David Fernando Muñoz Pauta

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Lab website: https://davidmunozpauta.wixsite.com/coral

EDUCATION

August 2018 – September 2021

Ph.D. Civil, Construction and Environmental Engineering.
The University of Alabama. Tuscaloosa AL, USA.
Thesis: Integration of physically-based and data-driven modeling approaches for compound coastal flood hazard assessment under uncertainties.

September 2015 – September 2017

MSc. Earth and Environment - Hydrology and Water Resources.
Wageningen University & Research. Wageningen, the Netherlands.
Thesis: Tidal influence on the discharge distribution at two junctions of the Kapuas River, Indonesia (Hydrodynamic Delft3D-FM model).

October 2007 – February 2013

Bachelor's in Civil Engineering.
University of Cuenca. Cuenca, Ecuador.
Thesis: Study to determine runoff coefficient variation and its impact on Calle Larga and Miguel Velez's collection system in Cuenca, Ecuador.

HONORS AND AWARDS

March 2023

2023 Faculty Mentoring Grant. Blacksburg, VA.

July 2022

2022 NHERI RAPID Facility Intensive Hands-On Training Workshop. Travel grant. Seattle WA.

April 2022

2022 Outstanding Dissertation Award. Department of Civil, Construction and Environmental Engineering, The University of Alabama. Tuscaloosa, AL. April 2022.

June 2019

National Water Center Innovators Program – Summer Institute. Consortium of Universities for the Advancement of Hydrologic Science (*CUAHSI*) and National Oceanic and Atmospheric Administration (*NOAA*). Tuscaloosa, AL.

February 2017

ERASMUS+ program. Student grant for traineeship. European Commission.

September 2014

SENESCYT scholarship. Open Call Program 2014, Ecuadorian government.

WORK EXPERIENCE

August 2022 to present

Assistant Professor. Charles E. Via, Jr. Department of Civil & Environmental Engineering at Virginia Tech. Patton Hall Blacksburg, VA 24061.

September 2021 to August 2022

Postdoctoral research associate. Center for Complex Hydrosystems Research (CCHR). The University of Alabama. 248 Kirkbride Ln, Tuscaloosa, AL 35401.

October 2017 – August 2018

Urban flood modeler. "*Cost Effective Neural Technique to Alleviate Urban Flood Risk*" - CENTAUR project. (https://www.sheffield.ac.uk/centaur). Department of Civil Engineering. Faculty of Sciences and Technology of the University of Coimbra (FCTUC) – Pólo II. Rua Luis Reis Dos Santos, 3030-790. Coimbra, Portugal.

March 2017 – July 2017

Internship. Urban flood modeling and sewer overflow control. "*CENTAUR* project" under the H2020 framework. Department of Civil Engineering. University of Coimbra. Coimbra, Portugal.

February 2013 – May 2015

Civil engineer. KIMSA Constructors / Azuay Prefecture. Cuenca, Ecuador. Amazonas Constructors / Enterprise of Economic Development (EDEC). Cuenca, Ecuador. Civil engineer (junior). Consultancy in Environmental and Sanitary Engineering (CONSULTORACAV) / Ministry of Urban Development and Housing (MIDUVI). Ministry of Transportation and Public Works (MTOP). Cuenca, Ecuador.

TEACHING EXPERIENCE

August 2023 to present

Lecturer. *Flood Hazard Modeling*. Department of Civil and Environmental Engineering. Virginia Tech, Blacksburg VA, USA.

August 2022 to present

Lecturer. *Data Analytics in Civil and Environmental Engineering*. Department of Civil and Environmental Engineering. Virginia Tech, Blacksburg VA, USA.

August 2019 – to July 2022

Guest lecturer. *Hydrodynamic modeling*. Department of Civil, Construction and Environmental Engineering. The University of Alabama. Tuscaloosa AL, USA.
Environmental Data Analysis. Department of Civil, Construction and Environmental Engineering. The University of Alabama. Tuscaloosa AL, USA.
Machine Learning. Department of Geography. The University of Alabama. Tuscaloosa AL, USA.

August 2019 – September 2021

Research assistant (RA). *Hydrodynamic modeling*. Department of Civil, Construction and Environmental Engineering. The University of Alabama. Tuscaloosa AL, USA.

August 2018 – July 2019

Graduate teaching assistant (TA). *Hydrodynamic modeling*. Department of Civil, Construction and Environmental Engineering. The University of Alabama. Tuscaloosa AL, USA.

