

Germán Poveda

Position: Full Professor, Universidad Nacional de Colombia at Medellín, Colombia.

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Education:

1. Civil Engineer, Universidad Nacional de Colombia, Medellín. 1983.
2. M.Sc. in Water Resources Engineering, Universidad Nacional de Colombia, Medellín. 1986.
3. M.Sc. in Sciences of Engineering. University of California, Davis, CA, USA. 1989.
4. Ph.D. in Water Resources. Universidad Nacional de Colombia, Medellín. 1998.
5. Post-Doctorate. Hidro-Ecology. University of Colorado, Boulder, CO, USA. 2001-2002.

Areas of Expertise:

1. Hydrology, Climatology, Meteorology, Oceanography, Water Resources, Ecology.
2. Hydro-climatology of Colombia and the Amazon River Basin.
3. Causes and impacts of El Niño-Southern Oscillation in the tropical Americas.
4. Climate change and its social, environmental and economic impacts.
5. Linkages between climate variability and climate change with human health, water resources, agriculture, hydro-energy, and natural risks and disasters.
6. Chaos, fractals, scaling and non-linear dynamics in geophysics and turbulence.
7. Stochastic processes and time series prediction.
8. Applied mathematics in engineering.

Academic, Professional and Scientific Credentials:

1. Appointed as a member of the American Geophysical Union (AGU) panel to update the AGU position statement on resilience to natural hazards. January 2021.
2. Member of the scientific steering committee to face the climate crisis in the state of Antioquia, Colombia, October 2020.
3. Member of the scientific steering committee of the “Science Panel for the Amazon”, convened by the “Sustainable Development Solutions Network (SDSN)”, a global initiative of the United Nations. February 2020.

4. Co-convenor of session A126 “The Hydro-climate of the Andes: Current Understanding and Future Challenges”. 2019 American Geophysical Union Fall Meeting, San Francisco, CA, USA. December 9-13, 2019.
5. Visiting Scientist at the Hydrometeorological Applications Program, National Center for Atmospheric Research (NCAR), Boulder, CO, USA. August 2019.
6. Member of the “2019 International Mission of Experts for Education, Science, Technology and Innovation”. Appointed by the President and Vice-President of Colombia.
7. Visiting Professor. Max Planck Institute for Biogeochemistry. Jena, Germany. 2019.
8. Member of the Board of the Colombian Academy of Exact, Physical and Natural Sciences of Colombia. Since 2018.
9. Member of the scientific team of the NASA Precipitation Measurement Mission (PMM). Since March 2018.
10. Member of the working group of the International Hydrology Programme of UNESCO for Latin American and the Caribbean (PHI-LAC) on the “Hydrogeomorphology of the Andean-Amazon River Basin”. September 2018.
11. Visiting Professor. Center of Climate and Resilience, Department of Geophysics, Universidad de Chile. Santiago de Chile, June 2018.
12. Co-Chair of ANDEX, a Regional Hydrological Programme of the Global Energy and Water Exchanges Programme (GEWEX), to investigate the climatology, hydrology and weather of the Andes Cordillera. Since December 2017. <https://www.gewex.org/project/andex/>.
13. Member of the scientific steering committee of the “First International Electronic Conference on the Hydrologic Cycle”. November 12-16; <https://sciforum.net/conference/CHyCle-2017>.
14. Scientific advisor of *Parque Explora* of Medellín for the interactive exposition on “El Niño and La Niña: Overlapping stories”, held at Medellín’s Planetary, with support from the French Agency for Development. April-June 2017. <https://www.parqueexplora.org/>
15. Member of the “Sustainable Development Solution Network-Amazonia” (SDSN-Amazonia), by designation of the Colombian Academy of Sciences. 2017: <https://www.sdsn-amazonia.org/>.
16. Member of the scientific steering committee of the “RIOCC-ADAPT” Project, to assess adaptation plans to climate change in the Iberoamerican Network of Climate Change Offices (Red Iberoamericana de Oficinas de Cambio Climático, RIOCC), an initiative of the Spanish Agency for International Cooperation and Development. 2017-2020. www.riocadapt.com.
17. Member of the Board and the External Advisory Committee of the World Wildlife Fund-Colombia (WWF). <http://www.wwf.org.co>.

18. Member of the “Inter-American Network of Academies of Sciences (IANAS) - Food and Nutrition Security for the Americas.” Designated by the Colombian Academy of Sciences. <http://www.ianas.org/index.php/programs/food-security/622>.
19. Member of the Intergovernmental Panel on Climate Change (IPCC), as Leading Author of the chapter on Latin America for the IPCC Assessment Reports No. 3, 4 and 5. From 1998 to 2015.
20. Member of the committee of “Protected Areas of Colombia”. Designated by the Colombian Academy of Sciences. Since 2015.
21. Member elected of the International Council for Science-Regional Office for Latin America and the Caribbean (ICSU-ROLAC). Since 2015; <http://www.icsu.org/latin-america-caribbean/about-icsu>.
22. Member elected of the scientific steering committee of the “Global Energy and Water Exchanges (GEWEX)” project, which makes part of the World Climate Research Programme (WCRP). 2015-to-date. <http://www.gewex.org/>.
23. Member of the scientific steering committee on Risks and Disasters of ICSU-ROLAC: <https://www.icsu.org/regions/rolac>. 2014-2019.
24. Member of the scientific steering committee of the Intra-Americas Study of Climate Processes programme (IASCLIP). Since 2014. https://www.eol.ucar.edu/field_projects/iasclip.
25. Member of the Editorial Board of the journal *Frontiers in Atmospheric Science*. Since 2014.
26. Member elected of the Scientific Advisory Board of *Parque Explora*, Medellín, Colombia. Since 2012; <http://www.parqueexplora.org>.
27. Member of the scientific steering committee of “AMAZALERT - Impacts of Climate Change and Land Use Changes in Amazonia” Programme. 2010-2015: <http://www.eu-amazalert.org>.
28. Member of the scientific steering committee of the “Vulnerability and Adaptation to Climate Extremes in the Americas” (VACEA) Programme. 2010-2016: <http://www.parc.ca/vacea>.
29. Full Professor, Universidad Nacional de Colombia, Medellín. 2010.
30. Correspondant Member. Elected by the Spanish Royal Academy of Exact, Physical and Natural Sciences. 2010.
31. Numerary Member of Chair No. 7. Elected by the Colombian Academy of Exact, Physical and Natural Sciences. 2009.
32. Member of the scientific steering committee of the “Global Change and Human Health” programme, of the Earth System Science Partnership (ESSP). 2006-2014: <http://www.futureearth.org/projects/gechh-global-environmental-change-and-human-health-2006-2014>.

