

# Song Shu, Ph.D.

Assistant Professor

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## Research Interests

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- Remote sensing, GIS, UAV, satellite radar and laser altimetry, LiDAR
- Lake and snow hydrology, water resources, soil erosion, climate change, urbanization

## Education

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- 2013 – 2019 **Ph.D.** in Geography and Geographic Information Science, University of Cincinnati (UC), U.S.  
Dissertation: *Satellite Radar and Laser Altimetry for Monitoring of Lake Water Level and Snow Accumulation in Arctic Regions*. Advisor: [Hongxing Liu](#)
- 2010 – 2013 **M.S.** in Geographic Information Science, East China Normal University (ECNU), China  
Thesis: *Spatial Cluster Analysis of Urban Landscape Pattern Using Stable Nighttime Light Satellite Images*. Advisor: [Bailang Yu](#)
- 2006 – 2010 **B. S.** in Physical Geography, East China Normal University (ECNU), China  
Thesis: *Methods for Deriving Urban Built-up Area Using Nighttime Light Data: Assessment and Application*. Advisor: [Bailang Yu](#)

## Appointments

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- 08/2019 - present Assistant Professor, Department of Geography and Planning, Appalachian State University
- 08/2018 – 08/2019 Adjunct Instructor, Department of Geography & GIScience, University of Cincinnati
- 01/2018 – 05/2018 Adjunct Instructor, Department of History & Geography, Northern Kentucky University
- 05/2017 – 01/2018 Research Assistant, Department of Geography & GIScience, University of Cincinnati
- 08/2013 – 05/2016 Teaching Assistant, Department of Geography & GIScience, University of Cincinnati
- 09/2010 – 06/2013 Teaching Assistant, Department of Geography, East China Normal University

## Referred Publications

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### Published

33. Xu, J., Tang, Y., Xu, J., **Shu, S.**, Yu, B., Wu, J., & Huang, Y. (2022). Impact of Snow Cover Phenology on the Vegetation Green-Up Date on the Tibetan Plateau. *Remote Sensing*, 14 (IF: 5.35) <https://doi.org/10.3390/rs14163909>
32. Xu, J., Tang, Y., Xu, J., Chen, J., Bai, K., **Shu, S.**, Yu, B., Wu, J., & Huang, Y. (2022). Evaluation of Vegetation Indexes and Green-Up Date Extraction Methods on the Tibetan Plateau. *Remote Sensing*, 14 (IF: 5.35) <https://doi.org/10.3390/rs14133160>
31. Yang, B., Liu, H., Kang, E.L., Hawthorne, T.L., Tong, S.T.Y., **Shu, S.**, & Xu, M. (2022). Traffic restrictions during the 2008 Olympic Games reduced urban heat intensity and extent in Beijing. *Nature Communications Earth & Environment*, 3, 105 <https://doi.org/10.1038/s43247-022-00427-4>

