

# FRANCISCO MUÑOZ ARRIOLA

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ORCID: <https://orcid.org/0000-0002-6613-6766>

## EDUCATION

**Ph.D. - Duke University**, Civil and Environmental Engineering, 2007

Dissertation: *Hydrological Response to Precipitation Discrepancy and Land-Use Changes in the Yaqui River Basin*. Committee members: Roni Avissar, Ana P. Barros, Amilcare Porporato, Miguel Medina Jr., and Henry P. Gavin.

**M.Sc. - Universidad Autónoma de Baja California**, Coastal Oceanography, 1997

Thesis: *Ni and Vanadyl Porphirins: Distribution and Use as Indices of Oil Activity*

**B.Sc. - Universidad Autónoma de Baja California**, Oceanography, 1994

Thesis: *Variability of Wastewater loads of Cd, Cu, and Pb to the Todos Santos Bay*.

## RESEARCH EXPERIENCE

**University of Nebraska-Lincoln**, Biological Systems Engineering Department

Associate Professor, School of Natural Resources, since July 2019

Associate Professor, since July 2019

**University of Nebraska-Lincoln**, Biological Systems Engineering Department

Assistant Professor, since February 2013

Courtesy appointment at the School of Natural Resources

**Universidade do Sao Paulo**, Luiz Quiroz College of Agriculture, Department of Biosystems Engineering.

Adjunct Professor, since July 2018

**United States Geological Survey**, California Water Science Center-San Diego

Volunteer for Science, December 2010 to December 2018

**University of California, San Diego**, Scripps Institution of Oceanography, Division of Climate, Atmospheric Science, and Physical Oceanography

Postdoctoral Fellow, October 2010-January 2013

**University of Washington**, Department of Civil and Environmental Engineering

Research Associate, May 2007-September 2010

**Duke University**, Department of Civil and Environmental Engineering

Research Assistant, 2003 to 2007

**Universidad Autónoma de Baja California**, Instituto de Investigaciones Oceanológicas

Research Scientist, 1999

**Universidad de Sonora**, Departamento de Investigación Científica y Tecnológica

Researcher, 1996-1998

**Universidad Autónoma de Baja California**, Instituto de Investigaciones Oceanológicas

Research Assistant, 1994-1996

Universidad Autónoma de Baja California, Facultad de Ciencias Marinas

Technician, 1993

## AWARDS AND HONORS

**Engineering Research Visioning Alliance (ERVA)** – The Role of Engineering in Addressing Climate Change, Expert (2021).

**University of Nebraska-Lincoln**, College of Law – Nebraska Governance and Technology Center (NGTC), Faculty Fellow (2020)

**University of Nebraska-Lincoln**, College of Engineering - Annual Recognition Teaching Award, Recipient (2020)

**University of Nebraska-Lincoln**-Inclusion and Diversity Faculty Fellow, (2018-2019)

**University of Nebraska-Lincoln**, College of Engineering Research - Annual Recognition Award, Recipient (2018)

**National Science Foundation**-Interdisciplinary Methods (for Disaster Research), Fellow, Recipient (2015-16)

**National Science Foundation**-Enabling the Next Generation of Hazards and Disasters Researchers Fellow, Recipient (2015-16)

**University of Nebraska-Lincoln**, Parent Association and Teaching Council-Contributions to Students Award, Recipient (2015)

**American Meteorological Society/National Science Foundation**-Summer Policy Colloquium Fellow, Recipient (2014)

**Dougherty Water for Food Global Institute**, Faculty Fellow, Recipient (since 2014)

**University of Nebraska-Lincoln-Layman Award**, Recipient (2014)

**University of Nebraska-Lincoln-Research Development Fellows Program**, Recipient (2013-2014)

**World Meteorological Organization**, Consultant (since 2011)

**Science and Technology National Council**, National Scientist System Award, Mexico (since 2010)

## GRANTS

### Pending

**University of Nebraska**-Collaborative Initiative (Submitted). *Toward innovation in adaptive water management using network analytics*. Co-PI, \$100,000.

### Funded

**United States Department of Agriculture**-Sustainable Agriculture Research and Education (2023-2026). *Assessing and Improving Lakota Land-User Social-Ecological Interactions and Impacts on Sustainability*, PI (\$250,000).

**United States Geological Survey**-CESU (2023-2024). *OpenET Science Team support and eeMETRIC development, operation, and review*. PI, \$225,000.

**Commission for Environmental Cooperation** (2023-2024). *Engaging Indigenous Communities within Mexico in the Central Grasslands Roadmap*. Co-PI (\$46,000).

**United States Department of Agriculture**-NIFA (2023-2026). *Dig, Sip, Breathe: Robotic Monitoring of Carbon and Water Cycles in Agriculture*. Co-PI, \$990,000.

**NASA**-Water Resources (2022-2025). *Accelerating adoption of irrigation scheduling with satellite-based precision evapotranspiration from OpenET*. Substitute PI, \$700,000.

**University of Nebraska**-System Science (2021-2023). *Resilience in agricultural working landscapes*. Co-PI, \$150,000.

**University of Nebraska**- Quantitative Life Sciences Initiative Summer Graduate Student Support competition. *Predictive and geospatial analytics for deep learning and statistical models in phenotype prognosis*. PI Francisco Munoz-Arriola (\$7,000).

**University of Nebraska-Lincoln**-Agriculture Research Division and Daugherty Water for Food Global Institute (2019-2020). *Irrigation Sustainability*. PI, \$40,000.

**University of Nebraska-Lincoln**-Agriculture Research Division (2019-2020). *Predictability and resilience of groundwater systems in Nebraska: coupling natural-human systems*. PI, \$30,000.

**United States Department of Agriculture-NIFA** Foundational's Plant Breeding for Agricultural Production (2018-2023). *Gene-to-Global Hydroclimatic Controls on Hybrid Performance Forecast*. PI, \$490,000.

**National Science Foundation**-Research Training (NRT) (2017-2022). *Training in Theory and Application of Cross-scale Resilience in Agriculturally Dominated Social Ecological Systems*. One of five Co-PIs, \$3,000,000.

**University of Nebraska**-System Science (2017-2018). *Modeling Resilient Interdependent Systems for Data-driven Decision Support*. Co-PI, \$20,000.

**United States Geological Survey** 104B (2017). *Impact of Variable Rate Irrigation on Consumptive Use of Water Resources*. Co-PI, \$20,000.

**University of Nebraska-Lincoln**-Office of Research and Economic Development (2016-2017). *Dynamics and Trade-offs among Social, Economic, and Ecological Components of Resilience in Working Agricultural Landscapes*. Co-PI, \$100,000.

**United States Department of Agriculture**-Foundational-HATCH Project (2016-2020). *Predictability of Water Distribution and Transport across Spatial and Temporal Scales: An Application on Cropland Management*. PI-Four Co-PIs (Approved - No funds provided and valued in \$3,200,000).

**CONACYT-SEMARNAT** (2015-2017). *Heterogeneity and Scalling of Land Surface-Atmosphere Water and Energy Fluxes In Regional Climate Systems of the Mexican Plateau*. PI, \$300,000 (my share \$20,000).

**United States Department of Agriculture**-Foundational-ARS Northern Plains Regional Climate Hub and Nebraska Extension (2015-2016). *Generating Nebraska Climate Information for Extension Use in Addressing Clientele Needs*. PI, \$10,000.

**Robert B. Daugherty Water for Food Global Institute**-University of Nebraska. (2015-2018). *Engineering Informed Water Resources-Decision Making and Sustainable Development for Agriculture in the Northern High Plains of the United States: The Physical Dimension*. PhD fellowship. PI, \$142,000.

**Robert B. Daugherty Water for Food Global Institute**-University of Nebraska. (2014-2017). *Software Development for Water- and Agriculture-resources Data and Information Access: the case of the Water for Food Interoperability System (WaFIS)*. Postdoctoral Fellowship. PI, \$126,000.

**US Geological Survey 104B** (2014-15). *Hydroclimatic controls on the conjunctive use of surface and ground water in the Platte River Basin*. PI, \$45,000.

**University of Nebraska-Lincoln**-Layman Award (2014-2015). *Sources of Agricultural Drought Predictability in the Central Great Plains*. PI, \$10,000.

**FEMSA Foundation** (2015-2016). *Short-term Hydrometeorological Forecast System with emphasis in Flood Forecasts*. PI, \$690,000 (withdrawn).

**Consejo Nacional de Ciencia y Tecnología-REDESCLIM** (2013). *Hydrometeorologic and Climate Digital Resources: Storage and Use*. PI, \$10,000.

**Consejo Nacional de Ciencia y Tecnología-REDESCLIM** (2012-2013). *Toward an Improved Database for Hydrometeorological and Hydroclimatological Assessments in México*. Co-PI, \$30,000.

**Consejo Nacional de Ciencia y Tecnología-REDESCLIM** (2012-2013). *Diagnostic of Hydrometeorological Extreme Events in México: Current State and Perspectives*. PI, \$26,000.

**Comisión Nacional del Agua** (2011). *Hydroclimatology of Southern River Basins*. \$50,000. PI. Instituto Mexicano de Tecnología del Agua (2010). *Applications of a coupled Atmospheric-Land Surface Modeling System for Flood Prediction in Mexico*. Co-PI, \$81,000.

## ACCEPTED AND PUBLISHED ARTICLES

<sup>1</sup>Graduate student; <sup>2</sup>Research Associate; <sup>3</sup>Visiting scholar

Sarzaeim<sup>1</sup>, P. and F. Muñoz-Arriola (Accepted). *A Method to Estimate Climate Drivers of Maize Yield Predictability leveraging Genetic-by-Environment interactions in the US and Canada*. *Agronomy*.

Ojeda Bustamante, W., Palerm Viqueira, J., and Muñoz-Arriola, F. (Accepted). *Las paradojas de la eficiencia de riego asociadas a la tecnificación de zonas de riego: cuentos y cuentas*. *Revista del Colegio de San Luis*.

Sarzaeim, P.; Muñoz-Arriola, F. *A Method to Estimate Climate Drivers of Maize Yield Predictability Leveraging Genetic-by-Environment Interactions in the US and Canada* (2024). *Preprints* 2024,2024030999.<https://doi.org/10.20944/preprints202403.0999.v1>.

Stuart, L., Hobbins, M., Niebuhr, E., Ruane, A.C., Pulwarty, R. Hoell, A., Thiaw, W., Rosenzweig, C., Muñoz-Arriola, F. Jahn, M. Farrar, M. (2024) *Enhancing Global Food Security: Opportunities for the American Meteorological Society*. *Bulletin of the American Meteorological Society*. <https://doi.org/10.1175/BAMS-D-22-0106.1>

Carrillo, C.M.<sup>2</sup>; Muñoz-Arriola, F.; Chen, L. (2023). *Multi-scale Sources of Precipitation Predictability in the Northern Great Plains*. *Preprints* 2023|20362. <https://doi.org/10.20944/preprints2023|2.0362.v.1>

Quiñones R, Samal A., Das Choudhury S. and Muñoz-Arriola, F. (2023) *OSC-CO<sup>2</sup>: coattention and cosegmentation framework for plant state change with multiple features*. *Front. Plant Sci.* 14:1211409. doi: 10.3389/fpls.2023.1211409.

