Margaret R. Wooten

Scientific Programmer/Analyst
Biospheric Sciences Laboratory, NASA Goddard Space Flight Center margaret.wooten@nasa.gov
Science Systems and Applications, Inc.

EDUCATION

M.S., Geospatial Information Sciences — University of Maryland, College Park, 2018

B.A., Mathematics & Geography — University of North Carolina, Chapel Hill, 2013

WORK EXPERIENCE

Senior Scientific Programmer/Analyst, Science Systems and Applications, Inc. December 2022 - present
Biospheric Sciences Laboratory, NASA Goddard Space Flight Center (GSFC)

- Organized and conducted field campaign in Senegal for collecting in-situ observations to validate deep learning land cover and tree height models
- Producing very high-resolution (VHR) land use and land cover composite maps in Ethiopia and Senegal for change analysis
- Leading an interagency agreement for monitoring impacts of agricultural and market investments using remote sensing data and modeling approaches

Scientific Programmer/Analyst II, Science Systems and Applications, Inc. April 2020 – December 2022
Biospheric Sciences Laboratory, NASA Goddard Space Flight Center

- Managed Enhanced Very High Resolution (EVHR) API, including implementing updates and bug fixes
- Developed zonal statistics workflow with Lidar and VHR data to build a forest growth spatial database
- Built machine learning models to predict crop type and crop yield in West Africa with Sentinel-2 data
- Produced training data for deep learning agricultural models using a semi-automated approach

Teacher's Assistant, University of Maryland College Park January 2017
Intro to Programming for Geospatial Analysis

- Generated daily lesson plans and led labs in Python for a dozen students
- Created and graded daily homework assignments
- Led study sessions and graded exams

Scientific Programmer/Analyst I, Science Systems and Applications, Inc. December 2014 – April 2020
Biospheric Sciences Laboratory, NASA Goddard Space Flight Center

- Assisted in development of EVHR, an API for producing analysis-ready imagery from commercial data
- Created code for mapping site index across the circumpolar boreal forest using multi-source data fusion
- Wrote stereogrammetry routine to mass process VHR canopy height models, and managed 80 TB of data
- Developed code for the creation of the global MODIS annual water masks (MOD44W v6)
- Led student interns in creating models for cloud masking and lake bathymetry with high-resolution imagery
- Built machine learning models for VHR land cover mapping in support of several research projects

Data Analyst, Sigma Space Corporation September 2013 – December 2014
Biospheric Sciences Laboratory, NASA Goddard Space Flight Center

- Responsible for the collection and management of a 30 TB Landsat data archive
- Created processes to automatically download and ingest satellite imagery into a cloud-based archive
- Developed workflows to produce water maps for NASA's Arctic-Boreal Vulnerability Experiment

Intern, Sigma Space Corporation August 2013 – September 2013
Biospheric Sciences Laboratory, NASA Goddard Space Flight Center

- Ported satellite image processing workflows from ENVI IDL to open-source Python
- Managed a network of climate data field sensors on center at GSFC
- Developed workflows to produce vegetation index layers for an automated wildfire management system

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PUBLICATIONS

M.T. Le, K. Wessels, J. Caraballo-Vega, N. Thomas, **M.R. Wooten**, M.L. Carroll, and C.S. Neigh. 2023. Training Strategies of CNN for Land Cover Mapping with High Resolution Multi-Spectral Imagery in Senegal. Proceedings of IEEE IGARSS 2023. doi: 10.1109/igarss52108.2023.10283308

C. Spradlin, **M.R. Wooten**, J.A. Caraballo-Vega, M.L. Carroll, C.S. Neigh, K. Wessels, M.T. Le, P. Montesano, W. Alemu, and N. Thomas. 2023. Large-Scale Distributed Compositing and Statistics Framework For Very-High-Resolution Remote Sensing Imagery. Proceedings of IEEE IGARSS 2023. doi: 10.1109/igarss52108.2023.10283222

