

Marcus N. Gomes Jr.

Curriculum Vitae

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Academic Background

- Jan–2024 to present **Postdoctoral Appointment**, *University of Arizona*, Concentration area: Hydrology and Atmospheric Sciences, NSF Project: Hydrologic closure relationships at different levels of hillslope model complexity
Advisor: Peter A. Troch, Ph.D.
- Jan–2020 to Dec–2023 **Doctor of Philosophy**, *University of Sao Paulo - Sao Carlos School of Engineering*, Title: [Advances in open source hydroinformatics for flood modeling and disaster education](#) (GPA 4.0). Concentration area: Hydraulic Engineering and Sanitation, [PhD thesis recently awarded as the best of 2023 in all engineering fields of USP](#), also news published [at USP website](#).
Advisor: Eduardo M. Mendiondo, Ph.D. Co-advisor: Marcio H. Giacomoni, Ph.D., P.E.
- Jan–2020– **Doctor of Philosophy**, *University of Texas at San Antonio*, Concentration area: Civil and Environmental Engineering, Title: Real-time Control of Green-Infrastructure and Stormwater Drainage Systems Through Looped-Feedback Control Approaches. Status: Graduation on hold (1 credit missing, currently on hold due to my current postdoc position and to only be able to defend afterward due to J1 visa constraints).
Advisor: Marcio Hofheinz Giacomoni, Ph.D., P.E.
- Jan–2018 to Dec–2019 **Master's in Hydraulic Engineering and Sanitation**, *University of Sao Paulo - Sao Carlos School of Engineering.*, Concentration area: Hydraulic Engineering and Sanitation
Status: Graduated. Advisor: Eduardo M. Mendiondo.
- Jan–2013 to Dec–2017 **B.Sc. in Civil Engineering**, *State University of Maringa - Brazil*
Advisor: Germano Romera, Ph.D.

Professional Interests

Investigating water resources issues in multiple spatio-temporal scales via numerical modeling and data assimilation.

Supervision

Master's Degree	Dr. Eduardo Mario Mendiondo
Ph.D. Degree	Dr. Marcio Hofheinz Giacomoni , Dr. Eduardo Mario Mendiondo
Postdoctorate	Dr. Peter Troch

Skills and Activities

Programming Language	Matlab, Python, VBA, Javascript
Environment	Latex, Microsoft Office, Git, Github, HTML, Wordpress, Google Earth Engine, QGIS
Operating System	Windows

Work Experience

- 2025–present **Post-doctoral Research Associate II**, *University of Arizona - Department of Hydrology and Atmospheric Sciences*
Task: Using innovative catchment-scale hydrologic-hydrodynamic modeling and advanced land-surface modeling to particularly account for accurate snow modeling, my current goal is to apply/develop a hillslope-storage-Boussinesq (hsB) model to estimate catchment-scale hydrologic signatures. Methodology application is performed in the Beaver Creek catchment, a tributary catchment of the Verde River in Northern Arizona.
- 2024–present **Post-doctoral Research Associate I**, *University of Arizona - Department of Hydrology and Atmospheric Sciences*
Task: Taking advantage of the unique and extensively monitored [Landscape Evolution Observatory](#) hillslopes high-resolution data, our project aims to assess how simplified 1D vadose Richards model coupled with a 2D Boussinesq saturated groundwater flow model can be adapted to use data assimilation techniques to identify effective material parameters and state-dependent hysteresis properties. In particular, we use a particle filter Monte Carlo ensemble approach to evaluate the temporal variation of soil material properties and discover state-dependent relationships to later use in simplified models.
- 2024-Spring **Teaching Assistant of Fundamentals of Surface Water Hydrology**, *University of Arizona - Department of Hydrology and Atmospheric Sciences*
Task: Course taught by Peter A. Troch, and I was responsible for reviewing and grading all assignments, projects, and exams.

- 2020–2023 **Graduate Research Assistant**, *School of Civil and Environmental Engineering, and Construction Management, Department of Civil and Environmental Engineering*
Task: Perform stormwater water quality analysis, develop numerical models, and set up and monitor field experiments. I was responsible for setting up autosamplers, rain gauges, v-notch weirs, and collecting and analyzing samples after storm events. In the water quality analysis, I was responsible for performing total suspended solids, volatile suspended solids, heavy metals, bacteria, pH, and temperature analyses. In this project, I was also responsible for the hydrological and hydraulic design of different permeable pavement structures funded by the City of San Antonio and constructed in January-2023 and under monitoring.
- 2022–2023 **Teaching Assistant of Hydrology I and II for Civil Engineering**, *University of Sao Paulo - Sao Carlos School of Engineering*
Task: Course taught by Eduardo M. Mendiondo and I was responsible for developing supporting materials, spreadsheets and numerical models for the applied hydrology classes, as well as teaching some of the classes. Classes were offered for students in the Junior and Sophomore years.
- 2018–2020 **Graduate Research Assistant**, *University of Sao Paulo - Sao Carlos School of Engineering, Department of Hydraulic Engineering and Sanitation*
Task: Perform stormwater water quality analysis, develop numerical models, and set up and monitor field experiments. I was also responsible for planning, designing, and controlling the execution of a bioretention system funded by FAPESP grants 2017/21940-2 and 2018/20865-0
- 2018–2019 **Teaching Assistant of Hydrology I and II for Civil Engineering**, *University of Sao Paulo - Sao Carlos School of Engineering*
Task: Develop supporting materials, spreadsheets, and numerical models for Applied Hydrology classes. Classes were offered for students in the Junior and Sophomore years.
- 2013–2015 **Teaching Assistant**, *State University of Maringa*
Task: Help, teach, and solve tests, exams, and proposed exercises from Physics I and Physics II of Civil Engineering and Environmental Engineering Classes. Classes were offered for students in the Sophomore year.
- 2012–2017 **Teaching Assistant**, *Curso e Colégio Alfa Preparatory School*
Task: Help, teach, and solve pre-school exams of Physics and Mathematics for students in preparation for college.