Sarzaeim, P., Muñoz-Arriola, F., Jarquin, D., Aslam, H., & De Leon Gatti, N. (2023). *CLIM4OMICS: a geospatially comprehensive climate and multi-OMICS database for*

- maize phenotype predictability in the United States and Canada. *Earth System Science Data*, 15(9), 3963-3990. <https://doi.org/10.5194/essd-15-3963-2023>.
- Sarzaeim, P., F. Munoz-Arriola, D. Jarquin, H. Aslam, and N. De Leon Gatti. *CLIM4OMICS: a geospatially comprehensive climate and multi-OMICS database for Maize phenotype predictability in the US and Canada*. *Earth System Science Data Discussions* (2023): 1-35. <https://doi.org/10.5194/essd-2023-11>.
- Ghosh<sup>3</sup>, K., and F. Munoz-Arriola (2023). *Hysteresis and streamflow-sediment relations across the continuum of natural-to-post dam construction in a highly regulated transboundary Himalayan River*. *Journal of Hydrology*. <https://doi.org/10.1016/j.jhydrol.2023.129885>.
- Rehana, S.<sup>3</sup>, Y. Pranathi, G. Basha, and F. Munoz-Arriola (2022). *Precipitation and Temperature Extremes and Association with Large-scale Climate Indices: An Observational Evidence over India*. *Journal of Earth System Science*. <https://doi.org/10.1007/s12040-022-01911-3>.
- Jaimés-Correa<sup>1</sup>, J.C., F. Munoz-Arriola, and S. Bartelt-Hunt (2022). *Modeling water quantity and quality nonlinearities for watershed adaptability to hydroclimate extremes in agricultural landscapes*. *Hydrology*. <https://doi.org/10.3390/hydrology9050080>.
- Sarzaeim<sup>1</sup>, P., F. Muñoz-Arriola, and D. Jarquin (2022). *Climate and genetic data enhancement using deep learning analytics to improve maize yield predictability*. *Journal of Experimental Botany*. DOI: 10.1093/jxb/erac146.
- Munoz-Arriola, F. and V. Macias-Zamora (2022) *Geospatial Synthesis of Biogeochemical Attributions of Porphyrins to Oil Pollution in Marine Sediments of the Gulf of México*. *Geosciences*. <https://doi.org/10.3390/geosciences12020077>.
- Singh<sup>3</sup>, V. and F. Munoz-Arriola (2021). *Improvements in Sub-Catchment Fractional Snowpack and Snowmelt Parameterizations and Hydrologic Modeling for Climate Change Assessments in the Western Himalayas*. *Hydrology*. 8(4), 179. <https://doi.org/10.3390/hydrology8040179>.
- Sarzaeim, P<sup>1</sup>, W. Ou<sup>1</sup>, L. Alves de Oliveira<sup>2</sup>, and Francisco Munoz-Arriola (2021). *Flood-Risk Analytics for Climate-Resilient Agriculture Using Remote Sensing in the Northern High Plains*. In *Geo-Extreme 2021*, pp. 234-244. <https://doi.org/10.1061/9780784483695.023>.
- Wilson, A., R. Cifelli, F. Munoz-Arriola, J. Giovannettone, J. Vano, T. Parzybok, A. Dufour, J. Jasperse, K. Mahoney, and B. McCormick (2021). *Efforts to Build Infrastructure Resiliency to Future Hydroclimate Extremes*. In *Geo-Extreme 2021*, pp. 222-233. <https://doi.org/10.1061/9780784483695.022>.
- Quiñones, R.<sup>1</sup>, F. Muñoz-Arriola, S. Das Choudhury, and A. Samal (2021). *Multi-feature data repository development and analytics for image cosegmentation in high-throughput plant phenotyping*. *PLOS-One*. <https://doi.org/10.1371/journal.pone.0257001>.

- Munoz-Arriola, F., T. Abdel-Monem, and A. Amaranto<sup>1</sup>(2021). *Common pool resource management: assessing water resources planning processes for hydrologically connected surface and groundwater systems.* Hydrology. <https://doi.org/10.3390/hydrology8010051>.
- Kumar, A.<sup>1</sup>, RAAJ Ramsankaran<sup>3</sup>, L. Brocca, and F. Munoz-Arriola (2021). *A simple machine learning approach to model real-time streamflow using satellite inputs: Demonstration in a data scarce catchment.* Journal of Hydrology. <https://doi.org/10.1016/j.jhydrol.2021.126046>.
- Pandey, V., P. K. Srivastava, R. K. Mall, F. Munoz-Arriola, and D. Han (2020). *Multi-Satellite Precipitation Products for Meteorological Drought Assessment and Forecasting in Bundelkhand region of Central India.* Geocarto Internacional. <https://doi.org/10.1080/10106049.2020.1801862>.
- Amaranto<sup>1</sup>, A., F. Pianosi, D. Solomatine, G. Corzo-Perez, and F. Munoz-Arriola (2020). *Sensitivity Analysis of Hydroclimatic Controls of Data-driven Groundwater Forecast in Irrigated Croplands.* Journal of Hydrology. <https://doi.org/10.1016/j.jhydrol.2020.124957>.
- Kumar, A.<sup>1</sup>, RAAJ Ramsankaran<sup>3</sup>, L. Brocca, F. Munoz-Arriola (2019). *A Machine learning approach for improving near-real-time satellite-based rainfall estimates by integrating soil moisture.* Remote Sensing. doi:10.3390/rs11192221.
- Amaranto<sup>1</sup>, A., F. Munoz-Arriola, G. Corzo-Perez, and D. Solomatine (2019). *A Spatially enhanced data-driven multi-model to improve semi-seasonal groundwater forecasts in the High Plains aquifer, USA.* Water Resources Research. DOI:10.1029/2018WR024301.
- Khan<sup>1</sup>, M., F. Munoz-Arriola, R. Shaik<sup>3</sup>, and P. Greer<sup>1</sup> (2019). *Spatial heterogeneity of temporal shifts in extreme precipitation across India.* Journal of Climate Change. DOI: 10.3233/JCC190003.
- Ou<sup>2</sup>, G., F. Munoz-Arriola, D. Uden<sup>2</sup>, D. Martin and C. Allen (2018). *Climate change implications for irrigation and groundwater in the Republican River Basin, USA.* Climatic Change. <https://doi.org/10.1007/s10584-018-2278-z>.
- Amaranto<sup>1</sup>, A., F. Munoz-Arriola, G. Meyer, D. Solomatine, and G. Corzo (2018). *Semi-seasonal Predictability of Water-table Changes Using Machine Learning Methods in Response to Integrated Hydroclimatic and Management Controls.* Journal of Hydroinformatics. doi: 10.2166/hydro.2018.002.
- Uden<sup>2</sup>, D.R., C.R. Allen, F. Munoz-Arriola, G. Ou<sup>2</sup>, and N. Shank (2018). *A Framework for Tracing Social–Ecological Trajectories and Traps in Intensive Agricultural Landscapes.* Sustainability. doi:10.3390/su10051646.



- Rudnick, D.R., T. Lo, J. Singh<sup>1</sup>, R. Werle, F. Muñoz-Arriola, T.M. Shaver, C.A. Burr, and T.J. Dorr (2018). *Reply to comments on "Performance assessment of factory and field calibrations for electromagnetic sensors in a loam soil"*. 203:272-276. DOI:10.1016/j.agwat.2018.02.036.
- Singh<sup>1</sup>, J., T. Lo, D.R. Rudnick, T.J. Dorr, C.A. Burr, R. Werle, T.M. Shaver, and F. Muñoz-Arriola (2018). *Performance Assessment of Factory and Field Calibrations for Electromagnetic Sensors in a Loam Soil*. *Agricultural Water Management*. 196: 87-98.
- Das, A., F. Munoz-Arriola, S. Singh, and M. Kumar<sup>3</sup> (2017). *Nutrient Dynamics of Brahmaputra (Tropical River) during Monsoon Period*. *Desalinization and Water Treatment*. doi:10.5004/dwt.2017.20788.
- Avery, W.A., C. Finkenbiner, T. E. Franz, T. Wang, A. L. Nguy-Robertson, A. Suyker, and T. Arkebauer, and F. Munoz-Arriola (2016). *Incorporation of globally available datasets into the roving cosmic-ray neutron probe method for estimating field-scale soil water content*. *Hydrol. Earth Syst. Sci.*, 20, 3859–3872.
- Livneh, B., T. Bohn, D. Pierce, F. Munoz-Arriola, B. Nijssen, R. Vose, D. Cayan, L. Brekke (2015): *A spatially comprehensive, hydrometeorological data set for Mexico, the U.S., and southern Canada 1950-2013*. *Nature - Scientific Data*, doi:10.1038/sdata.2015.42.
- Perez-Morga<sup>1</sup>, N., T. Kretzshmar, T. Cavazos, S. Smith, and F. Munoz-Arriola (2013). *Variability of Extreme Precipitation in coastal River Basins of the Southern Mexican Pacific Region*. *Geofisica Internacional*. 52(3): 277-291.
- Frans, C, Istanbuluoglu, E., M. Vimal, F. Munoz-Arriola and D. P. Lettenmaier (2013). *On runoff trends in the Upper Mississippi River Basin: influences of climate and land use*. *Geophysical Research Letters*. 40, doi:10.1002 /grl.50262, 2013.
- Tang, Q., E. Vivoni, F. Munoz-Arriola, and D. P. Lettenmaier (2012). *Predictability of evapotranspiration patterns using remotely-sensed vegetation dynamics during the North American monsoon*. *Journal of Hydrometeorology*, 13(1), 103-121.
- Preisler, H. K., A. L. Westerling, K. M. Gebert, F. Munoz-Arriola, and T. P. Holmes (2011). *Spatially Explicit Forecasts of Large Fire Probability and Suppression Costs for California Federal and State Lands*. *International Journal of Wildland Fire*, 20(4), 508-517.
- Muñoz Arriola, F. J. H. Salgado Rabadán, H. M. Rocchiccioli, S. Shukla, A. Güitrón De los Reyes, y R. Lobato Sánchez (2011). *Surface Hydrology in the Grijalva River Basin: Calibration of the Variable Infiltration Capacity Model*. *Aqua-LAC*, 3(1), 68-79. <https://doi.org/10.29104/phi-aqualac/2011-v3-1-0>.
- Sheffield, J, E. Wood and F. Munoz-Arriola (2010). *Long-term regional estimates of evapotranspiration for Mexico based on downscaled ISCCP data*. *Journal of Hydrometeorology*, 11(2), 253-275.