30. Huang, Y., Song, Z., Yang, H., Yu, B., Liu, H., Che, T., Chen, J., Wu, J., **Shu, S.**, Peng, X., Zheng, Z., & Xu, J. (2022). Snow cover detection in mid-latitude mountainous and polar regions using nighttime light data. *Remote Sensing of Environment*, 268, 112766 (IF: 13.85) <https://doi.org/10.1016/j.rse.2021.112766>
29. Xu, M., Liu, H., Mitchell, D., Lu, Y., Beck, R., Cohen, S., **Shu, S.**, & Dimova, N. (2022). Mapping river turbidity at a large basin-scale with a spatially transferable ensemble model and Landsat 8 multispectral imagery. *Science of the Total Environment*, Forthcoming (IF: 10.75)
28. **Shu, S.**, Liu, H., Beck, R.A., Frappart, F., Korhonen, J., Lan, M., Xu, M., Yang, B., & Huang, Y. (2021). Evaluation of historic and operational satellite radar altimetry missions for constructing consistent long-term lake water level records. *Hydrology and Earth System Science*, 25, 1643-1670 (IF: 6.62) <https://doi.org/10.5194/hess-25-1643-2021>
27. Wu, B., Yu, B., **Shu, S.**, Liang, H., Zhao, Y., & Wu, J. (2021). Mapping fine-scale visual quality distribution inside urban streets using mobile LiDAR data. *Building and Environment*, 206. (IF: 7.09) <https://doi.org/10.1016/j.buildenv.2021.108323>
26. Zhao, Y., Wu, B., **Shu, S.**, Yang, L., Wu, J., & Yu, B. (2021). Evaluation of ICESat-2 ATL03/08 Surface Heights in Urban Environments Using Airborne LiDAR Point Cloud Data. *IEEE Geoscience and Remote Sensing Letters*, 1-1(IF: 5.34) <http://dx.doi.org/10.1109/LGRS.2021.3127540>
25. Wang, C., Yu, B., Chen, Z., Liu, Y., Song, W., Li, X., Yang, C., Small, C., **Shu, S.**, & Wu, J. (2021). Evolution of Urban Spatial Clusters in China: A Graph-Based Method Using Nighttime Light Data. *Annals of the American Association of Geographers*, 1-22 (IF:3.98) <https://doi.org/10.1080/24694452.2021.1914538>
24. Frappart, F., Blarel, F., Fayad, I., Bergé-Nguyen, M., Crétaux, J.-F., **Shu, S.**, Schregenerberger, J., & Baghdadi, N. (2021). Evaluation of the Performances of Radar and Lidar Altimetry Missions for Water Level Retrievals in Mountainous Environment: The Case of the Swiss Lakes. *Remote Sensing*, 13, 2196 (IF: 5.35) <https://doi.org/10.3390/rs13112196>
23. Xu, M., Liu, H., Beck, R., Lekki, J., Yang, B., Liu, Y., **Shu, S.**, Wang, S., Tokars, R., Anderson, R., Reif, M., & Emery, E. (2021). Implementation Strategy and Spatiotemporal Extensibility of Multipredictor Ensemble Model for Water Quality Parameter Retrieval with Multispectral Remote Sensing Data. *IEEE Transactions on Geoscience and Remote Sensing*, 1-16 (IF: 8.13) <https://doi.org/10.1109/TGRS.2020.3045921>
22. Wang, S., Alexander, P., Wu, Q., Tedesco, M., & **Shu, S.** (2021). Characterization of ice shelf fracture features using ICESat-2 – A case study over the Amery Ice Shelf. *Remote Sensing of Environment*, 255, 112266 (IF: 13.85) <https://doi.org/10.1016/j.rse.2020.112266>
21. Yang, B., Liu, H., Kang, E.L., **Shu, S.**, Xu, M., Wu, B., Beck, R., Hinkel, K., & Yu, B. (2020). "Spatio-temporal Cokriging Method for Assimilating and Downscaling Multi-scale Remote Sensing Data." *Remote Sensing of Environment*, 112190 (IF: 13.85) <https://doi.org/10.1016/j.rse.2020.112190>,
20. **Shu, S.**, Liu, H., Frappart, F., Kang, E.L., Yang, B., Xu, M., Huang, Y., Wu, B., Yu, B., Wang, S., Beck, R., & Hinkel, K. (2020). "Improving Satellite Waveform Altimetry Measurements with a Probabilistic Relaxation Algorithm." *IEEE Transactions on Geoscience and Remote Sensing*, 1-16 (IF: 8.13) <https://doi.org/10.1109/TGRS.2020.3010184>
19. **Shu, S.**, Liu, H., Beck, R.A., Frappart, F., Korhonen, J., Xu, M., Yang, B., Hinkel, K.M., Huang, Y., and Yu, B., (2020). "Analysis of Sentinel-3 SAR altimetry waveform retracking algorithms for deriving temporally consistent water levels over ice-covered lakes." *Remote Sensing of Environment*, 239: 111643 (IF: 13.85).

