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EDUCATION

- **Ph.D., Hydrometeorology**..**December 2013**
Department of Hydrology and Atmospheric Sciences, University of Arizona, Tucson, AZ
Dissertation: *Improving Distributed Hydrologic Modeling and Global Land Cover Data*

- **M.S., Hydrology**...**December 2008**
Department of Hydrology and Water Resources, University of Arizona, Tucson, AZ
Thesis: *Understanding the Importance of Aspect on Mountain Catchment Hydrology: A Case Study in the Valles Caldera, NM*

- **B.A., Geology**...**May 2006**
Geology Department, Whitman College, Walla Walla, WA

RESEARCH EXPERIENCE

Post-Doctoral Associate – *U. of Arizona - Supervisor: W. van Leeuwen (**Jan 2019-present**)*
- Researching snow-forest interactions in Arizona and California
- Operate drones and process drone data to make 3-D models of forest structure
- Building and maintaining technology for distributing environmental data

Post-Doctoral Associate – *U. of Arizona - Supervisor: W. van Leeuwen (**Apr 2016-Dec 2018**)*
- Studied how forest structure (tree coverage, arrangement) influences snow cover in northern Arizona
- Built a web-based multiproduct snow mapping system

Post-Doctoral Associate – *U. of Arizona - Supervisor: X. Zeng (**January 2014-Mar 2016**)*
- Developed high-resolution gridded snow data for the United States; evaluated global snow products derived from satellite, reanalysis, and land models.
- Helped to develop the first global 1 km depth to bedrock estimates for global modeling systems.

Graduate Assistant – *U. of Arizona - Supervisors: P. A. Troch and X. Zeng (**August 2009-December 2013**)*
- Developed and implemented high resolution distributed hydrological models for flood and snowmelt simulations
- Built global 1 km vegetation datasets (Land Cover Type and Vegetation Cover) from MODIS data.

Graduate Assistant – *U. of Arizona. - Supervisor: P. A. Troch (**August 2006-December 2008**)*
- Studied how aspect (slope direction) controls water transit times in watersheds flowing in different directions from Redondo Peak, in the Valles Caldera, New Mexico.

Summer Internships – *Los Alamos National Laboratory - Supervisor: S. Johnson (**May-August 2002, 2004, 2006**)*
- Studied various factors that influence local climate in Los Alamos, NM, with an emphasis on sea surface temperature anomalies in the Pacific Ocean.
- Studied fire risk in the Los Alamos area.

TECHNICAL SKILLS

- Hydrologic modelling, monitoring, dataset creation, and decision support tools
  - Created a high resolution (1 m) snow model called SnowPALM for understanding how forest cover affects snowpack
  - Developed data for four major geophysical datasets (see data section below)
  - Designed and implemented field experiments
  - Created web-based decision support tools for monitoring snow, water, and vegetation change
    - SnowView – https://climate.arizona.edu/snowview/
    - DroughtView – https://droughtview.arizona.edu/

- GIS analysis (QGIS, ArcGIS) and working with web-based GIS viewers (e.g. Google Earth, Leaflet Maps)
  - Visit **https://github.com/broxtopd** for a variety of tools to help analyze and visualize GIS data
- Programming with Matlab, Python, HTML, Javascript, Open source GIS (GDAL) software
- Collecting and processing drone data for Structure from Motion 3-d reconstruction

RESEARCH HIGHLIGHTS AND MEDIA COVERAGE

- Snow study was featured in press releases by **UA News** and **AGU**, was referenced by various media outlets including the **New York Times**, **Tucson Daily Star**, **Wired Magazine**, **Pinal Central**, **Cronkite News**, **Arizona Public Media**, and others.
- **Broxton, P. D.**, X. Zeng, N. Dawson, A 35 Year Dataset for Climatological Snow Studies over the Conterminous US, *GEWEX News*, Vol. 29 No. 2, Quarter 2 2019.
- Editor highlight for "**Linking Snowfall and Snow Accumulation to Generate Spatial Maps of SWE and Snow Depth**" https://agupubs.onlinelibrary.wiley.com/article/10.1002/2016EA000174/editor-highlight/
- **Broxton, P. D.**, P. A. Troch, M. Schaffner, C. Unkrich, D. Goodrich, Improved Flash Flood Predictions using KINEROS/SM-hsB, *NHWRC Transmission*, August 2011.
- **AGU Outstanding Student Paper Award** *(December 2011)* - For submission titled, "Improving Flash Flood Predictions in Moderate Sized Watersheds by Adding Snowmelt and Baseflow to KINEROS" to 2011 AGU fall meeting
- **Hydrograf(x) Visualization Competition Award** *(December 2008)* - First Place Award in the Technical and Professional Category for entry titled, "Visualization in Hydrology Using Google Earth"