Extra Activities

I run a [website](#) and a [Youtube](#) channel with content of Civil and Environmental Engineering (In Portuguese), and I plan to translate them to English in the near future. I developed over 60 numerical tools to aid in various engineering calculations, including the design of pipes, concrete structures, and the solution of hydrology and hydraulics problems. The website has garnered more than 90,000 downloads from over 10 countries, which has allowed me to network with designers and engineers worldwide. My goal is to provide high-quality, useful content to the engineering and water resources community, free of charge in most cases. I also write online articles (+30) about water resources and civil engineering overall. The articles are the main source of leads to the website and are top-ranked in Brazilian search engine optimization. The website is available at: www.engenheiroplanilheiro.com.br (In Portuguese).

Scholarships

Ph.D Degree at UTSA	Financed by the City of San Antonio - Texas (\$ 153,000 USD). Project - Demonstrating the Environmental Benefits of Permeable Paved Surfaces over the Edwards Aquifer
Ph.D. Degree at USP	Ph.D. Scholarship by CAPES (R\$ 74,400)
M.Sc. Degree	Master's degree scholarship financed by FAPESP (R\$ 58,116)
Bsc. Degree	Free Tuition by State University Scholarship

Fields and Keywords of Interest

Civil and Environmental Engineering	Flood Control, Water Quality Transport and Fate, Hydrodynamic Models, Hydrological Models, Water Quality Models, Low Impact Development, System Analysis, Urban Drainage, Disaster Risk Reduction, Water Resources Planning and Management, Closure-relationships, Soil Physics, Sub-surface Hydrology
Electrical Engineering	Linear Systems and Control, Control of Non-Linear Systems, Model Predictive Control, Linear Quadratic Regulators, Model Predictive Control.
Mathematics, Computer Science	Numerical Modeling, Explicit Methods, Implicit Methods, Finite-Difference Methods, GPU Processing, Convex Optimization, Non-linear Non-Convex Optimization, Data Assimilation, Reinforcement Learning, Particle Filter

Reviewer for Scientific Journals

2020-present	<i>Journal of Hydrologic Engineering</i>
2020-present	<i>Revista Brasileira de Recursos Hídricos</i>
2020-present	<i>Revista DAE</i>
2021-present	<i>Journal of Hydrology</i>
2021-present	<i>Journal of Water Resources Planning and Management</i>
2021-present	<i>Revista REGA</i>
2022-present	<i>Hydrological Sciences Journal</i>
2022-present	<i>Sustainable Cities and Society</i>
2024-present	<i>Urban Water Journal</i>
2024-present	<i>The International Journal of River Basin Management</i>
2024-present	<i>Journal of Flood Risk Management</i>
2024-present	<i>Scientific Reports</i>
2024-present	<i>Geomatics - Natural Hazards and Risk</i>
2024-present	<i>AIMS Geosciences</i>
2024-present	<i>Journal of Asian Architecture and Building Engineering</i>
2025-present	<i>Hydrology and Earth System Sciences</i>
2025-present	<i>Water Resources Research</i>
2025-present	<i>Natural Hazards and Earth Systems Sciences</i>
2025-present	<i>Water Research - X</i>
2025-present	<i>Hydrology</i>
2025-present	<i>Applied Sciences</i>
2025-present	<i>Environmental Modelling and Software</i>

