

## Michael S. Town, Ph.D.

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### CONTACT INFORMATION

#### *Institution*

Geofysisk Institutt - Geophysical Institute  
Bjerknes Centre for Climate Research  
Universitetet i Bergen - University of Bergen

#### *Postal Address* *Physical address*

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### RESEARCH INTERESTS

Polar meteorology, Antarctica, Greenland, Climate modelling, Field work, Data science

### EDUCATION INTERESTS

Equitable education, Project-based learning, Experiential education, Data-based pedagogy

### ACADEMIC EDUCATION

**Seattle University**, Seattle, Washington USA

Masters in Teaching, (AΣN), 2011

**University of Washington**, Seattle, Washington USA

*Department of Atmospheric Sciences*

Ph.D., Atmospheric Sciences, 2007

Dissertation: "Investigations into the Climate of the South Pole"

Advisors: Stephen G. Warren, Von P. Walden

M.S., Atmospheric Sciences, 2005

Masters thesis: "Spectral and broadband longwave downwelling radiative fluxes, cloud radiative forcing, and fractional cloud cover over the South Pole"

Advisors: Stephen G. Warren, Von P. Walden

**University of Michigan**, Ann Arbor, Michigan USA

B.Sc., Physics (honors), 1999

Honors thesis: "Regional and Local Variability of Flow Regimes and Source Regions for a Rural Site in Northern Michigan"

Advisor: Mary Anne Carroll

### PROFESSIONAL ROLES

**Geophysical Institute, Bjerknes Centre for Climate Research**, Bergen, Norway

*Research Scientist*

**Dec 2021 - present**

#### *SNOWISO*

Creating climate transfer function from air temperature to stable water isotopes in near-surface snow. Analyzing data from near-surface polar snow. Developing forward model of near-surface snow processes. Advising UiB graduate students.

*Mt. Baker Climate Project (MBCP)*

Maintaining iButton temperature array network on the south side of Mt. Baker, Washington USA through the Lakeside Summer Research Institute (*LSRI*). Analyzing and presenting data from this temperature network. Advising high school students in geoscience research.

*Nisqually Land Trust Climate Project (NLTCP)*

Developing temperature array network in cooperation with the Nisqually Land Trust for monitoring of Nisqually Tribe land. Developing an educational program that incorporates tribal youth involvement in monitoring climate of tribal lands.

**Department of Earth and Space Sciences,  
University of Washington, Seattle, Washington USA**

*Affiliate Assistant Professor*

**April 2022 - present**

**Ballard Data Science, Seattle, Washington USA**

*Owner/Operator, Lead Data Scientist*

**Sept 2021 - present**

*Northwest Avalanche Center Consulting*

Advising and consulting with the Northwest Avalanche Center on operational incorporation of the SNOWPACK model forced with WRF data into avalanche forecasts.

*Climate advocacy consulting*

Advised environmental professional in climate advocacy debate with high profile climate skeptic.

*COVID19 prevention and mitigation*

Using health and safety guidelines published by CDC, made quantitative assessments of workplaces and a school for adequate ventilation. Designed and assessed air handling solutions for these sites.

**Lakeside School, Seattle, Washington USA**

*Science Faculty*

**Aug 2013 - Jun 2021**

*Physics and Honors Physics*

*Aug 2013 - Jun 2021*

Algebra-based Physics courses for which I developed project-based curricula that incorporates diversity/equity/inclusion, data science, and climate science into the standard Physics cannon.

Specific projects:

Analyzing acceleration data from the Pheonix Mars Lander to understand Force.

Monitoring and modeling the flight of Stomp Rockets to understand energy.

Studying the impacts of oppression and stereotype-threat on the historically marginalized in the field of science through media (e.g. *Think Black, Hidden Figures*) discussion, and reflection.

Using energy conservation to model the surface temperature of the Earth through simple radiative transfer.

*Engineering*

*Aug 2015 - Jun 2021*

Developed a new course centered around the engineering design process. The course was run with specific focus on service and design empathy. Community partners included: Skate Like a Girl, Seattle Audobon Society, Northwest Avalanche Center, Lakeside School Service Learning Program, and Lakeside School Outdoor Program.

