

SILVIA REGINA SANTOS DA SILVA

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RESEARCH

Dr. Santos da Silva's research focuses on environmental systems analysis in coupled human-natural systems, with particular emphasis on human-water system interactions. Her work involves climate, hydrologic and integrated assessment modeling to understand short- and long-term multi-sectoral impacts on the human-Earth system, support sustainable water resource management under changing conditions, and inform regional- to country-level planning of climate change mitigation and adaptation within an integrated water-energy-food (WEF) nexus framework.

EDUCATION

University of Maryland, College Park, USA. 2021

Doctor of Philosophy, Atmospheric and Oceanic Science.

"Exploring Recent Directions in Integrated Assessment Modeling Research: Implications for Scenario Analyses of Climate Change Mitigation and Impacts Using the GCAM Model".

Advisor: Dr. Fernando Miralles-Wilhelm.

University of Maryland, College Park, USA. 2014 - 2016

Master of Science, Atmospheric and Oceanic Science.

"Use and Evaluation of Atmospheric Stability Products derived from the NOAA Unique Cross-track Infrared Sounder (CrIS)/Advanced Technology Microwave Sounder (ATMS) Processing System (NUCAPS) Retrieval Products".

Advisor: Dr. Flavio Iturbide-Sanchez (NOAA/NESDIS).

Federal University of Rio de Janeiro, Rio de Janeiro, Brazil. 2002

Bachelor of Science, Meteorology.

PROFESSIONAL EXPERIENCE

University of Maryland Center for Environmental Science, MD, USA Jul 2024 - Present

Assistant Research Scientist, Horn Point Laboratory.

- Assessment of present and future freshwater availability in the Amazon River Basin (ARB) based on the application of the semi-distributed rainfall-runoff model *Hydro-BID* (award RG-T3489, *Development of a Regional Hydrological Platform and a Multi-Sector Nexus Model for the Amazon Basin*, Inter-American Development Bank (IDB)).
- Implementation of the hydrology model developed under RG-T3489 as part of the Amazon Regional Observatory (ARO) operational portal of the Amazon Cooperation Treaty Organization (ACTO) (award RG-T4288, *Innovation and Science for the Operationalization of the Water-Energy-Food Nexus within the Framework of the Amazon Regional Observatory*, IDB).
 - Development of an interactive web-based visualization dashboard to make modeling results accessible to non-technical water users and stakeholders. (in progress; Hydro-BID dashboard available at <https://www.oraotca.org/en>).
- Identification of analytical needs (data sources and modeling) to strengthen ARO's capabilities (award RG-T4288, IDB).
 - Development of new analytical products (e.g., environmental flows, streamflow regimes) and integration into the ARO platform.
- Capacity building for ACTO member countries and general audience on the operational hydrology-nexus model using the ARO portal as a learning platform (award RG-T4288, IDB).
 - Technical Trainer: Regional training on the use of the Nexus tools to strengthen integrated decisions between water, energy, food, and ecosystems in the Amazon, February/2026 ([Regional training - Amazon Basin Project](#)).
 - Series of webinars (recordings available online): [Webinar 1](#); [Webinar 2](#)

- Coupled human-Earth systems modeling using the Global Change Analysis Model (GCAM; maintained by JGCRI/PNNL) to investigate water and WEF nexus issues in Chile and Saudi Arabia.

George Mason University, VA, USA

Jun 2021 - Jun 2024

Postdoctoral Research Associate, College of Science.

