

Angel Darío Monsalve Sepúlveda, Ph.D.
Civil Engineer
Assistant Professor
Civil and Environment Engineering Department
University of Idaho

Contact Information

Civil & Environmental Engineering
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Summary and Research interest

I am a Civil Engineer holding Master's and PhD degrees in Civil Engineering, with extensive experience in research, teaching, and consulting. My specialization lies in fluvial geomorphology, with a keen interest in landscape evolution, sediment dynamics, hydraulic processes, and the intricate interaction between water and sediment flow dynamics. I am particularly adept at employing mathematical modeling techniques.

My advanced expertise in numerical modeling techniques, including Computational Fluid Dynamics, has contributed significantly to our understanding of the physical processes controlling sediment transport and flow fields. My primary focus is the fluvial geomorphology of mountain streams. I specialize in examining the effects of the spatial distribution of flow and sediment grain sizes, focusing on the continuous feedback between rivers and their environment.

Utilizing advanced numerical models, I incorporate the effects of free-surface, turbulence, and surface-subsurface interaction into the understanding of river flow dynamics. In addition to my research and teaching roles, I also bring over 10 years of experience in Hydraulic Engineering consulting from my home country, Chile.

Personal information

Birth date: August 16, 1983
Place of Birth: Arauco, Region of Biobío, Chile
Country of citizen: Chile
Family and given name: Angel Darío Monsalve Sepúlveda

Education

Ph.D. in Civil Engineering, University of Idaho, Department of Civil Engineering, Center for Ecohydraulics Research. Boise, Idaho, 2011-2016

- Doctorate Thesis: Sediment Transport Predictions and Bed Surface Adjustments in Spatially Variable Flow
- GPA: 4.0

Master of Science in Civil Engineering, Department of Civil Engineering, Universidad de Concepción, Chile, 2008-2010

- Master's Thesis: Field and numerical investigation on the spatial and temporal distributions of river's temperature
- Graduated with "Máxima Distinción" (Highest Honor)

Bachelor of Civil Engineering, Department of Civil Engineering, Universidad de Concepción, Chile, 2002-2008*

- *A bachelor's degree program in civil engineering in Chile takes six years minimum
- Graduated with "Máxima Distinción" (Highest Honor)

Academic experience

Assistant Professor: Civil and Environmental Engineering, University of Idaho, Moscow, ID, USA, Aug/2024 – present.

- Taught Open-channels Hydraulics, utilizing skills in course development and student engagement.
- Currently teaching CE322 Hydraulics and CE502 DS: Applied CFD using OpenFOAM

Postdoctoral Fellow, Center for Ecohydraulics Research, Civil and Environmental Engineering, University of Idaho, Boise, ID, USA, Jan/2022 – Aug/2024.

- Principal investigator: Daniele Tonina
- Project: NSF 2100926 - Collaborative Research: The role of streambed morphological changes induced by macro-roughness elements on hyporheic nitrous oxide generation.
- Main responsibilities: i) Experiment design, ii) Lead development, construction, and operationalization of experimental setups at the University of Idaho large mountain stream flume, iii) Collect data to test all hypothesis, and iv) Develop numerical simulations of experimental cases.
- Other roles: Support outreach activities, mentor and collaborate with graduate students.

Postdoctoral Fellow, Center for Ecohydraulics Research, Civil and Environmental Engineering, University of Idaho, Boise, ID, USA, Jan/2020 – Dec/2021.

- Principal investigator: Elwyn Yager
- Project: NCHRP 24-48 - Develop a Formula for Determining Scour Depth around Structures in Gravel-bed Rivers.
- Main responsibilities: i) Develop numerical simulations of experimental conditions and ii) Derive an equation to predict scour depth around structures in gravel-bed river.
- , resulting in
- Other roles: Report results (finalized with the publication of NCHRP Research Report 1031), mentor and collaborate with graduate students.

Lecturer and Researcher, Department of Civil Engineering, Universidad de la Frontera, Chile, 2016-2021 (Equivalent to assistant professor in the US system)

- Taught two and up to three classes per semester, utilizing skills in course development and student engagement.
- Started the hydraulics laboratory. Got funding for the open-channel flume, supervised its installation, and run the first experiments using it.
- Led the department's outreach program, creating activities and services for the external community.
- Served as an academic advisor, coordinating classes and schedules for the department.
- Conducted research, enhancing departmental knowledge and contributing to the field of Civil Engineering.

Research Assistant, Center for Ecohydraulics Research, University of Idaho, Boise, ID, USA, 2011-2016

- Engaged in multiple research projects related to my dissertation, strengthening analytical skills and contributing to the field of ecohydraulics.

