

Theodore Langhorst

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He/him/his

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Education

PhD Geological Sciences. University of North Carolina at Chapel Hill. 2023.

Dissertation Title: *Advancing Remote Sensing of Fluvial Sediment Transport and Storage*

M.S. Geological Sciences. University of North Carolina at Chapel Hill. 2019.

B.S. Geophysics. Ohio State University School of Earth Sciences. 2016.

Teaching Experience

Field Instructor. 2020-2022

Integrating Geosciences and Engineering in the Arctic

Undergraduate field course in Arctic hydrology. Helped students define and test field-based hypotheses on permafrost hydrology in Northern Alaska.

Teaching Assistant. 2019; 2021

Water in Our World (300-level hydrology course)

Weekly review and computational lab section. Introduction to manipulating, graphing, and interpreting data for applications in hydrology and climate.

Teaching Assistant. 2016

Introduction to Earth Science and *Geology of our National Parks*

Weekly review and hands-on lab for introductory Earth Science classes. Wide variety of topics for non-science majors.

Peer Reviewed Articles

2024 **Langhorst, T.** Andreadis, K., Allen, G. H., Global Cloud Biases in Optical Satellite Remote Sensing of Rivers. *Geophysical Research Letters*.

doi.org/10.1029/2024GL110085

2024 Friedmann, E., Gleason, C., Feng, D., **Langhorst, T.**, Estimating Riverine Total Suspended Solids from Spatiotemporal Satellite Sensor Fusion. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*.

doi.org/10.1109/JSTARS.2024.3443756

2024 Arp, C. D., Bondurant, A. C., Clement S., Eidam, E., **Langhorst T.**, Pavelsky T. M., Davis J., and Spellman K. V., "Observation of high sediment concentrations entrained in jumble river ice." *River Research and Applications*.

<https://doi.org/10.1002/rra.4309>

2024 Clement, S., Spellman, K., Eidam, E., **Langhorst, T.**, Arp, C., Davis, J., Pavelsky, T. and Bondurant, A., How Do You Sample a Frozen River? Increasing K-12 STEM Engagement Through Real-World Problem Solving and Scientific Research. *Connected Science Learning*.

doi.org/10.1080/24758779.2024.2328225

2023 Smith, L.C., Fayne, J.V., Wang, B., Kyzivat, E.D., Gleason, C.J., Harlan, M.E., **Langhorst, T.**, Feng, D., Pavelsky, T.M. and Peters, D.L., Peace-Athabasca Delta water surface elevations and slopes mapped from AirSWOT Ka-band InSAR. *Remote Sensing Letters*. doi.org/10.1080/2150704X.2023.2280464

- 2023 **Langhorst, T.**, Pavelsky, T., Eidam, E., Cooper, L., Davis, J., Spellman, K., Clement, S., Arp, C., Bondurant, A., Friedmann, E., & Gleason, C., Increased scale and accessibility of sediment transport research in rivers through practical, open-source turbidity and depth sensors. *Nature Water*. doi.org/10.1038/s44221-023-00124-2
- 2023 **Langhorst, T.**, & Pavelsky, T., Global Observations of Riverbank Erosion and Accretion from Landsat Imagery. *Journal of Geophysical Research: Earth Surface*. doi.org/10.1029/2022JF006774
- 2023 Harlan, M. E., Gleason, C. J., Flores, J. A., **Langhorst, T. M.**, & Roy, S., Mapping and characterizing Arctic beaded streams through high resolution satellite imagery. *Remote Sensing of Environment*. doi.org/10.1016/j.rse.2022.113378
- 2023 Wang, B., ..., **Langhorst, T.**, ..., (6th of 13 coauthors), Athabasca River Avulsion Underway in the Peace-Athabasca Delta, Canada. *Water Resources Research*. doi.org/10.1029/2022WR034114
- 2023 Wang, C., ..., **Langhorst, T.**, ... (9th of 19 coauthors), Quantification of wetland vegetation communities features with airborne AVIRIS-NG, UAVSAR, and UAV LiDAR data in Peace-Athabasca Delta. *Remote Sensing of Environment*. doi.org/10.1016/j.rse.2023.113646
- 2022 Yang, X., ..., **Langhorst, T.**, ... (12th of 17 coauthors), Mapping Flow-Obstructing Structures on Global Rivers. *Water Resources Research*. doi.org/10.1029/2021wr030386
- 2021 Eidam, E. F., **Langhorst, T.**, Goldstein, E. B., & McLean, M., OpenOBS: Open-source, low-cost optical backscatter sensors for water quality and sediment-transport research. *Limnology and Oceanography: Methods*. doi.org/10.1002/lom3.10469
- 2020 Whittemore, A., Ross, M. R. V., Dolan, W., **Langhorst, T.**, Yang, X., Pawar, S., Jorissen, M., Lawton, E., Januchowski-Hartley, S., & Pavelsky, T., A Participatory Science Approach to Expanding Instream Infrastructure Inventories. *Earth's Future*. doi.org/10.1029/2020EF001558
- 2019 Kyzivat, E. D., ..., **Langhorst, T.**, ..., (8th of 12 coauthors), A high-resolution airborne color-infrared camera water mask for the NASA ABoVE campaign. *Remote Sensing*. doi.org/10.3390/rs11182163
- 2019 **Langhorst, T.**, Pavelsky, T. M., Frasson, R. P. D. M., Wei, R., Domeneghetti, A., Altenau, E. H., Durand, M. T., Minear, J. T., Wegmann, K. W., & Fuller, M. R., Anticipated improvements to river surface elevation profiles from the surface water and ocean topography mission. *Frontiers in Earth Science*. doi.org/10.3389/feart.2019.00102
- 2019 Tuozzolo, S., **Langhorst, T.**, de Moraes Frasson, R. P., Pavelsky, T., Durand, M., & Schobelock, J. J., The impact of reach averaging Manning's equation for an in-situ dataset of water surface elevation, width, and slope. *Journal of Hydrology*. doi.org/10.1016/j.jhydrol.2019.06.038