33. Visiting Scientist invited by the National Center for Atmospheric Research, Boulder, CO, USA. 2010.
34. Visiting Scientist invited by the Centre for Ecology and Hydrology, Wallingford, UK. 2005.
35. Correspondent Member. Elected by the Colombian Academy of Exact, Physical and Natural Sciences. 2009.
36. Appointed as representative for Colombia to the FRIEND Programme of the International Hydrological Programme of UNESCO. March 2006.
37. Chair of Colombia's office of the International Biosphere-Geosphere Programme (IGBP). November 17, 2004. <http://www.igbp.net/>
38. Visiting Fellow at the Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO, USA. 2001-2002.
39. Member of the international scientific steering committee of the "Large Scale Atmosphere-Biosphere Experiment in Amazonia" (LBA). 2001-2015: <http://lba2.inpa.gov.br/>.
40. Member of the Inter-American Institute for Global Change Research (IAI). Since 1999.
41. Associate Professor. Universidad Nacional de Colombia, Medellín. 1996-2010.
42. Assistant Professor. Universidad Nacional de Colombia, Medellín. 1990-1996.
43. Member of the American Meteorological Society. Since 1994.
44. Member of the American Geophysical Union. Since 1992.
45. Research and Teaching Assistant. Department of Land, Air and Water Resources, University of California, Davis, CA, USA. 1988-1989.
46. Planning Engineer. Empresas Públicas de Medellín. 1986-1988.
47. Design Engineer. Sedic Ltd. Medellín. 1983-1985.

Distinctions, Awards and Recognitions

1. Elected "Fellow" of The World Academy of Sciences for advancing science in developing countries. January 1, 2021.
2. Diploma of Recognition from the President of Colombia, Iván Duque, and the Vice-President, Marta Lucía Ramírez, by serving as member of the 2019 International Mission of Experts, *"for your invaluable contributions in the development of a sustainable and inclusive growth strategy for Colombia. Your work will allow us to advance towards a knowledge society that reaches*

levels of development and collective well-being in the short and long term by taking advantage of our great ethnic diversity and natural and cultural resources.”

1. Ranked as “Senior Researcher”, the top category among Colombian researchers, by Colciencias (Colombian National Science Foundation). October 2019.
2. First Prize for best scientific research of the year in Colombia, awarded by the *Alejandro Angel Foundation*, in the category of Environment and Sustainable Development, to the project “Influence of the Choco Low-Leve Jet on the Hydroclimatology of Colombia’s Pacific Coast”. October 2019.
3. Figure included in the “Hall of Fame of Giovanni Images” of NASA, USA. The figure makes part of the paper: Bedoya-Soto et al., (2019), Seasonal shift of the diurnal cycle of rainfall over Medellin’s Valley, Central Andes of Colombia (1998–2005). *Frontiers in Earth Science*, 7:92, doi:10.3389/feart.2019.00092. Giovanni is an on-line tool for the display and analysis of geophysical and climatic parameters. 2019.
4. Recognized with the “Quarterly Franklin Membership” (Membership ID#TG97478) by the Editorial Board of the London Journals Press (UK), for “*research work to be distinctive and can indeed be significant for fellow researchers and scientists working in the same domain.*” October, 2018.
5. Included as one of “The Indispensables of the Year” in Colombia in 2017 by the web portal “La Silla Vacía”. December, 2017. <https://lasillavacia.com/>
6. Awarded with the “*Gerardo Molina Order*” by the Superior Council of Universidad Nacional de Colombia, the highest distinction awarded by the institution “*in recognition of professors who have made an exceptional contribution to the development of the University and its functions.*” Bogotá, September, 2017.
7. Ranked as “Senior Researcher”, the top category among Colombian researchers, by Colciencias (Colombian National Science Foundation). September, 2017.
8. Diploma of Recognition from the Medellin’s Mayor to the chapter of Antioquia of the Colombian Academy of Sciences. Medellín, December, 2016.
9. Advisor of the Ph.D. thesis “*Impacts of Climate Change and Climate Variability on the Spatio-Temporal Hydrological Dynamics of Amazonia*”, submitted by Alejandra M. Carmona. The thesis was given the honor of *Summa Cum Laude*, and received the “*Green Talents*” award from the Minister of Education and Sciences of Germany. 2016.
10. Diploma of Recognition from the School of Mines of Universidad Nacional de Colombia at Medellín, for “*your contribution to the development and projection of the Civil Engineering Curricular Program during the first centenary of existence.*” November, 2011.
11. Awarded with the “National Award for Scientific Merit”, in the category “Researcher of Excellence”, granted by the Colombian Association for the Advancement of Science. Bogotá, November, 2010.