<https://doi.org/10.1016/j.rse.2020.111643>

18. Wu, B., Yu, B., **Shu, S.**, Wu, Q., Zhao, Y., & Wu, J. (2020). A spatiotemporal structural graph for characterizing land cover changes. *International Journal of Geographical Information Science*, 1-29 (IF: 5.15) <https://doi.org/10.1080/13658816.2020.1778706>
17. Zhao, Y., Wu, B., Wu, J., **Shu, S.**, Liang, H., Liu, M., Badenko, V., Fedotov, A., Yao, S., & Yu, B. (2020). Mapping 3D visibility in an urban street environment from mobile LiDAR point clouds. *GIScience & Remote Sensing*, 57, 797-812 (IF: 6.4) <https://doi.org/10.1080/15481603.2020.1804248>
16. Chen, H., Huang, Y., Wang, S., **Shu, S.**, Yu, B., & Wu, J. (2020). Vertical Accuracy Analysis of ASTER GDEM V2 in Byrd Glacier, Antarctica. *Journal of Remote Sensing (Chinese)*, 24-8 (IF:2.32) <http://dx.doi.org/10.11834/jrs.20208361>
15. Xu, M., Liu, H., Beck, R., Lekki, J., Yang, B., **Shu, S.**, Liu, Y., Benko, T., Anderson, R., Tokars, R., Johansen, R., Emery, E., & Reif, M. (2019). Regionally and Locally Adaptive Models for Retrieving Chlorophyll-a Concentration in Inland Waters from Remotely Sensed Multispectral and Hyperspectral Imagery. *IEEE Transactions on Geoscience and Remote Sensing*, 1-17 (IF: 8.13) <https://doi.org/10.1109/TGRS.2019.2892899>
14. Xu, M., Liu, H., Beck, R., Lekki, J., Yang, B., **Shu, S.**, Kang, E.L., Anderson, R., Johansen, R., Emery, E., Reif, M., & Benko, T. (2019). A spectral space partition guided ensemble method for retrieving chlorophyll-a concentration in inland waters from Sentinel-2A satellite imagery. *Journal of Great Lakes Research*, 45, 454-465 (IF:3.03) <https://doi.org/10.1016/j.jglr.2018.09.002>
13. Beck, R., Xu, M., Zhan, S., Johansen, R., Liu, H., Tong, S., Yang, B., **Shu, S.**, Wu, Q., Wang, S., Berling, K., Murray, A., Emery, E., Reif, M., Harwood, J., Young, J., Nietch, C., Macke, D., Martin, M., Stillings, G., Stumpf, R., Su, H., Ye, Z., & Huang, Y. (2019). Comparison of satellite reflectance algorithms for estimating turbidity and cyanobacterial concentrations in productive freshwaters using hyperspectral aircraft imagery and dense coincident surface observations. *Journal of Great Lakes Research*, 45, 413-433 (IF:3.03) <https://doi.org/10.1016/j.jglr.2018.09.001>
12. **Shu, S.**, Liu, H., Frappart, F., Huang, Y., Wang, S., Hinkel, K.M., Beck, R.A., Yu, B., Jones, B.M., Arp, C.D., Wang, L., & Ye, Z. (2018). Estimation of snow accumulation over frozen Arctic lakes using repeat ICESat laser altimetry observations – A case study in northern Alaska. *Remote Sensing of Environment*, 216, 529-543 (IF: 13.85) <https://doi.org/10.1016/j.rse.2018.07.018>
11. Liu, H., & **Shu, S.** (2018). Derivation of Reliable Surface Elevation Measurements from ICESAT/GLAS Waveforms by Incorporating Spatial Contextual Information. In *IGARSS 2018 - 2018 IEEE International Geoscience and Remote Sensing Symposium* (pp. 7438-7440) <https://doi.org/10.1109/IGARSS.2018.8517985>
10. Johansen, R., Beck, R., Nowosad, J., Nietch, C., Xu, M., **Shu, S.**, Yang, B., Liu, H., Emery, E., Reif, M., Harwood, J., Young, J., Macke, D., Martin, M., Stillings, G., Stumpf, R., & Su, H. (2018). Evaluating the portability of satellite derived chlorophyll-a algorithms for temperate inland lakes using airborne hyperspectral imagery and dense surface observations. *Harmful Algae*, 76, 35-46 (IF: 5.9) <https://doi.org/10.1016/j.hal.2018.05.001>
9. Beck, R., Xu, M., Zhan, S., Liu, H., Johansen, R.A., Tong, S., Yang, B., **Shu, S.**, Wu, Q., Wang, S., Berling, K., Murray, A., Emery, E., Reif, M., Harwood, J., Young, J., Martin, M., Stillings, G., Stumpf, R., Su, H., Ye, Z., & Huang, Y. (2017). Comparison of satellite reflectance algorithms for estimating phyococyanin

values and cyanobacterial total biovolume in a temperate reservoir using coincident hyperspectral aircraft imagery and dense coincident surface observations. *Remote Sensing*, 9 (IF: 5.35) <https://doi.org/10.3390/rs9060538>