REFEREED PUBLICATIONS

- **Broxton, P. D.**, W. van Leeuwen, J. Biederman, Forest Structure and Topography Regulate the Thin, Ephemeral Snowpacks of the Semiarid Southwest US, *Ecohydrology*, doi: 10.1002/eco.2202
- Wang, Y.-H., **P. Broxton.**, Y. Fang, A. Behrangi, M. Barlage, X. Zeng, X., & G.-Y. Niu, 2019. A Wet-Bulb Temperature-Based Rain-Snow Partitioning Scheme Improves Snowpack Prediction Over the Drier Western United States. *Geophysical Research Letters*, 46, 13825– 13835. https://doi.org/10.1029/2019GL085722
- **Broxton, P. D.**, W. van Leeuwen, J. Biederman, 2019, Improving Snow Water Equivalent Maps with Machine Learning of Snow Survey and Lidar Measurements, *Water Resources Research*, 10.1029/2018WR024146.
- Dawson, N**., P. D. Broxton**, X. Zeng, 2019, Evaluation of Remotely-Sensed Snow Water Equivalent and Snow Cover Over the Continental United States, *J. Hydrometeor.*, 10.1175/JHM-D-18-0007.1.
- X. Zeng**., P. D. Broxton**, N. Dawson, 2018, Snowpack Change from 1982-2016 over Continental United States, *Geophysical Research Letters,* 10.1029/2018GL079621.
- Perdrial, J., Brooks, P.D., Swetnam, T. et al., 2018, A net ecosystem carbon budget for snow dominated forested headwater catchments: linking water and carbon fluxes to critical zone carbon storage, *Biogeochemistry*, 138: 225. DOI: 10.1007/s10533-018-0440-3.
- **Broxton, P. D.**, X. Zeng, and N. Dawson, 2017: The impact of a low bias in SWE initialization on CFS seasonal forecasts, *J. Climate*, doi: 10.1175/JCLI-D-17-0072.1.
- Dawson, N., **P. D. Broxton**, and X. Zeng, 2017: A new snow density parameterization for land data initialization. *J. Hydrometeor.*, **18**, 197-207, doi: 10.1175/JHM-D-16-0166.1.
- **Broxton, P. D.,** X. Zeng, and N. Dawson, 2016: Why Do Global Reanalyses and Land Data Assimilation Products Underestimate Snow Water Equivalent? *J. Hydrometeor.*, **17**, 2743–2761, doi: 10.1175/JHM-D-16-0056.1.
- **Broxton, P. D.,** X. Zeng, and N. Dawson, 2016: Linking snowfall and snow accumulation to generate spatial maps of SWE and snow depth. *Earth and Space Science*, **3**, 246–256, doi: 10.1002/2016EA000174.
- Dawson, N**., P. D. Broxton**, X. Zeng, M. Leuthold, and P. Holbrook, 2016: An Evaluation of Snow Initializations for NCEP Global and Regional Forecasting Models. *J. Hydrometeor.*, **17**, 1885–1901, doi: 10.1175/JHM-D-15-0227.1.
- Pelletier, J., **P. D. Broxton,** P. Hazenberg, X. Zeng, P. A. Troch, G.-Y. Niu, Z. Williams, M. Brunke, and D. Gochis, 2015: A gridded global data set of soil, intact regolith, and sedimentary deposit thicknesses for regional and global land surface modeling. *J. Adv. Modeling Earth Systems*, **8**, 41-65, doi: 10.1002/2015MS000526.
- Brunke, M., **P. D. Broxton**, J. Pelletier, D. Gochis, P. Hazenberg, D. M. Lawrence, L. R. Leung, G.-Y. Niu, P. A. Troch, and X. Zeng, 2015: Implementing and testing variable soil thickness in the Community Land Model version 4.5. *J. Climate*, **29**, 3441–3461, doi: 1175/JCLI-D-15-0307.1.

