

BRIAN J. BUTTERWORTH

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EDUCATION

University at Albany, State University of New York	Atmospheric Science	Ph.D.	2016
University of Colorado, Boulder	Geography	M.A.	2011
University of Delaware	Environmental Science	B.S.	2007

PROFESSIONAL EXPERIENCE

Research Associate – University of Wisconsin–Madison, Atmos. Science Study: <i>Chequamegon Heterogeneous Ecosystem Energy-balance Study Enabled by a High-density Extensive Array of Detectors (CHEESEHEAD)</i>	2019 – present
Postdoctoral Associate – University of Calgary, Geography Studies: <i>Ship and tower-based eddy covariance measurements of carbon dioxide flux over sea ice in the Canadian Arctic</i>	2016 – 2019
Graduate Researcher – Atmospheric Sciences Research Center, UAlbany Dissertation: <i>Air-Sea Carbon Dioxide Exchange in the Southern Ocean and Antarctic Sea Ice Zone</i>	2012 – 2016
Affiliate Faculty – Metropolitan State University of Denver	2011 – 2012
Geocoding Analyst – University of Wisconsin – Madison Study: <i>Drinking Water Systems, Hydrology, and Childhood Gastrointestinal Illness in Central and Northern Wisconsin</i>	2011 – 2012
Graduate Researcher – University of Colorado, Boulder Thesis: <i>A Climatological Study of the Relationship between Alpine Treeline and Thermally-Driven Upslope Winds on Niwot Ridge, Colorado</i>	2008 – 2011
Undergraduate Researcher – University of Delaware Study: <i>Impact of the biological control agent <i>Rhinoncomimus latipes</i> on mile-a-minute weed, <i>Persicaria perfoliata</i>, in field cages</i>	2006

PEER-REVIEWED PUBLICATIONS

Butterworth, B. J., and Coauthors, 2020: Connecting Land-Atmosphere Interactions to Surface Heterogeneity in CHEESEHEAD19. *Bulletin of the American Meteorological Society*, <https://doi.org/10.1175/BAMS-D-19-0346.1>. *in press*.

Duke, P. J., B. G. T. Else, S. Jones, S. Marriot, M. Ahmed, V. Nandan, **B. J. Butterworth**, S. Gonski, R. Dewey, L. Miller, K. Simpson, and H. Thomas, 2020: Seasonal Marine Carbon System Processes in an Arctic Coastal Landfast Sea Ice Environment Using an Innovative Underwater Sensor Platform. *Elementa: Science of the Anthropocene*, #ELEMENTA-D-20-00103R1, *accepted*.

Butterworth, B. J., and B. G. T. Else, 2018: Dried, closed-path eddy covariance method for measuring carbon dioxide flux over sea ice. *Atmospheric Measurement Techniques*, **11**, 6075–6090, <https://doi.org/10.5194/amt-11-6075-2018>.

Butterworth, B. J., and S. D. Miller, 2016: Air-sea exchange of carbon dioxide in the Southern Ocean and Antarctic marginal ice zone. *Geophysical Research Letters*, **43**, 7223–7230, <https://doi.org/10.1002/2016GL069581>

Butterworth, B. J. and S. D. Miller, 2016: Automated Underway Eddy Covariance System for Air–Sea Momentum, Heat, and CO₂ Fluxes in the Southern Ocean. *Journal of Atmospheric and Oceanic Technology*, **33**, 635–652, <https://doi.org/10.1175/JTECH-D-15-0156.1>

Hough-Goldstein, J., M. Schiff, E. Lake and **B. Butterworth**, 2008: Impact of the biological control agent *Rhinoncomimus latipes* (Coleoptera : Curculionidae) on mile-a-minute weed, *Persicaria perfoliata*, in field cages. *Biological Control*, **46**, 417–423, <https://doi.org/10.1016/j.biocontrol.2008.04.001>

MANUSCRIPTS UNDER REVIEW

Ahmed, M. M. M., B. G. T. Else, **B. J. Butterworth**, D. W. Capelle, C. Guéguen, L. A. Miller, C. Meilleur, and T. Papakyriakou, 2020: Widespread surface water pCO₂ undersaturation during ice melt season in an Arctic continental shelf sea (Hudson Bay, Canada). *Elementa: Science of the Anthropocene*, #ELEMENTA-D-20-00130, *revising*.

