field trips in Scotland

PEER-REVIEWED PUBLICATIONS (35)

My current h-index is 19, i10 index is 26, and my citations recorded by google scholar are 1674.

Rastner P., Notarnicola C., **Nicholson** L., Prinz R., Sailer R., and Paul, F. (2019) Automated mapping of snow cover on glaciers and calculation of snow line altitudes from multi-temporal Landsat data, *Remote Sensing*, 11(12), 1410, <https://doi.org/10.3390/rs11121410>

Zolles, T., Maussion, F., Galos, S. P., Gurgiser, W., and **Nicholson**, L. (2019) Robust uncertainty assessment of the spatio-temporal transferability of glacier mass and energy balance models, *The Cryosphere*, 13, 469-489, <https://doi.org/10.5194/tc-13-469-2019>.

Nicholson, L. I., McCarthy, M., Pritchard, H. D., and Willis, I. (2018) Supraglacial debris thickness variability: impact on ablation and relation to terrain properties, *The Cryosphere*, 12, 3719-3734, <https://doi.org/10.5194/tc-12-3719-2018>.

Prinz R., Heller A., Ladner M., **Nicholson** L. and Kaser G. (2018) Mapping the loss of Mt. Kenya's glaciers: an example of the challenges of satellite monitoring of very small glaciers, *Geosciences*, 8(5), 174, <https://doi.org/10.3390/geosciences8050174>.

Rieg L., Klug C., **Nicholson** L., Sailer R. (2018) Pléiades tri-stereo data for glacier investigations – Examples from the European Alps and the Khumbu-Himal, *Remote Sensing*, 10(10), 1563, doi: 10.3390/rs10101563.

Klug, C., Bollmann, E., Galos, S., **Nicholson**, L., Prinz, R., Rieg, L., Sailer, R., Stötter, J., and Kaser, G. (2018) Geodetic reanalysis of annual glaciological mass balances (2001–2011) of Hintereisferner, Austria, *The Cryosphere*, 8, 833-849

Strasser, U., Marke, T., Braun, L., Escher-Vetter, H., Juen, I., Kuhn, M., Maussion, F., Mayer, C., **Nicholson**, L., Niedertscheider, K., Sailer, R., Stötter, J., Weber, M., and Kaser, G. (2018) The Rofental: a high Alpine research basin (1890 m – 3770 m a.s.l.) in the Ötztal Alps (Austria) with over 150 years of hydro-meteorological and glaciological observations, *Earth System Science Data* 10, 151-171

Wirbel, A., Jarosch, A. H. and **Nicholson**, L. (2018) Modelling debris transport within glaciers by advection in a full-Stokes ice flow model, *The Cryosphere*, 12, 189-204

Evatt, G. W., Mayer, C., Mallinson, A. Abrahams, I. D., Heil, M. and **Nicholson**, L. (2017) The secret life of ice sails. *Journal of Glaciology*.

Nicholson, L. and Mertes, J. (2017) Thickness estimation of supraglacial debris above ice cliff exposures using a high resolution digital surface model derived from terrestrial photography. *Journal of Glaciology*.

Benn, D., Thompson, S., Gulley, J., Mertes, J., Luckman, A. and **Nicholson**, L. (2017) Structure and evolution of the drainage system of a Himalayan debris-covered glacier, and its relationship with patterns of mass loss, *The Cryosphere*, 11, 2247-2264