8. Ye, Z., Liu, H., Chen, Y., **Shu, S.**, Wu, Q., & Wang, S. (2017). Analysis of water level variation of lakes and reservoirs in Xinjiang, China using ICESat laser altimetry data (2003–2009). *PLoS ONE*, 12(9). doi: 10.1371/journal.pone.0183800 (IF: 3.75) <https://doi.org/10.1371/journal.pone.0183800>
7. Beck, R., Zhan, S., Liu, H., Tong, S., Yang, B., Xu, M., Ye, Z., Huang, Y., **Shu, S.**, Wu, Q., Wang, S., Berling, K., Murray, A., Emery, E., Reif, M., Harwood, J., Young, J., Nietch, C., Macke, D., Martin, M., Stillings, G., Stump, R., & Su, H. (2016). Comparison of satellite reflectance algorithms for estimating chlorophyll-a in a temperate reservoir using coincident hyperspectral aircraft imagery and dense coincident surface observations. *Remote Sensing of Environment*, 178, 15-30 (IF: 13.85) <https://doi.org/10.1016/j.rse.2016.03.002>
6. Wang, L., Liu, H., Wang, S., & **Shu, S.** (2015). “Antarctica 2013/2014 Seasonal melt extent and duration [in *State of the Climate in 2014.*]”. *Bulletin of the American Meteorological Society (BAMS)*, 96(7): S155-S157. (IF: 9.12) <http://dx.doi.org/10.1175/2015BAMSStateoftheClimate.1>
5. Wang, L., Liu, H., Wang, S., & **Shu, S.** (2014). “Antarctica 2012/2013 Seasonal melt extent and duration [in *State of the Climate in 2013.*]”. *Bulletin of the American Meteorological Society (BAMS)*, 95(7): S149-S150. (IF: 9.12) <https://doi.org/10.1175/2014BAMSStateoftheClimate.1>
4. Yu, B., **Shu, S.**, Liu, H., Wu, J., & Chen, Z. (2014). Object-based Spatial Cluster Analysis of Urban Landscape Pattern Using Nighttime Light Satellite Images: A Case Study of China, *International Journal of Geographical Information Science*, 28(11), 2328-2355. (IF: 5.15) <https://doi.org/10.1080/13658816.2014.922186>
3. Wu, B., Yu, B., Yue, W., **Shu, S.**, Tan, W., Hu, C., Huang, Y., Wu, J., & Liu, H. (2013). “A Voxel-Based Method for Automated Identification and Morphological Parameters Estimation of Individual Street Trees from Mobile Laser Scanning Data”, *Remote Sensing*, 5(2), 584-611. (IF: 5.35) <https://doi.org/10.3390/rs5020584>
2. Hu, Z., Wu, J., Wu, B., **Shu, S.**, & Yu, B. (2012). Simulating and mapping the variations of solar radiation at the Lujiazui region of Shanghai using Airborne LiDAR data. In, *Key Engineering Materials* (pp. 511-516) (IF: 0.44) <https://doi.org/10.4028/www.scientific.net/KEM.500.511>
1. **Shu, S.**, Yu, B., Wu, J., & Liu, H. (2011). “Methods for Deriving Urban Built-up Area Using Night-light Data: Assessment and Application”, *Remote Sensing Technology and Application* (in Chinese). 26(2), 169-176. (IF: 1.19) <http://www.rsta.ac.cn/CN/10.11873/j.issn.1004-0323.2011.2.169>

### In Review/Revision

2. **Shu, S.**, Yu, O., Schoonover, C., Liu, H., & Yang, B. Influence of Ground Control Points (GCP) on UAV-based Structure-from-Motion Snow Depth Retrieval – Implication for Optimal GCP Survey Strategy. *Remote Sensing of Environment*.
1. Wang, L., Liang, X., Liu, H., Kang, E.L., Su, H., **Shu, S.**, & Wang, J. “Spatiotemporal continuous shallow water bathymetry from a Kriged Kalman filter”. *Cartography and Geographic Information Science*

### In Preparation

5. **Shu, S.**, Liu, H., Beck, R.A., and Jones, B.M., Bathymetry Mapping for Arctic Thermokarst Lakes with

ICESat-2 Observations and Multispectral Satellite Images.

4. **Shu, S.**, Ekstrand, J., Yu, O., Schoonover, C., and Liu, F., UAV-based Soil Erosion Monitoring for the Removal of Ward's Mill Dam, NC.
3. Xu, M., Liu, H., Mitchell, D., Lu, Y., Beck, R., Cohen, S., **Shu, S.**, & Dimova, N. Spatially transferable multi-predictor ensemble model for river turbidity assessment at a basin scale using Landsat 8 multispectral imagery.
2. Wang, S., Liu, H., Jezek, K., Yu, B., Wang, L., Huang, Y., **Shu, S.**, Beck, R., & Ward, D. Half-century ice velocity records reveal the instability development process of Larsen Ice Shelf.
1. Wang, S., Liu, H., **Shu, S.**, Wu, Q., Huang, Y., Ward, D., & Beck, R. Integrating multi-source remote sensing data to investigate the decadal changes of Larsen B outlet glaciers following ice shelf collapse.