- Hazenberg P., Y. Fang, **P. D. Broxton**, D Gochis, G. Y. Niu, J. Pelletier, P. A. Troxh, X. Zeng, 2015: A hybrid-3D hillslope hydrological model for use in Earth system models. *Water Resour. Res.,* 51, 8218–8239, doi:10.1002/2014WR016842.
- Hazenberg, P., **P. D. Broxton**, D. Gochis, G.-Y. Niu, L. A. Prangle, J. D. Pelletier, P. A. Troch, X. Zeng, 2015: Testing the hybrid-3D hillslope hydrological model in a controlled environment. *Water Resour. Res.,*52, 1089–1107, doi:10.1002/2015WR018106
- **Broxton P. D.**, A. A. Harpold, J. A. Biederman, P. A. Troch, N. P. Molotch, P. D. Brooks, 2014: Quantifying the Effects of Vegetation Structure on Snow Accumulation and Ablation in Mixed-Conifer Forests, *Ecohydrology*, DOI: 10.1002/eco.1565.
- **Broxton P. D.**, X. Zeng, W. Scheftic, P. A. Troch, 2014: A MODIS-Based Global 1 km Maximum Green Vegetation Fraction Dataset, *Journal of Applied Meteorology and Climatology*, 53, 1996–2004, DOI: 10.1175/JAMC-D-13-0356.1.
- Scheftic, W., X. Zeng, **P. D. Broxton**, and M. Brunke, 2014: Intercomparison of seven NDVI products over the United States and Mexico, *Remote Sensing*, 6, 1057-1084; DOI:10.3390/RS6021057.
- **Broxton P. D**., Zeng, X., Sulla-Menashe, D., Troch, P. A., 2014: A Global Land Cover Climatology Using MODIS Data, *Journal of Applied Meteorology and Climatology*, 53, 1593–1605. DOI: 1175/JAMC-D-13-0270.1
- **Broxton P. D.**, P. A. Troch, M.S. Schaffner, C. Unkrich, D. Goodrich, 2014: An All-Season Flash Flood Forecasting System for Real-Time Operations, *Bulletin of the American Meteorological Society*, 95(3), 399-407, DOI: 10.1175/BAMS-D-12-00212.
- **Broxton P. D.**, P.A. Troch, S.W. Lyon. 2009: On the Role of Aspect to Quantify Water Transit Times in Small Mountainous Catchments, *Water Resources Research,* 45 (8), DOI: 10.1029/2008WR007438.
- Lyon S.W., P.A. Troch, **P. D. Broxton**, N.P. Molotch, P.D. Brooks, 2008: Monitoring the Timing of Snow Melt and the Initiation of Streamflow using a Distributed Network of Temperature/Light Sensors, *Ecohydrology*, 1 (3), 215-224.

DATASETS

- **Broxton, P.,** X. Zeng, and N. Dawson. 2019. Daily 4 km Gridded SWE and Snow Depth from Assimilated In-Situ and Modeled Data over the Conterminous US, Version 1. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. doi: https://doi.org/10.5067/0GGPB220EX6A.
- Pelletier, J.D., **P.D. Broxton**, P. Hazenberg, X. Zeng, P.A. Troch, G. Niu, Z.C. Williams, M.A. Brunke, and D. Gochis. 2016. Global 1-km Gridded Thickness of Soil, Regolith, and Sedimentary Deposit Layers. ORNL DAAC, Oak Ridge, Tennessee, USA. http://dx.doi.org/10.3334/ORNLDAAC/1304.
- **Broxton P.D.,** Zeng, X., Scheftic, W., Troch, P.A., 2014b, A MODIS-Based 1 km Maximum Green Vegetation Fraction Dataset, J. Appl. Meteorol. Clim., DOI: http://dx.doi.org/10.1175/JAMC-D-13-0356.1.
- **Broxton, P.D.,** Zeng, X., Sulla-Menashe, D., Troch, P.A., 2014a: A Global Land Cover Climatology Using MODIS Data. J. Appl. Meteor. Climatol., 53, 1593–1605. doi: http://dx.doi.org/10.1175/JAMC-D-13-0270.1