Specific projects:

Design and build skateboards for at risk youth in Seattle Area.

Avalanche science and safety practices in the Washington Cascades, including field work, data analysis, and equipment design/implementation.

Engineering and Geosciences in the Washington Cascades, including analysis of Northwest Avalanche Center forecasts and weather data from Mt. Baker, Washington.

*Lakeside Summer Research Institute (LSRI)*

*Jun 2017 - present*

Developed a summertime, geoscience-focused data science internship for high school students. Students engage in authentic geoscience research using cutting edge tools like Python and physical models of intermediate complexity (e.g., SNOWPACK). Curated data sets and external partnerships to support the authentic science experience.

Specific ongoing projects:

The Mt. Baker Climate Project - MBCP. Routine deployment and analysis of temperature data from the southern aspect of Mt. Baker in partnership with the Lakeside School Outdoor Program.

The Northwest Avalanche Center Forecast Consistency Project - NFCP. Students analyze the consistency of NWAC avalanche forecasts and report patterns to the NWAC forecasters and observers.

The Seattle Microclimate Project - SMP. Students analyze weather station data from around Seattle, including on the school's roof, to understand urban microclimates.

*Faculty Mentorship*

*Aug 2015 - Jun 2021*

Teacher mentor to early-career teachers, or teachers new to the Lakeside community. Performed non-evaluative observations. Provided feedback on lessons, assessments, curriculum, and classroom climate.

*Professional Community*

Planned, funded, and executed a school-wide assembly featuring Dr. Clyde Ford, author of *Think Black*. The experience included a breakout session with Dr. Ford for African-American identifying students and faculty.

Developed and implemented 3-minute teacher observation club at Lakeside School.

Instrumental in implementing proactive course selection advising to mitigate impact of stereotype threat on historically marginalized students.

Performed three year study on student performance based on self-identified gender in Honors Physics.

Assessed student performance from 2014-2019 at Lakeside School using anti-racist analysis and compositing techniques.

Participated in the hiring of six faculty.

Developed Engineering/Theater maker space in close collaboration with multiple stake-holders.

Participated in a national teaching fellowship organization (Knowles Teaching Initiative) (three national meetings/year), 2013-2016.

Developed, led, and funded a regional teacher observation network in the Pacific Northwest (Ob-

ervation Northwest, 2011-2017).

**Technology, Engineering, and Communications High School, Burien, Washington USA**

*Engineering teacher and Robotics coach*

**Aug 2012 - Jun 2013**

*Introduction to Engineering and Design*

*Aug 2013 - Jun 2021*

Developed project-based curriculum that incorporates diversity/equity/inclusion, data science, and design in an engineering class.

Specific projects:

Comfort design: design and assessment of a soundproofing solution.

Useful design: skateboard design and build unit in which students use design empathy and the engineering design process to make skateboards from scratch.

*Sustainable Design and Engineering*

Developed a new course centered around climate science and the engineering design process.

Specific projects:

Climate action: Reviewed the IPCC AR5 WG1 report for the US State Department. Our primary recommendations were directly quoted to the IPCC review committee.

Useful design: Project-based learning effort in which students independently investigated an environmental question or solved an environmental problem under mentorship from a local professional.

*FIRST Robotics Coach*

Co-led a team in the 'Frisbee Challenge' of 2012-2013.

*Student Mentorship*

Co-leader of after-school club in which we offered athletic activities and adult-male mentorship to all students.

*Professional Community*

Developed, led, and funded a regional teacher observation network in the Pacific Northwest (Observation Northwest, 2011-2017)

Developed and implemented 3-minute teacher observation club at TEC High School.

**University Preparatory Academy, Seattle, Washington USA**

*Science Faculty*

**Aug 2011 - Jun 2012**

*9th Grade Physics*

Executed and augmented a project-based curriculum in the traditional Physics cannon.