## Grants

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### Awarded

- "UAV-based Bathymetric Mapping and Soil Erosion Monitoring using LiDAR for the Removal of Ward's Mill Dam", *NCDOT (North Carolina Department of Transportation) Research and Development*, **Co-PI** with Dr. Narcisa Pricope (PI) and Dr. OK-Youn Yu (Co-PI). **\$ 448,735**. August 2022 – August 2024
- "Water Quality and Storage Monitoring Services for the Great Lakes Region of Eastern and Southern Africa by Integrating Multi-sensor Satellite Observations, Machine-learning Models and Cloud Computing Platform", *SERVIR Joint Initiative of NASA and the U.S. Agency for International Development (USAID)*, **Co-I (Institutional PI)** with Dr. Hongxing Liu (PI) and Dr. Richard Beck (Co-PI). **\$670,000**. February 2023 – January 2026.
- "Monitoring Long-term Water Level and Storage Dynamics of Arctic Lakes with Multi-Mission Satellite Radar and Laser Altimetry Data", *2022 Summer Stipend for Writing A Grant (SWAG) Program*, the Office of Research at Appalachian State University, **Sole PI. \$3,500**. 2022 summer.
- "UAV-based Soil Erosion Monitoring for the Removal of Ward's Mill Dam", *Chancellor's Innovation Scholars Program 2020 – 2021*, Appalachian State University, **PI** with Dr. OK-Youn Yu (Co-PI). **\$10,000**. 2020 – 2021
- "Monitoring snow accumulation in Appalachian Mountains with unmanned aerial vehicle (UAV) observations", *CAS Research/Proposal Development Summer Grant*, Appalachian State University, **Sole PI. \$5,000**. 2021 Summer
- "Phase II: Use of UAV-Based Thermal Infrared (TIR) Remote Sensing in Building Energy Performance Analysis", *Appalachian Energy Center Internal Grant Program*, Appalachian Energy Center, **Co-PI** with Dr. OK-Youn Yu (PI). **\$4,976**. August 2021
- "Use of UAV-Based Thermal Infrared (TIR) Remote Sensing in Building Energy Performance Analysis", *Appalachian Energy Center Internal Grant Program*, Appalachian Energy Center, **Co-PI** with Dr. OK-Youn Yu (PI) and Chris Schoonover (Co-PI). **\$4,999**. December 2020 – June 2021
- "UAV-Based Soil Erosion Monitoring and Assessment", *Conducting Complex Research Together (CONCERT) Grants*, Appalachian State University's Research Institute for Environment, Energy, and Economics (RIEEE), **Co-PI** with Dr. OK-Youn Yu (PI) and Chris Schoonover (Co-PI). **\$4,897**. January 2020 – May 2020

### Pending

- "River Flow Velocity, Discharge, and Channel Morphologic Data Acquisition and SWOT-enabled

Sedimentation Investigation in the Mobile River Basin in USA and the Gandaki River Basin in Nepal”, *NASA Research Opportunities in Space and Earth Science (ROSE-2022) – A.20 Terrestrial Hydrology*, **Co-I (Institutional PI)** with Dr. Hongxing Liu (PI), Dr. Sagy Cohen (Co-I), Dr. Lei Wang (Co-I). **\$633,761**. March 2023 – February 2026.

- “Investigating Long-term Water Level and Storage Dynamics of Arctic Lakes with ICESat-2 Bathymetry Observations, Satellite Multispectral Images and Radar Altimetry Measurements”, *NASA Research Opportunities in Space and Earth Science (ROSE-2022) – A.32 Studies with ICESat-2*, **PI** with Dr. Hongxing Liu (Co-I), Dr. Richard Beck (Co-I). **\$610,126**. May 2023 – May 2026.