- Development of a nexus-oriented regional hydrological model for the Amazon River Basin (ARB) to support the sustainable management of regional water resources against climate change (award RG-T3489, *Development of a Regional Hydrological Platform and a Multi-Sector Nexus Model for the Amazon Basin*, Inter-American Development Bank (IDB)).
 - Basin-scale hydrologic simulations using the *Hydro-BID* modeling system under future climate and socioeconomic scenarios. Milestone: First application of Hydro-BID for basin-wide hydrologic modeling of the ARB.
 - Model integration of *Hydro-BID* with the *WHAT-IF* WEF nexus model for planning scenario development.
 - Analysis of climate change impacts on regional water supply.
 - Stakeholder consultation and capacity building activities with IDB and member countries of the Amazon Cooperation Treaty Organization (ACTO), including *Hydro-BID* training workshop.
- Coupled human-Earth systems modeling using *GCAM* to support The World Bank Group's Country Climate and Development Reports (CCDRs).
 - Development of regionalized versions of *GCAM* for analyses at finer country-level scales.
 - Assessment of WEF implications of alternative climate mitigation strategies for multiple countries of interest of the CCDDR project.
 - Water availability and water scarcity assessment under future climate change.
 - Hands-on trainings on the use of *GCAM* and interpretation of modeling results.
- Integrated assessment using *GCAM* to explore the WEF implications of decarbonization and water scarcity issues in the Middle East.

University of Maryland, College Park, MD, USA

Aug 2016 - May 2021

Graduate Research Assistant, Department of Atmospheric and Oceanic Science.

- Research at the intersection of climate mitigation and climate impacts within the framework of the multi-sector GCAM model.
 - Analysis of potential trade-offs between the interdependencies within the WEF nexus and climate policies in Latin America.
 - Climate impacts on the renewable energy potential, wind and solar resources, to enhance GCAM climate change impact modeling.

Brazilian Navy, Rio de Janeiro, Brazil

2001 - 2015

Meteorologist and Forecaster, Marine Meteorological Service | Brazilian Navy Hydrographic Center.

- Elaboration of marine bulletins (climatological, severe weather warnings and forecasts) for the maritime area of Brazil.
- Assessment of the need for marine meteorological surveys in the Brazilian Navy area of interest.
- Planning and supervision of technical maintenance and installation of meteorological stations under the responsibility of the Brazilian Navy.
- Instructional activities: lectures and seminars in Synoptic Meteorology, Atmospheric Thermodynamics, Tropical Meteorology and Antarctic Meteorology.

TEACHING EXPERIENCE

University of Maryland Center for Environmental Science, MD, USA Spring 2026
UMCES Graduate Faculty, Marine Estuarine Environmental Sciences (MEES) Graduate Program.
Course: MEES617 – Hydrological Effects of Land Use Change. An Introduction to the Analysis of Water-Land Systems.

Course Description: This course addresses one of the major environmental drivers of the past century: land use and land cover change and its effects on the hydrologic cycle. The first half of the course introduces students to fundamentals of water-land interactions with a primary focus on the physical, chemical and biological aspects of hydrology in a changing world. The second half of the course focuses on exploring the relationships between land-water systems with a specific focus on water quality, pollution sources and contaminant fate and transport processes in water bodies. The course emphasizes the use of data and modeling tools to formalize these relationships and explore their implications.

George Mason University, VA, USA Fall 2023
Adjunct Faculty, Department of Atmospheric, Oceanic and Earth Sciences.
Course: CLIM 312-001 - Physical Climatology.
Course Description ([Climate Dynamics \(CLIM\) Course Schedule](#)): Quantitative description of nature and theory of the climate system, dynamics of atmosphere-ocean-land surface, internal interactions and response to external forcing, description of the climate record and simple climate models.

University of Maryland, College Park, MD, USA Spring 2016 | Fall 2017 | Fall 2018
Teaching Assistant, Department of Atmospheric and Oceanic Science.
Course: AOSC/GEOL 123 - Causes and Implications of Global Change.
Course Description ([AOSC 123 - Causes and Implications of Global Change](#)): Responsible policy and decision making on issues related to the global environment requires understanding of the basic scientific issues, relationships between the geophysical and biological sciences, the impacts on regional and global endeavors, and the political manner in which humans respond. This course embodies an integrated introduction to the broad scientific and social aspects of the global change problem.
Instructors: Dr. Rachel Pinker (pinker@umd.edu; Spring 2016) and Dr. Melissa Kenney (makenney@umn.edu; Fall 2017 | Fall 2018).

