

# Daniel Guyumus Preciado

daniel.guyumus.preciado@duke.edu  
Durham, NC

## Education

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### Duke University, Durham, NC (US)

PhD Candidate in Civil and Environmental Engineering (2021 - present).

### Universidad de Los Andes, Bogotá D.C. (CO)

M.Sc. in Civil and Environmental Engineering (2017)

### Universidad del Quindío, Armenia, Q (CO)

B.S. Civil Engineering (2013)

## Research Experience

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### Dr. Nathaniel Chaney's Lab. Duke University

Research Assistant (2021 - present)

- Developed and implemented a multiscale framework for subsurface flow representation in land-surface modeling under a clustering framework.
- Evaluated the representation of the Surface Water and Ocean Topography (SWOT) mission using a Land Surface Model and an ensemble analysis applied to the Connecticut River watershed.
- Characterized the role of heterogeneity using a Land Surface Model ensemble analysis with a case study in the Mediterranean mountains.

### Centro de Investigaciones en Ingeniería Ambiental (CIIA) Universidad de Los Andes

Research Assistant (2015 - 2017)

- Implemented a Hydrological model in the Páramo areas in the Andes mountains in Colombia, leveraging remote sensing data and hydrometeorological stations.
- Contributed to developing a Methodology for optimizing the selection of Sustainable Urban Drainage Systems (SUDS) for the city of Bogotá D.C.
- Evaluated flooding risk under different scenarios in the Bogotá River near BIMA Shopping Center, by implementing a hydraulic model using bidimensional analysis of river with multiple tributaries.

### Grupo de Investigación, Desarrollo y Estudio del Recurso Hídrico y del Ambiente (CIDERA), Universidad del Quindío

Undergraduate Researcher (2012 - 2013)

- Simulated an integrated long-term water balance for La Vieja River in Quindío Region using a Decision Support System (WEAP) for climate change assessment.
- Characterized users along the Quindío River during a field campaign for water use analysis.

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## Work Experience

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### INGECIENCIAS S.A.S

Design Engineer, Hydrology and Hydraulic specialist (06/2020 - 06/2021)

- Characterized climatology and implemented hydrological models to assess extreme streamflow events for risk analysis.
- Evaluated the hydraulic capacity of pluvial systems according to technical regulations in Colombia.

### División de Ordenamiento y Desarrollo Físico (DODF), Universidad Nacional de Colombia

Design Engineer, Hydrology and Hydraulic specialist (07/2019 - 03/2021)

- Evaluated the specialty designs supervised by the DODF aimed to improve the infrastructure of the University and all its dependencies.
- Designed and provided guidelines for specialty projects required by the University and all its dependencies.
- Generated technical specifications and budget plans for specialty projects.
- Supervised detailed designs and worked with different consultant companies to achieve the goals set in contractual projects aimed at the development of the University facilities.

### INGETEC S.A. - Ingenieros Consultores

Design Engineer, Hydrology specialist (03/2017-06/2019)

- Characterized climatology and erodibility for risk assessment in Canal Pedraza - Mina La Jagua (PRODECO, Colombia)
- Estimated baseflow and recharge in the Hydrogeological model in the San Pedro river basin (COLBUN, Chile)
- Characterized climatology, streamflows, and erodibility for multiple reservoirs on the Azuero Rivers for feasibility studies in Panamá (ACP, Panamá)
- Characterized climatology, streamflows, and environmental impacts (water component) in the Bayano River Water Supply Feasibility Study and Indio River Multipurpose Reservoir (ACP, Panamá)
- Technical assessment of the hydrological component in Miguillas Hydropower (ENDE CORANI, Bolivia)
- Characterized climatology and streamflows, evaluated environmental impacts and mitigations in multiple projects in Colombia as part of the hydrological component for feasibility studies to comply with the national regulatory entity (ANLA) requirements.

### AQUAING S.A.S

Assistant engineer on Hydrology and Hydraulics Analysis (06/2013-12/2014)

- Contributed to cartographic and meteorological data processing.
- Implemented hydrological models for flood risk analysis and sediment transport under supervision.
- Designed intake, storage, and water distribution and stormwater systems for 14 municipalities in Tolima, Colombia

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## Teaching Experience

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### Guest Lecturer:

Hydrology, Duke University (2025)

- Lectures (2) on Darcy's Law in a graduate-level course.