Publications in peer-reviewed journals - Published or Accepted

Journals

1. **Gomes, M.N.**, Jalihal, V., Castro, M. and Mendiondo, E.M., 2025. *Exploring the impact of rainfall temporal distribution and critical durations on flood hazard modeling.* **Natural Hazards**, 121(9), pp.10989-11012 <https://doi.org/10.1007/s11069-025-07186-3>.
2. Gomes Jr, M.N., do Lago, C.A. and Mendiondo, E.M., 2025. *A Simple Method for Designing Infiltration Low Impact Development Techniques Considering Effects of Urbanization and Climate Change,* **Brazilian Journal of Water Resources (RBHR)** (2025) (accepted).
3. Vasconcelos, J.G., **Gomes Jr, M.N.**, Oliveira, P.T.S., Yang, D. and Fang, X., 2025. Reformulating the Rational Method Considering Dissimilar Land Use Types. **Journal of Irrigation and Drainage Engineering**, 151(4), p.04025017 <https://doi.org/10.1061/JIEDH.IRENG-10431>.
4. **Gomes Jr., M.N.**, *Accounting for Spatial Runoff Variability in LID Design for Urban Catchments: Model and Software Development,* **Brazilian Journal of Water Resources**, (In Press).
5. **Gomes Jr**, Marcus Nóbrega, Ahmad F. Taha, Luis Miguel Castillo Rápalo, Eduardo Mario Mendiondo, and Marcio Hofheinz Giacomoni. "Real-time regulation of detention ponds via feedback control: Balancing flood mitigation and water quality." **Journal of Hydrology** 643 (2024): 131866. DOI: <https://doi.org/10.1016/j.jhydrol.2024.131866>
6. M. N. **Gomes Jr.**, C. A. F. do Lago, L. M. C. R apallo, P. T. S. Oliveira, M. H. Giacomoni, and E. M. Mendiondo, "HydroPol2D – Distributed Hydrodynamic and Water Quality Model: Challenges and Opportunities in Poorly-Gauged Catchments," **Journal of Hydrology**, 2023, DOI: <https://doi.org/10.1016/j.jhydrol.2023.129982>.
7. **Gomes Jr**, Marcus Nóbrega, Maria de Andrade Rocha Alencar Castro, Pedro Gustavo Câmara da Silva, Marcio Hofheinz Giacomoni, and Eduardo Mario Mendiondo. "Increasing flood awareness through dam-break serious games." **International Journal of Disaster Risk Reduction** 108 (2024): 104543. DOI: <https://doi.org/10.1016/j.ijdrr.2024.104543>.
8. M. N. **Gomes Jr.**, M. H. Giacomoni, A. F. Taha, and E. M. Mendiondo, "Flood risk mitigation and valve control in stormwater systems: State-space modeling, control algorithms, and case studies," **Journal of Water Resources Planning and Management**, vol. 148, no. 12, p. 04022067, 2022. [Online]. Available: [10.1061/\(ASCE\)WR.1943-5452.0001588](https://doi.org/10.1061/(ASCE)WR.1943-5452.0001588)
9. M. N. **Gomes Jr.**, L. M. C. Rapalo, P. T. S. Oliveira, M. H. Giacomoni, C. A. F. do Lago, and E. M. Mendiondo, "Modeling unsteady and steady 1-d hydrodynamics under different hydraulic conceptualizations: Model/software development and case studies," **Environmental Modeling and Software**, 2023. DOI: <https://doi.org/10.1016/j.envsoft.2023.105733>.
10. M. N. **Gomes Jr.**, M. H. Giacomoni, M. B. de Macedo, C. A. F. do Lago, J. A. Teixeira, T. R. Pereira, and E. M. Mendiondo, "A modeling framework for bioretention analysis: Assessing the hydrologic performance under system's uncertainty," **Journal of Hydrologic Engineering**, DOI: <https://doi.org/10.1061/JHYEFF.HEENG-5705> 2023.
11. M. N. **Gomes Jr.**, P. H. B. Alves, E. M. Mendiondo, and L. F. R. Reis, "Statistical, visual and non-parametric analyses for the optimization of IDF curve fitting and construction of hydraulic works design abacuses: case study in São Carlos - SP". **Revista DAE**, DOI: <https://doi.org/10.36659/dae.2021.013> 2020 (In Portuguese).
12. Rápalo, Luis MC, Marcus N. **Gomes Jr**, and Eduardo M. Mendiondo. "Developing an open-source flood forecasting system adapted to data-scarce regions: A digital twin coupled with hydrologic-hydrodynamic simulations." **Journal of Hydrology** (2024): 131929. DOI: <https://doi.org/10.1016/j.jhydrol.2024.131929>.