SKILLS

Disciplines: Earth Sciences, Hydrologic Modeling, Water Systems, Hydroclimatology, Water Resources Management, Multisector Dynamics.

Computer Skills: Python, R, QGIS, Fortran 90/95, Fortran 77, Linux, Microsoft Office, Power BI.

Languages: Fluent English, Native Portuguese, Advanced Spanish.

PUBLICATIONS

- Santos da Silva, S.R.**, Moreda, F.G., Miralles-Wilhelm, F., Moreira, A., von Borries, S., Cisneros, F., Munoz-Castillo, R., Roberts, P., Payet-Burin, R., Pereira-Cardenal, S., Arroyo, E.V., (2026), “A hydrological model to assess current and future freshwater availability: application to climate change impacts on hydrology in the Amazon River Basin through mid-century”. *Journal of Hydrology*, 664, 134473. doi: <https://doi.org/10.1016/j.jhydrol.2025.134473>
- Abad, J., **Santos da Silva, S.R.**, Flores, G., Filizola, N., (2025). River Monitoring Network Under Present And Future Scenarios. Amazonian Trajectories No. 7. [Policy Brief]. Amazon Cooperation Treaty Organisation (ACTO). Available at <https://www.oraotca.org>.
- Hejazi, M., **Santos da Silva, S.R.**, Miralles-Wilhelm, F., Kim, S., Kyle, P., Liu, Y., Vernon, C., Delgado, A., Edmonds, J., Clarke, L. (2023), “The Impacts of water scarcity on agricultural production and electricity generation in the Middle East and North Africa”. *Frontiers in Environmental Science*, 11, 1082930. doi: <https://doi.org/10.3389/fenvs.2023.1082930>
- Zapata, V., Gernaat, D., Yalaw, S., **Santos da Silva, S.R.**, Iyer, G., Hejazi, M., van Vuuren, D. (2022), “Climate change impacts on the energy system: A model comparison”. *Environmental Research Letters*, 17, 034036. doi: <https://doi.org/10.1088/1748-9326/ac5141>