12. Honorable Mention in the *Alejandro Angel Escobar Foundation Awards*, in the category of Environment and Sustainable Development, for the “Research Program for Integrated Water Management in Colombia”. Bogotá, August 2010.
13. Winner of the distinction “Meritorious Integral Academy”, granted by the School of Mines, Universidad Nacional de Colombia, Medellín, September 2010.
14. Designated by the Superior Council of the University of Antioquia as representative of eminent personalities of science, technology and culture, before the Governing Board of the University of Antioquia Foundation, Medellín, April, 2009.
15. Selected by the *Gerente* magazine as one of the “100 Leaders of Society in Colombia” in 2008.
16. Awarded with the “*Order of Democracy Simón Bolívar*” in the grade of “Knight Cross” by the House of Representatives of Colombia, through resolution No. 163 of 2007.
17. Selected by *El Tiempo* newspaper as one of the “Persons of the Year 2007 in Colombia”.
18. Selected by the *Cambio* magazine as one of the “50 Leaders of the Year 2007” in Colombia.
19. Selected the *Gerente* magazine as one of the “100 Leaders of the Society in Colombia” in 2007.
20. Winner of the “Academic Excellence” Medal, granted by the Higher Council of the National University of Colombia. Bogotá, September 11, 2007. This distinction is awarded to “*a professor who, for his dedication and performance in his university teaching career, presents an academic life and work worthy of being exalted as an example of academic career, integrity, dedication and transcendence, widely visible throughout the University.*”
21. Included in the exhibition “Scientists from Antioquia”, held at the thematic library of Medellín's Public Enterprises. September to November 2007.
22. Winner of the National Science Prize in the category of Environment and Sustainable Development, awarded by the *Alejandro Angel Escobar Foundation*, for the “Hydrological Atlas of Colombia”. Bogotá, September, 2007.
23. Winner of the Honorable Mention in the category of Exact, Physical and Natural Sciences, granted by the *Alejandro Ángel Escobar Foundation*, for the work “Early Warning System for Malaria in Colombia”. Bogotá, September, 2007.
24. Winner of the “La Rábida” Award in Ibero-American Studies in the Scientific-Technical category, granted by the International University of Andalusia, Spain, for the work “Development of an Early Warning System for Malaria in Colombia”. Principal Investigator of the project that received the Award. September, 2006.
25. Elected member of the International Association for Hydrologic Sciences (IAHS) 2005.

26. “Meritorious Research” Medal, awarded by the School of Mines, National University of Colombia, Medellín. September 2004.
27. Winner of the Honorable Mention of the *Hernán Alcaraz Henao* Award, granted by the Colombian Society of Entomology, for the study “*Effect of Temperature on the Development of Ovaries and the Gonotropic Cycle of Anopheles albimanus (Diptera: Culicidae) in Relation to the El Niño-Southern Oscillation Event*”
28. Winner of the Honorable Mention in the category of Exact, Physical and Natural Sciences, awarded by the *Alejandro Angel Escobar Foundation*, for the study “Association between El Niño/Southern Oscillation phenomenon and malaria outbreaks in Colombia”. September 2001.
29. Winner of the *Lorenzo Codazzi* Award for “Excellence in Engineering”, granted by the Colombian Society of Engineers for the study “Hydrological Atlas of Colombia”. Bogotá, May 2001.
30. Winner of the *University Merit* Medal, granted by the National University of Colombia. September, 2000.
31. Winner of the National Science Award in the category of Environment and Sustainable Development, granted by the *Alejandro Angel Escobar Foundation*, as a member of the research group of the project “Hydrological Balances of Colombia”. September 2000.
32. Winner of the National Science Award in the category of Exact, Physical and Natural Sciences, granted by the *Alejandro Angel Escobar Foundation*, for the work “Dynamic Feedbacks between the El Niño-Southern Oscillation Phenomenon and the Hydrology of Colombia”. Bogotá, September 1999.
33. Winner of the Scholarship for Outstanding Researchers in Colombia. Granted by Colciencias. 1995.
34. Award to the best work of Ph.D. students at the “XV Hydrology Days” Meeting of the American Geophysical Union, Fort Collins, Colorado, U.S.A., April 1995.
35. Winner of the scholarship for Ph.D. studies in Colombia, with a 22-month internship at the University of Colorado, Boulder, CO, USA. 1993-1995.
36. Winner of the Meritorious Mention to the Master's Thesis in Water Resources Engineering, entitled “The Hurst Phenomenon”, granted by the Board of Directors of the Faculty of Mines, National University of Colombia, Medellín, September 1988.
37. Winner of the scholarship granted by the Empresas Públicas de Medellín for the Graduate Program in Water Resources. 1985-1987.
38. Winner of the Meritorious Mention to the undergraduate thesis “Techniques for the Reconstruction of Hydrological Records”, granted by the Board of Directors of the School of Mines, National University of Colombia, Medellín, December 1983.

Software:

1. HidroSIG. A geographic information system of Colombia's hydroclimatology.
2. SIGMA: Geographic Information System for malaria in Colombia.

Advisor of Ph.D. students:

1. Alejandra María Carmona. *Impacts of Climate Change and Climate Variability on the Spatio-Temporal Hydrological Dynamics of Amazonia*. Universidad Nacional de Colombia. Medellín. 2016.
2. Juan Fernando Salazar. *Biotic regulation of the environment*. Universidad Nacional de Colombia. Medellín, 2015. Meritorious Ph.D. Thesis.
3. Guillermo León Rúa. *Influence of El Niño-Southern Oscillation on entomological parameters in Colombia*. Ph.D. Thesis. Universidad de Antioquia. *Summa Cum Laude*. 2006.
4. Andrés Felipe Zapata. *Coupling between water, energy and carbon budgets in Andes- Amazon systemría* - Universidad Nacional de Colombia. Medellín. On-going.
5. Luis Alejandro Builes. *Non-linear interactions between the Andes, the Amazon and the Tropical North Atlantic* Universidad Nacional de Colombia. Medellín, 2018.
6. Raúl A. Montoya. *Ocean-atmosphere interactions in the surge zone of La Guajira (Colombian Caribbean) at diverse timescales*. Universidad Nacional de Colombia. Medellín, 2019.
7. Leidy Johanna Yepes. *Observations and numerical simulations of the Chocó low-level jet over the far eastern Pacific and western Colombia*. Universidad Nacional de Colombia. Medellín, Meritorious Mention.
8. Hernán D. Salas. *Synchronization and interdependence between diurnal, annual and inter-annual cycles of the Colombian hydro-climatology with respect to ENSO*. Universidad Nacional de Colombia. Medellín, 2020.
9. Juan Mauricio Bedoya. *Land-atmosphere interactions in Tropical South America and Colombia at a wide range of timescales*. Universidad Nacional de Colombia. Medellín, 2020.