Laboratory Manager, Hydraulic Engineering Laboratory, University of Concepción, Chile, 2010-2011

- Managed the hydraulics laboratory, ensuring smooth operations and optimal execution of ongoing experiments.

Trainee Civil Engineer, EULA Center - Center for Environmental Studies, University of Concepción, Chile, 2008-2010

- Participated in hydrological and hydraulic research projects, gaining firsthand experience and knowledge in the field.
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Scholarships/Awards (highest levels only)

Outstanding Professor, Civil Engineering Graduates, 2022

- Recognized as the best mentor and professor by Civil Engineering graduates.

Fondecyt Iniciación en Investigación, Project # 11200949, 2020-2023

- Awarded for the project "Including the Spatial Variability of Boundary Shear Stress and Grain Size Distribution in Sediment Transport Predictions - Applications to Mountain Streams".
- Most prestigious research fund for early career researchers in Chile. My project was ranked #1 in the country.

Conicyt Scholarship (Becas Chile – Chile Scholarship), 2010

- Awarded for PhD Studies at the University Of Idaho.
- Most prestigious scholarship in Chile to study abroad.

University of Concepción Graduate Department Scholarship, 2008

- Awarded for Master of Sciences studies at the University of Concepción.

Scholarship Accomplishments

Refereed Journals

- Yager, E. M., Shim, J., Hodge, R., Monsalve, A., Tonina, D., L. Johnson, J. P., & Telfer, L. (2024). Pro+: Automated protrusion and critical shear stress estimates from 3D point clouds of gravel beds. *Earth Surface Processes and Landforms*, 49(7), 2155-2170. <https://doi.org/10.1002/esp.5822>
- Heidi E. J. Smith, Angel D. Monsalve, Jens M. Turowski, Dieter Rickenmann, and Elowyn M. Yager (2023). Controls of local grain size distribution, bed structure and flow conditions on sediment mobility. *Earth Surface Processes and Landforms*. doi.org/10.1002/esp.5599
- Angel Monsalve, Elowyn M. Yager, and Daniele Tonina (2023). Evaluating Apple iPhone LiDAR measurements of topography and roughness elements in coarse bedded streams. *Journal of Ecohydraulics*. doi.org/10.1080/24705357.2023.2204087
- Dudunake, T., Tonina, D., Reeder, W. J., & Monsalve, A. (2020). Local and reach-scale hyporheic flow response from boulder-induced geomorphic changes. *Water Resources Research*, 56, e2020WR027719. <https://doi.org/10.1029/2020WR027719>
- Monsalve, A., Segura, C., Hucke, N., and Katz, S. (2020): A bed load transport equation based on the spatial distribution of shear stress – Oak Creek revisited, *Earth Surf. Dynam.*, 8, 825–839, <https://doi.org/10.5194/esurf-8-825-2020>, 2020.
- Monsalve, A., E.M. Yager (2017) Bed surface adjustments to spatially variable flow in low relative submergence regimes. *Water Resources Research*, 53, 9350–9367. <https://doi.org/10.1002/2017WR020845>.
- Monsalve, A., E.M. Yager, and M. Schmeeckle (2017) Effects of bed forms and large protruding grains on near-bed flow hydraulics in low relative submergence conditions. *Journal of Geophysical Research: Earth Surface*, 122, 1845–1866. <https://doi.org/10.1002/2016JF004152>.
- Monsalve, E.M. Yager, J. Turowski, and D. Rickenmann (2016) A probabilistic formulation of bed load transport to include spatial variability of flow and surface grain size distributions, *Water Resour. Res.*, 52, 3579–3598, [doi:10.1002/2015WR017694](https://doi.org/10.1002/2015WR017694).
- Yager, E.M., M. Kenworthy, and A. Monsalve (2015), Taking the river inside: Fundamental advances from laboratory experiments in measuring and understanding bedload transport processes, *Geomorphology*. 244. 21-32. <https://doi.org/10.1016/j.geomorph.2015.04.002>
- Link, O., A. Huerta, A. Stehr, A. Monsalve, C. Meier, M. Aguayo (2012), The solar-to-stream power ratio: A dimensionless number explaining diel fluctuations of temperature in mesoscale rivers. *River Research and Applications*. DOI: 10.1002/rra.2579.
- Monsalve, A., Link, O. & Stehr, A. (2012), “The thermal regime of rivers: development, verification and application of a numerical model”. *Water Technology and Sciences (in Spanish)*. 3(4):41-56