- Munoz-Arriola, F., D.P. Lettenmaier, Zhu, C., and R. Avissar (2009). *Water resources sensitivity of the Rio Yaqui Basin, México to agriculture extensification under multi-scale climate conditions*. *Water Resources Research*, 45, W00A20, doi:10.1029/2007WR006783.
- Munoz-Arriola, F., Shradhdhanand Shukla, Theodore J. Bohn, Chunmei Zhu, Ben Livneh, Dennis P. Lettenmaier, René Lobato Sánchez, and Ana Wagner Gomez (2009). *Forecasting Surface Hydrology in North America*. *Border Climate Summary, July 2009*: 1-5.
- Munoz-Arriola, F., D. P. Lettenmaier, C. Zhu, A. W. Wood, R. Lobato Sánchez, and A. Wagner Gomes (2008). *Extended West-wide Seasonal Hydrological System: Seasonal Hydrological Prediction in the NAMS region*. *CLIVAR Exchanges*, 43: 24-25.
- Muñoz Arriola, F., J. D. Carriquiry-Beltran, E. Nieto-Garcia, and M. Hernandez-Ayon (1999). *Colorado River Delta*, In: *Mexican and Central American Coastal Lagoon Systems: Carbon, Nitrogen and Phosphorus Fluxes*. S.V. Smith. LOICZ Reports and Studies No. 13, pp 59-69.

#### ACCEPTED OR PUBLISHED BOOKS

<sup>1</sup>Graduate student; <sup>2</sup>Research Associate; <sup>3</sup>Visiting scholar

- Lamine, S., P.K. Srivastava, A. Kayad, P., F. Munoz-Arriola, P.C. Pandey (2023). *REMOTE SENSING IN PRECISION AGRICULTURE: TRANSFORMING SCIENTIFIC ADVANCEMENT INTO INNOVATION*. Elsevier books/Academic Press. ISBN 978-0-323-91068-2.
- Singh, Vijay P., Shalini Yadav, Krishna K. Yadav, Gerald A. Corzo Perez, Francisco Munoz-Arriola, and Ram N. Yadava (2022). *APPLICATION OF REMOTE SENSING AND GIS IN NATURAL RESOURCES AND BUILT INFRASTRUCTURE MANAGEMENT*. ISBN-13: 978-3-031-14095-2. <https://doi.org/10.1007/978-3-031-14096-9>.
- Ramanathan, A.L.R., S. Chidambaram, M.P. Jonathan, M.V. Prasana, P. Kumar, and F. Munoz-Arriola (2021). *ENVIRONMENTAL RESILIENCE AND TRANSFORMATION IN TIMES OF COVID-19: CLIMATE CHANGE EFFECTS ON ENVIRONMENTAL FUNCTIONALITY*. Elsevier. ISBN# 978-0323855129. 438pp.
- Kumar, M., F. Munoz-Arriola, H. Furumai, and T Chaminda (2020) *RESILIENCE, RESPONSE, AND RISK IN WATER SYSTEMS: SHIFTS IN NATURAL FORCINGS AND MANAGEMENT PARADIGMS*. Springer Transactions in Civil and Environmental Engineering. ISBN#978-981-15-4667-9: 395pp.

#### ACCEPTED OR PUBLISHED BOOK CHAPTERS AND WHITE PAPERS

<sup>1</sup>Graduate student; <sup>2</sup>Research Associate; <sup>3</sup>Visiting scholar

- Janin<sup>1</sup>, J., S. Choudhary, F. Munoz-Arriola, and D. Khare (2023). *Remote Sensing and Machine Learning Applications for the Assessment of Urban Water Stress: A Review*. In: *Emerging Technologies for Water Supply, Conservation and Management*.
- Janin<sup>1</sup>, J., F. Munoz-Arriola, and D. Khare (2021). *Short-Term Resilience and Transformation of Urban Socio-environmental Systems to COVID-19 Lockdowns in India using Air Quality as Proxy*. In *ENVIRONMENTAL RESILIENCE AND TRANSFORMATION IN TIMES OF COVID-19* (Eds. Ramanathan et al). Elsevier. DOI: 10.1016/C2020-0-02703-9.
- Shaik<sup>3</sup> R., F. Munoz-Arriola, D. A. Rico<sup>1</sup>, and S. L. Bartelt-Hunt (2019). *Modelling Water Temperature's Sensitivity to Atmospheric Warming and River Flow*. In *Environmental Biotechnology: for sustainable future* (Eds. R. B. Sobti, N. Arora, and R. Kothari) ISBN 978-981-10-7283-3.
- Lawrence-Dill, C.J., Patrick Schnable, Nathan Springer, and: Natalia de Leon, Jode Edwards, David Ertl, Shawn Kaeppler, Nick Lauter, John McKay, Francisco Munoz-Arriola, Seth Murray, Duke Pauli, Nathalia Penna Cruzato, Colby Ratcliff, James Schnable, Kevin Silverstein, Edgar P. Spalding, Addie Thompson, Ruth Wagner, Jason Wallace, Justin Walley, and Jianming Yu (2018). White paper: High Throughput, Field-Based Phenotyping Technologies for the Genomes to Fields (G2F) Initiative. 2018 NIFA FACT Workshop. January 28-30, 2018, 8 pp.
- Shekhar, S., J. Colleti, F. Munoz-Arriola, L. Ramaswamy, C. Krinz, L. Varshney, D. Richardson (2017). *Intelligent Infrastructure for Smart Agriculture: An Integrated Food, Energy and Water System*. eprint arXiv:1705.01993. [2017arXiv170501993S](https://arxiv.org/abs/1705.01993). A Computing Community Consortium (CCC) white paper, 8 pp.
- Munoz-Arriola, F. D. Martin, and D. Eisenhauer (2014). *Nebraska's Water Resources in Changing Climate*. In: *Understanding and Assessing Climate Change: Implications for Nebraska*.
- Wilder, M., G. Garfin, P. Ganster, H. Eakin, P. Romero-Lankao, F. Lara-Valencia, A. Cortez-Lara, S. Mumme, C. Neri, and F. Munoz-Arriola (2013). *Impacts of Future Climate Change in the Southwest on Border Communities*. In: *National Climate Assessment Southwest*.
- Muñoz Orozco A. and F. Munoz-Arriola (2010). *Water, Climate, and Agro-ecological Systems: Past, Present, and Challenges*. In: *Lectures in Etnobotany*. Ed. J.A. Cuevas Sanchez. (In Spanish).

## ACCEPTED OR PUBLISHED PROCEEDINGS

<sup>1</sup>Graduate student; <sup>2</sup>Research Associate; <sup>3</sup>Visiting scholar; <sup>4</sup>Undergraduate

Rico<sup>1</sup>, D. A., F. Muñoz-Arriola, J. Bradley, and C. Detweiler (Accepted). *Analytics for Real-Time Inertial Localization of the Tethered Aircraft Unmanned System*. 18th International Symposium on Experimental Robotics (ISER), 2023, 11 pp.

- Ojeda Bustamante, W., Palerm Viqueira, J., and Muñoz-Arriola, F. (2023). *El ahorro del agua a través de la tecnificación de grandes zonas de riego: cuentas y cuentos*. COMEIL-23003. VIII Congreso Nacional y I Congreso Internacional de Riego, Drenaje y Biosistemas, October 6, 2023.
- Heeren, D.M., Hayde, L.G., Eisenhauer, D.E., McCornick, P.G., Mohammed, A.T., Mittelstet, A.R., Boldt, A.L., Qiao, X., Mabie, D.M. and Munoz-Arriola, F. (2023). *A Graduate-Level Field Course in Irrigation and Agricultural Water Management for an Immersive Learning Experience*. In *2023 ASABE Annual International Meeting* (p. 1). American Society of Agricultural and Biological Engineers. doi:10.13031/aim.202301165.
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## SOFTWARE AND DATABASE DEVELOPMENTS

<sup>1</sup>Graduate student; <sup>2</sup>Research Associate; <sup>3</sup>Visiting scholar; <sup>4</sup>Undergraduate

Aslam<sup>1</sup>, H, Sarzaeim<sup>1</sup>, P., and F. Muñoz-Arriola (2023). CLImate for Maize OMICS: CLIM4OMICS Analytics and Database. DOI 10.5281/zenodo.8002909.

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- Cantú-Guerrero<sup>1</sup>, J., Craven, J., A. Amaranto<sup>1</sup>, G. Corzo-Perez, F. Munoz-Arriola (2018). *Prototype of Software Platform to Forecast Semiseasonal Well-Level Responses to Climate and Irrigation Scheduling in the High Plains*.
- Herrera-Leon<sup>1</sup>, L. A., M. Khan<sup>1</sup>, G. Lopez-Morteo<sup>3</sup>, and F. Munoz-Arriola (2018). *Unified-access mechanisms for Weather, Climate, Water data with geospatial constrains and resolutions*.
- Osornio-Hernandez<sup>1</sup>, J. D., G. Lopez-Morteo<sup>3</sup>, and F. Munoz-Arriola (2018). *Database management for multi-dimensional data storage*.
- Rico<sup>1</sup>, D. A., J. Korus, and F. Munoz-Arriola (2017). *Mining Alphanumerical Stratigraphic Data for Aquifer Diagnosis and Ground water-level Forecast*.
- Rico<sup>4</sup>, D. and F. Munoz-Arriola (2016). *Seasonal Hydrological Forecast System: A Prototype. Funded by the Daugherty Water for Food Institute and UNL*.
- Munoz-Arriola, F. and G. Lopez-Morteo<sup>3</sup>. (1) Two data-collectors of data via web services programed in Python and Java; (2) six APIs that standardize/translate/deliver data in multiple formats (CSV, JSON, netCDF, postgresSQL, SPSS, HDF and text); (3) three apps (2 for smart phone and webpage); (4) analytics to address crop, livestock, and community needs.

## DIVERSITY, INCLUSION, AND EQUITY PRODUCTS

- BRIDGE: Breakthrough Recruitment for Inclusive Diversity Growth and Excellence (Accepted). University of Nebraska–Lincoln Faculty and Staff Search Best Practices Guide for Inclusive Excellence: 58pp.
- Second Faculty of Color Symposium (2021). *Capitalizing on Opportunities for External Funding Support: Equity and Inclusion in the Advancement of Research Programs and Creative Activity at UNL*. <https://diversity.unl.edu/faculty-color-symposium>, University of Nebraska-Lincoln. November 12, 2021
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## SURVEYS, POLICY, AND OUTREACH

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Greer, H., S. Rehna, A. Kumar, M. Ou, and F. Munoz-Arriola. *Editorial on extreme events and climate change*. Lincoln Journal Star (06/06/2017).