- Mertes, J. D, Gulley, J. D., Benn, D. I., Thompson, S.S. and **Nicholson**, L.I. (2017) Using Structure from Motion to create DEMs and Orthoimagery Using Historical Terrestrial and Oblique Aerial Imagery from 1896, 1936 and 1978, *Earth Surface Processes and Landforms*.
- Prantl, H., **Nicholson**, L., Sailer, R., Hanzer, F., Rastner, P. and Juen, I. (2017) Glacier snowline determination from terrestrial laser scanning intensity data, *Geosciences*, 7, 60
- Galos, S. P., Klug, C., Maussion, F., Covi, F., **Nicholson**, L., Rieg, L., Gurgiser, W., Mölg, T. and Kaser, G. (2017) Reanalysis of a ten year record (2004-2013) of seasonal mass balances at Langenferner / Vedretta Lunga, Ortler-Alps, Italy, *The Cryosphere*, 11, 1417-1439.
- Nicholson**, L. I., Petlicki, M., Partan, B., and MacDonell, S. (2016) 3D surface properties of glacier penitentes over an ablation season, measured using a Microsoft Xbox Kinect, *The Cryosphere* doi:10.5194/tc-2015-207
- Hartl, L., Fischer, A., Klug, C. and **Nicholson**, L. (2016) Can a simple Numerical Model Help to Fine-Tune the Analysis of Ground-Penetrating Radar Data? Hochebenkar Rock Glacier as a Case Study. *Arctic, Antarctic, and Alpine Research*, 48 (2), 377-393.
- Prinz, R., **Nicholson**, L. I., Mölg, T., Gurgiser, W., and Kaser, G. (2016) Climatic controls and climate proxy potential of Lewis Glacier, Mt. Kenya, *The Cryosphere*, 10, 133-148.
- Collier, E., Maussion, F., **Nicholson**, L.I., Mölg, T., Immerzeel, W. W. and Bush, A. B. G. (2015) Impact of debris cover on glacier ablation and atmosphere-glacier feedbacks in the Karakoram. *The Cryosphere*, 9, 1617-1632.
- Collier, E., **Nicholson**, L.I., Brock, B.W, Maussion, F., Essery, R. and Bush, A. B. G. (2014) Representing moisture fluxes and phase changes in glacier debris cover using a reservoir approach. *The Cryosphere*, 8, 1429-1444.
- Gurgiser, W, Marzeion, B., **Nicholson**, L., Kaser, G. and Ortner, M. (2013) Modeling energy and mass balance of Shallap Glacier, Peru. *The Cryosphere*, 7, 1787-1802.
- MacDonell, S., Kinnard, C., Mölg, T., **Nicholson**, L. and Abermann, J. (2013) Meteorological drivers of ablation processes on a cold glacier in the semiarid Andes of Chile. *The Cryosphere*, 7, 1513-1526.
- Gurgiser, W., Mölg, T., **Nicholson**, L. and Kaser, G. (2013) Mass balance model parameter transferability on a tropical glacier. *Journal of Glaciology*, 59 (217), 845-858.
- Nicholson**, L., Prinz, R., Mölg, T. and Kaser, G. (2013) Micrometeorological conditions and surface mass and energy fluxes on Lewis glacier, Mt Kenya, in relation to other tropical glaciers. *The Cryosphere*, 7, 1205-1225.
- Nicholson**, L. and Benn, D. I. (2013) Properties of supraglacial debris in relation to surface energy and mass balance modelling of debris covered glaciers. *Earth Surface Processes and Landforms*, 38 (5), 490-501 DOI: 10.1002/esp.3299.

- MacDonell, S., **Nicholson**, L. and Kinnard, C. (2013) Parameterisation of incoming longwave radiation over glacier surfaces in the semiarid Andes of Chile. *Theoretical and Applied Climatology*, 111, 3-4, 513-528 DOI: 10.1007/s00704-012-0675-1.
- Prinz, R., **Nicholson**, L. and Kaser, G. (2012) Variations of the Lewis Glacier, Mount Kenya, 2004-2012. *Erdkunde*, 66 (3), 255-22.
- Benn, D.I., Bolsch, T., Hands, K., Gulley, J., Luckman, A., **Nicholson**, L.I., Quincey, D., Thompson, S., Toumi, R., Wiseman, S. (2012) Response of debris-covered glaciers in the Mount Everest region to recent warming, and implications for outburst flood hazards. *Earth-Science Reviews*, 114, 156-174.
- Rabatel, A., Castebrunet, H., Favier, V., **Nicholson** L., and Kinnard, C. (2011) Glacier changes in the Pascua-Lama region, Chilean Andes (29° S): recent mass-balance and 50-year surface-area variations. *The Cryosphere*, 5, 1029-1041.
- Prinz, R., Fischer, A., **Nicholson**, L., Kaser, G. (2011) Seventy-six years of mean mass balance rates derived from recent and re-evaluated ice volume measurements on tropical Lewis Glacier, Mount Kenya. *Geophysical Research Letters*, 38, L20502, doi:10.1029/2011GL049208.
- Nicholson**, L., Marín, J., Lopez, D., Rabatel, A., Bown, F., and Rivera, A. (2010) Glacier inventory of the upper Huasco valley, Norte Chico, Chile: glacier characteristics, glacier change and comparison to central Chile. *Annals of Glaciology*, 50 (53), 111-118.
- Kinnard C., Koerner, R. M., Zdanowicz, C. M., Fisher, D. A., Zheng, J., Sharp, M. J., **Nicholson**, L. and Lauriol, B. (2009) Stratigraphic analysis of an ice core from the Prince of Wales icefield, Ellesmere Island, Arctic Canada, using digital image analysis: high-resolution density, past summer warmth reconstruction and melt effect on ice core solid conductivity. *Journal of Geophysical Research*, 113, D24120, doi:10.1029/2008JD011083.
- Lukas, S., **Nicholson**, L.I., Humlum, O. (2007). Comment on Lønne and Lyså 2005: “Deglaciation dynamics following the Little Ice Age on Svalbard: Implications for shaping of landscapes at high latitudes, *Geomorphology* 72, 300-319”. *Geomorphology*, 84, 145-149.
- Nicholson** L. and Benn, D. I. (2006) Calculating ice melt beneath a debris layer using meteorological data. *Journal of Glaciology*, 52 (178), 463-470.
- Diolauti, G., Kirkbride, M., Smiraglia, C., Benn, D. I., D’Agata, C., and **Nicholson**, L. (2005) Calving processes and Lake evolution at Miage glacier (Mont Blanc, Italian Alps). *Annals of Glaciology*, 40, 207-214.
- Lukas, S., **Nicholson**, L., Ross F. H., and Humlum, O. (2005) Formation, meltout processes and landscape alteration of high-arctic ice-cored moraines – examples from Nordenskiöld Land, Central Spitsbergen. *Polar Geography*, 29 (3), 57-187.