- Santos da Silva, S.R.**, Iyer, G., Wild, T. B., Hejazi, M. I., Vernon, C. R., Binsted, M., Miralles-Wilhelm, F. (2021), “The implications of uncertain renewable resource potentials for global wind and solar electricity projections”. *Environmental Research Letters*, 16, 124060. doi:<https://doi.org/10.1088/1748-9326/ac3c6b>
- Zhao, M., Binsted, M., Wild, T., Khan, Z., Yarlagadda, B., Iyer, G., Vernon, C. R., Patel P., **Santos da Silva, S.R.**, Calvin, K. V. (2021), “plutus: An R package to calculate electricity investments and stranded assets from the Global Change Analysis Model (GCAM)”. *Journal of Open Source Software*, 6(65), 3212. doi:<https://doi.org/10.21105/joss.03212>
- Santos da Silva, S.R.**, Hejazi, M., Iyer, G., Wild, T. B., Binsted, M., Miralles-Wilhelm, F., Patel, P., Snyder, A. C., Vernon, C. R. (2021), “Power sector investment implications of climate impacts on renewable resources in Latin America and the Caribbean”. *Nature Communications*, 12, 1276. doi:<https://doi.org/10.1038/s41467-021-21502-y>
- Vergara, W., Fenham J., **Santos da Silva, S.R.** (2020), “Zero Carbon: The opportunity, cost and benefits of the coupled decarbonization of the power and transport sectors in Latin America and the Caribbean”. UN Environment Programme, Office for Latin America and the Caribbean, Panama. <http://euroclimaplus.org/images/2020-publicaciones/ZeroCarbonLACFullReport190520.pdf>
- Yalew, S.G., van Vliet, M.T.H., Gernaat, D.E.H.J., Ludwig, F., Miara, A., Park, C., Byers, E., De Cian, E., Piontek, F., Iyer, G., Mouratiadou, I., Glynn, J., Hejazi, M., Dessens, O., Rochedo, P., Pietzcker, R., Schaeffer, R., Fujimori, S., Dasgupta, S., Mima, S., **Santos da Silva, S.R.**, et al. (2020), “Impacts of climate change on energy systems in global and regional scenarios”. *Nature Energy*. doi:10.1038/s41560-020-0664-z
- Santos da Silva, S.R.**, Miralles-Wilhelm, F., Muñoz-Castillo, R., Clarke L. E., Braun, C. J., Delgado, A., et al. (2019), “The Paris pledges and the energy-water-land nexus in Latin America: Exploring implications of greenhouse gas emission reductions”. *PLoS ONE* 14(4): e0215013. doi:10.1371/journal.pone.0215013
- Santos da Silva, S.R.**, McJeon, H.C., Miralles-Wilhelm, F., Muñoz-Castillo, R., Clarke L. E., Delgado, A., et al. (2018), “Energy-water-land nexus in Latin America and the Caribbean: a perspective from the Paris Agreement Climate Mitigation Pledges”. IDB Working Paper Series - Inter-American Development Bank, 2018, IDB-WP-901, 33 pp. <https://publications.iadb.org/bitstream/handle/11319/8961/Energy-Water-Land-Nexus-in-Latin-America-and-the-Caribbean.pdf>
- Iturbide-Sanchez, F., **Santos da Silva, S.R.**, Liu, Q., Pryor, K. L., Pettey, M. E., and Nalli, N. R. (2018), "Toward the Operational Weather Forecasting Application of Atmospheric Stability Products Derived From NUCAPS CrIS/ATMS Soundings," *IEEE Transactions on Geoscience and Remote Sensing*, Vol. 56(8). doi:10.1109/TGRS.2018.2824829
- Iturbide-Sanchez, F., Liu, Q., Gambacorta, A., Barnett, C., Nalli, N., Tan, C., **Santos da Silva, S.R.** (2017), "Using Averaging Kernels to study the vertical resolution of NUCAPS temperature and water vapor," *2017 IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, Fort Worth, Tx, USA, pp. 33-35. doi:10.1109/IGARSS.2017.8126886
- Iturbide-Sanchez, F., **Santos da Silva, S.R.**, Liu, Q. (2016), "Use of temperature and humidity profiles derived from satellite retrievals for the derivation of atmospheric stability indices," *2016 IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, Beijing, China, pp. 3963-3966. doi:10.1109/IGARSS.2016.7730030

PUBLICATIONS (Under Review)

- Henze, J., **Santos da Silva, S.R.**, Feijoo, F., DeStephano, P., Flores, F., Miralles-Wilhelm, F., Paltan, H., (2026), “Decarbonizing Under Water Stress: Water-Energy-Land Nexus Insights from Chile's 2050 Carbon Neutrality Pathway”. Under review at *Environmental Research Letters*.
- Maldonado, R.S., Benitez, S., Carvajal, M., Karres, N., **Santos da Silva, S.R.**, Moreda, F., Miralles-Wilhelm, F., (2026), “Climate Change Impacts on Hydrology and Socio-Environmental Exposure Across the Amazon Basin”. Under review at *Scientific Reports*.

PUBLICATIONS (In Preparation)

Santos da Silva, S.R., Hejazi, M., Miralles-Wilhelm, F., *et al.*, (2026), “Lessons Learned from the National Water Strategy of Saudi Arabia: an integrated analysis of the water-energy-food nexus implications”.

PUBLICATIONS IN THE MEDIA

“Preparing for Climate’s Impact on Renewables”, PNNL, April, 21, 2021: [Preparing for Climate’s Impact on Renewables | Feature | PNNL](#).