### Not Awarded

- "Mapping Snow Water Equivalent using UAV-based Photogrammetry and in-field Gamma Radiation Observations", *ORAU Ralph E. Powe Junior Faculty Enhancement Award*, **Sole PI (Institution Finalist)**. **\$10,000**. 2022 – 2023
- *Faculty Reassigned Time for Spring 2022*, the Office of Research at Appalachian State University, one course release, Spring 2022
- "Mapping Bathymetry and Monitoring Water Level and Storage Dynamics of Arctic Thermokarst Lakes with ICESat-2 Observations and Multispectral Satellite Images", *NASA Research Opportunities in Space and Earth Science (ROSES-2019)*, **Co-PI (Institutional PI)** with Dr. Hongxing Liu (PI) and Dr. Richard Beck (Co-PI). **\$441,072**. April 2020 – April 2023.
- "Monitoring Snow Accumulation Surrounding Boone with Unmanned Aerial Vehicle, Airplane, and Satellite Elevation Observations ", *Conducting Complex Research Together (CONCERT) Grants*, Appalachian State University’s Research Institute for Environment, Energy, and Economics (RIEEE), **PI** with Dr. OK-Youn Yu (PI). **\$5,479.**, January 2021 – September 2021
- "Monitoring Snow Accumulation in Appalachian Mountain Regions with Unmanned Aerial Vehicle (UAV), Airplane, and Satellite Surface Elevation Observations", *University Research Council Grants*, Appalachian State University, **PI**, **\$5,000**. 2020-2021
- "Comparative Analysis of Unmanned Aerial Vehicle (UAV) Surveying Accuracy", *Chancellor's Innovation Scholars Program 2019 – 2020*, Appalachian State University, **Co-PI** with Dr. OK-Youn Yu. **\$10,000**. 2019 – 2020
- "Estimating Mountain Snow Accumulation using NASA ICESat-2 Satellite Laser Altimetry Observations", *ORAU Ralph E. Powe Junior Faculty Enhancement Award*, **Sole PI**. **\$10,000**. 2020 – 2021
- *CAS Research/Proposal Development Summer Grant*, Appalachian State University, **Sole PI**. **\$5,000**. 2020 Summer

### Conference and Invited Presentations

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**Shu, S.**, Yu, O., Schoonover, C. "Ground Control Point Survey Strategy for Snow Depth Retrieval Using Drone-based Structure-from-Motion Photogrammetry", American Geophysical Union Annual Meeting, New Orleans, LA, USA, December 2021

Liu, H., Xu, X, & **Shu, S.** “Mapping Bathymetry of Arctic Lakes with ICESat-2 Observations and Multispectral Satellite Images” IEEE International Geoscience and Remote Sensing Symposium 2020.

**Shu, S.**, "A General Introduction to ICESat-2 Satellite Mission, Data Products and Processing Tools", Webinar



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invited by Dr. Hongxing Liu at Department of Geography, University of Alabama, Tuscaloosa 2020.

**Shu, S.**, Liu, H., Beck, R.A., and Frappart, F., (2019). "*Analysis of Sentinel-3 SAR altimetry waveform retracking algorithms for deriving temporally consistent water levels over ice-covered lakes*" American Geophysical Union Annual Meeting, San Francisco, CA, USA, December 2019.

Liu, H., & **Shu, S.**, "*Derivation of Reliable Surface Elevation Measurements from ICESAT/GLAS Waveforms by Incorporating Spatial Contextual Information*" IEEE International Geoscience and Remote Sensing Symposium 2018

**Shu, S.**, & Liu, H. (2018). "*Waveform Analysis of Sentinel-3 SAR Altimetry in the Retrieval of Water Levels over Seasonally-frozen Lakes*", AAG Annual Meeting 2018, New Orleans, Louisiana, USA, April, 2018.

**Shu, S.**, Liu, H., & Frappart, F., (2017). "*Improving Satellite Waveform Altimetry Measurements with a Probabilistic Relaxation Algorithm*", AAG Annual Meeting, Boston, USA, April, 2017.

**Shu, S.** (2017) The Department of Geography Colloquium, "*Estimation of the Arctic Snow Depth using Satellite Laser Altimetry Observations*", University of Cincinnati, Ohio, USA, February, 2017.

**Shu, S.**, Liu, H., Frappart, F., Kang, L.E., Wang, L., & Hinkel, K.M. (2016). "*Improving ICESat-1 Altimetric Measurements Using Probabilistic Relaxation Algorithm*", AAG Annual Meeting 2016, San Francisco, California, USA, April, 2016.