Helbig, M., T. Gerken, E. Beamesderfer, D. D. Baldocchi, T. Banerjee, S. C. Biraud, W. O. J. Brown, N. A. Brunsell, E. A. Burakowski, S. P. Burns, **B. J. Butterworth**, et al., 2020: Integrating continuous atmospheric boundary layer and tower-based flux measurements to advance understanding of land-atmosphere interactions. *Agricultural and Forest Meteorology*, #AGFORMET-S-20-01618, *revising*.

Metzger S., D. Durden, S. Paleri, M. Sührling, **B. J. Butterworth**, C. Florian, M. Mauder, D. M. Plummer, L. Wanner, K. Xu, A. R. Desai. Observing System Simulation Experiments double scientific return of surface-atmosphere synthesis. *Journal of Advances in Modeling Earth Systems*, #2020MS002458, *submitted*.

MANUSCRIPTS IN PREPARATION

Butterworth, B. J., and B. G. T. Else. Annual carbon dioxide flux over seasonal sea ice in the Canadian Arctic. *full draft coauthor review*.

J. Watts, T. Bell, K. Anderson, T. Holding, **B. J. Butterworth**, S. Miller, B. Else, J. Prytherch, J. Shutler. Reconciling polar eddy covariance air-sea gas transfer velocity parameterisations: critical review and sensitivity to sea ice data and uncertainties. *full draft coauthor review*.

OTHER PUBLICATIONS

Paleri, S., **B. J. Butterworth**, and A. R. Desai: Spatial Patterns and Scales. *Conceptual Boundary Layer Meteorology: The Air Near Here*, A.L. Hiscox and A.G. McCombs, Eds., Elsevier, in press. **[book chapter]**

Helbig, M., T. Gerken, E. Beamesderfer, D. D. Baldocchi, T. Banerjee, S. C. Biraud, N. A. Brunsell, S. P. Burns, **B. J. Butterworth**, et al.: Whitepaper: Understanding land-atmosphere interactions through tower-based flux and continuous atmospheric boundary layer measurements, AmeriFlux Management Project, 47 pp., 2020. **[white paper]**

PUBLISHED DATASETS

Miller, S. and **B. J. Butterworth**, (2016). Eddy covariance air-sea momentum, heat, and carbon dioxide fluxes in the Southern Ocean from the Nathaniel B. Palmer (cruise NBP1210). Integrated Earth Data Applications (IEDA). doi: <http://dx.doi.org/10.1594/IEDA/323564>.

Miller, S. and **B. J. Butterworth**, (2016). Eddy covariance air-sea momentum, heat, and carbon dioxide fluxes in the Southern Ocean from the Nathaniel B. Palmer (cruise NBP1402). Integrated Earth Data Applications (IEDA). doi: <http://dx.doi.org/10.1594/IEDA/323565>.

Desai, A. R., **B. J. Butterworth**, S. P. Oncley, (2019), CHEESEHEAD Datasets:

AmeriFlux US-PFb	NW1 Pine-1	https://doi.org/10.17190/AMF/1717850
AmeriFlux US-PFc	NW2 Aspen-1	https://doi.org/10.17190/AMF/1717851
AmeriFlux US-PFd	NW3 Tussock-1	https://doi.org/10.17190/AMF/1717852
AmeriFlux US-PFe	NW4 Lake-1	https://doi.org/10.17190/AMF/1717853
AmeriFlux US-PFg	NE1 Pine-2	https://doi.org/10.17190/AMF/1717854
AmeriFlux US-PFh	NE2 Pine-3	https://doi.org/10.17190/AMF/1717855
AmeriFlux US-PFi	NE3 Hardwood-1	https://doi.org/10.17190/AMF/1717856
AmeriFlux US-PFj	NE4 Maple-1	https://doi.org/10.17190/AMF/1717857
AmeriFlux US-PFk	SW1 Aspen-2	https://doi.org/10.17190/AMF/1717858
AmeriFlux US-PFL	SW2 Aspen-3	https://doi.org/10.17190/AMF/1717859
AmeriFlux US-PFm	SW3 Hardwood-2	https://doi.org/10.17190/AMF/1717860
AmeriFlux US-PFn	SW4 Hardwood-3	https://doi.org/10.17190/AMF/1717861
AmeriFlux US-PFp	SE2 Hardwood-4	https://doi.org/10.17190/AMF/1717862
AmeriFlux US-PFq	SE3 Aspen-4	https://doi.org/10.17190/AMF/1717863
AmeriFlux US-PFr	SE4 Tussock-2	https://doi.org/10.17190/AMF/1717864
AmeriFlux US-PFs	SE5 Aspen-5	https://doi.org/10.17190/AMF/1717865
AmeriFlux US-PFt	SE6 Pine-4	https://doi.org/10.17190/AMF/1717866