TECHNICAL PRESENTATIONS (PRESENTED)

- **Broxton, P. D.**, W. van Leeuwen, J. Biederman, K. Hartfield, The impact of forest cover on snowpack in the semi-arid southwestern US, American Geophysical Union Fall Meeting, San Francisco, CA, Dec 9 2019.
- **Broxton, P. D.**, W. van Leeuwen, J. Biederman, SnowView: SnowView: A Satellite Data and Model Driven Decision Support Tool for monitoring snowpack, precipitation, and streamflow, American Water Resources Association Annual Water Resources Conference, Salt Lake City, UT, Nov. 6, 2019.
- **Broxton, P. D.**, W. van Leeuwen, J. Biederman, Using multi-angle aerial photography from a UAV and Structure from Motion to improve snowpack monitoring in Northern Arizona, Arizona Hydrological Society Annual Symposium, Tucson, AZ, Sep 27, 2019.
- **Broxton, P. D.**, W. van Leeuwen, J. Biederman, SnowView: A satellite data and model driven decision support tool for water resource management, 33rd Conference on Hydrology, 99th American Meteorological Society Annual Meeting, Phoenix, AZ, Jan 7, 2019.
- **Broxton, P. D.**, W. van Leeuwen, J. Biederman, Snowpack Monitoring along Arizona's Mogollon Rim, Colorado Basin River Forecast Center Stakeholder Meeting, Phoenix, AZ, Nov 15, 2018.
- **Broxton, P. D.**, W. van Leeuwen, J. Biederman, The Effect of Forest Structure on Snowpack along Arizona's Mogollon Rim, 86th Annual Western Snow Conference, Albuquerque, NM, April 16-19, 2018.