**Shu, S.**, Liu, H., Hinkel, K.M., Beck, R.A., Wang, L., Jones, B.M., Ye, Z., & Yu, B. (2015). "*Snow Depth and Lake Elevation Variability of Alaskan Arctic Coastal Plain Derived from ICESat-1 Laser Altimetry*", AAG Annual Meeting, Chicago, Illinois, USA, April, 2015. (**Winner, first Place**)

**Shu, S.**, Liu, H., Hinkel, K.M., Beck, R.A., & Wang, L. (2014). "*Spatio-temporal Variability of Ice and Snow Surface Elevation in Alaskan Arctic Lakes from ICESat Altimetry Observations, 2003-2009*", AAG Annual Meeting, Tampa, Florida, USA, April, 2014.

Liu, H., Yang, B., & **Shu, S.** (2013). "*Spatio-temporal analysis of surface temperature and water level variability of thermokarst lakes on the Arctic Coastal Plain of northern Alaska using multiscale satellite thermal images and ICESat laser altimetry*", AGU Annual Meeting, San Francisco, USA, December, 2013.

**Shu, S.**, Yu, B., Liu, H., & Wu, J., (2012). "*Object-based Spatial Cluster Analysis of Urban Landscape Pattern Using Nighttime Light Satellite Images: A Case Study of China*", AAG Annual Meeting, New York, USA, February, 2012.

## Research Experience

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2021 – 2022	PI, " <i>UAV-based Soil Erosion Monitoring for the Removal of Ward's Mill Dam</i> ", Chancellor's Innovation Scholars Program 2020 – 2021, Appalachian State University. (Co-PI: Dr. OK-Youn Yu)
2021 – 2022	PI, " <i>Monitoring snow accumulation in Appalachian Mountains with unmanned aerial vehicle (UAV) observations</i> ", CAS Research/Proposal Development Summer Grant, Appalachian State University
2020 – 2020	Co-PI, " <i>UAV-Based Soil Erosion Monitoring and Assessment</i> ", <i>Conducting Complex Research Together (CONCERT) Grants</i> , Appalachian State University's Research Institute for Environment, Energy, and Economics (RIEEE) (PI: Dr. OK-Youn Yu, Fangxiao Liu)

- 2016 – 2018 Research Assistant, NASA project “*Algorithm development and comparison for deriving water quality parameters for inland lakes and rivers from multispectral and hyperspectral images*” (PI: Dr. Hongxing Liu), University of Cincinnati
- 2016 – 2017 Research Assistant, USDA project “*Application of Airborne LiDAR Remote Sensing of Forest Canopy Structure and Fragmentation with Oil/Gas development in the Appalachian Region*” (PI: Dr. Hongxing Liu), University of Cincinnati
- 2014 – 2015 Research Assistant, NSF project “*Toward a Circumarctic Lakes Observation Network (CALON): Multiscale observations of lacustrine systems*” (PI: Dr. Hongxing Liu), University of Cincinnati
- 2012 – 2013 Research Assistant, project “*Spatio-temporal analysis of urban clusters in the Yangtze River Delta using nighttime light data and object-based method.*” (PI: Dr. Bailang Yu), East China Normal University
- 2011 – 2012 Research Assistant, project “*Geographic Information System of Monitoring and Controlling the Gasoline Evaporation in Typical Cities of China.*” (PI: Dr. Bailang Yu), East China Normal University
- 2011 – 2012 Research Assistant, the project “*Identification and morphological parameters estimation of individual street trees from Vehicle-borne Laser Scanning data.*” (PI: Dr. Bailang Yu), East China Normal University

## Teaching

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### Course Taught at Appalachian State University

- GHY 3310 *Environmental Remote Sensing*. 2019 – present, as Instructor
- GHY 3812 *Geographic Information Science*. 2019 – present, as Instructor
- GHY 4810 *Digital Image Processing*. 2019 – present, as Instructor
- GHY 5000 *Research Themes in Geography*. 2019 – Present, as Guest Lecturer

### Course Taught at Northern Kentucky University

- GEOG 419 *Introduction to Remote Sensing*. Spring 2018, as Instructor

### Course Taught at University of Cincinnati

- GEOG 1044 *Natural Disasters and Hazards*. Summer 2019, 2018, 2017, 2016, as Instructor
- GEOG 1040 *Earth from Space*. Summer 2019, as Instructor
- GEOG 6091 *Advanced GIS*. Fall 2018, as Instructor
- GEOG 6071 *Introduction to GIS*. Summer 2018, as Instructor
- GEOG 6085 *Spatial Statistics II*. Spring 2016, 2015, as Teaching Assistant
- GEOG 3033 *Advanced Environmental Geography*. Fall 2014, as Teaching Assistant
- GEOG 6051 *Urban Habitat*. Fall 2014, as Teaching Assistant
- GEOG 2062 *People and Environment II*. Spring 2014, as Teaching Assistant
- GEOG 6074 *Computer Cartography*. Fall 2013, as Teaching Assistant