*Senior Physics*

Executed and augmented a project-based curriculum in the traditional algebra-based Physics cannon. Developed new projects science-investigation project with community partners (e.g. local P-patch).

*Professional Community*

Developed and implemented 3-minute teacher observation club at University Preparatory Academy.

Organized race-awareness discussion for faculty: White People: what are they all about?

**Laboratoire de Glaciologie et Géophysique de l'Environnement  
(LGGE), Grenoble, France**

*Research Associate*

**Dec 2008 - Dec 2009**

*Polar Model Evaluation*

Evaluated a polar mesoscale model (Model Atmospherique Regional, MAR) over the East Antarctic interior using in situ observations and Kalman-filter spectral analysis.

*Stable boundary layer investigations*

Analyzed summertime meteorological measurements for Dome C, Antarctica. Planned boundary layer measurements for 2009-2010 field season at Dome C, Antarctica.

**University of Washington,  
Department of Atmospheric Science, Seattle, Washington USA**

*Research Associate*

**Aug 2007 - Nov 2008**

*Stable boundary layers and surface energy budget at the South Pole*

Used the South Pole as a laboratory for understanding stable boundary layers. Curated routine meteorology and radiation measurements. Simulated subsurface energy fluxes.

*Post-depositional processes in near-surface polar snow*

Used the surface energy budget of the South Pole to understand potential impacts of large energy fluxes and temperature gradients in the near-surface snow on the stable water isotope climate signal.

**University of Washington,  
Department of Atmospheric Science, Seattle, Washington USA**

*Graduate Student*

**May 2000 - Aug 2007**

*The surface energy budget at the South Pole*

Examined the surface energy budget using curated routine meteorology and radiation measurements. Simulated subsurface energy fluxes. Made major contributions to "Collaborative Research: Longwave radiation processes and surface energy budget on the Antarctic Plateau", Award: 0540087.

*Clouds and longwave radiative transfer over the South Pole*

Analyzed spectral infrared measurements of the sky and snow surface to understand longwave radiation over East Antarctica. Developed accurate cloud climatology for the South Pole. Evaluated satellite performance over the South Pole.

*Winterover technician and field team leader at the South Pole*

*Dec 2000 - Nov 2001*

Winterover field team leader for the South Pole Atmospheric Radiation and Cloud Lidar Experiment (SPARCLE). Ran and maintained passive and active remote sensing of atmosphere, clouds, and surface properties. Performed tethered balloon and kite soundings of the near-surface atmosphere. Performed other duties as necessary.

**University of Michigan, Department of Atmospheric, Oceanic, and Space Science (AOSS),**  
Ann Arbor, MI USA

*Research Assistant*

**Jun 1998 - Aug 1999**

*Global Monitoring Laboratory Technician*

*Sep 1998 - Aug 1999*

Maintained measurements of CO and O<sub>3</sub> at the AOSS site in Ann Arbor, MI. Mentored other undergraduate students. Calibrated and CO and O<sub>3</sub> measurements from the PROPHET Experiment.

*Field work in rural Michigan*

*Jun 1998 - Aug 1998*

Deployed and maintained field measurements of CO and O<sub>3</sub> at the University of Michigan Biological Station as part of the PHotochemistry, Emissions, and Transport (PROPHET) Experiment.

#### PUBLICATIONS

Rowe, P.M., V.P. Walden, R.E. Brandt, M.S. Town, S.R. Hudson, and S. Neshyba, 2021: Evaluation of Temperature-Dependent Complex Refractive Indices of Supercooled Liquid Water Using Downwelling Radiance and In-Situ Cloud Measurements at South Pole. *J. Geophys. Res.: Atmospheres*, 127, e2021JD035182. <https://doi.org/10.1029/2021JD035182>.

Town, M. S., 2018: Avalanche Science and Safety Practices in a High School Classroom. *The Avalanche Review*, 37.1, pp. 14-17.

Warren, S. G., and M. S. Town, 2011: Antarctica. *Encyclopedia of Climate and Weather* 2nd Ed., Oxford Univ. Press.