CONFERENCE PRESENTATIONS AND TALKS

Santos da Silva, S.R., Miralles-Wilhelm, F., Moreda, F., Payet-Burin, R. (2025), “Development of a Nexus-Oriented Regional Hydrological Platform to Support Water Policies and Investments in the Amazon River Basin”. *AGU25: American Geophysical Union Annual Meeting*, New Orleans, LA, USA, 2025. <https://agu.confex.com/agu/agu25/meetingapp.cgi/Paper/1995205>. (Oral presentation).

Santos da Silva, S.R. (2025), “Lessons Learned from the Development of a Hydrology and Water Resources Model for the Amazon River Basin”. *Webinar Deep-dive on Satellite Observations for Hydrology*. Webinar organized by the World Meteorological Organization. (Oral presentation).

Santos da Silva, S.R. and Miralles-Wilhelm, F. (2025), “Lessons Learned from a Multi-Country Scenario Analysis of Energy-Water-Land-Climate Nexus Challenges”. The Global FEWture Alliance Second Annual Symposium, College Park, MD, USA, 2025. <https://globalfewture.umd.edu/events/second-annual-symposium>. (Oral presentation; recording available at: <https://www.youtube.com/watch?v=dVc8RUR3zAc>).

Payet-Burin, R., **Santos da Silva, S.R.**, Moreda, F., Pereira-Cardenal, S., Miralles-Wilhelm, F. (2025), “Development of a Regional Hydrological Platform and a Water-Energy-Food Nexus Model for the Amazon Basin”. *EGU General Assembly 2025*, Vienna, Austria, EGU25-19460, <https://doi.org/10.5194/egusphere-egu25-19460>.

Santos da Silva, S.R., Moreda, F., Miralles-Wilhelm, F., Borries, S., Moreira, A., Cisneros, F., Muñoz-Castillo, R. (2024), “Assessing Climate Change Impacts on the Surface Water Resources of the Amazon River Basin”. *AGU24: American Geophysical Union Annual Meeting*, Washington, D.C., USA, 2024. <https://agu.confex.com/agu/agu24/meetingapp.cgi/Paper/1688790>. (Oral presentation).

Henze, J., **Santos da Silva, S.R.**, Feijoo, F., DeStephano, P., Flores, F., Miralles-Wilhelm, F., Paltan, H. (2024), “Exploring the Impacts of Chile's 2050 Carbon Neutrality Pathway on the Water-Energy-Land Nexus using an Integrated Assessment Model”. *AGU24: American Geophysical Union Annual Meeting*, Washington, D.C., USA, 2024. <https://agu.confex.com/agu/agu24/meetingapp.cgi/Paper/1643324>.

Santos da Silva, S.R., Hejazi, M., Miralles-Wilhelm, F., Kamboj, P., Kyle, P. (2023), “Water constrained scenarios for the Middle East and North Africa region and for Saudi Arabia: exploring implications for the energy and food systems”. *IAMC Meeting*, Venice, Italy, 2023.

Santos da Silva, S.R., Miralles-Wilhelm, F. (2023), “Lessons Learned from a Multi-Country GCAM Breakout Exercise for Scenario Analysis of Energy-Water-Land-Climate Nexus Challenges”. *GCAM Annual Meeting*, virtual, 2023.

Santos da Silva, S.R., Moreda, F., Miralles-Wilhelm, F., Borries, S., Moreira, A., Cisneros, F., Muñoz-Castillo, R. (2023), “Modeling of the Amazon Basin”. *HydroBID Community of Practice Meeting (ECOP) 2023*, Buenos Aires, Argentina, 2023. (Oral presentation).

Santos da Silva, S.R., Moreda, F., Miralles-Wilhelm, F., Borries, S., Moreira, A., Cisneros, F., Muñoz-Castillo, R. (2022), “A Large-Scale Hydrological Modeling Framework to Assess Climate-Impacted Changes in Water Availability in the Amazon Basin”. *American Geophysical Union Fall Meeting*, Chicago, IL, USA, 2022. <https://agu.confex.com/agu/fm22/meetingapp.cgi/Paper/1190507>. (Oral presentation).