ADVISING & MENTORING EXPERIENCE

August 2023 to present

Md. Shadman Sakib. *PhD. Student.* Virginia Tech (Advisor)

August 2022 to present

Samuel Daramola. *PhD. Student.* Virginia Tech (Advisor)

November 2021 – July 2022

Georgios Boumis. *PhD. Student.* The University of Alabama (Mentor)

August 2021 – July 2022

Sadaf Mahmoudi. *PhD. Student.* The University of Alabama (Mentor)

August 2021 – July 2022

Meraj Sohrabi. *PhD. Student.* The University of Alabama (Mentor)

January 2021 – July 2022

Ebrahim Hamidi. *PhD. Student.* The University of Alabama (Mentor)

June 2019 – May 2021

Aaron Vandermus. *MSc. Student.* The University of Alabama (Mentor)

October 2018 – April 2019

Afrin Hossain Anni. *MSc. Student.* The University of Alabama (Mentor)

October 2017 – September 2018

Bruno Duarte. *MSc. Student.* University of Coimbra (Mentor)

RESEARCH PROPOSAL EXPERIENCE

1. **Agency:** National Science Foundation (NSF)
   Title: Collaborative Research: CAS-Climate: Nonstationarity of Compound Coastal Floods in the Anthropocene,
   Start date: October 1, 2022
   Amount: $79,794 (of $510,777)
   Role: PI
   Status: Awarded

2. **Agency:** National Science Foundation (NSF)
   Title: Improving Total Water Level Predictability and Large-scale Compound Flood Hazard Assessment with Physics-informed Machine Learning & Data Fusion Frameworks
   Start date: August 1, 2024
   Amount: $407,000
   Role: PI
   Status: Pending

SYNERGISTIC ACTIVITIES

American Society of Civil Engineers (ASCE)
Member of Compound Flooding Task Committee. Manual of Practice. April 2022.
(https://www.asce.org/)

Conference convener
AGU - Natural Hazards; AGU Fall Meeting 2022. Chicago IL. December 2022.
(https://agu.confex.com/agu/fm22/prelim.cgi/Session/160178)

K-12 education outreach. Translate local research into K-12 lesson plans. Scientific Research and Education Network (SciREN) Alabama. April 2022 (https://sciren.ua.edu/)

Journal referee
Weather and Climate Extremes (Elsevier)
Earth's Future (AGU)
Water Resources Research (AGU)
Natural Hazards and Earth System Sciences (EGU)
Nonlinear Processes in Geophysics (EGU)
Scientific Reports (Nature)

PEER-REVIEWED PUBLICATIONS

19. Merizalde M.J., Muñoz, P., **Muñoz, D.F.,** Corzo, G., Samaniego, E., and Célleri R. (2023). Integrating geographic data and the SCS-CN method with LSTM networks for enhanced runoff forecasting in a complex mountain basin. Frontiers in Water. https://doi.org/10.3389/frwa.2023.1233899.

18. Moragoda, N., Cohen, S., Gardner, Jhon, **Muñoz, D.F.,** Narayanan, A., Moftakhari, H., Pavelsky, T. M. (2022). Modeling and Analysis of Sediment Trapping Efficiency of Large Dams using Remote Sensing. Water Resources Research. https://doi.org/10.1029/2022WR033296

17. Hamidi, E., Peter, B., **Muñoz, D.F.,** Moftakhari, H., and Moradkhani, H. (2022). Fast Flood Extent Monitoring With SAR Change Detection Using Google Earth Engine. IEEE Transactions on Geoscience and Remote Sensing. https://doi.org/10.1109/TGRS.2023.3240097

16. Abbaszadeh, P., **Muñoz, D. F.,** Jafarzadegan, K., Moftakhari, H., Moradkhani, H. (2022). Perspective on uncertainty quantification and reduction in compound flood modeling and forecasting. iScience by Cell Press. https://doi.org/10.1016/j.isci.2022.105201

15. **Muñoz, D.F.,** Moftakhari, H., Kumar, M., Moradkhani, H., (2022). Compound Effects of Flood Drivers, Sea Level Rise, and Dredging Protocols on Vessel Navigability and Wetland

Inundation Dynamics. Frontiers in Marine Science 9. https://doi.org/10.3389/fmars.2022.906376

14. Jafarzadegan, K., **Muñoz, D. F.,** Moftakhari, H., Gutenson J., Savant G., Moradkhani H. (2021). Real-time coastal flood hazard assessment using DEM-based hydrogeomorphic classifiers. Natural Hazards and Earth System Sciences. https://doi.org/10.5194/nhess-2021-359

13. **Muñoz, D. F.,** Abbaszadeh, P., Moftakhari, H., Moradkhani, H. (2021). Accounting for uncertainties in compound flood hazard assessment: The value of data assimilation. Coastal Engineering. https://doi.org/10.1016/j.coastaleng.2021.104057

12. Moftakhari, H., **Muñoz, D. F.,** Song, J. Y., Alipour, A., & Moradkhani, H. (2021) Challenges for Appropriate Characterization of Compound Coastal Hazards. In Geo-Extreme 2021 (pp. 58-68). https://ascelibrary.org/doi/pdf/10.1061/9780784483695.007

11. **Muñoz, D. F.,** Muñoz P., Moftakhari H., Moradkhani H. (2021). From local to regional compound flood mapping with deep learning and data fusion techniques. Science of the Total Environment. https://doi.org/10.1016/j.scitotenv.2021.146927

10. **Muñoz, D. F.**, Muñoz P., Alipour A., Moftakhari H., Moradkhani H., Mortazavi B. (2021). Fusing multi-source data to estimate the effects of urbanization, sea level rise and hurricane impacts on long-term wetland dynamics. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing. https://doi.org/10.1109/JSTARS.2020.3048724.