Reports, books and book chapter published

- E. Yager, A. Monsalve, J. Shim, D. Tonina, C. Keady, C. Borden, S. Borden (2023) Determining Scour Depth Around Structures in Gravel-Bed Rivers. NCHRP Research Report 1031. doi.org/10.17226/27027

- Link, O. y *Monsalve, A.* (2010) “Métodos y modelación numérica en hidráulica de cauce abierto” Concepción, Editorial Universidad de Concepción. 117 p. ISBN 978-956-8029-89-0 (Numerical methods and modeling in open channels hydraulics)
- Link, O., *Monsalve, A.*, Stehr, A., García, A. y Urrutia, R. (2009) Thermal regime of the Itata River, Chapter 3, pp. 44-57 (In: Parra, Castilla, Romero, Quiñones y Camaño Eds. La Cuenca Hidrográfica del Río Itata, Aportes Científicos Para Su Gestión Sustentable. Concepción (The Itata River watershed, scientific contributions for a sustainable management), Editorial Universidad de Concepción, 389 pp). ISBN: 978-956-227-326-8

Conferences and presentations

- K. Adler, D. Tonina, A. Monsalve, W. Reeder (2024) Stream-vegetation interactions impacting interfacial exchange from top to bottom. Abstract ID#: 1542995, Proceedings of the 2024 AGU fall meeting. Washington DC, USA.
- D. Tonina, K. Adler, A. Monsalve, W. Reeder, D. Tartakovsky, E. Yager (2024) The Role of Sediment Transport and Boulders on Hyporheic Fluxes and Hyporheic Habitat in Plane Bed Rivers. Abstract ID#: 1559130, Proceedings of the 2024 AGU fall meeting. Washington DC, USA.
- K. Adler, W. Reeder, J. Moreto, A. Bertagnoli, T. Dudunake, A. Monsalve, X. Liu, D. Tonina (2024) Volumetric Pressure Reconstruction around a Submerged Obstacle Using Stereoscopic Multi-Planar PIV with Applications to Hyporheic Flow Modeling. Bulletin of the American Physical Society
- A. Monsalve, W. Reeder, J.R. Moreto, X. Liu, and D. Tonina (2023) Comparison of CFD and RIM-SPIV experimentally obtained pressure fields of an open channel flow around a cylinder. Proceedings of the 15th International Symposium on Particle Image Velocimetry. San Diego, California, USA.
- A. Monsalve, W. Reeder, D. Tonina (2022) Beyond The Field Of View Of Particle Image Velocimetry – Coupling Large Eddy Simulations To PIV/Refractive Index-Matched Fluid To Obtain Spatial And Temporal Variations Of Pressure Fields. Proceedings of the 2022 AGU fall meeting. Chicago, USA.
- C. Segura, A. Monsalve (2021) : A bed load transport equation based on the spatial distribution of shear stress - oak creek revisited. Proceeding of the 2021 Geological Society of America meeting. Portland, Or. USA.
- A. Monsalve, C. Segura (2020) A new approach to estimate bed load including the spatial distribution of shear stress: Oak Creek Revisit. Proceedings of the 2020 AGU fall meeting. San Francisco, USA.
- E. Yager, A. Monsalve, R. Kaitna, S. Leblois, and M. Gundlach (2019) Taking the plunge: the limited control of flow magnitude on step-pool morphology. Proceedings of the 2020 AGU fall meeting. San Francisco, USA.
- A. Monsalve, Yager, E (2018) Bed Surface Responses to Different Hydrographs and Sediment Supply Conditions in Low Relative Submergence Regimes. Proceedings of the 2018 AGU fall meeting. Washington DC, USA.
- A. Monsalve, Yager E. (2017) Bed Surface Responses to Spatially Variable Flow in Low Relative Submergence Conditions. AGU fall meeting. New Orleans, Louisiana, USA.
- A. Monsalve, Yager, E. (2015). Formation and establishment of forced sediment patches in high gradient channels. Proceedings of the 2015 CSDMS (Community Surface Dynamic Modeling System) annual meeting. Boulder, Colorado, USA. Poster presentation.