## ARTICLES SUBMITTED AND IN REVIEW

<sup>1</sup>Graduate student; <sup>2</sup>Research Associate; <sup>3</sup>Visiting scholar

Jain<sup>1</sup>, J., F. Munoz-Arriola, and D. Khare (Submitted, under review). Disaster governance and hydroclimate discrepancies for improved flood risk management: a case study of India. *Advances in Water Resources. International Journal of Disaster Risk Reduction*.

Carrillo-Cruz<sup>2</sup>, C. M., F. Munoz-Arriola, and L. Chen (Submitted, under review). *Multi-scale Sources of Subseasonal Predictability of Precipitation Connected with Extended Wet and Drought Events in the US Northern Great Plains*. *Frontiers in Earth Sciences*.

Werner, K.<sup>1</sup>, F. Munoz-Arriola, F. K., F. D. Rico<sup>1</sup>, J.C. Chacon, A. and G. Corzo (Submitted). *Large-scale Resilient Agroecosystems after the Effect of Dry and Wet Spells* (Invited) *Journal of Science of the Total Environment*.

Alves de Oliveira<sup>2</sup>, L., F. Munoz-Arriola, D. Martin, and C. Allen (scientific article). *Crafting an irrigation sustainability framework in the Northern High Plains (USA) using stakeholders' opinions*. To be submitted to *Environmental Science and Policy*.

Muñoz-Arriola, F. M. Khan<sup>1</sup>, S. Majumder, and D. Khare (scientific article). *Geospatial attributions of hydrologic regime shift to integrated climate and land-use patterns of variability in watersheds across the contiguous U.S.* *Geosciences*.

Quiñones, R.<sup>1</sup>, F. Muñoz-Arriola, S. Das Choudhury, and A. Samal (scientific article). *Cosegmentation for Plant Phenotyping (CosegPP) Data Repository Collected Via a High-Throughput Imaging System*. *Plant Phenomics*.

## RESEARCH PRODUCTS IN PREPARATION

<sup>1</sup>Graduate student; <sup>2</sup>Research Associate; <sup>3</sup>Visiting scholar; <sup>4</sup>Research Faculty

Cronk, J., Panday, S. and Malakar, A. and F. Munoz-Arriola, (Scientific Article), *Modeling Overdraft-Driven Nitrate Transport in Shallow Wells for Mitigation and Scenario Planning*.

Lopez-Morteo<sup>3</sup>, G.A. R. Quiñones, and F. Munoz-Arriola. *How to introduce data science training in Biological Systems and Agriculture Engineering Majors: A conceptual Framework.*

Munoz-Arriola, F., H. Aslam, P. Sarzaeim, D. Jarquin (software in progress). *GEnetics by ENvironment (GEEN): A Phenotype Predictive System.*

Janin<sup>1</sup>, J., F. Munoz-Arriola, and Deepak Khare (scientific article). *Geopolitical and environmental drivers of climate-resilient urban water infrastructure in India.*

Luna<sup>3</sup>, I., D. Jarquin<sup>4</sup>, and F. Munoz-Arriola (scientific article). *Statistical approach to estimate the number of ensembles required to improve the predictability of extreme precipitation.*

## ORAL PRESENTATIONS

<sup>1</sup>Graduate student; <sup>2</sup>Research Associate; <sup>3</sup>Visiting scholar; <sup>4</sup>Research Faculty; <sup>5</sup>Undergraduate Research Experience

Aslam, H<sup>1</sup>. and F. Munoz-Arriola. *Integration of Biophysical data in a hydrologic knowledge graph precursor for water and carbon tradeoff.* IUGG Berlin 2023. July 16, 2023.

Aslam, H<sup>1</sup>. and F. Munoz-Arriola. *Towards the Design of Large-scale Hydrologic Knowledge Graphs for Data Integration, Management, and Analytics for data-driven models.* American Geophysical Union, Fall Conference, Chicago, IL. December 14, 2022.

Ghosh, K<sup>3</sup>. and F. Munoz-Arriola. *Streamflow-sediment relations across the continuum of natural-to-post dam construction periods in a Himalayan River basin.* European Geosciences Union 2022, May 26, 2022.

Jain, J., Khare, D. and Arriola, F.M., *Designing a Metric System for the evaluation of the Resilience due to Extreme Events in a Socio-Environmental System* (No. EGU22-11347). Copernicus Meetings. European Geosciences Union 2022, May 26, 2022.

Sarzaeim, P.<sup>1</sup>, Munoz-Arriola, F., Jarquin, D., and De Leon Gatti, N. *Consolidating OMICs and Environmental Database for Maize Yield Predictions in a Changing Climate.* The 64th Annual Maize Genetics Meeting, Mar 31-Apr 3, St. Louis, MO, USA.

Quiñones, R.<sup>1</sup>, F. Munoz-Arriola, S. Das, and A. Samal *Accurate Co-Segmentation in High-Throughput and High Dimensional Plant Image Sequences* NAPPN 2022 (North American Plant Phenotyping Network). 2-25 February 2022. Athens, GA. **Graduate student award.**

Lucas, N.<sup>5</sup>, J. Jain<sup>1</sup>, and F. Munoz-Arriola. *Diagnostics of Drought and Infectious Disease as Compounded Events in Socio-Environmental Systems.* 102nd American Meteorological Society Annual Meeting, Virtual Meeting. January 26, 2022.

Quiñones, R.<sup>1</sup>, F. Munoz-Arriola, S. Das, and A. Samal. *Advancing Detection of Dynamic Environmental Effects on Plants Using Computer Vision Analytics in High-Throughput Phenotyping Facilities.* 102nd American Meteorological Society Annual Meeting, Virtual Meeting. January 24, 2022.



- Aslam, H.<sup>1</sup> and F. Munoz-Arriola. *Climate Visualization Analytics for the Performance GxE Modeling (Phenotype Predictability Software) Large-Scale Experiment*. 102nd American Meteorological Society Annual Meeting, Virtual Meeting. January 24, 2022.
- Sarzaeim, P.<sup>1</sup>, H. Aslam<sup>1</sup>, R. Quiñones<sup>1</sup>, and F. Munoz-Arriola. *Development of Climatic Spatiotemporal and Analytical Visualization for Maize Response to Climate*. 102nd American Meteorological Society Annual Meeting, Virtual Meeting. January 24, 2022.
- Sarzaeim, P.<sup>1</sup>, W. Ou<sup>1</sup>, L. Alves de Oliveira<sup>2</sup>, and Francisco Munoz-Arriola (2021). *Flood-Risk Analytics for Climate-Resilient Agriculture Using Remote Sensing in the Northern High Plains*. Geo-Extreme 2021 conference, November 8, 2021.
- Wilson, A., R. Cifelli, F. Munoz-Arriola, J. Giovannettone, J. Vano, T. Parzybok, A. Dufour, J. Jasperse, K. Mahoney, and B. McCormick (2021). *Efforts to Build Infrastructure Resiliency to Future Hydroclimate Extremes*. Geo-Extreme 2021 conference, November 8, 2021.
- Munoz-Arriola, F., W. Ou, J. Jain, H. Aslam, and A. Zarco. *Towards a Conceptual Framework to Predict Physical Vulnerability of Major Crops to Winter Floods in The Northern High Plains*. 2021 ASABE Annual International Meeting. Virtual and On Demand, July 13-15, 2021 (Invited).
- Rico, D.A.<sup>1</sup>, Carrick Detweiler, Francisco Muñoz-Arriola. *The Tethered Aircraft Unmanned System (TAUS) Operational Performance Validation for a Reliable Deployment Sensing Atmospheric Variables*. 2021 ASABE Annual International Meeting. Virtual and On Demand, July 13-15, 2021.
- Ghosh, K.<sup>3</sup>, F. Munoz-Arriola, and T. Chakraborty. *The impact of river regulation on streamflow and sediment dynamics in the Eastern Himalayan river basin*. The Geological Society of America 2020, October 27, 2020.
- Ntaganda, P., L. Alves de Oliveira, F. Muñoz-Arriola. *Groundwater data records and hydroclimate perspectives in the Northern High Plains*. 2020 ASABE 2020 Annual International Meeting. Virtual and On Demand, July 13-15, 2020.
- Sarzaeim, P., D. Jarquin, and F. Muñoz-Arriola. *Analytics for climate-uncertainty estimation and propagation in maize-phenotype predictions*. 2020 ASABE 2020 Annual International Meeting. Virtual and On Demand, July 13-15, 2020.
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- Munoz-Arriola, F., C. Wunderlin, P. Sarzaeim, M. Khan, W. Ou, and P. Greer. *Toward the integration of hydrometeorological and climate complexities in standards for resilient infrastructure design*. 100th American Meteorological Society Annual Meeting, Boston, MA. January 15, 2020.
- Sarzaeim, P., W. Ou, Khan, L. Alves, and F. Munoz-Arriola. *Spatiotemporal diagnostics of major crops' vulnerability in the Northern High Plains*. 100th American Meteorological Society Annual Meeting, Boston, MA. January 15, 2020.
- Wilson, A. M., R. Cifelli, A. Dufour, T. W. Parzybok, M. Dettinger, J. A Vano, F. Munoz-Arriola, K. A. Miller. *Toward greater resilient water infrastructure to future hydrometeorological extremes: Lessons from Orville dam and Hhurricane Harvey*. 100th American Meteorological Society Annual Meeting, Boston, MA. January 15, 2020.
- Kausik Ghosh, Francisco Munoz-Arriola. *Understanding Geopolitically Contentious River Basin between India and Bangladesh: The Role of Changing Climate and Water Infrastructures in the Himalayan River Tista*. American Geophysical Union, Fall Conference, Washington, DC. December 13, 2019.
- Banda, M. M., D. M. Heeren, D. L. Martin, F. Munoz-Arriola, and L. G. Hayde. 2019. *Economic analysis of deficit irrigation in sugarcane farming: Nchalo Estate, Chikwawa District, Malawi*. ASABE 2019 Annual conference. Boston, MA. July 8, 2019.
- Sarzaeim, P., F. Munoz-Arriola, A. Amaranto, D. Jarquin, and D. Bradford. *Geospatial assessment of phenotype predictive analytics using machine learning techniques*. ASABE 2019 Annual conference. Boston, MA. July 8, 2019.
- Munoz-Arriola, F. A. Amaranto, J. Cantu-Guerrero, J. Craven, G. Corzo, M. Khan, and D. Solomatine *Mapping and predictive analytics of groundwater resilience using machine learning: the integration of policies and uncertainties in a decision support tool*. ASABE 2019 Annual conference. Boston, MA. July 8, 2019.
- Lopez-Morteo, G. and F. Munoz-Arriola. *Data science training for Biological Systems and Agriculture Engineering Majors: A conceptual Framework*. ASABE 2019 Annual conference. Boston, MA. July 10, 2019.
- Munoz-Arriola, F., M. Ou, D. Martin, C.R. Allen. *Crafting an Irrigation Sustainability Framework the case of the Northern High Plains, US*. ASABE 2019 Annual conference. Boston, MA. July 10, 2019.
- Munoz-Arriola, F., P. Sarzaeim, A. Amaranto, D. Jarquin, and D. Bradford. *Geospatial assessment of phenotype predictive analytics using machine learning techniques*. European Geosciences Union General Assembly 2018. Vienna, Austria. April 8, 2019.
- Sarzaeim, P., A. Amaranto, G. Lopez-Morteo, D. Jarquin, and F. Munoz-Arriola. *Environmental Data Generation, Collection, and Storage for Cross-Scale Phenotype Predictability in the G2F Initiative*. G2F 2019 Collaborator's Meeting. February 9, 2019.