## Mentoring

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### Graduate Student at Appalachian State University

- Alex O’Neill Graduation: Fall 2020. Thesis: *A Modeling Approach to Hazard Analysis in High Mountain Regions: A Case Study of the Sagarmatha National Park, Nepal.*
- Bailey Chavis Graduation: Spring 2022. Non-thesis track.



Jacob Ekstrand Graduation: Spring 2022. Non-thesis track.

### **Undergraduate Student at Appalachian State University**

Anton Hengst Graduation: Fall 2020. Thesis: *Sub-Annual to Annual Dynamics of Alaskan Ice-Marginal Lakes from Automated Image Classification Using Google Earth Engine*

### **Current Ph.D. Dissertation Committee at the University of Alabama**

Javar Henry Committee formed. Dissertation: title not determined yet.

## **University Service**

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### **Department of Geography and Planning, Appalachian State University**

2020 – Present Department Personnel Committee

2020 – Present Graduate Exam Committee

2019 – Present Speaker Committee

2019 – 2022 Advisor for Appalachian Geographical Society, GTU Honor Society

2022 Physical Geography and Planning Search Committee

## **Professional Service**

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### **Journal Reviewer**

*Remote Sensing of Environment*

*GIS & Remote Sensing*

*Journal of Oceanology*

*Remote Sensing*

*IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*

*Wetland*

*Southeastern Geographer*

*International Journal of Remote Sensing*

### **Journal Themed Issues**

2020 – 2021 Guest Editor, *Remote Sensing*, Special Issue – [Radarsat Based Water Level Estimation](#) (With Frédéric Frappart, Isabel Vigo, Joana Fernandes, David García-García, José Darrozes, Fabien Blarel, Cassandra Normandin)

### **Other Service Activities**

2019, 2021 Judge for the Outstanding Student Presentation Awards (OSPA) of American Geophysical Union Annual Meeting

## **Awards and Honors**

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- 04/2018 **The Robert Bruce McNee Award for Outstanding Academic Achievements** in Department of Geography and Geographic Information Science, University of Cincinnati
- 04/2017 **Finalist of Student Paper Competition** in AAG Remote Sensing Specialty Group, “*Improving Satellite Waveform Altimetry Measurements with a Probabilistic Relaxation Algorithm*”, AAG Annual Meeting 2017, Boston, U.S.
- 2016 – 2017 **Graduate School Dean’s Fellowship**, University of Cincinnati
- 04/2015 **First Place Award** in R.S. Tarr Student Illustrated Paper Competition in AAG Cryosphere Specialty Group, “*Snow Depth and Lake Elevation Variability of Alaskan Arctic Coastal Plain Derived from ICESat-1 Laser Altimetry*”, AAG Annual Meeting 2015, Chicago, Illinois, U.S.
- 06/2013 Shanghai Outstanding Graduate Student Award

- 02/2012 **Third Place Award** in AAG GIS Specialty Group, “*Object-based Spatial Cluster Analysis of Urban Landscape Pattern Using Nighttime Light Satellite Images: A Case Study of China*”, AAG Annual Meeting 2012, New York, U.S.
- 2012 Excellent Student Award of East China Normal University
- 2012 “Wisdom” Scholarship for excellent graduate students in East China Normal University
- 2011 Excellent Student Award in Department of Geography, East China Normal University
- 2008 Excellent Student Award of East China Normal University
- 2008 Second-level Outstanding Scholarship of East China Normal University
- 2007 Third-level Outstanding Scholarship of East China Normal University

## Society Membership

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2013 – present American Association of Geographers (AAG)

2019 – present American Geophysical Union (AGU)

## Professional Skills

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Programming language: Python, R, C#, Matlab, VB.NET, C++, SAS, ArcObjects, ENVI IDL

Professional software: ArcGIS (Pro and Desktop), ENVI, Drone2Map, eCognition, SPSS, SAS, Microsoft Visual Studio and Code, Microsoft Office, CorelDraw, Orange