Santos da Silva, S.R., Miralles-Wilhelm, F., Kyle, P., Khan, Z., Benli, B., Serrat-Capdevila, A., Engle, N.L., Paltan, H., Rodriguez, D. (2022), “Advances in National-Level Integrated Assessment Modeling: Recent Development and Applications of the GCAM Model in African Countries”. *IAMC Meeting*, College Park, MD, 2022. (Oral presentation).

- Santos da Silva, S.R.**, Hejazi, M., Miralles-Wilhelm, F., Kyle, P. (2022), “The energy-water-land nexus challenges of deep decarbonization in Saudi Arabia”. *IAMC Meeting*, College Park, MD, 2022.
- Miralles-Wilhelm, F., **Santos da Silva, S.R.** (2022), “Support to Water GP Teams on Nexus Analytics: Lessons and Opportunities from Integrated Assessment Modeling in Selected CCDRs”, The World Bank Group (webinar – invited speaker).
- Santos da Silva, S.R.** (2021), “The contributions of Integrated Assessment Models (IAMs) to the climate science”, Mason Climate Dynamics Seminar Series, Dept. of Atmospheric, Oceanic, and Earth Sciences, George Mason University, Fairfax, VA, USA (Oral presentation).
- Santos da Silva, S.R.**, Hejazi, M., Iyer, G., Wild, T.B., Binsted, M., Miralles-Wilhelm, F., Patel, P., Snyder, A.C., Vernon, C. R. (2021), “Power sector investment implications of climate impacts on renewable resources in Latin America and the Caribbean”. *Cross-sectoral ISIMIP and PROCLIAS online workshop 11-15 January 2021* (Oral presentation).
- Santos da Silva, S.R.**, McJeon H.C., Miralles-Wilhelm, F., Muñoz-Castillo, R., Clarke L.E., Hejazi, M.I. (2018), “An Energy-Water-Land Nexus Perspective from the Paris Pledges in Latin America”. *American Geophysical Union Fall Meeting*, Washington, D.C., USA, 2018. <https://agu.confex.com/agu/fm18/meetingapp.cgi/Paper/349634>
- Santos da Silva, S.R.**, Kousky, V.E. (2016), “Extreme Wet and Dry Events over Southeast Brazil and Associated Atmospheric Circulation Patterns”, *96th American Meteorological Society Annual Meeting*, New Orleans/Louisiana, USA. <https://ams.confex.com/ams/96Annual/webprogram/Paper280121.html>

DISSERTATION ADVISOR

MSc. Dissertation, **Josephine C. Henze**, September 2024.

Dissertation submitted to the Water Science, Policy and Management program of the School of Geography and the Environment, University of Oxford, UK.

Dissertation title: What about Water? Insights into Chile’s 2050 Decarbonization Pathway and the Water-Energy-Land Nexus.

TRAINING COURSES | RELEVANT EVENTS

- OPERANTAR XXVI (Antarctic Operation XXVI) as the forecaster of the Brazilian Antarctic Station “Comandante Ferraz”, South Shetland Islands, King George Island, January - February 2008.
- EUMETSAT/NOAA/IODE Training Course on The Use of Satellite Wind and Wave Products for Marine Forecasting, Oostende, Belgium, 2009.
- Hydrometeorological Prediction Center International Desk Training, NOAA, October - January 2011. Operational training for the use of products from Numerical Weather Prediction models over South America for their application in the analysis and weather forecasting.
- Participation in the XVI Pan American Games, Guadalajara, Mexico 2011, as the meteorologist of the Brazilian Sailing team.
- Synoptic Meteorology and Climatic Variability Course, Brazil’s National Institute of Meteorology, Brasília, Brazil, May 2012.

REVIEWER

- *Scientific Reports*, Springer Nature.
- *Environmental Research Letters*, IOP Publishing.
- *Climatic Change*, Springer.
- *Energy for Sustainable Development*, Elsevier.
- *Energy Policy*, Elsevier.