OTHER PUBLICATIONS AND PRESENTATIONS AT SCIENTIFIC MEETINGS

Rastner, P.; Hanzer, F.; Klug, Ch.; **Nicholson**, L.; Notarnicola, C.; Prinz, R.; Sailer, R.; Siegmann, M.; Strasser, U. (2014): Uncertainties of meltwater modelling to runoff: scopes of the hiSNOW project. In: Abstracts of the International Symposium on The Future of the Glaciers: From the past to the next 100 years, Torino, Italy. Torino: University of Torino, S. 35.

Mölg, T., Cullen, N. J., Hardy, D., Kaser, G., **Nicholson**, L., Prinz, R., Winkler, M. (2013) East African glacier loss and climate change: Corrections to UNEP article “African without ice and snow”, *Environmental Development*, 6, 1-6.

Cogley, J.G., R. Hock, L.A. Rasmussen, A.A. Arendt, A. Bauder, R.J. Braithwaite, P. Jansson, G. Kaser, M. Möller, L. **Nicholson** and M. Zemp (2011) Glossary of Glacier Mass Balance and Related Terms, IHP-VII Technical Documents in Hydrology No. 86, IACS Contribution No. 2, UNESCO-IHP, Paris.

Winkler, M., R. Prinz, L. **Nicholson**, N. Cullen and C. Kinnard (2011) Ice-mounted masts as platforms for micro-meteorological measurements on glaciers. In: IASC Workshop on the use of automatic measuring systems on glaciers: Extended abstracts and recommendations, Pontresina, Switzerland. IMAU, Utrecht University, the Netherlands.

Lukas, S., **Nicholson**, L.I., Humlum, O. (2007) Comment on Lønne and Lyså 2005: “Deglaciation dynamics following the Little Ice Age on Svalbard: Implications for shaping of landscapes at high latitudes, *Geomorphology* 72, 300-319”. *Geomorphology* 84: 145-149.

Nicholson, L. (2003) Thermal properties of supraglacial debris, Ngozumpa Glacier, Nepal. *Quaternary Newsletter*, 101, pp. 66-69.

8 unpublished technical reports to Compañía Minera Nevada, and the Direccion General de Aguas, Chile, co-authored by the CEAZA glaciology group on the state of glaciers at the Pascua Lam Mine site (in Spanish)

Numerous **oral** and **poster** presentations at international scientific meetings since 2002:
<http://lindseynicholson.org/publications/presentations-poster/>
<http://lindseynicholson.org/publications/presentations-oral/>

Invited oral contributions:

- **Nicholson**, L. and Collier, S. E. (2014) Evaluating models of sub-debris ice ablation. AGU Fall Meeting, San Fransisco, USA, 15 – 19 Dec. 2014
- **Nicholson**, L. (2002) Keynote address: The development of supraglacial lakes, Ngozumpa Glacier, Nepal. International Conference on Mountain Hazards and Mitigation, Kathmandu, 18-22 Nov. 2002.