W. Alemu, C. S. Neigh, J. A. Caraballo-Vega, **M.R. Wooten**, E. Muluken, G.-M. Maru, and C. Mulu. 2023. Land Cover Mapping in the Amhara Region of Northwest Ethiopia Using Convolutional Neural Networks and Domain Adaptation Techniques. Proceedings of IEEE IGARSS 2023. doi: 10.1109/igarss52108.2023.10283273

J.A. Caraballo-Vega, M.L. Carroll, C.S. Neigh**, M.R. Wooten**, B. Lee, A. Weis, M. Aronne, W. Alemu, and Z. Williams. 2023. Optimizing WorldView-2, -3 cloud masking using machine learning approaches Remote Sensing of Environment 284 113332. doi: 10.1016/j.rse.2022.113332

A. Elders, M.L, Carroll, C.S. Neigh, A.L. D'Agostino, **M.R. Wooten**, M.E. Brown. 2022. Estimating Crop Type and Yield of Small Holder Fields in Burkina Faso Using Multi-day Sentinel-2. Remote Sensing Applications: Society and Environment. doi: 10.1016/j.rsase.2022.100820

M. Feng, J.O. Sexton, P. Wang, S. Channan, P.M. Montesano, W. Wagner, **M.R. Wooten**, and C.S. Neigh. 2022. ABoVE: Tree Canopy Cover and Stand Age from Landsat, Boreal Forest Biome, 1984-2020. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/2012

C.S. Neigh, W.C. Wagner, P.M. Montesano, and **M.R. Wooten**. 2021. Estimating Bare Earth in Sparse Boreal Forests With WorldView Stereo Imagery IEEE Geoscience and Remote Sensing Letters 1-5. doi: 10.1109/lgrs.2021.3112387

C.S. Neigh, N.M. Thomas, M. Carroll, **M.R. Wooten**, and J.L. Mccarty-Kern. 2020. A multi-modal approach for monitoring changes in agriculture in the Mekong River delta. Proceedings of IEEE IGARSS 2020. doi: 10.1109/IGARSS39084.2020.9324083

C.S. Neigh, M.L. Carroll, P.M. Montesano, D.A. Slayback, **M.R. Wooten**, A.I. Lyapustin, D.E. Shean, O. Alexandrov, M.J. Macander, C.J. Tucker. 2019. An API for Spaceborne Sub-Meter Resolution Products for Earth Science. Proceedings of IEEE IGARSS 2019. doi: 10.1109/IGARSS.2019.8898358

P.M. Montesano, C.S. Neigh, W. Wagner, **M.R. Wooten**, and B.D. Cook. 2019. Boreal canopy surfaces from spaceborne stereogrammetry Remote Sensing of Environment 225, 148-159. doi: 10.1016/j.rse.2019.02.012

M. Enenkel, D. Osgood, M. Anderson, B. Powell, J. McCarty, C. Neigh, M. Carroll, **M.R. Wooten**, G. Husak, C. Hain, M.E. Brown. 2018. Exploiting the convergence of evidence in satellite data for advanced weather index insurance design. Weather, Climate and Society 11: 1 doi: 10.1175/WCAS-D-17-0111.1

C.S. Neigh, M. L. Carroll, **M.R. Wooten**, J.L. McCarty, B.F. Powell, G.J. Husak, M. Enenkel, and C.R. Hain. 2018. Smallholder crop area mapped with wall-to-wall WorldView sub-meter panchromatic image texture: A test case for Tigray, Ethiopia Remote Sensing of Environment 212, 8-20. doi: 10.1016/j.rse.2018.04.025

J.L. McCarty, C. Neigh, M. Carroll, and **M.R. Wooten.** 2017. Extracting smallholder cropped area in Tigray, Ethiopia with wall-to-wall sub-meter WorldView and moderate resolution Landsat 8 imagery Remote Sensing of Environment 202 142-151. doi: 10.1016/j.rse.2017.06.040