Journals

12. A. S. Ballarin, J. G. S. M. Uchôa, M. S. dos Santos, A. Almagro, I. P. Miranda, P. G. C. da Silva, M. N. **Gomes Jr.**, E. Wendland, P. T. S. Oliveira, "Brazilian water security threatened by climate change and human behavior". **Water Resources Research**, DOI: <https://doi.org/10.1029/2023WR034914> 2023.
13. do Lago, C.A., Giacomoni, M.H., Bentivoglio, R., Taormina, R., **Junior**, M.N.G. and Mendiondo, E.M., 2023. *Generalizing rapid flood predictions to unseen urban catchments with conditional generative adversarial networks*. **Journal of Hydrology**, 618, p.129276, DOI: <https://doi.org/10.1016/j.jhydrol.2023.129276>.
14. K. McClymont, D. G. F. Cunha, C. Maidment, B. Ashagre, A. F. Vasconcelos, M. B. de Macedo, M. F. N. Dos Santos, M. N. G. **Júnior**, E. M. Mendiondo, A. P. Barbassa et al., "Towards urban resilience through sustainable drainage systems: A multi-objective optimisation problem", **Journal of Environmental Management**, vol. 275, p. 111173, 2020, DOI: <https://doi.org/10.1016/j.jenvman.2020.111173>
15. M. Batalini de Macedo, M. Nobrega **Gomes Júnior**, T. R. Pereira de Oliveira, M. H. Giacomoni, M. Imani, K. Zhang, C. Ambrogi Ferreira do Lago, and E. M. Mendiondo, "Low impact development practices in the context of united nations sustainable development goals: A new concept, lessons learned and challenges," **Critical Reviews in Environmental Science and Technology**, vol. 52, no. 14, pp. 2538–2581, 2022, DOI: <https://doi.org/10.1080/10643389.2021.1886889>
16. Ambrogi Ferreira Do Lago, Cesar, Jose Artur Teixeira Brasil, Marcus Nóbrega **Gomes**, Eduardo Mario Mendiondo, and Marcio H. Giacomoni. "Improving pluvial flood mapping resolution of large coarse models with deep learning." **Hydrological Sciences Journal** 69, no. 5 (2024): 607-621. DOI: <https://doi.org/10.1080/02626667.2024.2329268>
17. J. Brasil, M. Macedo, C. Lago, T. Oliveira, M. **Júnior**, T. Oliveira, and E. Mendiondo, "Nature-based solutions and real-time control: Challenges and opportunities," **Water**, vol. 13, no. 5, p. 651, 2021, DOI: <https://doi.org/10.3390/w13050651>.
18. J. A. T. Brasil, M. B. de Macedo, T. R. P. de Oliveira, F. G. Ghiglieno, V. C. B. de Souza, G. Marinho e Silva, M. N. **Gomes Júnior**, F. A. A. de Souza, and E. M. Mendiondo, "Can we scale digital twins of nature-based solutions for stormwater and transboundary water security projects?" **Journal of Hydroinformatics**, 2022, DOI: <https://doi.org/10.2166/hydro.2022.142>
19. M. Batalini de Macedo, M. N. **Gomes Júnior**, V. Jochelavicius, T. R. P. de Oliveira, and E. M. Mendiondo, "Modular design of bioretention systems for sustainable stormwater management under drivers of urbanization and climate change," **Sustainability**, vol. 14, no. 11, p. 6799, 2022, <https://doi.org/10.3390/su14116799>.
20. T. R. P. de Oliveira, M. B. de Macedo, T. H. Oliveira, C. A. F. do Lago, M. N. **Gomes Jr**, J. A. T. Brasil, and E. M. Mendiondo, "Different configurations of a bioretention system focused on stormwater harvesting in Brazil," **Journal of Environmental Engineering**, vol. 147, no. 12, p. 04021058, 2021, [https://doi.org/10.1061/\(ASCE\)EE.1943-7870.0001938](https://doi.org/10.1061/(ASCE)EE.1943-7870.0001938)
21. Jochelavicius, V., E. M. Mendiondo, M. N. **Gomes Jr.**, and M. B. de Macedo, "Construction of Intensity-Duration-Frequency curves with future climate change scenarios for the city of São Carlos - SP aiming at the design of compensatory techniques," **Revista DAE**, vol. 147, p. 19-32, DOI: <https://doi.org/10.36659/dae.2022.065> (In Portuguese).