INVITED TALKS

Butterworth, B. J. and A. R. Desai: Be a CHEESEHEAD: Results from the Chequamegon Heterogeneous Ecosystem Energy-Balance Study Enabled by a High-Density Extensive Array of Detectors study. *National Center for Atmospheric Research (NCAR) Earth Observatory Laboratory (EOL) Seminar Series*. Dec 1, 2020.

Butterworth, B. J., 2019: Carbon Dioxide Exchange over Oceans and Sea Ice. *Center for Sustainability and the Global Environment (SAGE) and Nelson Institute Center for Climatic Research (CCR) Spring Meeting*, Madison, Wisconsin.

Butterworth, B. J., 2019: Air-Sea Carbon Dioxide Exchange in the Southern Ocean and Antarctic Sea Ice Zone. *UW-AOS Colloquium*, Madison, Wisconsin.

PRESENTATIONS (FIRST AUTHOR)

Butterworth, B. J., A. Desai, S. Paleri, L. Wanner, M. Mauder, 2020: Influence of Mesoscale Eddies on Energy Balance Closure over a Heterogeneous Ecosystem. *AGU Fall Meeting 2020*, H192-08. [Oral Presentation]

Butterworth, B. J., A. Desai, S. Paleri, S. Metzger, D. Durden, C. Florian, M. Mauder, L. Wanner, D. LaLuzerne, 2020: Advances in Energy Balance Research from CHEESEHEAD19. *AmeriFlux Annual Meeting*, 8 Oct. 2020. [Poster Presentation]

Butterworth, B. J., Desai, A., Paleri, S., Metzger, S., Durden, D., Florian, C., Mauder, M., Wanner, L., Sühling, M., and Xu, K., 2020: Using Spatial Eddy Covariance to Investigate Energy Balance Closure over a Heterogeneous Ecosystem, *A CHEESEHEAD virtual mini-session*, 17 June 2020. [Oral Presentation]

Butterworth, B. J., Desai, A., Paleri, S., Metzger, S., Durden, D., Florian, C., Mauder, M., Wanner, L., Sühling, M., and Xu, K., 2020: Using Spatial Eddy Covariance to Investigate Energy Balance Closure over a Heterogeneous Ecosystem, *EGU General Assembly 2020, Online*, 4–8 May 2020, EGU2020-22480, <https://doi.org/10.5194/egusphere-egu2020-22480>. [Chat-based presentation]

Butterworth, B. J., Desai, A. R., Metzger, S., and Paleri, S. 2019: Impact of the Spatial Distribution of Surface Fluxes on Energy Balance Closure over a Heterogeneous Ecosystem. *AGU Fall Meeting 2019*, B41K-2496. [Poster Presentation]

Butterworth, B. J., A. Desai, S. Oncley, W. Brown, S. Metzger, D. Durden, P. Townsend, E. Kruger, P. Stoy, G. Petty, M. Schwartz, E. Olson, H. Vogelmann, S. Paleri, K. Xu, and J. Mineau, 2019: Updates on the Chequamegon Heterogeneous Ecosystem Energy-balance Study Enabled by a High-density Extensive Array of Detectors. *AmeriFlux Annual Meeting*, Boulder, Colorado. [Poster Presentation]

Butterworth, B. J., B. Else, 2019: Annual Carbon Dioxide Flux over Seasonal Sea Ice in the Canadian Arctic. *Annual AOSS Community Poster Reception*, Madison, Wisconsin. [Poster]

Butterworth, B. J., and B. Else (Presenter), 2017: Eddy Covariance Measurements of Greenhouse Gas Exchange in an Arctic Marine Environment. *ArcticNet 2017 Annual Scientific Meeting*, Winnipeg, Manitoba. [Poster Presentation]