- Munoz-Arriola, F., G. Lopez-Morteo, D. Jarquin, D. Osornio, A. Herrera, and A. Amaranto. *Weather/climate data collection for large-scale phenotype predictability in the Midwest*. American Meteorological Society 99<sup>th</sup> Annual Meeting. Phoenix, AZ. January 9, 2019.
- Munoz-Arriola, F., C. Reed, A. Amaranto, N. Shank, and T. Abdel-Monem. *Resilient groundwater systems in complex agricultural landscapes: integrating data, management, and policy*. American Geophysical Union, Fall Conference, Washington, DC. December 12, 2018.
- Allen, C.R., J. Carroll, F. Munoz-Arriola, G. Ou, and T. Smith. *Crafting and Irrigation Sustainability Framework for Nebraska*. 2018 Natural Resources Districts Annual Conference. Kearny, NE. September 26, 2018.
- Kahn, M., C. Zimmer, and F. Munoz-Arriola. *The Effects of Varying Management Practices and Hydroclimatic Changes on Nitrogen Loads at Watershed-scale in the Northern High Plains*. ASABE 2018 Annual conference. Detroit, MI. July 31, 2018.
- Kahn, M., S. Majumder, and F. Munoz-Arriola. *Toward a non-stationary assessment of annual runoff generation in response to integrated climate and land-use changes at watershed scale*. ASABE 2018 Annual conference. Detroit, MI. July 31, 2018.
- Amaranto, A., F. Munoz-Arriola, G. Corzo, and D. Solomatine. *A Data-driven Multimodels Approach to Improve Groundwater Forecasts in the High Plains Aquifer*. ASABE 2018. Detroit, MI. July 31, 2018.
- Khan, M., F. Munoz-Arriola, J. Clarke, G. Meyer, R. Shaik, and A. Herrera-Leon. *Geospatial attribution of extreme rainfall and urban expansion in India using fuzzy clustering*. European Geosciences Union General Assembly 2018. Vienna, Austria. April 11, 2018.
- Amaranto, A., F. Munoz-Arriola, G. Corzo, and D. Solomatine. *Combining Multiple Data-driven Models for Spatiotemporal Groundwater Forecasts in The High Plains Aquifer*. European Geosciences Union General Assembly 2018. Vienna, Austria. April 10, 2018.
- Shaik, R., S. Galla, F. Munoz-Arriola, M. Khan, and A. Naresh. *Climate change sensitivity assessment using SWAT for a highly agricultural watershed, Shell Creek, Nebraska, USA*. Conference: SWAT 2018 International Workshops and Conference in Chennai, India.
- Otte, M. and F. Munoz-Arriola. *Representing Temperature and Precipitation Extremes by Dynamical Downscaling Using a Global, Multi-resolution Atmospheric Modeling System*. American Meteorological Society 30<sup>th</sup> Conference on Climate Variability and Change 2017. Baltimore, US. July 28, 2017.
- Luna-Espinoza, I., D. Jarquin, D. Rico, and F. Munoz-Arriola. *Mapping Physical Vulnerability to Extreme Precipitation on River Basins with Water, Agriculture, and Energy Resources*

- Infrastructure*. American Meteorological Society 24<sup>th</sup> Conference on Probability and Statistics. Baltimore, US. July 28, 2017
- Amaranto, A., G. Corzo Perez, D. Solomatine, G. Meyer, and F. Munoz-Arriola. *Semi-seasonal to Seasonal Predictability and Uncertainty of Groundwater Depletions using a Data-Driven Model Ensemble Approach in Irrigated Areas of the Northern High Plains*. American Meteorological Society 16th Conference on Artificial Intelligence and its Applications to the Environmental Sciences 2017. Baltimore, US. July 28, 2017.
- Munoz-Arriola, F., A. Sharma, K. Werner, J. C. Chacon, G. Corzo, and M. K. Goyal. *Hydrocentric view of Agro-ecosystem Resiliency to Extreme Hydrometeorological and Climate Events in the High Plains, US*. European Geosciences Union General Assembly 2017. Vienna, Austria. April 28, 2017.
- Amaranto, A., G. Corzo Perez, D. Solomatine, G. Meyer, and F. Munoz-Arriola. *Data Driven Models to Forecast Groundwater Level in Response to Hydro-climatological Conditions and Agricultural Water Demand*. European Geosciences Union General Assembly 2017. Vienna, Austria. April 28, 2017.
- Munoz-Arriola, F. and A. Amaranto. *Analytics to Enhance Crop-, Livestock-, and Community- Decisions in a Changing Climate*. American Society of Agricultural and Biological Engineers. Orlando, FL. July 21, 2016.
- Amaranto, A., G. Meyer, D. Solomatine, G. Corzo, and F. Munoz-Arriola. *Hydroclimatic vs Consumptive Water-Use Controls for Water Table Predictions using Artificial Neural Networks and Support Vector Machines Models*. American Society of Agricultural and Biological Engineers. Orlando, FL. July 21, 2016.
- Jaimes, J., S. Bartelet-Hunt, and F. Munoz-Arriola. *Streamflow Generation Responses to Extreme Hydrometeorological and Climate Events in an Intensively Agricultural Watershed*. SWAT 2015 Conference, West Lafayette, IN. October 14, 2015.
- Munoz-Arriola, F. R. Walko, A. Mohamad Abadi, L. Castro-Garcia, M. Otte, and G. Lopez-Morteo. *Toward Improving Predictability of Extreme Hydrometeorological Events in the Northern High Plains: Multi-scale Climate vs Land Surface Hydrology Modeling*. American Meteorological Society, Phoenix, AZ. January 9, 2015.
- Munoz-Arriola, F. R. Walko, A. Mohamad Abadi, L. Castro-Garcia. *Toward Improving Predictability of Extreme Hydrometeorological Events in the Northern High Plains*. American Geophysical Union, Fall Conference, San Francisco, CA. December 18<sup>th</sup> 2014.
- Munoz-Arriola, F. A. Mohamad-Abadi, A. I. Ramirez-Orozco, R. Walko, and M. Otte. *Predicibilidad de Eventos Hidrometeorológicos y Climáticos Extremos en México: El Caso del "Ocean Land Atmosphere Model" (OLAM)*. Unión Geofísica Mexicana, Puerto Vallarta, México. November 4th 2014.

- Oglesby, R., C. Rowe, and F. Munoz-Arriola. *Downscaling Future Climate Change Projections for Water Resource Applications: A Case Study for Mesoamerica*. American Geophysical Union, Fall Conference, San Francisco, CA. December 9<sup>th</sup> 2013.
- Munoz-Arriola, F., R. Hanson, M. Dettinger, and D. Cayan. *Agriculture and Extreme Events: Modeling the Conjunctive Use of Groundwater and Surface Water*. American Geophysical Union Meeting for the Americas. May 15<sup>th</sup> 2013.
- Perez-Morga, N., T. Kretzschmar, T. Cavazos, and F. Munoz-Arriola. *Interannual variability of the summer precipitation and streamflow in coastal river basins in Southern Oaxaca, Mexico*. American Geophysical Union Meeting for the Americas. May 16<sup>th</sup> 2013.
- Munoz-Arriola F. *Extreme Events and the Climate-Water-Food Nexus*. Hydrometeorologic and Climate Extreme Phenomena Conference, Manzanillo, Mexico. March 7<sup>th</sup> 2013.
- Munoz-Arriola F., R. Hanson, M. Dettinger, and D. Cayan. *Climate-Water Resources-Land-Use in California's Central Valley: Integrating Groundwater and Surface Water Modeling*. American Geophysical Union, Fall Conference, San Francisco, CA. December 3<sup>rd</sup> 2012.
- Munoz Arriola, F. *Modeling the Effect of Hydrometeorological and Hydroclimatological Phenomena on Water Resources*. Unión Geofísica Mexicana Annual Meeting, Puerto Vallarta, México. November 8, 2011.
- Munoz Orozco, A., A. Santacruz and F. Munoz-Arriola. *Specificity of Native Maize Varieties in México: toward a Strategy of Adaptation to Global Climate Change*. American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America Annual Meeting. San Antonio, CA. October 18 2011.
- Munoz-Arriola F., M. Dettinger, R. Hanson, and D. Cayan. *Climate Variability and Water Regulation Impacts on Surface Water and Groundwater Interactions in Central Valley, CA*. 28th Biennial Groundwater Conference and 20th GRA Annual Meeting "California's Water Future Goes Underground". Sacramento, CA October 5<sup>th</sup> 2011.
- Munoz-Arriola F. *Modeling Surface Hydrology in Agrosystems*. California Water and Environmental Modeling Forum 2011. Monterey CA March 1<sup>st</sup> 2011.
- Hanson, R., W. Schmid, A. Flint, L. Flint, F. Munoz, C.C. Faunt, and M.D. Dettinger. *Linking GCMs to regional hydrologic models to assess potential future conjunctive use*. Rocky Mountain (63rd Annual) and Cordilleran (107th Annual) Joint Meeting. 18–20 May 2011.
- Salgado Rabadán, J. H., F. Muñoz Arriola, H. M. Rocchiccioli, A. Güitrón De los Reyes y R. Lobato Sánchez. *Calibración Automática Múltiple del Modelo Hidrológico Superficial de Capacidades*. XXI Congreso Nacional de Hidráulica. Guadalajara, Mexico, October 2010.
- Muñoz Arriola, F., S. Shukla, J. H. Salgado Rabadán, E. Aguilar Garduño, O. Rodríguez López, R. Lobato Sánchez, J. Guadalupe Rosario de la Cruz. *Hydrology of the Grijalva-*