Advisor of M.Sc. students:

1. Manuela Velásquez. *Modeling of ecological and socioeconomic systems in the area of the Cabo Manglares National Natural Park*. Universidad Nacional de Colombia. Medellín. On-going.

2. Daniela Posada. *Analysis of long-term trends in the variables of the hydrological balance in the Amazon River basin*. Universidad Nacional de Colombia. Medellín. On-going.
3. Elizabeth Arango. *Effects of deforestation on watershed hydrology*. Universidad Nacional de Colombia. Medellín. 2019.
4. Jessica Gómez. *Prediction of monthly river flows in Colombia for hydroelectric generation, with emphasis on minimum flows*. Universidad Nacional de Colombia. Medellín, 2018.
5. Daniel González. *Quantification of the temporal dynamics of surface atmospheric pressure and precipitation in different biomes and hydro-climatic conditions*. Universidad Nacional de Colombia. Medellín, 2018.
6. Sebastián Bernal. *A new System Dynamics model of climate and malaria incidence in Colombia*. Universidad Nacional de Colombia. Medellín, 2018.
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8. Luz Adriana Acosta. *Evaluation of environmental and climate factors as risk elements associated with the transmission of dengue and leishmaniasis at different temporal and spatial scales in Colombia*. Universidad Nacional de Colombia. Medellín, 2015.
9. Luisa Fernanda Diez. *Modeling the relationships between climate variability and change in the incidence of malaria in Colombia: A comparative analysis of system dynamics and agent-based simulation*. Universidad Nacional de Colombia. Medellín, 2015.
10. Luisa Fernanda Vallejo. *Spatio-temporal dynamics of air rivers in northern South America and the possible effects of climate change*. Universidad Nacional de Colombia. Medellín, 2014.
11. Andrés Camilo Carvajal. *Estimation of maximum river flows in the context of climate change and variability*. Universidad Nacional de Colombia. Medellín, 2014.
12. Andrés Felipe Duque. *Effect of global environmental change on average and extreme river flows in the Amazon River basin*. Universidad Nacional de Colombia. Medellín, 2014.
13. Diana Carolina Rueda. *Characterization of the low-level jet over the Eastern Colombian plains*. Universidad Nacional de Colombia. Bogotá, 2014.
14. Hernán D. Salas. *Spatio-temporal variability of rain in the tropical Andes and the Amazon from scaling concepts and information theory*. Universidad Nacional de Colombia. Medellín, 2012.
15. Liliana Jaramillo. *Characterization of rainfall and precipitation events during 2003-2010 as seen by the Tropical Rainfall Measurement Mission (TRMM) over Colombia and the Amazon River basin*. Universidad Nacional de Colombia. Medellín, 2012.
16. Leidy Johanna Yepes. *Intra-seasonal climate variability and its effect on precipitation in Colombia: Diagnosis and prognosis*. Universidad Nacional de Colombia. Medellín, 2012.

17. Alejandra María Carmona. *Identification of main modes of hydroclimatic variability in Colombia and the Amazon River basin through the Hilbert-Huang Transform*. Universidad Nacional de Colombia. Medellín, 2011. Mention of Meritorious Thesis.
18. Armando Ealo. *Analysis of complementary generation between hydraulic and wind energy. Case study: Guajira, Colombia*. Universidad Nacional de Colombia. Medellín, 2011.
19. Johanna P. Jiménez. *Effects of climate change on water resources for electric power generation (Study case: Jaguas hydroelectric plant)*. Universidad Nacional de Colombia. Medellín, 2011.
20. Ignacio Rodríguez. *Numerical forecast of precipitation in Eastern Antioquia, Colombia, using the ETA/CPTEC model*. Universidad Nacional de Colombia. Medellín, 2010.
21. Edicson G. Pulgarin. *Regional formulas for the estimation of Intensity-Frequency-Duration curves based on the scaling properties of rainfall*. Universidad Nacional de Colombia. Medellín, 2010.
22. Lina Alexandra Acevedo. *Hydrological estimation under climate change scenarios*. Universidad Nacional de Colombia. Medellín, 2009.
23. Julián Zuluaga. *Analysis of the spatio-temporal variability of drought in Colombia*. Universidad Nacional de Colombia. Medellín, 2009.
24. Oscar Alonso Rueda. *Modeling of soil moisture in the Colombian coffee growing region under different land cover types*. Universidad Nacional de Colombia. Medellín, 2008. Mention of Meritorious Thesis.
25. Jorge I. Hernández. *Spatio-temporal disaggregation of tropical rain and its hydrological response. Implications for climate change*. Universidad Nacional de Colombia. Medellín, 2008. Mention of Meritorious Thesis.
26. Diana Milena Álvarez. *New approaches for the estimation of extreme river flows in Colombia*. Universidad Nacional de Colombia. Medellín, 2007. Mention of Meritorious Thesis.
27. Oscar David Alvarez. *Estimation of the uncertainty in the long-term water balances of Colombia*. Universidad Nacional de Colombia. Medellín, 2007.
28. Julián Esteban Morales. *Interactions between the Chocó low-level jet and the Western Andes of Colombia*. Universidad Nacional de Colombia. Medellín, 2006. Awarded the 2006 Best Undergraduate Study by the Colombian Society of Geology.
29. Juan Fernando Salazar. *Hydrological cycle and Darwinian models in Daisy-World*. Universidad Nacional de Colombia. Medellín, 2006. Mention of Meritorious Thesis.
30. Sara Cristina Vieira. *Dynamic modeling of convective precipitation*. Universidad Nacional de Colombia. Medellín, 2006.