- A. Monsalve, Yager, E. (2014). Including sediment patches in sediment transport predictions in steep mountain channels. Proceedings of the 2014 CSDMS (Community Surface Dynamic Modeling System) annual meeting. Boulder, Colorado, USA. Poster presentation.
- Yager, E., A. Monsalve, H. Smith and A. Badoux (2013) Are grain packing and flow turbulence the keys to predicting bedload transport in steep streams? AGU fall meeting. San Francisco, California, USA.
- A. Monsalve, Yager, E. (2013). Effects of sediment patches on sediment transport predictions in steep mountain channels. 2013 AGU fall meeting. San Francisco, California, USA. Poster presentation.
- A. Monsalve, Yager, E. (2012). Development of forced patches in steep channels. 2012 AGU fall meeting. San Francisco, California, USA. Poster presentation.
- Stehr, A., Bohle, G., Caamaño, D., Link, O., Monsalve, A., Caamaño, F., Torres, P. y Aguayo, M. (2009). "Evaluation of different spatial discretization schemes in the hydrologic response of an Andean watershed". V International Conference on SWAT, Boulder Colorado, USA, 4-7 August.
- Stehr, A., Link, O., Monsalve, A., (2009) Development and verification of a stream temperature model for the Itata river, Chile. Analysis of potential impacts of climate change. An international conference on "Science and Information Technologies for Sustainable Management of Aquatic Ecosystems".

Chilean Conferences and Journals

- *Monsalve, A.* (2015). Evaluating the influence of hyporheic flows on solute transport using a numerical model. *Revista Ingeniería de Obras Civiles - RIOC - Volumen 5/2015.*
- *Monsalve, A.,* (2014). Effects of reach channelization and straightening on the habitat quality for Chinook salmon at spawning and juvenile stages. *Revista Ingeniería de Obras Civiles - RIOC - Volumen 4/2014.*
- *Monsalve, A., Link, O. y Stehr, A.* (2011). Numerical modeling of the thermal regime of the lower Itata. XX Congreso Nacional de Ingeniería Hidráulica. Proceedings XIX Chilean Hydraulics Congress, Chilean Society of Hydraulic Engineering. Viña del Mar, Chile (In Spanish)
- *Monsalve, A., Link, O., Stehr, A., Bohle, G.* (2009). Measurements and predictions of Itata's river temperature. Proceedings XIX Chilean Hydraulics Congress, Chilean Society of Hydraulic Engineering. Viña del Mar, Chile (In Spanish)
- *Bohle, G., Link, O., Stehr, A., Monsalve, A.* (2009). Climate change influence on the Lower Itata's river discharge Proceedings XIX Chilean Hydraulics Congress, Chilean Society of Hydraulic Engineering. Viña del Mar, Chile (In Spanish)

Courses Taught

Solid Mechanics, Spring Semester, 2016

Fluid Mechanics, Spring and Fall Semesters, 2016 - 2020

Open Channel Hydraulics, Spring and Fall Semesters, 2016 - 2020

Thermodynamics, Fall Semester, 2016 - 2017

Open Channel Hydraulics Modeling, Spring and Fall Semesters, 2018 - 2020

* S: Spring semester, F: Fall semester, S/P: Spring and Fall semesters

Selected consulting project – experience as hydraulics engineer

All these projects were executed and developed in Chile

2020: Hydrogeological Study of the Metrenco Electrical Substation Project - Besalco Energy S.A.

2020: Hydrological and Hydraulic Study - Design of El Arrayán Collectors - Puerto Montt - Serviu.

2018-2019: Modeling and Design of Sanitation Works of the Angol Master Plan. Public Works Department, MOP, Chile. Role: Hydraulic Modeling, Hydraulic Engineering Verification, Modeling, and Construction.

2017-2018: Advisory to the Inspection for the Design of River Works and Aluvional Control in the El Tránsito River Basin, Alto Del Carmen, Atacama Region. Public Works Department, MOP, Chile. Role: Hydraulic Engineering Verification, Modeling, and Construction.

2016-2018: Hydrological Behavior Study of the Trancura River Basin and its Tributaries, Flow Modeling in Different Precipitation Conditions (Low and High Rainfall), and Identification of Flooding Areas. Public Works Department, MOP, Chile. Role: Hydraulic Modeling.

Other skills and qualifications

- Participation and lecturer in diverse Certification and Specialization courses for graduate engineers in Chile including: i) Design of water supply system in rural areas, ii) Design of hydraulic structures for irrigation systems, and iii) Management of hydraulic projects.
- Vast experience in operating the hydraulics laboratory and conducting experimental studies.
- Highly skilled in coding and numerical model development.

Computer Skills (highest skills listed only)

- Programming languages: Python, Matlab, and C++.
- Geomorphological suite: Landlab
- CFD Modeling software and libraries: OpenFOAM, Ansys Fluent, FastMECH, NAYS2DH, NAYSEddy, CFDEM, Aspherix, DualSphysics.
- Engineering Software: Autocad Civil 3D, QGIS, HecRas, Phabsim.

Other Interests : Soccer, Music composition

Updated on: January 2025