9. **Muñoz, D. F.,** Moftakhari, H., Moradkhani, H. (2020). Compound effects of flood drivers and wetland elevation correction on flood hazard assessment. Water Resources Research. https://doi.org/10.1029/2020WR027544.

8. **Muñoz, D. F.**, Simões, N.E., Leitão, J.P., Marques, A.S., Maluf, L. (2019). Generalizing multi-reward functions aimed at identifying the best locations to install flow control devices in sewer systems. Urban Water Journal. https://doi.org/10.1080/1573062X.2019.1700284.

7. **Muñoz, D. F.**, Cissell, J., Moftakhari H. (2019). Adjusting emergent wetland elevation with OBIA, random forest and the 2016 NLCD. Remote Sensing. https://doi.org/10.3390/rs11202346.

6. **Muñoz, D. F.,** Yin, D., Bakhtyar, R., Moftakhari, H., Xue Z. G., Mandli K., Ferreira C. (2021). Inter-model comparison of Delft3D-FM and 2D HEC-RAS for Total Water Level Prediction in Coastal to Inland Transition Zones. Journal of the American Water Resources Association. https://doi.org/10.1111/1752-1688.12952

5. Yin, D., **Muñoz, D. F.,** Bakhtyar, R., Moftakhari, H., Xue Z. G., Mandli K., Ferreira C. (2021). Extreme water level simulation and component analysis using a compound flooding model framework in Delaware Estuary during Hurricane Isabel. Journal of the American Water Resources Association. https://doi.org/10.1111/1752-1688.12947

4. Moftakhari, H., **Muñoz, D. F.,** Jay, D. A., Akbari, A., AghaKouchak, A., Moradkhani, H. (2021). The nonlinear interaction of sea-level rise and surge-tide alters coastal flooding dynamics. AGU Advances *(Under review)*.

3. Lewis, M., Moftakhari, H., Boehm, M., **Muñoz, D. F.,** Mekonnen, M., and Moradkhani, H. (2023). A regional perspective to Coastal Food, Energy, and Water Nexus along the Unites States' Gulf Coast. Journal of Environmental Management *(Under review)*.

2. Mahmoudi, H., Moftakhari, H., **Muñoz, D. F.,** Sweet W., and Moradkhani, H. (2023). A better flood thresholding is crucial for effective sea level rise impact communication. Nature Communications *(Under review)*.

1. **Muñoz, D. F.,** Jay, D. A., Akbari, A., AghaKouchak, A., Moradkhani, H. (2021). Characterizing cascading uncertainty in compound flood modeling via process-based and machine learning modeling. Natural Hazards and Earth System Sciences. *(Submitted)*.

REPORTS/WHITE PAPERS

January 2019

Tutorial/Hand-out: Python programming. CE 591: Environmental Data Analysis. The University of Alabama.

January 2019

Tutorial/Hand-out: HEC-RAS modeling. CE 491/570: Open Channel Flow, The University of Alabama.

March 2017 – July 2017

Technical report: 1D-2D urban flood model of Zona Central catchment in Coimbra, Portugal. (MIKE URBAN, MIKE FLOOD and MIKE 21). University of Coimbra.

CONFERENCES

Mahmoudi, S., Moftakhari, H., Moradkhani, H., and **Muñoz, D.F.** (2023). The Effects of Sea Level Rise on Future High Tide Flooding Regimes. American Geophysical Union (AGU). San Francisco, CA.

Muñoz, D F., Moftakhari, H., and Moradkhani H. (2023). Cascading Uncertainty in Compound Flood Modeling. 3rd International Workshop on Waves, Storm surges, and Coastal Hazards. Notre Dame, IN.

Muñoz, D F., Moftakhari, H., and Moradkhani H. (2023). Compound Flood Mapping Across Scales: The Power of Physics-Informed Machine Learning Frameworks. Georgia, GA.

Muñoz, D F., Moftakhari H., Kumar, M., Moradkhani H. (2022). Dynamic Response of Estuarine Systems to Dredging Protocols and Sea Level Rise. American Geophysical Union (AGU). Chicago, IL

Mahmoudi, S., **Muñoz, D.F.,** Moftakhari, H., and Moradkhani, H. Physics-informed Machine Learning for Estimation of Spatially-distributed Sea Level Rise Rates and their Associated High Tide Flooding.