31. Lina Isabel Ceballos. *Comparative analysis of diverse ENSO models. Case Study: El Niño 2002-2003*. Universidad Nacional de Colombia. Medellín, 2005.
32. Manuel David Zuluaga. *Diagnosis of Mesoscale Convective Systems over Colombia, Colombian Amazon and Eastern Pacific Ocean during 1998-2002*. Universidad Nacional de Colombia. Medellín, 2005.
33. Paola Andrea Arias. *Intra-seasonal variability of the Colombian hydroclimatology with emphasis on the Madden-Julian Oscillation*. Universidad Nacional de Colombia. Medellín, 2005.
34. Luis Fernando Salazar. *Patterns of hydroecological scaling in Amazonia*. Universidad Nacional de Colombia. Medellín, 2004.
35. Carlos D. Hoyos. *Diagnosis, modeling and prediction of the South-Asian monsoon and its intra-seasonal variability*. Universidad Nacional de Colombia. Medellín, 2003.
36. John Freddy Mejía. *Diurnal cycle and 4-D rainfall variability in Colombia as seen by TRMM (Tropical Rainfall Measuring Mission)*. Universidad Nacional de Colombia. Medellín, 2002.
37. Carlos Daniel Ruiz. *Modeling the entomological-climatic interaction of malaria transmission in Colombia through System Dynamics*. Universidad Nacional de Colombia. Medellín, 2002.
38. Luz Adriana Cuartas. *Atmospheric moisture balance of Colombia*. Universidad Nacional de Colombia. Medellín, 2001.
39. Lina M. Mercado. *Modeling rainforest carbon and water dynamics - Comparison of different land-use systems following removal of primary forest in the Colombian Amazon*. Lund University Master's Programme in Environmental Science, Lund, Sweden, November 1999.
40. Fernando A. González L. *Effects of the ITCZ-ENSO in the rainfall regimes of the central Andes of Colombia*. Universidad Nacional de Colombia. Manizales, 1998.
41. Luis Hernando Gómez. *Geostatistics in precipitation modeling in Colombia*. Universidad Nacional de Colombia. Medellín, 1998.
42. Carlos A. Perez. *Evidences of climate change in Colombia: Trends and phase changes*. Universidad Nacional de Colombia. Medellín, 1997.

Advisor of Undergraduate Thesis:

1. Alejandro Olarte. *Interannual Variability of Precipitation in Colombia*. Universidad Nacional de Colombia, Medellín, 2019.

2. Manuela Velásquez. *Estimation of the Water Balance in the Colombian Pacific Region*. Award for 2016 best undergraduate thesis, granted by the School of Mines, Universidad Nacional de Colombia, Medellín, 2018.
3. Sara María Vallejo. *Modeling and validation of the probabilistic quantiles of the flow duration curve in Colombian rivers and its variation during the ENSO phases*. Universidad Nacional de Colombia, Medellín, 2016.
4. Daniela Posada. *Long-term trends in the Amazon River basin streamflows flows and their relationship with drainage area*. Universidad Nacional de Colombia, Medellín, 2015.
5. Liliana Jaramillo, Laura I. López, and Fredy A. Villada. *Rainfall characterization in Colombia as seen by the 3B42 algorithm of TRMM satellite during 1998-2009*. Universidad Nacional de Colombia, Medellín, 2010.
6. Alvaro A. Navarro, Ángelo A. Atehortúa, and Hernán D. Salas. *Analysis of precipitation in the Aburrá and San Nicolás valleys through the Intensity-Duration-Frequency curves*. Universidad Nacional de Colombia, Medellín, 2010.
7. Johanna Yepes. *Influence of the intra-seasonal precipitation variability on the San Carlos, Calderas, Jaguas and La Miel hydroelectric power plants*. Universidad Nacional de Colombia, Medellín, 2009.
8. Susana Galeano. *Fourier analysis and effects of temporary aggregation on the memory characteristics of rainfall in Colombia*. Meritorious undergraduate thesis. Received the award for best undergraduate thesis and the *Otto de Greiff Award* granted by the National University of Colombia. Bogotá, February 2008.
9. Julio Cesar Mesa. *Estimation of extreme river flows in Colombia*. Universidad Nacional de Colombia, Medellín, 2006.
10. Andrea Zuluaga. *Methods for estimating minimum river flows in Colombia*. Universidad Nacional de Colombia, Medellín, 2006.
11. Silvia A. Montoya. *Revisiting the estimation of evapotranspiration in Colombia*. Universidad Nacional de Colombia, Medellín, 2006.
12. Carolina Gutiérrez. *Evidence of climate change on average and and extreme river flow series in Colombia*. Universidad Nacional de Colombia, Medellín, 2006.
13. Adriana M. Gutiérrez. *Evidence of climate change in precipitation and temperature series in Colombia*. Universidad Nacional de Colombia, Medellín, 2006.
14. Jesús D. Gomez. *Estimation of the multifractal spectrum in hourly precipitation series in the tropical Andes of Colombia*. Universidad Nacional de Colombia, Medellín, 2005.
15. Juan David Osorio. *Analysis of intrinsic modes and the Hilbert-Huang transform in hydroclimatic series of Colombia*. Universidad Nacional de Colombia, Medellín, 2005.

