

Lindsey Nicholson [B.Sc. Ph.D.]

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PROFESSIONAL SUMMARY

An environmental research scientist and teacher specialising in glaciology and climate science, I like working in multidisciplinary teams and using my knowledge and skills to engage students and serve societal needs.

TECHNICAL SKILLS

- Expert in managing environmental monitoring instruments and designing monitoring programs: weather stations, camera systems, eddy covariance instruments and river gauging stations
- Surface energy balance, regional climate, hydrological and earth-process modelling
- Experienced in environmental sampling of ice, sediment, rock and water
- Dye tracing studies of hydrological networks and mountain river gauging
- Experienced with MVS Structure-from-Motion digital surface generation, also terrestrial laser scanning and other close range scanning tools
- Topographic and geophysical surveying: theodolite, dGPS, EM, GPR and sonar
- Geomorphological mapping and sedimentary logging
- Laboratory skills including luminescence dating and ion chromatography analysis of water chemistry
- Satellite image analysis, air photograph interpretation and terrestrial optical and infrared photogrammetry
- Spatiotemporal data management and analysis
- Matlab, basic IDL, Python and R, ArcGIS, Adobe CS, Agisoft Photoscan
- Able communicator and supportive team member or manager
- Wide range of teaching experience delivered to students and professionals
- Supervision of undergraduate, masters and doctoral level students
- Trained in climate science communication; online and hands-on outreach experience
- Experienced project manager for both academic and commercial projects

EDUCATION

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

Thesis: Modelling melt beneath supraglacial debris: implications for the climatic response of debris-covered glaciers.

Supervised by Prof. Doug Benn, Examined by Prof O. Humlum and Prof. C.K.B. Ballantyne.

1996 – 2000 | B.Sc. Honours in Geography 1st class, University of Edinburgh

Dissertation: The geomorphological impact of climate change on glaciers in the Ngozumpa valley, Khumbu Himal, Nepal

RESEARCH EMPLOYMENT

2009-present | Researcher/Glaciology group leader, University of Innsbruck, Austria

- Lead of 4 projects totalling €750k and collaborator on 4 additional projects.
- Contributing coordinator of the Upper Rofental Open Air Laboratory, and manager of the INTERACT Research Station Hintereis
- Currently leader of the Ice and Climate research unit
- Supervision of three MSc students, two PhD students, and two postdoctoral researchers.
- Research activities involve: Regional atmospheric modelling of East African climate; 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 flow and response to climate forcing; ground penetrating measurements and determination of surface debris cover and glacier ice thickness.
- Teaching on summer schools in glaciology and related topics.
- Outreach activities through national days, university programs, social media and blog contributions.

Brief research project descriptions can be found here: <http://lindseynicholson.org/research/>

2007-2009 | Investigator/Leader Glaciology Group, CEAZA, Universidad de La Serena, 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.
- Manager of a USD 1M commercial project to assess impact of mining activity on glaciers, results of which are reported to the operator and Chilean water authority. 8 technical reports produced in 12 months.

2005-2007 | Postdoctoral Researcher, Earth and Atmospheric Sciences, University of Alberta, Canada

- Variability of Arctic climate and sea ice over the past millennium: implications for ice cap mass balance
- Water chemistry laboratory manager

2002-2004 | Luminescence dating laboratory analyst, University of St Andrews, UK

- Six new ages on Himalayan glacial sediments using optically stimulated luminescence.

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

- Assistant for a 4-year project surveying and monitoring the evolution of supraglacial lakes on debris-covered glaciers.
- Collaborator in an international project studying the thermal regime of ice-contact lakes involving Universities of St Andrews, Dundee, Milan and the Italian Glaciological Committee.