- **Broxton, P. D.**, W. van Leeuwen, J. Biederman,, SWANN: The Snow Water Artificial Neural Network Modelling System, AGU Fall Meeting, San Francisco, CA, December 14, 2017.
- **Broxton, P. D.**, W. van Leeuwen, J. Biederman, Leveraging LiDAR derived forest and snow information into snow models to inform water resource management, 2nd Annual Airborne Snow Observatory Workshop, Mammoth, CA, September, 12, 2017.
- **Broxton, P. D.**, W. van Leeuwen, J. Biederman, Snow monitoring in the Salt/Verde Watersheds, Arizona Hydrological Society – 30th Annual Symposium, Flagstaff, AZ, September 7, 2017.
- **Broxton, P. D.**, X. Zeng, N. Dawson, How are CFS seasonal forecasts affected by poor snow initialization?, 5th WGNE workshop on systematic errors in weather and climate models, Montreal, Quebec, Canada, June 19-23, 2017.
- **Broxton, P. D.**, A. Harpold, W. van Leeuwen, J. Biederman, Demonstrating the Uneven Importance of Fine-Scale Forest Structure on Snow Distributions using High Resolution Modeling, AGU Fall Meeting, San Francisco, CA, December 12-16, 2016.
- **Broxton, P. D.**, X. Zeng, N. Dawson, Understanding the mismatch between snow and climate in global reanalysesand land models, 96th American Meteorological Society Annual Meeting, New Orleans, LA, January, 10-14, 2016.
- **Broxton, P. D.**, J. Pelletier, M. Brunke, P. Hazenberg, X. Zeng, P. Troch, G.-Y. Niu, D. Gochis, Z. Williams, High resolution global soil and alluvial thickness data for global modeling, 20th Annual CESM Workshop, Breckenridge, CO, June 15-18, 2015.
- **Broxton, P. D.**, J. Pelletier, M. Brunke, P. Hazenberg, X. Zeng, P. Troch, G.-Y. Niu, D. Gochis, Z. Williams, A new global soil and alluvial thickness dataset for terrestrial process studies, 2015 NASA Carbon Cycle & Ecosystems Joint Science Workshop, College Park, MD, April 20-25, 2015.
- **Broxton, P. D.**, X. Zeng, W. Scheftic, Value-Added Global Vegetation Data Development for Weather and Climate Prediction, 7th International Conference on the Global Water and Energy Cycle, The Hague, Netherlands, July 14-17, 2014.
- **Broxton, P. D.**, J. Pelletier, X. Zeng, P. Hazenberg, P. A. Troch, D. Gochis, High Resolution Vegetation Datasets for the Community Land Model, Atmospheric and Interdisciplinary Research, Tucson, AZ, April 2013.
- **Broxton, P. D.**, J. Pelletier, X. Zeng, P. Hazenberg, P.A. Troch, D. Gochis, High Resolution Soils and Vegetation Datasets to Improve Land Modeling, CESM Land Model Working Group and Biogeochemistry Working Group Meetings, Boulder, CO, February 20-22, 2013.
- **Broxton, P. D.**, P. Hazenberg, G.-Y. Niu, J. Pelletier, P. A. Troch, X. Zeng, D. Gochis, Using the Hillslope-Storage Boussinesq (hsB) Model for horizontal water movement in global land modeling, AGU Fall Meeting, San Francisco, CA, December 3-7, 2012
- **Broxton, P. D.**, A. Harpold, P. A. Troch, P. D. Brooks, Using LIDAR and Distributed Snow Modeling to Understand Small-Scale Snow Variability, CUAHSI Biennial Science Meeting, Boulder, CO, July 14, 2012.
- **Broxton P. D.,** A. Harpold, P. A. Troch, P. D. Brooks, Improving Distributed Snow Modeling with LIDAR Data, 22nd Annual El Dia del Agua, Tucson, AZ, April 2012.
- **Broxton, P. D.**, P. A. Troch, M. Schaffner, C. Unkrich, D. Goodrich, Improving Flash Flood Predictions in Moderate Sized Environments by Adding Snowmelt and Baseflow to KINEROS, AGU Fall Meeting, San Francisco, CA, December 5-9, 2011.
- **Broxton, P. D.**, P. A. Troch, P. D. Brooks, The Relationship Between Mountain Hydrology and Landscape Position Under Different Climatic Conditions, 21st Annual El Dia del Agua, Tucson, AZ, March, 2011.
- **Broxton, P. D.**, P. A. Troch, M. Schaffner, C. Unkrich, D. Goodrich, T. Wagener, H. Gupta, S. Yatheendradas, Enhancing an Overland Flow Model for Flash Flood Predictions in Multiple Environments, Atmospheric and Interdisciplinary Research, Tucson, AZ, March 2011.
- **Broxton, P. D.**, M. Schaffner, P.A. Troch, D. Goodrich, C. Unkrich, Development of a Distributed All-Season Flash Flood Forecasting System, 6th Southwest Hydrometeorology Symposium, Tempe, AZ, September 28, 2011.
- **Broxton, P. D.,** P. A. Troch, P. D. Brooks, Can Landscape Heterogeneity Buffer or Exacerbate Changes in Mountain Hydrology Under Different Climatic Conditions? AGU Fall Meeting, San Francisco, CA, December 13-17, 2010.
- **Broxton, P. D.,** P. A. Troch, M. Schaffner, C. Unkrich, D. Goodrich, H. Gupta, T. Wagener, S. Yatheendradas, Using a Continuous Hydrologic Model in Support of Flash Flood Predictions, NWS Eastern Region Flash Flood Conference, Wilkes-Barre, PA, June 2-4, 2010.
- **Broxton, P. D.,** P. A. Troch, M. Schaffner, C. Unkrich, D. Goodrich, H. Gupta, T. Wagener, S. Yatheendradas, Improving Flash Flood Prediction in Multiple Environments, AGU Fall Meeting, San Francisco, CA, December 14-18, 2009.

- **Broxton, P. D.,** P. A. Troch, S.W. Lyon, Understanding the Importance of Aspect on Mountain Catchment Hydrology, AGU Fall Meeting, San Francisco, CA, December 15-19, 2008.
- **Broxton, P. D.,** P. A. Troch, P.D. Brooks, S.W. Lyon, J.R. Gustafson, W.C. Veatch, The relationship between water travel times and aspect: Toward a greater understanding of the coupling of hydrology and solar energy, 18th Annual El Dia del Agua, Tucson, AZ, March 6, 2008.
- **Broxton, P. D.,** P. A. Troch, P. D. Brooks, S.W. Lyon, J.R. Gustafson, W.C. Veatch, Travel Time Distribution Modeling in the Valles Caldera, New Mexico, AGU Fall Meeting, San Francisco, CA, December 10-14, 2007.

REFERENCES

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