Publications in Conferences

Conference
Proceedings

1. **Gomes Jr.** M. N., H. Bauser, P. A. Troch, *Identifying the state dependence of effective material properties in a simplified hydrologic hillslope model*, **The Conference on Computational Methods on Water Resources (CMWR)**, Tucson, 2024.
2. Brasil, J.A., Papagiannakis, A.T., Giacomoni, M.H., Johnson, D., **Gomes Jr.**, M.N. and Mendiondo, E.M., 2023. Hydrologic and Water Quality Treatment Performance of Four Permeable Pavement Surfaces. In *International Low Impact Development Conference 2023* (pp. 114-122).
3. M. N. **Gomes Jr.**, Giacomoni, M.H., Taha, A.F. and Mendiondo, E.M., 2022, August. *Model Predictive Control for Stormwater Reservoirs: Investigating Effects of Climate Change and Urbanization*. **IEEE Conference on Control Technology and Applications (CCTA)** (pp. 691-698). IEEE.
4. M. N. **Gomes Jr.**, C. A. F. do Lago, M. H. Giacomoni, E. M. Mendiondo, " *Expanding the 2-Dimensional Green-Ampt and Non-linear Reservoir Hydrological Model from SWMM to MATLAB®*". **AGU Fall Meeting, New Orleans**, 2021.
5. M. N. **Gomes Jr.**, M. H. Giacomoni, E. M. Mendiondo, A. F. Taha, " *Real-Time Control of Stormwater Reservoirs for Flood Risk Mitigation*". **The 2nd International Symposium on Water System Operations**, 2021.
6. M. N. **Gomes Jr.**, P. A. Braga, M. B. de Macedo, E. M. Mendiondo, " *Preliminary design of detention ponds using specific design discharge and orifice stage discharge relationship for different climate patterns*". **Brazilian Symposium of Water Resources**, 2021.
7. M. N. **Gomes Jr.**, P. A. Braga, E. M. Mendiondo, " *Impact of rainfall changes on the Pacaembu-SP detention reservoir: assessment of water security regarding flood risk*". **Brazilian Symposium of Water Resources**, 2019 (In Portuguese).
8. M. N. **Gomes Jr.**, E. M. Mendiondo, F. Dornelles, A. T. Papagiannakis, " *Permeable Pavement Hydrological Model to Assess the Long-Term Efficiency of Maintenance Using High-Resolution Temperature and Rainfall Data*". **World Environmental and Water Resources Congress**, 2021, 1103-1117.
9. M. N. **Gomes Jr.**, E. O. Pavan, L. M. C. Rápalo, M. H. Giacomoni, E. M. Mendiondo, " *Bidirectional Hydrodynamic and Water Quality Model (2DCAWQ): Modeling Challenges in Basins with Scarce Data: Application in the Tijuco Preto - São Carlos Basin*". **XIV National Meeting on Urban Waters and IV Symposium on Revitalization of Urban Rivers**, 2022 (In Portuguese).
10. M. N. **Gomes Jr.**, M. H. Giacomoni, E. M. Mendiondo, " *The role of raster resolution into overland flow and total suspended solids modeling in small urban catchments*". **Brazilian Symposium of Water Resources**, (2021).
11. M. N. **Gomes Jr.**, M. H. Giacomoni, A. T. Papagiannakis, " *Spatial Assessment of Overland Flow, Pollutant Concentration, and First Flush Using a 2D Non-Point Source Pollution and Hydrological Model for Urban Catchments*". **World Environmental and Water Resources Congress**, 2021, 397-413.
12. M. N. **Gomes Jr.**, M. H. Giacomoni, E. M. Mendiondo, " *Bioretention Sizing via Process-Based Simulation: Generalized TC-Hydro Model Applied in Design Conditions*". **XIV National Meeting on Urban Waters and IV Symposium on Revitalization of Urban Rivers**, 2022 (In Portuguese).
13. M. N. **Gomes Jr.**, T. R. de Oliveira, T. H. Oliveira, M. B. de Macedo, M. H. Giacomoni, E. M. Mendiondo, " *Nature-based solutions for sustainable stormwater: a model approach and sensitivity analysis for bioretention design using Green and Ampt and reservoir flood routing*". **Second International Conference of Water, Megacities, and Global Change**, UNESCO, 2021.
14. M. N. **Gomes Jr.**, L. M. C. Rápalo, E. M. Mendiondo, *A Serious Game for societal risk perception of dam-break flood assessment using a hydrodynamic model*, **Latin American Hydraulic Congress**, (2022). *Award of Best Paper*.

15. M. N. **Gomes Jr.**, C. A. F do Lago, M. H. Giacomoni, E. M. Mendiondo, Assessing the role of cross-section shape for flood routing under compound flood events using a hydrodynamic model, **Latin American Hydraulic Congress**, (2022).
16. C. A. F. do Lago, M. N. **Gomes Jr.**, E. M. Mendiondo, M. H. Giacomoni, "Application of Artificial Neural Networks to Predict Water Surface Elevation". **AGU Fall Meeting, 2021, New Orleans**.
17. T. R. P. de Oliveira, M. N. **Gomes Jr.**, M. B. de Macedo, E. M. Mendiondo, "Análise da sensibilidade do potencial matricial em protótipo de biorretenção". **Brazilian Symposium of Water Resources**, 2019 (In Portuguese).
18. CASTRO, M.A.R.A.; **Gomes Jr.**, M.N.; SANCHEZ, M.H.; FILHO, P.B.S., MENDIONDO, E.M. *Review of the Risk Index Applied to Dam Failure Simulation in Brazil*. **XXV Brazilian Symposium of Water Resources**. Anais. Aracaju (SE), 2023 (In Portuguese).
19. SANCHEZ, M.H; **Gomes Jr.**, M.N.; CASTRO, M.A.R.A.; MENDIONDO, E.M. *River flow forecasting methods: A review*. **XXV Brazilian Symposium of Water Resources**. Anais. Aracaju (SE), 2023.
20. M. R. de Sousa, M. N. **Gomes Jr.**, E. O. Pavan, L. M. C. Rápalo, F. A. R. Nararro, E. M. Mendiondo, "Physically Distributed Modeling Based on Urban Watersheds: Hydropol2D Model Applied to São Carlos (SP)", **XXV Brazilian Symposium of Water Resources**. Proceedings. Aracaju (SE), 2023 (In Portuguese).
21. E. O. Pavan, M. N. **Gomes Jr.**, L. M. C. Rápalo, M. R. de Sousa, M. S. dos Santos F. A. R. Nararro, E. M. Mendiondo, "Physically Based Modeling of Large Basins - Challenges and Opportunities for Applying The Hydropol2D Model", **XXV Brazilian Symposium of Water Resources**. Proceedings. Aracaju (SE), 2023 (In Portuguese).
22. L. F. Roysen, M. N. **Gomes Jr.**, E. O. Pavan, E. M. Mendiondo, "RTC-Stormwater Model: Advances In Flood Modeling And Control Of Urban Drainage Devices", **XXV Brazilian Symposium of Water Resources**. Proceedings. Aracaju (SE), 2023 (In Portuguese).
23. A. S. Ballarin, J. G. S. M. Uchoa, M. S. dos Santos, A. Almagro, I. P. Miranda, P. G. C. da Silva, G. J. da Silva, M. N. **Gomes Jr.**, E. C. Wendland, P. T. S. de Oliveira, "The Future of Water Security In Brazil: Separating The Impacts Of Climate Change And Water Demand", **XXV Brazilian Symposium of Water Resources**. Proceedings. Aracaju (SE), 2023 (In Portuguese).
24. M. S. dos Santos, M. N. **Gomes Jr.**, D. A. Bressianim L. L. Ladeira, M. R. Benso, E. M. Mendiondo "Review of the Implementation of Model Predictive Control (MPC) In Urban Reservoirs", **XXV Brazilian Symposium of Water Resources**. Proceedings. Aracaju (SE), 2023 (In Portuguese).
25. G. M. e Silva, M. R. Benso, P. G. C. da Silva, M. N. **Gomes Jr.**, E. M. Mendiondo, "Serious Game on Water Risks For Planetary Health: A New Model For Knowledge Co-Production", **XXV Brazilian Symposium of Water Resources**. Proceedings. Aracaju (SE), 2023 (In Portuguese).
26. L. M. C. Rápalo, M. N. **Gomes Jr.**, D. A. Bressiani, M. R. Benso, E. M. Mendiondo "Threats of Urban Flash Floods on Human Stability for The Next Century", **XXV Brazilian Symposium of Water Resources**. Proceedings. Aracaju (SE), 2023.
27. I. M. Benites, M. N. **Gomes Jr.**, A. Botari, J. C. Botari, L. Vanalli, "Analysis of the Urban Drainage System: Case Study of the Stormwater Galleries at the intersection of Rua Governador Nei Braga and Avenida Brasil in the city of Umuarama-PR". **XVII Safety, Health and Environment World Congress**, 2017 (In Portuguese).