- Usumacinta River Basin: An assessment to understand historical and future flood events.* American Geophysical Union-The Meeting of the Americas 2010. Foz do Iguazu, Brazil August 2010.
- Muñoz Arriola, F., S. Shukla, D. P. Lettenmaier, A. Wagner Gomes and R. Lobato Sanchez. *Reliability of streamflow forecasts for the Rio Yaqui Basin.* 34<sup>th</sup> Climate Diagnostics and Prediction Workshop, Monterey, CA. October 29<sup>th</sup> 2009.
- Rodriguez Lopez, O, R. Lobato Sanchez, F. Muñoz Arriola, C. Zhu, E. Pardo, J. G. Rosario, J. Salgado, and I. Rivas. *Aplicación del Acoplamiento MM5-VIC para la Simulación Hidrometrica en la Cuenca del Rio Grijalva.* OMMAC, Cancun, QR, Mexico. November 12<sup>th</sup> 2009.
- Munoz-Arriola, F., S. Shukla, L. Luo, A. Munoz-Orozco, and D.P. Lettenmaier. *Drought Predictability in Mexico.* American Meteorological Society, Phoenix, AZ, USA. January 15<sup>th</sup> 2009.
- Muñoz Arriola, F., S. Shukla, T. Bohn, C. Zhu, D. P. Lettenmaier, A. Wagner Gomes and R. Lobato Sanchez. *Drought monitoring and forecast in Mexico: Applications of the University of Washington West-wide Seasonal Hydrologic Forecast System.* Annual Congress of the Union Geofisica Mexicana. Puerto Vallarta, Mexico. Oct. 30<sup>th</sup> 2008.
- Muñoz Orozco, A., F. Muñoz Arriola, and D.P. Lettenmaier. *Some elements to Improve and Explore Genetic Drought Resistance.* 2008 Join Annual Meeting GSA, SSAA, ASA, CSSA, and GCAGS, October 2008 San Antonio, Texas, USA.
- Muñoz Arriola, F., C. Zhu, A. Ray, and D. Lettenmaier. *Northwestern Mexico Hydrological drought predictability: influences and effects.* Regional Climate Forum for Northwest Mexico and Southwest United States, April 10<sup>th</sup> 2008. Ensenada, BC, México.
- Barros, A. P, F. Munoz, A. W. Wood, N. Voisin, T. Bohn, J. C. Rodriguez, D. P. Lettenmaier, S. S. Burges, and C. J. Watts. *Monitoring the diurnal cycle of land-atmosphere interactions in Sonora, Mexico during NAME/SMEX04.* 85<sup>th</sup> Annual American Meteorological Society Meeting, San Diego, CA. USA.
- Muñoz, F., T. Jackson, and D. Lettenmaier. *SMEX04. NAME 2004 Data Analysis and Seventh Science Working Group Meeting (SWG-7).* Mexico City, Mexico.
- Muñoz Arriola, F. *Eutrophication in the Guaymas Bay: a mass balance approach.* LOICZ Workshop on Mexican Coastal Lagoons. Merida, Yucatan. Mexico.
- Muñoz Arriola, F. *Metabolism on the Colorado River Delta.* LOICZ Workshop on Mexican Coastal Lagoons. Merida, Yucatan. Mexico.
- Botello-Ruvalcaba, M., F. Muñoz Arriola, and M. Elliot. *Net Metabolism and Nutrient Balance Dynamics for the Guaymas Bay: Selection of System's Boundary Conditions.* 1<sup>st</sup> Sea of Cortes International Symposium. Hermosillo, Sonora. Mexico.
- Muñoz Arriola, F. and J.V. Macias-Zamora. *Vanadil etio porfirinas: indicador de contaminacion por petróleo.* XI Oceanography National Congress. Ensenada, Baja California. Mexico.

Botello-Ruvalcaba, M., Elliot, M., V. De Jong, F. Muñoz. *Net Gross Metabolism and Nutrient Budget Dynamic for Coastal Ecosystem in the Gulf of California*. Second Environmental Modeling Seminar 98. Lilliehammer, Norway.

Muñoz Arriola, F. and M. Botello-Ruvalcaba. *Eutrophication and Management with respect to present and future industrial development: the Guaymas Bay*. Environmental University Congress. Hemosillo, México.

Muñoz Arriola, F. and Francisco Delgadillo-Hinojosa. *Heavy Metal Fluxes in the Guaymas Bay: A Prospective Study*. Environmental University Congress. Hermosillo, México.

## POSTER PRESENTATIONS

Carranza, K., Allen, C., Meredith, G., Muñoz-Arriola, F., Doan Crider, D., and E. Boyd-Valandra. Assessing socioecological interactions and resilience with an ecosystem services framework. ESA Annual Meeting (Ecological Society of America). 15-90 August 2022. Montreal, Canada.

Munoz-Arriola, F., P. Sarzaeim, D. Jarquin, H. Aslam, and J. Cronk. *Data-driven enhancements of Climate data for spatially comprehensive genetic-by-environment (GxE) simulations*. National Association of Plant Breeders' 2022 Annual Meeting. August 9, 2022.

Aslam, H. and F. Muñoz-Arriola. Data Management and Visualization Architecture for the integration and modeling of Climate and OMICS data for GxE modeling. National Association of Plant Breeders' 2022 Annual Meeting. August 9, 2022.

Igiraneza Sinyigenga, L. and F. Muñoz Arriola. Towards a Framework for the Assessment of the Socio-economic Impacts of Irrigation Water Use Under Variable Surface Water-Groundwater Interactions. University of Nebraska-Lincoln Spring Research Fair. April 15, 2022. Lincoln, NE. **Awarded as best poster.**

Lucas, N., M. Shyaka, and F. Muñoz-Arriola. Drought and COVID-19 as Compound Events. University of Nebraska-Lincoln Spring Research Fair. April 15, 2022. Lincoln, NE.

Carter, J. P. Sarzaeim, D. Jarquin, R. Quinones, E. Tanghanwaye, and F. Munoz-Arriola. *The Genetic by Environment (GEEN) Phenotype Predictive System Software Development*. NAPPN Annual Conference. February 17, 2021.

Wilson, A. M., R. Cifelli, F. Munoz-Arriola, J. Giovannettone, J. Vano, T. Parzybok, A. Dufour, J. Jasperse, K. Mahoney, and B. McCormick. *Efforts to Build Infrastructure Resiliency to Future Hydroclimate Extremes*. 101st American Meteorological Society Annual Meeting, Virtual Meeting. January 11, 2021.

Jain, J<sup>1</sup>, D. Khare, and F. Munoz-Arriola. Mapping Attributions between Flood Vulnerabilities and Risk Management Policies in India. 101st American Meteorological Society Annual Meeting, Virtual Meeting. January 11, 2021.



- Ntaganda<sup>5</sup>, P., M. Shyaka<sup>5</sup>, and F. Munoz-Arriola. Rwanda's Hydroclimate across Urban and Agricultural Landscapes. 101st American Meteorological Society Annual Meeting, Virtual Meeting. January 11, 2021.
- Wilson, A. M., R. Cifelli, F. Munoz-Arriola, J. Giovannettone, J. Vano, T. Parzybok, A. Dufour, J. Jasperse, K. Mahoney, and B. McCormick. *Efforts to Build Infrastructure Resiliency to Future Hydroclimate Extremes*. American Geophysical Union, Fall Conference, Virtually. December 9, 2020.
- Jarquin<sup>4</sup>, D., F. Munoz-Arriola, P. Sarzaeim<sup>1</sup>, A. Amaranto<sup>1</sup>. *Improving genomic prediction of target hybrids in unobserved environments using geospatial assessment of predictive analytics derived from machine learning techniques*. 6th International Conference of Quantitative Genetics. Virtual and On Demand, November 10-14, 2020.
- Daniel A. Rico<sup>1</sup>, Carrick Detweiler, Francisco Muñoz-Arriola. *Power-over-Tether UAS Leveraged for Nearly-Indefinite Meteorological Data Acquisition*. 2020 ASABE 2020 Annual International Meeting. Virtual and On Demand, July 13-15, 2020.
- Alves de Oliveira, L., F. Muñoz-Arriola, D. Martin, C.R. Allen. *Crafting an irrigation sustainability framework in the Northern High Plains (USA) using stakeholders' opinions*. 2020 ASABE 2020 Annual International Meeting. Virtual and On Demand, July 13-15, 2020.
- Khan, M., C. Wunderlin, P. Sarzaeim, W. Ou, and F. Munoz-Arriola. *Decoupling the Hydroclimatological condition before and during the recent flooding event in the Missouri River Basin*. 100th American Meteorological Society Annual Meeting, Boston, MA. January 13, 2020.
- Ghosh, Kausik and Francisco Munoz-Arriola. *Hydroclimate and Anthropogenic Drivers of Streamflow Pulses in the Himalayan River Tista, India*. American Geophysical Union, Fall Conference, Washington, DC. December 11<sup>th</sup>, 2019.
- Cifelli, Robert, Anna Maria Wilson, Alexis Dufour, Tye W Parzybok, Michael D Dettinger, Julie A Vano, Francisco Munoz-Arriola, Kathleen Anne Miller. *Toward Greater Resilient Water Infrastructure to Future Hydrometeorological and Climate Extremes: Lessons from Oroville Dam and Hurricane Harvey*. American Geophysical Union, Fall Conference, Washington, DC. December 11<sup>th</sup>, 2019.
- Munoz-Arriola, F., A. Amaranto, P. Sarzaeim, L. Alves-Oliveira. *Mapping the reliability of semi-seasonal forecasts of groundwater-levels using machine learning across the Northern High Plains*. American Geophysical Union, Fall Conference, Washington, DC. December 11<sup>th</sup>, 2019.
- Jarquin, D., F. Munoz-Arriola, P. Sarzaeim, and A. Amaranto. *Geospatial assessment of phenotype predictive analytics using machine learning techniques and genome information*. 2019 National Association Plant Breeders Conference. Pine Mountain, GA. August 27<sup>th</sup>, 2019.

- Rico, D. A., C. Detweiler, and F. Munoz-Arriola. Power Tethered UAS Network for Automated Indefinite Data Acquisition to Assist Agricultural Management and Production. ASABE 2019 Annual conference. Boston, MA. July 9<sup>th</sup>, 2019.
- Amaranto, A., D. Solomatine, G. Corzo, F. Pianosi, and F. Munoz-Arriola. Sensitivity Analysis of Data-driven Groundwater Forecast to Hydro-climatic Controls in Irrigated Croplands. European Geosciences Union General Assembly 2018. Vienna, Austria. April 8<sup>th</sup>, 2019.
- Munoz-Arriola, F. C. Detweiler, D. Rico, P. Sarzaeim, A. Amaranto. Cross-scale phenotype predictive data analytics using machine learning techniques and long-term persistent monitoring with UAVs: A framework. Phenome 2019. February 10, 2019.
- Helda, N., A. Kilic, F. Munoz-Arriola, and R. G. Allen. Evaluation of TRMM Multi-satellite Precipitation Analysis (TMPA) product (3B42) over Indonesia (1998-2017). 11th International Symposium on Lowland Technology, September 26-28, 2018 in Hanoi, Vietnam.
- Rico, D., C. Barnes, and F. Munoz-Arriola. Technologic development and policy studies for resilient FEWES systems. NSF 2018 Research Traineeship (NRT) Meeting: Advancing knowledge and transforming the future. Arlington, VA. September 27, 2018.
- Munoz-Arriola, F. Allen, C., S. Elbaum, N Shank, and D. Twidwell. Explore, build, and innovate the Food-Energy-Water nexus: A graduate training program on resilient complex landscapes NSF 2018 Research Traineeship (NRT) Meeting: Advancing knowledge and transforming the future. Arlington, VA. September 27, 2018.
- Rico, D.A., C. Detweiler, and F. Munoz-Arriola. Tethered drone system for high throughput phenotyping: design and building. Big Data Hub Regional Conference, Lincoln, NE. September 21, 2018.
- Kahn, M., F. Munoz-Arriola, and J. Clarke. Mapping nonstationary regimes across the US. Big Data Hub Regional Conference, Lincoln, NE. September 21, 2018.
- Amaranto, A., F. Munoz-Arriola, G. Corzo, and D. Solomatine. Improving geospatial representation of groundwater yields across the groundwater management divisions. Big Data Hub Regional Conference, Lincoln, NE. September 21, 2018.
- Allen, C., S. Elbaum, N Shank, D. Twidwell, and F. Munoz-Arriola. *Training in Theory and Application of Cross-scale Resilience in Agriculturally Dominated Social Ecological Systems*. Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS) 2018: Principal Investigators Workshop, Alexandria, VA. May 16-18 2018.
- Helda, N., A. Kilic, F. Munoz-Arriola, and R. G. Allen. *Statistical Geospatial Assessment of TRMM multi-satellite precipitation analysis (TMPA) product (3B42\_v7) over Indonesia (1998-2017)*. UNL Graduate Research Fair, Lincoln, NE. April 15 2018.