Froyland, H. K., N. Untersteiner, M. S. Town, S. G. Warren, 2010: Evaporation from Arctic sea ice in summer during the International Geophysics Year, 1957-1958. *J. Geophys. Res.*, 115, D15104, doi:10.1029/2009JD012769.

Genthon, C., M. S. Town, D. Six, V. Favier, S. Argentini, A. Pellegrini, 2010: Meteorological atmospheric boundary layer measurements and ECMWF analyses during summer at Dome C, Antarctica. *J. Geophys. Res.*, 115, D05104, doi:10.1029/2009JD012741.

Town, M. S., 2009: Training Scientists to Manage. *Science*, 326, DOI: 10.1126/science.326.5956.1062-a.

Town, M.S., S.G. Warren, V.P. Walden, and E.D. Waddington, 2008: Effect of atmospheric water vapor on modification of stable isotopes in near-surface snow on ice sheets. *J. Geophys. Res.*, 113, D24303, doi:10.1029/2008JD009852.

Town, M.S., E.D. Waddington, V.P. Walden, S.G. Warren, 2008: Temperatures, heating rates, and vapor pressures in the near-surface snow of East Antarctica. *J. Glaciol.*, 54, 487-498.

Hagler, G., M. Bergin, E. Smith, M. Town, and J. Dibb, 2008: Local anthropogenic impact on particulate elemental carbon concentrations at Summit, Greenland. *Atmos. Chem. Phys.*, 8, 2485-2491.

Town, M.S., V.P. Walden, S.G. Warren, 2007: Cloud cover climatology over the South Pole from visual observations, satellite retrievals, and surface based infrared measurements. *J. Climate*, 20, pp. 544-559.

Town, M.S., V.P. Walden, S.G. Warren, 2005: Spectral and broadband longwave downwelling radiative fluxes, cloud radiative forcing and fractional cloud cover over the South Pole. *J. Climate*, 18, pp. 4235-4252.

Walden, V.P., M.S. Town, B. Halter, and J.W.V. Storey, 2005: First Measurements of the Infrared Sky Brightness at Dome C, Antarctica. *Publications of the Astronomical Society of the Pacific*, 117 (829), pp. 300-308.

Hudson, S.R., M.S. Town, V.P. Walden, S.G. Warren, 2004: Temperature, humidity, and pressure response of radiosondes at low temperatures. *J. Atmos. and Oce. Technol.*, 21 (5), pp. 825-836.

Cooper, O.R., J.L. Moody, T.D. Thornberry, M.S. Town, M.A. Carroll, 2001: PROPHET 1998 meteorological overview and air-mass classification. *J. Geophys. Res.-Atmos.*, 106 (D20), pp. 24289-24299.

Pippin, M., S. Bertman, T. Thornberry, M. Town, M.A. Carroll, S. Sillman, 2001: Seasonal variations of PAN, PPN, and O-3 at the upper Midwest PROPHET site. *J. Geophys. Res.-Atmos.*, 106 (D20), pp. 24451-24463.

SELECTED  
PRESENTATIONS

Town, M.S., C. Mehring, L. Searl, D. Parry, T. Anand. Air temperature and snow extent from iButton temperature measurements on the southern aspect of Mt. Baker, WA USA. Northwest Science Association, Cal Poly, Humboldt, CA, USA, 16 May 2022.

Town, M.S., I. Gorodetskaya, H. Gallee, S.G. Warren, V.P. Walden, E.D. Waddington. The surface energy budget at South Pole, Antarctica, from observations and a regional model. Risk Management Solutions, London, May 2021. (Invited Talk).

Town, M.S., Student performance based on race and gender at Lakeside School from 2014-2019. Lakeside School, March 2021.

Town, M.S., Gleaming your own Cube: How to make a skateboard. CO Corvallis Maker Fair, Oregon State University, April 9, 2016. (Invited Interactive Presentation).

Town, M.S., Integrating Arts into STEM Education: Providing a Visceral Experience. CO Corvallis Maker Fair, Oregon State University, April 8, 2016. (Invited Talk).