16. Johanna P. Jimenez and Lina M. Marin. *Obtaining water for domestic consumption from air drying*. Universidad Nacional de Colombia, Medellín, 2004.
17. Hernán A. Moreno and Sara Vieira. *Characterization of the diurnal cycle of precipitation in the Tropical Andes of Colombia. Southern Region*. Universidad Nacional de Colombia, Medellín, 2001.
18. Paola Arias, Paula Agudelo, and Luis F. Salazar. *Characterization of the diurnal cycle of precipitation in the Tropical Andes of Colombia. Central Region*. Universidad Nacional de Colombia, Medellín, 2001.
19. Valdimir Toro and Juan F. Álvarez. *Characterization of the diurnal cycle of precipitation in the Tropical Andes of Colombia. Northern Region*. Universidad Nacional de Colombia, Medellín, 2001.
20. Angela M. Rendón. *Variability of the Choco low-level jet and its influence on the climate of Colombia*. Universidad Nacional de Colombia, Medellín, 2001.
21. Julio César Salazar. *Quantification of chaos in mechanical vibratory systems*. Universidad Nacional de Colombia, Medellín, 2001.
22. Ricardo Mantilla. *Morphology, topology of river basins using digital terrain models*. Universidad Nacional de Colombia, Medellín, 2000. Meritorious undergraduate thesis and winner of the *Luis de Greiff Award* for the best undergraduate thesis in Civil Engineering granted by the Antioquian Society of Engineers.
23. Olga Janet Barco, and Luz Adriana Cuartas. *Evapotranspiration in Colombia*. Universidad Nacional de Colombia, Medellín, 1998.
24. Marta María Gil and Natalia Quiceno. *Influence of the El Niño-Southern Oscillation on the annual cycle of the hydro-climatology of Colombia*. Universidad Nacional de Colombia, Medellín, 1997.
25. Carlos M. Betancur and Luis F. Sánchez. *Estimation of the scale of fluctuation in rainfall and streamflow series in Colombia*. Universidad Nacional de Colombia, Medellín, 1992.
26. Julio C. Izquierdo. *Applications of the Kriging method to interpolate hydrological fields*. Universidad Nacional de Colombia, Medellín, 1992.

Research Projects:

1. 2020-2021. Investigador Principal. “Efectos sobre las variables hidrológicas y la provisión potencial de servicios ecosistémicos producto del cambio de cobertura vegetal. Caso de estudio sistema socioecológico de la cuenca del Río Mira”. Fundación para la Promoción de la Investigación y la Tecnología Banco de la República. Colombia.

2. 2019-2020. Co-Investigador Principal. “Upper air observations over the far Eastern Pacific (OTRC; ChocoJEX II). National Science Foundation de Estados Unidos.
3. 2017-2018. Investigador Principal. “Validación de Diferentes Productos Satelitales de Precipitación de la NASA sobre Colombia”. Convocatoria nacional de proyectos para el fortalecimiento de la investigación, creación e innovación de la Universidad Nacional de Colombia 2016-2018. Seleccionado para conformar el Programa de Investigación de las Misiones de Medición de la Precipitación (PMM) de la NASA de Estados Unidos.
4. 2017. Co-Investigador. “Análisis de las Propiedades Cualitativas de la Función de Distribución de Probabilidad Invariante de Caudales para Cuencas Hidrográficas Bajo Regímenes Estacionarios de Precipitación”. Convocatoria nacional de proyectos para el fortalecimiento de la investigación, creación e innovación de la Universidad Nacional de Colombia 2016-2018.
5. 2014-2017. Investigador Principal. “Estimación de los Balances de Agua, Energía, Carbono y Entropía en el Sistema Andes-Amazonía”. Financiado por COLCIENCIAS.
6. 2016-2017. Co-Investigador. “Sistema de Observación Ecológica para Colombia: Prototipo para el Monitoreo de Cambios en Biodiversidad y Funcionamiento de Ecosistemas”. Financiado por el Instituto Max Planck de Biogeoquímica, Jena, Alemania, y COLCIENCIAS.
7. 2016-2017. Investigador Principal. “Influencia de la Corriente de Chorro del Chocó sobre la Hidroclimatología de la Región Pacífica Colombiana”. Financiado por la DIME. Universidad Nacional de Colombia, Sede Medellín.
8. 2016. Co-Investigador. “Permanencia de cayos insulares del Caribe colombiano ante eventos extremos históricos y futuros”. Expedición Científica SeaFlower 2016.
9. 2016. Co-Investigador. “Desarrollo de un modelo computacional para apoyar la toma de decisiones en la vigilancia, prevención y control de enfermedades transmitidas por *Aedes aegypti* con énfasis en dengue bajo la influencia del clima en Medellín y Santa Marta”.
10. 2014-2016. Co-Investigador. “El efecto del cambio climático en la incidencia de la malaria: Modelos computacionales como herramientas de apoyo a la toma de decisiones de adaptación”. Financiado por COLCIENCIAS.
11. 2011-2016: Investigador Principal en Colombia. “Vulnerability and Adaptation to Climate Extremes in the Americas (VACEA)”. Programa de Investigación internacional financiado por IDRC de Canadá.
12. 2013-2015. Co-Investigador. “Cambio Climático: Gestión del Riesgo y Sostenibilidad de la Producción de Banano en Colombia”. Financiado por COLCIENCIAS.
13. 2013-2015. Investigador Principal. “Estimación de Caudales Máximos en un Contexto de Cambio y Variabilidad Climática”. Convocatoria del programa nacional de apoyo a estudiantes de posgrado para el fortalecimiento de la investigación, creación e innovación