Butterworth, B. J., and S.D. Miller, 2016: Air-Sea Exchange of Carbon Dioxide in the Antarctic Marginal Ice Zone. *ArcticNet 2016 Annual Scientific Meeting*, Winnipeg, Manitoba. [Oral Presentation]

Butterworth, B. J., and S.D. Miller, 2016: Air-Sea Exchange of Carbon Dioxide in the Southern Ocean and Antarctic Marginal Ice Zone. *Air-sea Gas Flux; Progress and Future Prospects Science Workshop*, IFREMER, Brest, France. [Oral Presentation]

Butterworth, B. J., and S.D. Miller, 2015: Air-Sea CO₂ Flux by Eddy Covariance in the Southern Ocean and Antarctic Sea Ice Zone. *7th International Symposium on Gas Transfer at Water Surfaces*, Seattle, WA. [Oral Presentation]

Butterworth, B. J., and S.D. Miller, 2015: Unattended Measurements of High Latitude Air-sea CO₂ Exchange by Eddy Covariance, *19th Conference on Air-Sea Interaction*, Phoenix, AZ. [Oral Presentation]

Butterworth, B. J., and S.D. Miller, 2014: Long-term Southern Ocean Air-sea CO₂ Flux by Eddy Covariance from an Ice Breaker. *Ocean Sciences Meeting*, Honolulu, HI. [Oral Presentation]

Butterworth, B. J., and S.D. Miller, 2013: Air-sea Fluxes of CO₂ over the Southern Ocean. *6th International SOLAS Summer School*, Xiamen, China. [Oral and Poster Presentation]

TEACHING EXPERIENCE

Metropolitan State University of Denver

Introduction to Physical Geography	2012 (2 classes)
Map Use	2012
Weather and Climate	2011

University of Colorado, Boulder

Laboratory for Physical Geography I	2009 (3 classes), 2010 (2 classes), 2011 (3 classes)
Laboratory for Physical Geography II	2008 (3 classes), 2009 (3 classes), 2010 (3 classes)
Mountain Meteorology (TA)	2009

Mentoring

James Mineau	UW-Madison undergraduate	2019-2021
Leo Mikula	UW-Madison technician	2019
Zach Szumloz	SUNY Albany undergraduate	2014

GRANTS

Travel Grant – 2 nd International workshop of Air-Sea Gas Fluxes (France)	2016
Travel Grant – Surface Ocean Lower Atmosphere Study summer school (China)	2013
Travel Grant – University at Albany Graduate Student Association	2013
Adam Kolff Memorial Research Fellowship	2010

HONORS & AWARDS

Narayan R. Gokhale Distinguished Research Scholarship Award
United States Antarctic Service Medal
CU Boulder Geography Scholarship
Outstanding Senior in Environmental Science Award – University of Delaware
Member of Phi Beta Kappa – academic fraternity
Member of Alpha Zeta – honors agricultural fraternity
Honors Program at University of Delaware
Tuition Scholarship – University of Delaware

PROFESSIONAL ACTIVITIES

Special Collection Organizer	<i>Advances in scaling and modeling of land-atmosphere interactions</i> across JGR: Biogeosciences, JGR: Atmospheres, JAMES, and ESS	2020
Workshop Organizer	Organized a workshop (funded by NEON) on cloud computing resources for processing data from the CHEESEHEAD project	2019
Session Convener & Chair	<i>AGU Meeting</i> – B21C - Surface-Atmosphere Interactions: Advances in Analysis and Scaling of Surface-Atmosphere Fluxes	2019
Early Career Workshop	Participated the AmeriFlux Early Career Workshop at the <i>AmeriFlux Annual Meeting</i> , Boulder, Colorado	2019
Session Chair	<i>ArcticNet Science Meeting</i> – Ocean-Sea-Ice-Atmosphere Interaction, Winnipeg, MB, Canada	2016
Air-Sea Gas Flux Workshop	Presented at the 2 nd International workshop on Air-Sea Gas Fluxes: Progress and Future Prospects, IFREMER, Brest, France	2016
Summer School	Surface Ocean Lower Atmosphere Study (SOLAS), Xiamen, China	2013

OUTREACH

DEI Town Hall Organizer	Working with UW Postdoctoral Association's Diversity & Inclusion Committee to organize a forum on diversity, equity, and inclusion challenges faced by postdocs from underrepresented groups	2020
Open House Organizer	Helped organize an open house event to illustrate the CHEESEHEAD project to the community of Park Falls, WI	2019