Hydraulica de Ríos, Universidad de Los Andes (2016)

- Taught (1) lecture on HEC-RAS 2D and demonstrated the implementation of a case study using remote sensing data.

Modelación de Hidrosistemas, Universidad de Los Andes (2016)

- Taught (1) lecture on Introduction to MATLAB and guided students on practical examples of basic commands.

### Teaching Assistant:

Environmental Spatial Data Analysis, Duke University (2025)

- Held office hours and graded student coursework.

Fluid Mechanics, Duke University (2023)

- Led undergraduate lab sessions and experiments on fluid topics
- Held office hours and graded student coursework

Análisis de Hidrosistemas, Universidad de Los Andes (2017)

- Held office hours and graded student coursework

Hidraulica de Ríos, Universidad de Los Andes (2016)

- Held office hours and graded student coursework
- Codeveloped course assignments with the instructor, graded them, and answered student questions.

Modelacion de Hidrosistemas, Universidad de Los Andes (2016)

- Held office hours and graded student coursework
- Codeveloped course assignments with the instructor, graded them, and answered student questions.

## Publications

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Guyumus, D., Torres-Rojas, L., Bacelar, L., Xu, C., and Chaney, N.: HydroBlocks-MSSUBv0.1: A Multiscale Approach for Simulating Lateral Subsurface Flow Dynamics in Land Surface Models, <https://doi.org/10.5194/egusphere-2025-563>, 2025. (preprint)

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Kokko, E.-R., Chaney, N., Guyumus, D., Bacelar, L., Torres-Rojas, L., and Okkonen, J.: Modelling of temporal and spatial trends in soil conditions in Finland using HydroBlocks model, <https://doi.org/10.5194/egusphere-2025-4024>, 2025. (preprint)

Alzate, S., Guyumus, D., Quijano, J., and Díaz-Granados, M.: Two-dimensional hydraulic flood modeling in domains with multiple tributary areas for risk analysis, in: River Flow 2016, 118th Conference on Fluvial Hydraulics – RiverFlow, 1784–1792, 2016.

Alzate, S., Guyumus, D., Quijano, J., and Diaz-Granados, M.: Modelación hidráulica bidimensional para el análisis de amenaza de inundación en dominios con múltiples tributarios., XXVII Congreso latinoamericano de hidráulica, Lima, Perú, 2016. (conference paper)

## **Leadership and Activities**

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### **Peer Reviewer**

- Geoscientific Model Development,
- Hydrology and Earth System Sciences

### **Student Organizations**

- Vice-President - Grad Chapter Society of Hispanic Professional Engineers, Duke University
- Academic Director - Asociacion Nacional de Estudiantes de Ingenieria Civil, Universidad del Quindio

### **Seminars**

- Organizer - Mechanics Seminar, Duke University.

## **Presentations**

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Guyumus, D., & Chaney, N. (2025, March). *Assessing the Performance of Land Surface Models in Representing Flood Dynamics: A HydroBlocks-SWOT Approach in the Connecticut River Basin*, US [Oral]. EGU 2025. Copernicus GmbH.

Guyumus, D. (2024, December). *Leveraging SWOT to Learn the Space-Time Behavior of Inundation: Opportunities to Improve Hydrologic Modeling*. [Poster]. AGU 2024, Washington, D.C.

Guyumus, D. (2023, December). *New Methodology for Simulating Groundwater Flow in Large-Scale LSMs: Implications for Continental-Scale Hydrological Processes* [Poster]. AGU 2023, San Francisco, CA.

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Guyumus, D. (2022, December 12). *A Numerical Approach to Efficiently Model Groundwater Flow at High Spatial Resolutions Using the HydroBlocks Land Surface Model* [Oral]. AGU 2022, Chicago, IL.

Guyumus, D. (2016, June). *Two-dimensional hydraulic flood modeling in domains with multiple tributary areas for risk analysis* [Poster]. 118th Conference on Fluvial Hydraulics – RiverFlow, St. Louis, MI.

Alzate, S., Guyumus, D., Quijano, J., & Díaz-Granados, M. (2016, July). *Modelación hidráulica bidimensional para el análisis de la amenaza de inundación en dominios con múltiples tributarios*. [Oral]. XXII Seminario Nacional de Hidráulica e Hidrología, Bogotá, Colombia.