Publications - Under Review or In Preparation

Journals

1. **Gomes Jr., M. N.,** M. A. R. A. Castro. *A Continental Framework for Mapping Multi-Hazard Susceptibility and Socioeconomic Exposure Across South America*. **npj Natural Hazards** (Under review).
2. **Gomes Jr., M. N.,** Castro, M. A. R. A., Sanchez, M. H., Rápalo, L., Giacomoni, M. H., de Paiva, R. C., Bates, P. *Spatio-Temporal Performance of 2D Local Inertial Hydrodynamic Models for Urban Drainage and Dam-Break Applications*. **Journal of Hydrology**, 2024. DOI: <https://doi.org/10.48550/arXiv.2410.09325> (Under review).
3. **Gomes Jr., M. N.,** Benites, I. M., Elsharif, S. M., Taha, A. F., Giacomoni, M. H. *Modeling and Design Optimization of Looped Water Distribution Networks Using MS Excel: Developing the Open-Source X-WHAT Model*. **Water Resources Management**, 2024. DOI: <https://doi.org/10.48550/arXiv.2405.09044> (Under review).
4. **Gomes Jr., M. N.,** Castro, M. A. R. A. *Rainfall Temporal Distribution Trends in Brazil*. **Scientific Data** (In preparation).
5. **Gomes Jr., M. N.,** Bauser, H. H., Troch, P. A. *Identifying the State Dependence of Effective Material Properties in a Simplified Hydrologic Hillslope Model*. **Water Resources Research**, 2025. DOI: <https://essopenarchive.org/doi/full/10.22541/essoar.175181464.43589172> (Under review).
6. Castro, M. A. R. A., **Gomes Jr., M. N.,** Mendiondo, E. M. *Probabilistic Dam Break Flood Mapping via Monte-Carlo Simulation*. **Journal of Hydrology**. DOI: <https://essopenarchive.org/doi/full/10.22541/essoar.175181464.43589172> (Submitted).
7. Rápalo, L. M. C., **Gomes Jr., M. N.,** Mendiondo, E. M. *Multiple Degrees of Human Instability Due to Urban Overland Flow Within the 21st Century: An Urban Watershed Case Study in Brazil*. **International Journal of Disaster Risk Reduction** (Under review).
8. Castro, M. A. R. A., **Gomes Jr., M. N.,** Mendiondo, E. M. *Trade-Offs Between Full Momentum, Diffusive Wave, and Local-Inertial Solvers for Dam-Break Flood Modeling*. **Natural Hazards** (Under review).
9. Sanchez, M. H., **Gomes Jr., M. N.,** Castro, M. A. R. A., Rápalo, L. C., Mendiondo, E. M. *Assessment of Urban Flood Risk in Developing Countries Based on Climate Change Scenarios*. **Urban Climate** (Submitted).
10. Sousa, M. R., **Gomes Jr., M. N.,** Mendiondo, E. M. *Hydrological–Hydrodynamic Modeling of Climate-Induced Urban Flooding of Design Storms Using HydroPol2D: A Case Study in São Carlos, Brazil*. **Brazilian Journal of Water Resources** (Under review).
11. **Gomes Jr., M. N.,** Brasil, A., Johnson, D. W., Papagiannakis, A. T., Giacomoni, M. H. *A Coupled Darcy–Richards Framework for Hydrological Modeling of Permeable Pavements, Green Roofs, and Bioretention Systems*. **Environmental Modelling and Software** (Under review).
12. Brasil, J. T., **Gomes Jr., M. N.,** Johnson, D. W., Papagiannakis, A. T., Mendiondo, E. M., Giacomoni, M. H. *A Digital Twin Framework for Real-Time Probabilistic Forecasting of Permeable Pavement Performance*. **Water Research** (Under review).
13. **Gomes Jr., M. N.** *Gridded Bias-Corrected Intensity–Duration–Frequency Curves for Brazil Using BR-DWGD, IMERG, CHIRPS, and PERSIANN Datasets with Locally-Derived Disaggregation Coefficients*. **Journal of Hydrology** (Submitted).
14. **Gomes Jr., M. N.** *Accounting for Spatial Runoff Variability in LID Design for Urban Catchments: Model and Software Development*. **Brazilian Journal of Water Resources** (Under review).
15. Castro, M., **Gomes Jr., M. N.,** Montenegro, S. *Assessing the Socioeconomic Benefits of the Agreste Water Supply System in Pernambuco, Brazil*. **Brazilian Journal of Water Resources** (Under review).