Park Falls Public Library	Presentation on the scientific motivations for the CHEESEHEAD study to community of Park Falls, WI	2019
Sexual Harassment Prevention Training Organizer	Helped organize a sexual harassment prevention training event for the participants of the CHEESEHEAD project	2019
Ark Community Charter School	Presentation on the Southern Ocean gas exchange experiment to 3 rd grade class in Troy, NY	2014

FIELD CAMPAIGNS

Park Falls, Wisconsin (May – Oct): Managed field operations for the CHEESEHEAD field campaign to determine the influence of mesoscale atmospheric processes on the Earth's energy balance.	2019
Quebec City, QC (May 10 – 23): Installed eddy covariance system on board the CCGS Amundsen for the Summer 2018 Expedition. Sailed (May 17 – 21) as part of equipment testing cruise in the St. Lawrence Estuary.	2018
Hokkaido, Japan (Feb 27 – Mar 11): Deployed under-ice eddy covariance system for measuring O ₂ fluxes in Saroma-ko Lagoon in Hokkaido, Japan as part of an international collaboration (SCOR Working Group 152 on Measuring Essential Climate Variables in Sea Ice) to compare methods for measuring biogeochemical properties of sea ice.	2018
Amundsen Leg 2a (July 5 – 14): Sailed aboard the research vessel CCGS Amundsen from Kuujuarapik, Quebec to Iqaluit, Nunavut to take measurements of air-sea-ice gas exchange in Hudson Bay.	2017
Amundsen Leg 1 (May 22 – June 11): Sailed aboard the research vessel CCGS Amundsen as part of the BaySys project from Quebec City to St. Johns, Newfoundland. Installed eddy covariance system on the bow mast of the ship to collect measurements of air-sea-ice gas exchange of carbon dioxide and methane.	2017
Cambridge Bay, Nunavut (Apr 21 – May 5): Traveled to Qikirtaajuk Island in Dease Strait to install an eddy covariance tower to collect long-term, continuous measurements of air-sea-ice carbon dioxide flux.	2017
Cranberry Lake, New York (Aug 11 – 22): Lake-atmosphere gas exchange, collaboration between ASRC, SUNY ESF, Columbia University.	2014
Research Vessel Ice Breaker (RVIB) Nathaniel B. Palmer (June 22 – 29): Equipment repairs and 6-day cruise from Punta Arenas to Valparaiso, Chile	2013
RVIB Nathaniel B. Palmer (Nov 19 – 26): Equipment repair, Punta Arenas, Chile	2013
RVIB Nathaniel B. Palmer (Dec 20, 2012 – Feb 12, 2013): Installed & maintained EC system aboard 40-day cruise from Punta Arenas, Chile to McMurdo Station, Antarctica	2012

Niwot Ridge, Colorado (August): Collaboration with Daniel Wolfe (NOAA) investigating boundary-layer development on Niwot Ridge using tethered sonde.	2010
Colorado Springs, Colorado (August): NCAR Bio-hydro-atmosphere interactions of Energy, Aerosols, Carbon, H ₂ O, Organics & Nitrogen (BEACHON) study – Weather balloon releases to investigate troposphere over Hayman Fire burn site.	2010
Niwot Ridge, Colorado (summer) – Installed EC equipment and an array (3km x 4km) of temperature probes on Niwot Ridge to investigate the interaction between the local meteorology and vegetation patterns.	2009
White Clay Creek State Park, Delaware (summer) – Tested the effectiveness of using host-specific weevil as a biological control agent for invasive mile-a-minute weed.	2006

JOURNAL REVIEWER

Boundary-Layer Meteorology	2021
Limnology and Oceanography Methods	2020
Forests	2020
Ocean Science	2019
Atmospheric Measurement Techniques	2016, 2018

ADVISORS

Postdoctoral – Dr. Ankur R. Desai	University of Wisconsin – Madison, Atmospheric Sci.
Postdoctoral – Dr. Brent G. T. Else	University of Calgary, Geography
Ph.D. – Dr. Scott D. Miller	University at Albany, SUNY, Atmospheric Science
Master's – Dr. Peter D. Blanken	University of Colorado, Boulder, Geography