TECHNICAL SKILLS

- Expert in managing environmental monitoring instruments and designing monitoring programs. In particular, weather stations, camera systems, eddy covariance instruments, dye tracing, laser scanning and river gauging stations.
- Able communicator and supportive team member or manager.
- Experienced in managing research groups, research projects and facilities.
- Wide range of teaching experience to students and professionals.
- Data organisation and analysis, GIS, statistics and time series analysis.
- Environmental sampling of ice, sediment, rock and water.
- Ion chromatography for analysis of water and snow chemistry.
- Optically stimulated luminescence dating of sediments.
- Topographic & geophysical surveying: Photogrammetry, theodolite, DGPS, EM, GPR, sonar.
- Air photograph interpretation, geomorphological mapping and sedimentary logging.
- Energy balance, hydrological and earth-process modelling (MATLAB, basic python).
- Basic skills in regional climate modelling (NCAR WRF model) and back trajectory analysis (HYSPLIT and METEX)
- Jupyter notebooks, github, OLAT as teaching and sharing tools
- Trained in climate science communication and online and hands-on outreach

GRANTS AWARDED IN RECENT YEARS

As principle investigator:

- Austrian Science Fund (FWF) Stand-alone Project: P 28521 **€202,930**
Dynamics of debris-covered glaciers in the Hindu Kush-Karakoram-Himalaya
- Austrian Research Promotion (FFG) Agency Austrian Space Applications Program (ASAP): **€225,000**
High resolution spaceborne studies of mass balance processes on glaciers of the Khumbu Himal.
- Austrian Science Fund (FWF) Elise Richter Grant: V 309 **€317,050**
Modelling debris-covered glaciers at a range of spatial and temporal scales
- Austrian Federal Ministry of Science, Research and Economy (BWF) Polish exchange grant (unused due to Polish collaborator changing workplace)
- National Geographic Waitt Grant: **USD 15,000:**
Measuring growth of penitentes in the arid Andes of Chile

As co-investigator:

- Autonomous Province of Bolzano
hiSNOW – High resolution monitoring and modelling under climate change conditions
- Autonomous Province of Bolzano:
GLORI – Glaciers to Rivers sediment transfer in Alpine basins
- National Geographic: Young Scientist Award

POP deposition in southern Greenland

- Austrian Science Fund (FWF) Stand-alone Project:
Reconstruction and Projecting the Global Behaviour of Glaciers from 1850 - 2300

MEMBERSHIPS AND SERVICES TO THE COMMUNITY

- **Member:** International Glaciological Society (IGS); American Geophysical Unions (AGU); European Geosciences Union (EGU); Quaternary Research Association, Royal Scottish Geographical Society (RSGS).
- **Journal reviewer:** Journal of Glaciology; The Cryosphere; Annals of Glaciology; Journal of Geophysical Research; Journal of Hydrology; Environmental Research Letters; Earth Surface Processes and Landforms; Earth Surface Dynamics; Journal of Maps
- **Project proposal reviewer:** Swiss National Science Foundation (SNF); Chilean National fund for scientific and technological development (FONDECYT); US National Science Foundation (NSF); Canadian Foundation for Innovation (CFI).
- **Member of Working group** on mass balance methods and terminology for the International Association of Cryospheric Sciences (IACS) (2008-2011).
- **Leader of Working group** on Debris Covered Glaciers International Association of Cryospheric Sciences (IACS) (2018-2022).
- **Convener:** Debris Covered Glacier session at EGU (biannually).
- **Scientific Editor:** Journal of Glaciology (IGS International Symposium on Changes in Glaciers and IGS International Symposium on Glaciology in High-Mountain Asia), Frontiers.
- **Outreach:** Regular blogging on my personal website and occasional guest blogs on others. Maintain a community website for glaciology research in the Khumbu Himal (<https://solokhumbuglaciersresearch.wordpress.com>) and an associated public outreach facebook page and twitter account aimed at tourists and the local community. Participation in schools outreach events and university open days.

PROFESSIONAL REFERENCES

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