- Munoz-Arriola, F. D. Jarquin, D. Osornio, and G. Lopez-Morteo. *Evidencing Transitions to Nonstationary using Extreme Precipitation Return Periods*. European Geosciences Union General Assembly 2018. Vienna, Austria. April 10<sup>th</sup> 2018.
- Osornio-Hernandez, J.D., G.A. Lopez-Morteo, and F. Munoz-Arriola. *A review of different database management systems for storing multidimensional, spatially gridded, and time variable data*. Midwest Big Data Hub, Omaha, NE. October 2<sup>nd</sup> 2017.
- Herrera-Leon, A. G. Lopez-Morteo, and F. Munoz-Arriola. *Simplifying Access to Publicly Available Climate/Weather/Water Data Across Geopolitical Boundaries*. Midwest Big Data Hub, Omaha, NE. October 2<sup>nd</sup> 2017.
- Khan, M. Shaik, R., A. Herrera, and F. Munoz-Arriola. *Assessing Extreme Events and Population Growth in India: Suitability of Climate Analytics and Synthesis*. Midwest Big Data Hub, Omaha, NE. October 2<sup>nd</sup> 2017.
- Shaik, R., M. Khan, A. Herrera, and F. Munoz-Arriola. *Study of Observed Precipitation and Temperature Extreme Indices over India*. American Meteorological Society 30<sup>th</sup> Conference on Climate Variability and Change 2017. Baltimore, US. July 28<sup>th</sup> 2017.
- Amaranto, A., F. Muñoz Arriola, M. Goyal Kumar, G. E. Meyer, D. Solomatine, G. Corzo-Perez, and D. Jarquin. *Hydroclimatic Controls on Agroecosystem Resiliency in the Northern High Plains*. American Geophysical Union, Fall Conference, San Francisco, CA. December 16<sup>th</sup> 2016.
- Jaimes, J., S. Bartelet-Hunt, and F. Munoz-Arriola. *Water Quality Modeling of an Agricultural Watershed under Extreme Weather Events*. American Geophysical Union, Fall Conference, San Francisco, CA. December 16<sup>th</sup> 2016.
- Rico, D.A., J.C. Chacon, G. Corzo, K. Smith, F. Munoz-Arriola. *Implementing Verification Procedures on a Calibrated vs. non-Calibrated Streamflow for Agricultural Drought Forecast*. American Geophysical Union, Fall Conference, San Francisco, CA. December 16<sup>th</sup> 2016.
- Maguire, M. and F. Munoz-Arriola. *Exploring Large-scale Parameterization of Irrigation in the Northern High Plains*. American Society of Agricultural and Biological Engineers. Orlando, FL. July 21, 2016.
- Rico, D.A., J.C. Chacon, G. Corzo, K. Smith, F. Munoz-Arriola. *Role of Calibration on Streamflow Prediction for Seasonal Agricultural Forecasts*. American Meteorological Society, New Orleans, LA. January 14, 2016.
- Munoz-Arriola, F., R. Stowell, C. Ancona-Villarreal, A. Rosales-Martinez, G. Lopez-Morteo, and D. Rudnick. *Use of Interoperability/Information Systems to Inform Crop-, Cattle-, and Community-Decision Makers in a Changing Climate*. American Meteorological Society, New Orleans, LA. January 14, 2016.

- Castro-Garcia, L., G. Lopez-Morteo, and F. Munoz-Arriola. *The Water for Food Interoperability System (WaFIS)*. 2015 Natural Resources Districts Legislative Conference, Lincoln, NE. January 28, 2015
- Morton, F., K. Smith, A. Mohammad Abadi, I. Luna, and F. Munoz-Arriola. *Assessing Land Surface Hydrologic Resilience to Extreme Hydrometeorological Events in Natural and Water-controlled Ecosystems*. American Meteorological Society, Phoenix, AZ. January 9, 2015.
- Rico, D., C. E. Ancona-Villareal, A. A. Rosales-Martínez, L. Castro, G Lopez Morteo, and F. Munoz-Arriola. *Toward a Drought Seasonal Forecast in the Platte River Basin*. American Meteorological Society, Phoenix, AZ. January 9, 2015.
- Ou, G., F. Munoz-Arriola, X. Chen, and A. Kilic. *Improving Soil-Vegetation Dynamics in the Soil and Water Assessment Tool (SWAT)*. American Geophysical Union, Fall Conference, San Francisco, CA. December 16, 2014.
- Smith, K., M. Morton, D. Rico, A. Mohamad Abadi, I. Luna, B. Livneh, and Francisco Munoz-Arriola. *Hydroclimatology of Flood and Drought Events in the Northern High Plains, U.S.* American Geophysical Union, Fall Conference, San Francisco, CA. December 16, 2014.
- Castro-Garcia, L., G. Lopez-Morteo, and F. Munoz-Arriola. *Water for Food Information System*. 2014 Water for Food Conference, Seattle, WA. October 21, 2014.
- Munoz-Arriola, F., A. Mohammad Abadi, K. Smith, M. Morton, D. Rico, L. Castro-Garcia, and G. Lopez-Morteo. *Achieving Water Sustainability in the Era of Information Technology: The Role of Hydroinformatics and Integrated Hydrology*. 2014 Water for Food Conference, Seattle, WA. October 21, 2014.
- Morton, M., D. Rico, J. Abraham Torres, A. Mohammad Abadi, I. Luna, and F. Munoz-Arriola. *Assessing Soil Moisture Response to Extreme Hydrometeorological Events in the Platte River Basin*. University of Nebraska-Lincoln Summer Research Symposium, Lincoln, NE. August 6, 2014.
- Rico, D.A., Abraham, J.T., Azar, M., Mallory, M., Francisco, Munoz-Arriola. *Determining Streamflow Sensitivity to Changes in Temperature on the Platte River Basin*. Poster presented at the Nebraska Summer Research Symposium, University of Nebraska-Lincoln, Lincoln, NE.
- Morton, M., D. Rico, J. Abraham Torres, A. Mohammad Abadi, I. Luna, and F. Munoz-Arriola. *Assessing the Impact of Large Scale Climate Variability on Surface Water Resources in Nebraska*. University of Nebraska-Lincoln Undergraduate Research Fair, Lincoln, NE. April 16<sup>th</sup> 2014
- Munoz-Arriola, F., W. Lavado, R. J. Oglesby, C. M. Rowe, J. L. Vazquez-Aguirre. *Transcontinental hydrometeorological extremes and streamflow generation in the Pacific*

- Coast. American Geophysical Union, Fall Conference, San Francisco, CA. December 10<sup>th</sup> 2013.
- Munoz-Arriola, F., M. Dettinger, R. Hanson, C. Faunt, and D. Cayan. *Modeling the Conjunctive use of Surface Water and Groundwater in California's Central Valley*. 2013 Water for Food Conference, Lincoln, Nebraska. May 5<sup>th</sup> 2013.
- Munoz-Arriola, F., M. Dettinger, R. Hanson, C. Faunt, and D. Cayan. *Hydroclimatic Limits on Conjunctive use of Surface Water and Groundwater in California's Central Valley. Vulnerability and Adaptation to Extreme Events in California in the Context of a Changing Climate: New Scientific Findings*, San Diego, CA. December 13<sup>th</sup> 2011.
- Munoz-Arriola, F., M. Dettinger, R. Hanson, C. Faunt, and D. Cayan. *Climate Variability and Water-Regulation Effects on Surface Water and Groundwater Interactions in California's Central Valley*. American Geophysical Union, Fall Conference, San Francisco, CA. December 5<sup>th</sup> 2011.
- Frans, C. E. Istanbuloglu, V. Mishra, F. Munoz-Arriola, D. P. Lettenmaier. *Examining the role of climate and land use change on hydrologic trends in the Upper Mississippi River Basin*. American Geophysical Union, Fall Conference, San Francisco, CA. December 8<sup>th</sup> 2011.
- Munoz-Arriola, F., M. Dettinger, R. Hanson, and D. Cayan. *Surface Water and Groundwater interactions: Natural vs Human Factors in Central Valley CA*. Groundwater-Surface Water Interaction: California's Legal and Scientific Disconnect. Sacramento CA. June 14<sup>th</sup> 2011.
- Munoz-Arriola, F. R. Hanson, M. Dettinger, and D. Cayan. *Interdependence of Climate and Land Surface Hydrology in the Central Valley: The use of modeling and remote sensing*. California Water and Environmental Modeling Forum 2011. Monterey CA March 1<sup>st</sup> 2011.
- Tang, Q., F. Munoz-Arriola, E. Vivoni, and D. P. Lettenmaier. *Effects of vegetation dynamics on evapotranspiration and soil moisture in Northwestern Mexico*. American Meteorological Society, Seattle, WA, USA. January 24<sup>th</sup> 2011
- Frans, C. F. Munoz-Arriola, E. Istanbuloglu, D. P. Lettenmaier. *Impacts of Agricultural Extensification on Regional-scale Hydrology: the case of the Mississippi River Basin*. American Meteorological Society, Seattle, WA, USA. January 24<sup>th</sup> 2011.
- Munoz-Arriola, F. R. Hanson, Q. Tang, T. Das, M. Dettinger, and D. Cayan. *Surface hydrology-climate interdependency in the Central Valley Agrosystem*. American Geophysical Union, Fall Conference, San Francisco, CA. December 17<sup>th</sup> 2010.
- Frans, C. F. Munoz-Arriola, E. Istanbuloglu, D. P. Lettenmaier. *Impacts of variable agricultural expansion and contraction on regional scale hydrology: The case of the Upper Mississippi River and Ohio River Basins*. American Geophysical Union, Fall Conference, San Francisco, CA. December 13<sup>th</sup> 2010.