J.L. Schnase, M.L. Carroll, R.L. Gill, **M.R. Wooten**, K. Weber, K. Blair, J. May, and W. Toombs. 2017. NASA Wrangler: Automated cloud-based data assembly in the recover wildfire decision support system. Proceedings of IEEE IGARSS 2017, pp. 5201-5204. doi: 10.1109/IGARSS.2017.8128173

M.L. Carroll, C.M. DiMiceli, J.R.G. Townshend, R.A. Sohlberg, A.B. Hubbard, and **M.R, Wooten**. 2017. MOD44W: Global MODIS water maps user guide. International Journal Digital Earth Volume, 10: 207-218.

M.L. Carroll, M.E. Brown, **M.R. Wooten**, J.E. Donham, A.B. Hubbard, and W.B. Ridenhour. 2016. In-situ Air Temperature and Relative Humidity in Greenbelt, MD, 2013-2015. ORNL DAAC, Oak Ridge, Tennessee, USA. doi: 10.3334/ORNLDAAC/1319

M.L. Carroll, **M.R. Wooten**, C. DiMiceli, R. Sohlberg, and M. Kelly. 2016. Quantifying Surface Water Dynamics at 30 Meter Spatial Resolution in the North American High Northern Latitudes 1991–2011 Remote Sensing 8 (8): 622. doi: 10.3390/rs8080622

J.L. Schnase, M.L. Carroll, K.T. Weber, M.E. Brown, R.L. Gill, **M.R. Wooten**, J. May, K. Serr, E. Smith, R. Goldsby, K. Newtoff, K. Bradford, C. Doyle, E. Volker, and S. Weber. 2014. RECOVER: An Automated, Cloud-Based Decision Support System for Post-Fire Rehabilitation Planning, Int. Arch. Photogrammetry Remote Sensing Spatial Information Science, XL-1, 363–370. doi:10.5194/isprsarchives-XL-1-363-2014

PRESENTATIONS

Oral

M.R. Wooten, C.S. Neigh, J.A. Caraballo-Vega, K.J. Wessels, M.L. Carroll, M.E. Brown, M.T. Le, N.M. Thomas, W.C. Wagner, W.G. Alemu, A.E. Elders. “Regional-Scale Land Cover Change Mapping Across Senegal with Deep Learning and High Resolution Imagery.” Oral presentation at AGU Fall Meeting. San Francisco, CA. December 12, 2023.

M.R. Wooten, C.S. Neigh, B. Poulter, P. Montesano, J. Sexton, M. Feng, P. Wang, S. Channan, W. Wagner. 2022. "Estimating Site Index in circumpolar boreal forests with airborne lidar and very-high resolution stereo imagery." Oral flash talk presentation at the ABoVE Science Team Meeting. Fairbanks, AK. May 11, 2022.

C.S. Neigh, **M.R. Wooten (presenting author),** M.L. Carroll, P.M. Montesano, D.A. Slayback, A.I. Lyapustin, D.E. Shean, O. Alexandrov, M.J. Macander, C.J. Tucker. "Analysis ready very high-resolution commercial optical remote sensing products for biodiversity monitoring." Oral presentation at AGU Fall Meeting. San Francisco, CA. December 10, 2019.

M.L. Carroll, **M.R. Wooten (presenting author)**, C.M. DiMiceli, J.R.G. Townshend, R.A. Sohlberg, A.B. Hubbard. "MODIS Collection 6 Annual Water Maps." Oral presentation at MODIS Science Team Meeting. College Park, MD. November 20, 2019.

C.S. Neigh, **M.R. Wooten (presenting author)**, M.L. Carroll, P.M. Montesano, D.A. Slayback, A.I. Lyapustin, D.E. Shean, O. Alexandrov, M.J. Macander, C.J. Tucker. "An API for Commercial Very High Resolution Products for Earth Science." Oral presentation at NASA Earth Science Technology Forum. Mountain View, CA. June 11, 2019.