Research Metrics (as of October 2025)

ResearchGate ○ **Research Interest Score:** 444.3
○ **Citations:** 522
○ **h-index:** 12
○ **Profile:** [Research Gate](#)

Google Scholar ○ **Citations:** 489 (since 2020: 488)
○ **h-index:** 11
○ **i10-index:** 13
○ **Profile:** [Google Scholar](#)

Professional Memberships

- American Society of Civil Engineering (ASCE) - 2020-2021
- American Geophysical Union (AGU) - 2021-2022, 2024-present
- Brazilian Water Resources Association (ABRH) 2019-2020, 2021-2022.

Selected Open-Source Models Developed

Name	Description	GitHub Link
DRAIN-LID	MATLAB framework for mixed-form Richards-based infiltration/evaporation/drainage in LID (permeable pavements, green roofs, bioretention), with ponding logic, orifices/spillways, ET reduction, pollutant build-up/washoff, adaptive time-stepping, and full mass-balance diagnostics.	github.com/marcusnobrega-eng/DRAIN-LID
GEE_GeoHydro	Google Earth Engine workflows for large-scale hydroclimatic and hazard analyses, including data extraction, indices, and map products for flood, drought, and wildfire susceptibility. Preliminary results can be seen in https://sairiskframework.projects.earthengine.app/view/risk-viewer .	github.com/marcusnobrega-eng/GEE_GeoHydro
HydroPol2D	Distributed 2D hydrologic-hydrodynamic and water quality model (MATLAB) for overland flow (Local Inertial Approximation), infiltration (Green-Ampt), recharge (linear reservoir), shallow GW (2D Boussinesq model), reservoirs/dam-break (internal boundary conditions), snow (degree day method), and single-pollutant transport (build-up and wash-off approach); CPU/GPU support and rich raster/animation outputs.	github.com/marcusnobrega-eng/HydroPol2D
GRIDF-BR	National toolbox for gridded, bias-corrected IDF curves in Brazil combining BR-DWGD/IMERG/CHIRPS/PERSIANN with locally derived sub-daily scaling; includes diagnostics and a GEE visualization app. Preliminary results can be visualized in https://gridf-470516.projects.earthengine.app/view/gridf-br	github.com/marcusnobrega-eng/GRIDF
MoDOBR	Optimization-based sizing of infiltration LID (area-height coupling) with dynamic Green-Ampt, pre/post-urbanization hydrographs, drains/spillways, climate-scaling freeboard, feasibility checks, and spreadsheet-friendly implementation.	github.com/marcusnobrega-eng/MoDOBR
PFSA	Peak Flow Search Approach: enhanced spreadsheet method (per Vasconcelos et al., 2025) for systems with dissimilar land uses; searches critical duration using IDF + subcatchment-specific C and T_c ; includes multiple T_c methods and comparisons to RM/MRM.	github.com/marcusnobrega-eng/PFSA
HydroHP	1D Saint-Venant solver (Lax-Friedrichs) for channel hydraulics, dam-break and flood-wave propagation; CSV-driven cross-sections and automated plots/animations.	github.com/marcusnobrega-eng/HydroHP
X-WHAT	Open-source Excel/MATLAB toolkit for looped water distribution network analysis and optimization. Supports design and teaching use.	github.com/marcusnobrega-eng/X-WHAT
hsB	Finite-volume, semi-implicit hillslope-storage Boussinesq (1D) solver with variable width $w(x)$, space/time-varying recharge, finite thickness D (saturation-excess overflow), and robust mass-balance diagnostics.	github.com/marcusnobrega-eng/1D_hsb
hsB-SM	Coupled canopy/energy, two-layer soil moisture (RZ/TZ), perched hsB groundwater, and linearized de Saint-Venant routing; MATLAB implementation for catchment hydrographs with rigorous bookkeeping and diagnostics.	github.com/marcusnobrega-eng/1D_hsb-SM