Meraj Sohrabi, **Muñoz, D.F.,** Moftakhari H., Moradkhani H. A novel statistical approach for tropical cyclone-driven compound flood forecasting (2022). American Geophysical Union (AGU). Chicago, IL.

Lewis, M., Moftakhari, H., **Muñoz, D.F.,** Mekonnen, M., Moradkhani, H., Boehm., M. Current and Future State of the Gulf of Mexico's Food, Energy, and Water Nexus (2022). American Geophysical Union (AGU). Chicago, IL.

Hamidi, E., Peter, B., **Muñoz, D.F.,** Moftakhari, H., and Moradkhani, H. Fast Flood Mapping with Synthetic Aperture Radar Data Using Google Earth Engine (2022). American Geophysical Union (AGU). Chicago, IL.

Moradkhani, H., Jafarzadegan, K., Abbaszadeh, P., Moftakhari, H., Alipour, A., **Muñoz, D.F.,** Yarveysi F., and Gavahi K., Toward A Universal Portrayal of Extreme Events: Hazard, Vulnerability and Risk (2022). American Geophysical Union (AGU). Chicago, IL.

Moragoda, N., Cohen, S., Gardner, Jhon, **Muñoz, D.F.,** Narayanan, A., Moftakhari, H., Pavelsky, T. M. Modeling and Analysis of Sediment Trapping Efficiency of Large Dams using Remote Sensing (2022). American Geophysical Union (AGU). Chicago, IL.

Muñoz, D F., Abbaszadeh P., Moftakhari H., Moradkhani H. (2021). Accounting for Uncertainties in Compound Flood Hazard Assessment with Data Assimilation. American Geophysical Union (AGU). New Orleans, LA.

Muñoz, D F., Vandermus A., Moftakhari H. (2021). Wetland Dynamics and Morphological Changes due to Hurricane-induced Sediment Deposition. American Geophysical Union (AGU). New Orleans, LA. https://doi.org/10.1002/essoar.10509187.1

Muñoz, D F., Muñoz P., Moftakhari H., Moradkhani H. (2021). Large-scale compound flood mapping with deep learning and data fusion techniques. European Geosciences Union (EGU). https://doi.org/10.5194/egusphere-egu21-1454

Muñoz, D F., D Yin, J Tian, R. Bakhtyar, K. Mandli, C Ferreira (2020). Influence of Forcing Conditions on Total Water Level Prediction and Spatiotemporal Patterns in Delaware Bay, USA. Ocean Sciences Meeting (OSM). San Diego, CA. https://doi.org/10.1002/essoar.10502630.1

Muñoz, D.F., Moftakhari, H (2019). Integrating estuarine hydrodynamics with remotely sensed data to assess marsh migration patterns. 25th Biennial Coastal and Estuarine Research Federation (CERF) Conference. Mobile Bay, AL.

Muñoz, D.F., Kästner, K., Hoitink, A.J.F., Moftakhari H. (2018). Influence of coastal morphology on river discharge division and tidal energy transport at tidal junctions in the Kapuas River, Indonesia. American Geophysical Union (AGU). Washington, DC. https://www.essoar.org/doi/10.1002/essoar.10500441.1

LANGUAGES

Spanish (native).
Portuguese (intermediate).
Dutch (familiar).
English (proficient).

AFFILIATIONS AND MEMBERSHIPS

Center for Coastal Studies at Virginia Tech. https://coastal.fralinlifesci.vt.edu/
Alabama Water Institute (AWI). http://ovpred.ua.edu/alabama-water-institute/
American Geophysical Union (AGU). https://www.agu.org
European Geosciences Union (EGU). https://www.egu.eu/

SOFTWARE EXPERTISE

Hydrodynamics

Delft3D-FM, ADCIRC, HEC-RAS, SWMM, MIKE (Urban, Flood, Zero, 21), Flood Modeler, and Groundwater Modeling System (GSM)

Programming

Matlab, Python, R studio, Jupyter notebooks, and Latex

Geospatial analysis

ArcGIS, QGIS, SNAP, AutoCAD (Civil 3D), and ERDAS Imagine.

REFERENCES

Hamed Moftakhari
Assistant Professor
Department of Civil, Construction and Environmental Engineering, The University of Alabama, USA
hmoftakhari@eng.ua.edu
Phone: 205-348-0239

Celso Ferreira
Associate Professor
Department of Civil, Environmental, and Infrastructure Engineering, George Mason University, USA
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Department of Civil, Construction and Environmental Engineering, The University of Alabama, USA
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Ton Hoitink
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Earth and Environment, Wageningen University & Research, the Netherlands
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