C.S. Neigh, **M.R. Wooten (presenting author),** M.L. Carroll, P.M. Montesano, D.A. Slayback, A.I. Lyapustin, D.E. Shean, O. Alexandrov, M.J. Macander, C.J. Tucker. "Analysis ready very high-resolution commercial optical remote sensing products for biodiversity monitoring." Oral presentation at the Biodiversity and Ecological Forecasting Science Team Meeting. Crystal City, VA. May 21, 2019.

M.R. Wooten, M.L.Carroll. "Intro to Remote Sensing of Vegetation." Oral presentation at NASA ARSET Workshop. Pocatello, ID. October 6, 2015.

Poster

M.R. Wooten, C.S. Neigh, J.A. Caraballo-Vega, K.J. Wessels, M.L. Carroll, M.T. Le, M.E. Brown, N.M. Thomas, W. Wagner, W. Alemu, A. Diouf, M. Mbaye, B. Ndao, G. Tappan, P. Bunting, R. Mathieu, P. Montesano. "Deep Learning Approaches for Monitoring Land Cover Land Use Trends in Senegal with Very High Resolution Optical Imagery and Data Fusion." Poster presentation at NASA Land Cover Land Use Change Science Team Meeting. Gaithersburg, MD. April 2, 2024.

M.R. Wooten, C.S. Neigh, M. Carroll, J. Caraballo-Vega, K. Wessels, M.T. Le, N. Thomas, A. Elders, M. Brown, W. Wagner, W. Alemu, P. Bunting, G. Tappan, R. Mathieu, P. Montesano. 2023. "The Impact of Investment on Irrigated Rice, Dryland Agriculture and Afforestation in Senegal using SAR and Optical Time-Series Imagery in Data Fusion Approaches." Poster presentation at NASA Joint Science Team Workshop. May 11, 2023.

M.R. Wooten, J.A. Caraballo-Vega, P.M. Montesano, M.L. Carroll, C.S. Neigh, C.S. Spradlin, M.T. Le, K. Wessels. 2023. "The Application of Convolutional Neural Networks to Measure Forest Structure with Spaceborne Lidar and WorldView Data." Poster presentation at Silvilaser. London, UK. September 6, 2023.

M.R. Wooten, C.S. Neigh, B. Poulter, P. Montesano, J. Sexton, M. Feng, P. Wang, S. Channan, W. Wagner. 2022. "Estimating Site Index in circumpolar boreal forests with airborne lidar and very-high resolution stereo imagery." Poster presentation at the ABoVE Science Team Meeting. Fairbanks, AK. May 11, 2022.

M.R. Wooten, P.M. Montesano, C.S. Neigh, W.C. Wagner. 2020. “Evaluating spaceborne vertical structure estimates of boreal forests with airborne lidar.” Poster presentation at AGU Fall Meeting. Virtual. December 15, 2020.

M.R. Wooten, C.S. Neigh, P.M. Montesano, W.C. Wagner. 2019. “Verifying space borne-derived structural estimates with airborne data in circumpolar-boreal forests.” Poster presentation at AGU Fall Meeting. San Francisco, CA. December 10, 2019.

M.R. Wooten, M.L. Carroll. 2018. “An Open-Source Web Application for Investigating Trends in Global Inland Water.” Poster presentation at AGU Fall Meeting. Washington, D.C. December 13, 2018.

M.R. Wooten, C.R. Neigh, M.L. Carroll, J.L. McCarty. 2017. “Semi-automated approach to mapping sub-hectare agricultural fields using very high resolution (VHR) data in a high-performance computing environment.” Poster presentation at AGU Fall Meeting. New Orleans, LA. December 13, 2017.

M.R. Wooten, M.L. Carroll, J.L. Schnase. 2015. “Mapping Pinyon-Juniper Woodlands at a Sub-10 Meter Spatial Resolution.” Poster presentation at AGU Fall Meeting. San Francisco, CA. December 18, 2015.