14. 2013-2015. Investigador Principal. “Evaluación de factores climáticos y entomológicos como elementos de riesgo asociados con la transmisión de la leishmaniasis periurbana en el municipio de Ovejas, Sucre”. Convocatoria del programa nacional de apoyo a estudiantes de posgrado para el fortalecimiento de la investigación, creación e innovación de la Universidad Nacional de Colombia 2013-2015.
15. 2012-2014. Co-Investigador. “Modelamiento y simulación de los efectos del cambio climático en la incidencia de la Malaria en Colombia”. Convocatoria DIME 2012. Universidad Nacional de Colombia, Sede Medellín.
16. 2008-2014. Co-Investigador Principal en Colombia. “AMAZALERT - Programa de Investigación de los Efectos del Cambio y la Variabilidad Climática en la Amazonia”. Financiado por la Unión Europea.
17. 2009-2010. Investigador Principal. “Identificación de Modos Principales de Variabilidad Hidro-Climática y Evidencias de Cambio Climático en Colombia y la Cuenca Amazónica Mediante la Transformada de Hilbert-Huang”. Convocatoria Nacional de Investigación 2009. COLCIENCIAS.
18. 2009. Investigador Principal. “Análisis de la Precipitación en los Valles de Aburrá y de San Nicolás mediante la estimación de Curvas Intensidad-Duración-Frecuencia”. Financiado por la Convocatoria DIME “*Bicentenario Independencia de la Nación 2008-2009*”. Universidad Nacional de Colombia, Sede Medellín.
19. 2008-2009. Investigador Principal. “Efectos del Cambio Climático en la Hidrología Colombiana con Énfasis en Caudales Mínimos”. Financiado por DIME, Universidad Nacional de Colombia, Sede Medellín.
20. 2008. Co-Investigador. “Sistema de Información Geográfica, de código abierto y de dominio público, orientado a la gestión integral del agua. HidroSIG 4.0”. Convocatoria Nacional De Investigación 2008. Universidad Nacional de Colombia.
21. 2008. Co-Investigador: “Diseño y montaje de un sistema piloto para la detección de la inversión térmica en el Valle de Aburrá”. Financiado por la Universidad Nacional de Colombia.
22. 2008-2009: Investigador Principal: “Impacto del Cambio Climático sobre las Lluvias en Colombia”. Financiado por Colciencias de Colombia y CNPq de Brasil.
23. 2005-2008: Investigador Principal. “Programa de Investigación de la Gestión Integral del Agua en Colombia”, financiado por COLCIENCIAS dentro de la convocatoria nacional sobre Programas Estratégicos de Investigación en el tema de Manejo Integral del Agua.
24. 2006-2007: Co-Investigador. “Impacto de El Niño/Oscilación del Sur en el uso del recurso atún aleta amarilla (*thunnus albacares*) en el Océano Pacífico oriental. Investigador

- Principal: Dr. Juan Suárez Sánchez. Universidad Autónoma de Tlaxcala, México. Agosto 8 a 20 de 2006.
25. 2005: Co-Investigador. “Modelación de Procesos de la Interacción Suelo-Atmosfera en Sudamérica Tropical”. Centro de Hidrología y Ecología (CEH), Wallingford, Reino Unido, Septiembre-Noviembre 2005.
 26. 2005: Investigador Principal. “TROPICANDES-Un programa de Investigación para los Andes Tropicales de Sur América”. International Council of Scientific Unions (ICSU). Paris. 2005.
 27. 2005: Co-Investigador. “Prospectus for an interdisciplinary hydrology project in the Whitewater/Walnut basins, Kansas as a natural laboratory”. Investigador Principal: V. K. Gupta, University of Colorado, EUA. National Science Foundation de Estados Unidos.
 28. 2005: Co-Investigador. “Sustainable Management of High Altitude Andean River Basins (SUMAAR)”. Investigador Principal: Dr. Remigio Galárraga, Universidad Politécnica de Quito, Ecuador. Instituto Interamericano para la Investigación del Cambio Global (IAI).
 29. 2005: Co-Investigador. “Extension of the Pan American Studies Sounding Network (PACS-SONET) for continuing monitoring of climate variability over the Americas”. Investigador Principal Dr. Michael Douglas, National Severe Storm Lab, Norman, OK, USA.
 30. 2000-2005: Investigador Principal. “Vínculos entre la Variabilidad Climática y la Salud Humana en Colombia”. Financiado por el Instituto Interamericano para la Investigación del Cambio Climático (IAI).
 31. 2004-2005: Investigador Principal. “Patrones de Escalamiento Hidro-Ecológico en la Amazonia”. Financiado por DIME, Universidad Nacional de Colombia.
 32. 2004-2005: Investigador Principal: “Estudio para implementar Métodos de Predicción de Caudales Medios Mensuales”. Financiado por Empresas Públicas de Medellín.
 33. 2003-2004: Investigador Principal. “Diagnóstico, modelación y pronóstico de la variabilidad intra-anual de la precipitación en Colombia”. Financiado por COLCIENCIAS. Programa de Ciencias Básicas.
 34. 2003-2004: Investigador Principal. “Análisis comparativo de modelos propuestos para el fenómeno ENSO. Caso de Estudio: El Niño 2002-2003”. Financiado por COLCIENCIAS. Programa de Ciencia y Tecnología del Mar.
 35. 2002-2004: Co-Investigador Principal. “Desarrollo de un Sistema de Alerta Temprana para la Malaria en Colombia”. Financiado por COLCIENCIAS. Programa de Ciencias de la Salud.
 36. 2003-2004: Co-Investigador Principal. “Aprovechamiento del Agua Atmosférica”. Financiado por DIME, Universidad Nacional de Colombia, Sede Medellín.