TEACHING EMPLOYMENT

LECTURER (2017 - PRESENT): University of Innsbruck

- Climate and cryosphere MSc module
- Literature Seminar for Cryospheric Science MSc module

LECTURER AND MEMBER OF ACADEMIC BOARD (2013-PRESENT): Juneau Icefield Research Program

- Preparing/delivering lectures on glacier mass balance, glacier-climate interaction, applied glaciology

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

- Preparing/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 (2012) 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): 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): Geography and Geosciences, University of St Andrews.

- Developer, coordinator and teacher of two courses in Quaternary Environmental Reconstruction.
- Teaching assistant for analytical methods in Geoscience
- Tutor and advisor for first and second year students
- Field work leader on glaciology field trip to Norway

UNDERGRADUATE DEMONSTRATOR (2000-2004): Geography and Geosciences, University of St Andrews.

PART-TIME LECTURER AND TUTOR (2003): Geographical Foundations course, English Language Teaching Centre, University of St Andrews.

- 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. (in review) 3D surface properties of glacier penitentes over an ablation season, measured using a Microsoft Xbox Kinect, *The Cryosphere*, 10, 1897-1913.
- Hartl, L., Fischer, A., Klug, C. and **Nicholson**, L. (2016) Combining ground penetrating radar and numerical modelling to estimate the thickness of Hochebenkar rock glacier, 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. Impact of debris cover on glacier ablation and atmosphere-glacier feedbacks in the Karakoram. *The Cryosphere*, 9, 1617-1632, 2015
- 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.
- 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.
- 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., Gulle, 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
- Prinz, R., A. Fischer, L. **Nicholson**, G. Kaser (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.
- Rabetel, A., H. Castebrunet, V. Favier, L. **Nicholson** and C. Kinnard (2010) Glacier changes in the Pascua-Lama region, Chilean Andes (29° S): recent mass-balance and 50-year surface-area variations. *The Cryosphere Discussions*, 4: 2307-2336.
- Nicholson**, L., J. Marín, D. Lopez, A. Rabetel, F. Bown, F and A. Rivera (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., R. M. Koerner, C. M. Zdanowicz, D. A. Fisher, J. Zheng, M. J. Sharp, L. **Nicholson** and B. Lauriol (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.
- Nicholson** L. and D. I. Benn (2006) Calculating ice melt beneath a debris layer using meteorological data. *Journal of Glaciology*, 52, No. 178, 463-470.

Diolauti, G., M. Kirkbride, C. Smiraglia, D. I. Benn, C. D'Agata, C., and L. **Nicholson** (2005) Calving processes and Lake evolution at Miage glacier (Mont Blanc, Italian Alps). *Annals of Glaciology*, 40, pp. 207-214.

Lukas, S., L. **Nicholson**, F. H. Ross and O. Humlum (2005). Formation, meltout processes and landscape alteration of high-arctic ice-cored moraines – examples from Nordenskiöld Land, Central Spitsbergen. *Polar Geography*, 29, No. 3, pp. 157-187.

TECHNICAL REPORTS AND OTHER PUBLICATIONS

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

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.

PRESENTATIONS AT SCIENTIFIC MEETINGS

Numerous first author oral and poster presentations at scientific conferences, academic workshops and public sector meetings since 2002. Details can be found here:

<http://lindseynicholson.org/publications-peer-reviewed/presentations-oral/>

<http://lindseynicholson.org/publications-peer-reviewed/presentations-poster/>

Invited oral contributions:

- Nicholson, L. and Collier, S. E. (2014) Evaluating models of sub-debris ice ablation. AGU Fall Meeting, San Francisco, 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.

GRANTS AWARDED IN THE LAST 5 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
- National Geographic Waitt Grant: USD 15,000
Measuring growth of penitentes in the arid Andes of Chile
- Austrian Federal Ministry of Science, Research and Economy (BMWFV) Polish exchange grant

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 for the International Association of Cryospheric Sciences (IACS) (2008-2011)
- **Convener:** Debris Covered Glacier session at EGU
- **Scientific Editor:** IGS International Symposium on Changes in Glaciers – Annals of Glaciology
- **Science blogging:** on my own website and as a guest on others