Book Chapters

- 2023 Yang, X., **Langhorst, T.**, Pavelsky, T., Chapter A2.4 River Morphology. *Cloud-Based Remote Sensing with Google Earth Engine: Fundamentals and Applications*. Springer Nature. doi.org/10.1007/978-3-031-26588-4

Invited Talks and Seminars

- 2024 Deep learning and remote sensing of fluvial suspended sediment flux. *University of Cincinnati, Department of Chemical and Environmental Engineering*
- 2024 Multi-Modal Deep Learning of Suspended Sediment. *River Morphology Information System (RIMORPHIS) Workshop*, hosted by Purdue University.

Field Work Campaigns

- 2023 Lead sediment monitoring study in collaboration with NASA SWOT satellite validation. Sag. River, AK
- 2022 Lead and mentored undergraduates in Arctic field campaigns. Sag. River, AK.
- 2021 Lead and mentored undergraduates in Arctic field campaigns. Sag. River, AK.
- 2019 Co-Lead 6-week field campaign with rotating crew of 11 researchers from 5 institutions. Peace Athabasca Delta, Canada.
- 2018 Assisted with 4 weeks of hydrographic surveys. Peace Athabasca Delta, Canada.
- 2017 Assisted with water surface elevation surveys. North Saskatchewan River, Canada. Sagavanirktok River, AK.
- 2016 Lead bathymetric study for hydrodynamic modeling. Olentangy River, OH.

Outreach

Open-source instrumentation – As an extension of my open-source water quality sensor work I have supported schools and citizen science projects in the United States, Canada, the United Kingdom, Madagascar, and Nepal. Since 2020.

Skype a Scientist – I phone in to classrooms to connect with students about how science works, what we do, and answer their questions. Since 2023.

Service

Instrumentation Committee member - Consortium of Universities for the Advancement of Hydrologic Science (CUAHSI). Since 2022.

Department Senator - UNC Graduate and Professional Student Government. 2021-2022.

Conference Submissions

Multi-Model Comparison of Suspended Sediment Flux in the Sagavanirktok River, Alaska. EGU General Assembly 2024.

Simultaneous remote sensing of river discharge and suspended sediment on the Sagavanirktok River, Alaska. *AGU Fall Meeting 2022. Oral.*

The first year of OpenOBS deployments: successful turbidity measurements in diverse environments and applications. *OSM 2022. Poster.*

Global riverbank migration from 36 years of satellite imagery. *AGU Fall Meeting 2021. Oral.*

Variability and controls of riverbank erosion in the United States from 35 years of satellite imagery. *AGU Fall Meeting 2020. Poster.*

Remotely sensed discharge and sediment flux of the Sagavanirktok River. *AGU Fall Meeting 2019. Poster.*

Anticipated improvements to in-river DEMs from the Surface Water and Ocean Topography mission. *AGU Fall Meeting 2018. Poster.*

Successful Funding

Title: Sediment fluxes in boreal rivers: determining relative seasonal loads and expanding long-term monitoring capability

Funding Agency: NSF, #2153778

Principal Investigator: Emily Eidam, Oregon State University

Role: Contributing Researcher (explicitly funded but not as an investigator)

Duration: Fall 2022 - Fall 2024

Amount: \$336,638 (2 semesters + \$15,000 instrument development funds for Langhorst)

Description: This proposal was based on my previous work on low-cost, do-it-yourself turbidity sensors. These sensors allowed us to continuously monitor sediment loads under ice without risking expensive commercial devices and allowed students to build their own sensors. My work on this project was detailed in the Langhorst et al. (2023) publication in *Nature Water*.