Town, M.S., Current Issues in Climate Change. Lakeside School, Seattle, WA USA, May 2014.

Town, M.S., I. Gorodetskaya, H. Gallee, S.G. Warren, V.P. Walden, E.D. Waddington. The surface energy budget at South Pole, Antarctica, from observations and a regional model. University of New South Wales, Sydney, Australia, 25 May 2009. (Invited Talk).

Town, M.S., S.G. Warren, V.P. Walden, E.D. Waddington. Effect of atmospheric water vapor on water stable isotopes in near-surface snow on ice sheets. Niels Bohr Institute, Copenhagen, Denmark, 21 February 2008. (Invited talk).

Town, M.S., V.P. Walden, S.G. Warren. Model evaluation using a South Pole data set: An observational perspective. Laboratoire de Glaciologie et Géophysique de l'Environnement, Grenoble, France, 12 February 2008. (Invited talk).

Town, M.S., V.P. Walden, S.G. Warren. Energy transfer processes affecting isotopic fractionation in the near- surface snow on the Antarctic Plateau. International Union of Geodesy and Geophysics, Perugia, Italy, 2- 13 July 2007. (Talk).

Town, M.S., V.P. Walden, S.G. Warren. Energy transfer processes over the Antarctic Plateau. American Geophysical Union Fall Assembly, San Francisco CA, 11-15 December 2006. (Talk).

Town, M.S. A summary of: Adaptation and mitigation: Responses to climate change. The NCCR Climate summer school Swiss Climate Research. Program on Climate Change Summer Institute, Leavenworth WA, 22 September 2006. (Talk).

Town, M.S., V.P. Walden, S.G. Warren. Cloud cover climatology for the South Pole from surface-based infrared radiation measurements. Graduate Climate Conference, Pack Forest, April 2006. (Poster).

Town, M.S., V.P. Walden, S.G. Warren. Cloud cover from ground-based infrared measurements at the South Pole. Cloud Climatology Workshop 2005, Madison Wisconsin, 5-6 April 2005. (Talk).

Town, M.S., V.P. Walden, S.G. Warren. Cloud cover climatology for the South Pole from surface-based infrared radiation measurements. 8 th Conference on Polar Meteorology, American Meteorological Society, San Diego CA, 9-13 January 2005. (Extended Abstract and Poster).

Town, M.S., V.P. Walden. Uncertainty analysis of data from the Polar Atmospheric Emitted Radiance Interferometer (PAERI) during the South Pole Atmospheric Radiation and Cloud Lidar Experiment (SPARCLE). International Radiation Symposium, International Radiation Commission, Busan Korea, 23- 28 August, 2004. (Extended Abstract and Poster).

- COMPUTER SKILLS
- Operating Systems: Linux/Unix, Windows, MacOS,
  - Languages: Python, Matlab, some Unix shell scripts, some SQLite
  - Packages: Pandas, SkiLearn, L<sup>A</sup>T<sub>E</sub>X, DB Browser, common Linux/Windows/MacOS database, spreadsheet, and presentation software
  - Models: LBLRTM, SNOWPACK, MAR, finite-element heat transfer modeling

- OTHER SKILLS
- Wilderness First Aid (2016-present)
  - Wilderness First Aid Instructor (2019-present)
  - Avalanche Recreation Level 1 (2016), Level 2 (2018), Rescue Course (2019)

- HONORS AND AWARDS
- Knowles Teacher Initiative (Senior Fellow, 2016-present)
  - Knowles Teacher Initiative (Fellow, 2011-2016)
  - Alpha Sigma Nu ( $\Sigma$ N) Honors Society (2011)
  - Antarctic Service Medal (2001).
  - Member of Sigma Pi Sigma (National Physics Honors Society, 1999)
  - Research Undergraduate Experience Fellowship (1998)
  - Member of Golden Key National Honor Society (1998)
  - Dean's List (1995-1998)

- CURRENT PROFESSIONAL SOCIETIES
- American Avalanche Association
  - Northwest Science Association
  - Knowles Teacher Initiative