37. 2003-2004: Co-Investigador Principal. “Sistema de Información Geográfica aplicado a la Gestión de Recursos Naturales”. Financiado por DIME, Universidad Nacional de Colombia, Sede Medellín.
38. 2001-2002: Associate Researcher (Visiting Fellow), Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, Estados Unidos. Interacción Agua-Clima-Vegetación, Hidro-Ecología.
39. 2000-2002: Investigador Principal. “Caracterización del ciclo diurno de la precipitación y Ambientes Atmosféricos en Sistemas Convectivos de Meso-escala sobre Colombia con información de la misión TRMM”. Financiado por Dirección Nacional de Investigaciones, Universidad Nacional de Colombia (DINAIN).
40. 2000-2002: Investigador Principal. “Balance de humedad atmosférica para Colombia”. Financiado por la Dirección Nacional de Investigaciones, Universidad Nacional de Colombia.
41. 2000-2001: Investigador Principal. “Inventario Hidrológico de Antioquia. Fase II”. Financiado por Colciencias a través del Centro de Ciencia y Tecnología de Antioquia.
42. 2000-2001: Investigador Principal. “Análisis del Ciclo diurno de la precipitación en Colombia”. Universidad Nacional de Colombia, Medellín. Financiado por DINAIN.
43. 2000-2006: Investigador principal. “Atlas Hidrológico de Colombia”. Financiado por la Unidad de Planeación Minero-Energética, Ministerio de Minas y Energía, Colciencias, y el Instituto Interamericano para la Investigación sobre Cambio Global.
44. 1999-2003: Co-Investigador Principal. “Benefits of incorporating ENSO forecasts into reservoir operation and hydroelectric power distribution procedures”. Financiado por el Instituto Interamericano para la Investigación del Cambio Climático.
45. 1998-1999: Investigador Principal. “Asociación entre brotes epidémicos de malaria en Colombia y el fenómeno El Niño-Oscilación del Sur”. Financiado por COLCIENCIAS.
46. 1998-1999: Investigador Principal. “Inventario y Balances Hidrológicos de Antioquia. Fase I. Catálogo de Estudios de Cantidad de Agua. Mapa Digital de Redes de Drenaje y Cuencas de Antioquia”. Programa Cátedra del Agua de Antioquia. Financiado por el Centro de Ciencia y Tecnología de Antioquia.
47. 1997-1999: Co-Investigador Principal. Proyecto: “Balances Hídricos de Colombia”. Financiado por la Unidad de Planeación Minero-Energético del Ministerio de Minas y Energía de Colombia (UPME) y COLCIENCIAS.
48. 1996: Co-Investigador Principal. “Estudio Hidrometeorológico para la definición de Estrategias de Largo Plazo en Generación de Energía Eléctrica”. Financiado por la Unidad de Planeación Minero-Energético del Ministerio de Minas y Energía de Colombia (UPME).

49. 1992-1997: Investigador Principal. “Influencia de fenómenos oceánico-atmosféricos de gran escala en la hidro-climatología de Suramerica tropical”. Financiado por COLCIENCIAS.
50. 1995: Co-Investigador Principal. “Evaluación de tendencias, estacionariedad y homogeneidad en series de caudales de Colombia”. Posgrado Recursos Hidráulicos. Financiado por Interconexión Eléctrica S.A.
51. 1993-1995: Professional Research Associate. Cooperative Institute for Research in Environmental Sciences (CIRES) /Center for Study of Earth from Space (CSES). University of Colorado, Boulder, USA. Area de trabajo: Influencia de fenómenos climáticos de gran escala sobre la hidrología de Colombia.
52. 1993-1994: Co-Investigador: “Metodologías de Predicción Hidrológica considerando Fenómenos de Gran Escala”. Financiado por las Empresas Públicas de Medellín.
53. Diciembre 1991-Marzo 1992: Visiting Faculty. Cooperative Institute for Research in Environmental Sciences (CIRES)/Center for Study of Earth from Space (CSES). University of Colorado, Boulder, EUA. Áreas de trabajo: Análisis Estocásticos de series temporales paleo-climáticas y Cascadas Aleatorias en procesos de lluvia.
54. 1991-1992 Investigador Principal: “Planificación Integral de Cuencas Usando Análisis de Múltiples Objetivos”. Finaciado por COLCIENCIAS.
55. 1988-1989: Kerney Foundation, University of California, Davis. 1988-1989: Post-Graduate Researcher. Land, Air and Water Resources Department. Áreas de trabajo: Caos y Fractales en Sistemas Hidrológicos. Atractores Extraños, Caos y Fractales en la Turbulencia Atmosférica. Sistemas Dinámicos no Lineales y Caos en Turbulencia.
56. 1986-1987: El fenómeno de Hurst en series Temporales Geofísicas. Financiado por Empresas Públicas de Medellín.
57. 1986-1987- “Metodología de estimación de caudales mínimos en la Quebrada Doña María”. Proyecto realizado en el Posgrado en Aprovechamiento de Recursos Hidráulicos y financiado por Empresas Públicas de Medellín.
58. 1985-1987: “Impacto de Proyectos Hidroeléctricos en Antioquia”. Proyecto realizado por el Posgrado en Aprovechamiento de Recursos Hidráulicos y financiado por CORNARE.

Additional Information:

Reviewer of scientific research papers for the following journals, agencies, universities and research groups: Intergovernmental Panel on Climate Change (IPCC), National Oceanic and Atmospheric Administration (NOAA), *Nature*, *Nature Climate Change*, *Nature Geophysics*, *Water Resources Research*, *Climate Dynamics*, *Climate Research*, *Journal of Geophysical Research- Atmospheres*, *Journal of Geophysical Research-Oceans*, *Journal of Hydrology*, *Remote Sensing of Environment*, *Acta Tropica*, *Journal of Vegetation Science*, *Frontiers in Earth Sciences*, *Journal of Climate*, *International Journal of Climatology*, *Climatic Change*, *Advances in Meteorology*, *Global Change*, *Journal of*

Geophysical Research, Journal of Hydrology, Remote Sensing of Environment, International Journal of Climatology, Hydrology and Earth System Sciences, Environmetrics, Journal of Hydrometeorology, Monthly Weather Review, Frontiers in Atmospheric Sciences, Earth System Dynamics, Environmental Health Perspectives, DYNA, Avances en Recursos Hidráulicos, Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales, Revista Ingeniería Universidad Javeriana, Boletín del Centro de Control de Contaminación del Pacífico, Interciencia, Journal of Science and Technology of the Americas Colombia, French Institute of Environmental Studies, Universidad de Chile, Universidad Nacional Autónoma de México, Universidad del Valle, Universidad de Antioquia, Universidad Javeriana, Universidad Industrial de Santander, among others.