Grant Writing Collaboration

- **Improving continuous streamflow simulations for Beaver Creek with special focus on wet winters**
 - **P.I** - Dr. Peter A. Troch
 - **Tasks:** This funded proposal by SRP aimed in developing a surface-subsurface parsimonious model (Hillslope Storage Boussinesq - Soil Moisture) to represent catchment scale hydrological processes coupled with a high resolution SNOWPALM model as top forcing boundary condition. The physically-based model solves land surface energy balance, infiltration/saturation excess overland flow, and perched aquifer flow with a 1D Boussinesq model. This proposal was written by Peter A. Troch and me.
- **Multi-Contaminant Exposure in Moab's Backwaters under Climate Change**
 - **P.I** - Dr. Peter A. Troch
 - **Tasks:** Develop an integrated surface–subsurface and transport modeling framework for Moab's Colorado River backwaters, coupling a calibrated 2-D hydrodynamic model with river–aquifer exchange and pollutant transport (ammonia, uranium, salinity/TDS, nitrate) to generate exposure envelopes under historical and CMIP6 scenarios. This proposal was written by Peter A. Troch and me.
- **Analysis of Unit Hydrograph Models for San Antonio Watersheds**
 - **P.I** - Dr. Marcio H. Giacomoni
 - **Tasks:** I helped to define the methods used to systematically assess the best unit hydrograph theory used for San Antonio observed data. The idea is that the standard PRF 484 unit hydrograph was oversizing the detention ponds in the city. Therefore, investigating the best-fitted unit hydrograph would reduce the associated costs of low-impact development designs.
- **Curbing Climate Change-Induced Floods via Control Theory for Urban Drainage Systems**
 - **P.I's** - Dr. Marcio H. Giacomoni and Dr. Ahmad F. Taha
 - **Tasks:** Our previous [research](#) was the starting point of this proposal. We developed a real-time control model that can potentially increase the efficiency of stormwater systems for flood control. In this proposal, we plan to advance the mathematical modeling to include new stormwater systems (e.g., tunnels, dividers) and actuators (e.g., pumps and gates) to optimally control floods via real-time optimization.
- **Collaborative Research: Feedback Control of Air and Water Pressure in Pipelines and Networks: Coupling Water Operation Modeling with Smart Valves**
 - **P.I's** - Dr. Marcio H. Giacomoni, Dr. Jose G. Vasconcelos, Dr. Ahmed A. Abokifa, and Dr. Ahmad F. Taha.
 - **Tasks:** I collaborated in the mathematical description of the hydraulic conceptualization of the filling pipe problem, defining the governing equations, and reviewing the methodology.

Current Collaborators

- Peter Troch, Professor at University of Arizona. [Google Scholar](#), [Website](#).
Ph.D
- Hannes Bauser, Assistant Professor at University of Nevada, Las Vegas. [Google Scholar](#), [Website](#).
Ph.D
- Paul D. Bates, Professor at University of Bristol. [Orcid](#), [Google Scholar](#), [Website](#).
Ph.D
- Ahmad F. Taha, Associate Professor at Vanderbilt University. [Google Scholar](#), [Twitter](#), [Website](#).
Ph.D

- Eduardo Mario Mendiondo, Ph.D. Professor at University of Sao Paulo, Sao Carlos School of Engineering. [Orcid](#), [Google Scholar](#).
- José Vasconcelos, Ph.D. Professor at Auburn University. [Google Scholar](#).
- Marcio H. Giacomoni, Ph.D, P.E. Professor at University of Texas at San Antonio. [Orcid](#), [Google Scholar](#), [Website](#).
- Paulo T.S. Oliveira, Ph.D. Associate Professor at Federal University of Campo Grande. [Orcid](#), [Google Scholar](#), [Twitter](#), [Website](#).
- Marina B. de Macedo, Ph.D. Associate Professor at Federal University of Itajubá. [Orcid](#), [Google Scholar](#), [Website](#).
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- César Ambrogi
Ferreira do
Lago, Ph.D. University of Texas at San Antonio. [Orcid](#), [Google Scholar](#).
- Daniele Bresisani, Ph.D. Associate Professor at Federal University of Pelotas. [Orcid](#), [Google Scholar](#), [Website](#).
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- Tiantian Zhou, Ph.D. University of California, Davis. [Google Scholar](#).
- Andre S. Ballarin, Ph.D. Assistant Professor at University of Sao Paulo. [Orcid](#), [Google Scholar](#)

Languages

- Portuguese Native Speaker
- English English (TOEFL - Advanced). Lived two years in the US from January 2020 to January 2022 and from January 2024 to now. Ph.D. dissertation written in English, publications and presentations in English. Currently living in the U.S. for postdoctoral research.
- Spanish Intermediate

Professional References

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