- Perez-Morga, N., T. Kretzschmar, F. Munoz-Arriola, and T. Cavazos. *Climate Variability in Southern Mexico: the case of the Oaxacan Pacific Coast Basins*. American Geophysical Union, Fall Conference, San Francisco, CA. December 13<sup>th</sup> 2010.
- Munoz-Arriola, F., A. Wagner-Gomez, S. Shukla, T. Bohn, and D. P. Lettenmaier. *Streamflow Forecast with Agriculture Applications in Northwestern México*. Steve Burges retirement symposium. Hydrology in the 21st Century: Links to the past, and a vision for the future. University of Washington, Seattle, WA, March 25<sup>th</sup>, 2010.
- Munoz-Arriola, F., S. Shukla, T. Bohn, D. P. Lettenmaier, R. Lobato-Sanchez, and A. Wagner-Gomez. *Predicción Hidrológica y de Sequía en Norte América*. 2<sup>o</sup> Taller sobre Variabilidad y Cambio Climático en la Costa Oeste de América del Norte. IMTA and University of Arizona, Jiutepec, Morelos, July 22 del 2009.
- Munoz-Arriola, F., Q. Tang, C. Zhu, E.R. Vivoni, and D.P. Lettenmaier. *Interannual and intraseasonal interactions between greening process and soil moisture in the North American monsoon region in northwestern Mexico*. American Geophysical Union, Fall Conference, San Francisco, CA.
- Shukla, S., F. Munoz-Arriola, T. Bohn, A. C. Steinemann, and D. P. Lettenmaier. *Assessment of ESP based Drought Prediction Skill*. CPDW Meeting, Nebraska, USA October 23<sup>rd</sup> 2008.
- Munoz-Arriola, F., S. Shukla, T. Bohn, A. Ray, R. Labato Sanchez, A. Wagner Gomes, and D. P. Lettenmaier. *Intraseasonal-to-interannual hydrologic prediction and water resource applications in the NAME Tier I core area*. Climate Prediction Program for the Americas Meeting, Maryland, MD, USA. Sept. 2008.
- Bohn, T., Francisco Munoz, S. Shukla, B. Livneh, and D. P. Lettenmaier. *Incorporating multi-model ensemble techniques into a real-time drought monitoring system*. Climate Prediction Program for the Americas Meeting, Maryland, MD, USA. Sept. 2008.
- Munoz-Arriola, F., C. Zhu, A. Ray, and D. Lettenmaier. *Hydrological drought sensitivity to land use changes in a Northwestern Mexico River Basin*. Regional Climate Forum for Northwest Mexico and Southwest United States, Abril 10 del 2008. Ensenada, BC, México.
- Zhu, C. F. Munoz-Arriola, A. Wood, A. Wagner-Gomez, R. Lobato-Sanchez and D. P. Lettenmaier. *The Extended University of Washington West-wide Hydrological Seasonal Forecast System: Covering Mexican Territory*. Regional Climate Forum for Northwest Mexico and Southwest United States, Abril 10 del 2008. Ensenada, BC, México.
- Munoz-Arriola, F., G. Thomas, A. Wood, A. Wagner-Gomez, R. Lobato-Sanchez, and D. P. Lettenmaier. *Hydrological Forecasting in Mexico: Extending the University of Washington West-wide Seasonal Hydrologic Forecast System*. American Geophysical Union, Fall Conference 2007, San Francisco, CA.

Wei Li, A. P. Barros, D. Hyuk-Kang, O. P. Prat, P. Shrestha, K. Tao, J. Giovannettone, F. Munoz, W. Patrick, C. Peters-Liddard, and T. Jackson. *Surface fluxes and convective instability in boundary layer in the summer Fort Cobb experiment, CLASIC*. American Geophysical Union, Fall Conference 2007, San Francisco, CA. Munoz-Arriola, F. and D. Lettenmaier. *Hydrological drought sensitivity to land use changes in the Yaqui River Basin*. 2007 Joint Assembly (AGU), Acapulco, México.

## INVITED TALKS

Universidad Autónoma de Baja California-Instituto de Ciencias Agrícolas. *Bases para una agricultura de acción climática y resiliente*. III Simposio Internacional de Agricultura, Seguridad Alimentaria y Conservación del Suelo. Diciembre 9, 2022. Ejido Nuevo Leon, Baja California, México (Virtual).

Colegio Mexicano de Ingenieros en Irrigación A.C. *Aplicaciones informáticas para el diagnóstico y pronóstico de la resiliencia agrícola a eventos hidrometeorológicos y climáticos extremos*. VII Congreso Nacional de Riego, Drenaje y Biosistemas. November 23, 2022. Teziutlán, Puebla, México (Virtual).

University of Nebraska-Lincoln. *Climate connections and connectivity in the technologic continuum for agriculture*. NSF ERC ARC Retreat, University of Nebraska-Lincoln. August 16, 2022.

El Salvador and Honduras Secretariats of the Environment and Natural Resources. *Llenado de datos con Maquinas de aprendizaje para el análisis de resiliencia a sequías del acuífero High Plains en Nebraska*. Groundwater: Capacitación sobre manejo de las aguas subterráneas, con foco en la protección de la calidad del agua en el acuífero transfronterizo. September 30, 2022. Virtual.

Asociación Mexicana de Hidráulica. *Perspectivas digitales y conceptuales para la Construcción de la Resiliencia a los Eventos Extremos del Sector Hidroagrícola e Hidroecológico en la Frontera México-EUA*. Panel on Impacto del Cambio Climático: Eventos Extremos Inundaciones. Primer Cumbre Binacional del Agua. September 22, 2022. México City, Mexico.

Asociación Mexicana de Hidráulica. *Uso de ciencia de datos para la mejora en la predicción de la resiliencia a inundaciones*. Panel on Impacto del Cambio Climático: Eventos Extremos Inundaciones. May 13, 2022. Mexico City, México.

Indian Institute of Technology-Roorkee & National Institute of Hydrology. *Climate-resilient water resources and the quest to achieve local-to-global security and sustainability*. 2022 Water Conclave. March 2, 2022. Roorkee, India.

Universidad Católica Nuestra Señora de la Asunción. *Sistemas hidrológicos Complejos: Infraestructura hídrica resiliente al clima*. Virtual. November 24, 2021.



Colorado School of Mines. Departmental Seminar. Leveraging collective actions and digital collectives to (re)design climate-resilient water systems in a non-stationary world. Virtual. March 22, 2021.

Banaras Hindu University. Sixth Graduate Seminar on Natural Resource Management. *Collective (Re)design of climate-resilient water resources*. Virtual-South Africa. March 18, 2021.

University of Zululand and Chang'An University. Earth and Environmental Sciences International Webinar Conference 2021. *Climate-resilient water infrastructure in a non-stationary world*. Virtual-South Africa. February 1, 2021.

Escuela Colombiana de Ingeniería Julio Garavito, Ministry of Foreign Affairs of the Netherlands, IHE Delft. *Complejidades de la construcción de infraestructura hídrica y agrícola resiliente al Cambio Climático*. Seminario Abierto Hidroinformática Para La Sostenibilidad De Los Recursos Hídricos. Virtual-Colombia January 29, 2021.

International Association for Water, Environment, Energy, and Society. Application of Remote Sensing and GIS: Water, Environment, Land and Society. *Climate-Resilient Water Infrastructure in Complex Agricultural landscapes: Integration of Data, Management, and Policy*. INTERNATIONAL WORKSHOP jointly Organized by IAWEES & IHE Delft, Institute for Water Education. In Association with: RNTU, NIH, CSIR-AMPRI, WALMI, NCU, CVRU. Virtual-India. December 2, 2020.

Genomes to Fields initiative. *Plugin-based architecture of software to predict corn phenotypes*. 2020 G2F GxE Collaborator's Meeting at the Phenome Meeting. February 24, 2020.

American Meteorological Society-Water Resources Committee. *2019 Midwest Flood Event: complexities, effects, and resilience*. Water Resources Committee. September 25, 2019.

University of Nebraska-Lincoln. *The water continuum: predictability of a resilient complex system in a changing environment*. Stout Lecture. Earth and Atmospheric Sciences Department. October 19, 2018.

University of Nebraska-Lincoln. *From paper to BIG Data: the NEXUS Water-Food-Energy Ecosystem services in the era of information*. Department of Biological Systems Engineering. Lincoln, NE. September 12<sup>th</sup> 2018.

The Ohio State University. *Extreme precipitation: predictability and transitions to nonstationary design*. Department of Civil, Environmental and Geodetic Engineering. Columbus, Ohio, February 2<sup>nd</sup> 2018.

Computing Community Consortium (Computing Research Poster). Munoz-Arriola, F., S. Shekhar, J. Colleti, L. Ramaswamy, C. Krinz, L. Varshney, and D. Richardson. *Toward a Resilient Food-Energy-Water-Ecosystem Services Nexus: Analytics and Synthesis*. Computing Community Consortium. Computing Research: Addressing National Priorities and Societal Needs. Washington D.C. October 22<sup>nd</sup> 2017.

National Institute of Hydrology. *Engineering a Resilient Food-Water-Energy Nexus in a Changing Climate*. Roorkee, India, June 26th 2017.

Tezpur University. *Toward a Food-Energy-Water-Ecosystem Services Nexus for Rapid Growing Cities in a Changing Climate*. ISSUE-2017 Tezpur University, Tezpur, India, June 22<sup>nd</sup> 2017.

National Weather Service (NWS-NOAA) Training Center. *The Continuum Research-Information-Operations-Society*. Eighth Annual Missouri Basin River Forecaster's Meeting. January 26<sup>th</sup> 2017.

Daugherty Water for Food Institute-UNL. *From paper to BIG DATA: Interoperability of the NEXUS Water-Food-Energy Data*. DWFI-Research Forum. May 12<sup>th</sup>, 2016.

Universidad Autonoma de Chapingo. *Cambio Climático y el Nexo Agua-Alimento-Energía: Monitoreo, Modelación, y Predicción*. Chapingo, Mexico City. June 9th 2015.

Universidad Nacional Autonoma de México. *Predictability of Hydrometeorologic and Climate Extreme Events*. 3rd Climate and Meteorologic North West Regional Meeting 2015. Mexico City, June 4th 2015.

Daugherty Water for Food Institute-UNL. *From paper to BIG DATA: Interoperability of the NEXUS Water-Food-Energy Data*. DWFI-Research Forum. May 28, 2015.

Colegio de Postgraduados. *Flood and Drought Forecast*. Montesillo, México. November 24<sup>th</sup>, 2014.

Universidad Autónoma de Chapingo. *Nexus Water-Food-Energy: Challenges and Oportunities*. Texcoco, México. November 24, 2014.

School of Natural Resources-UNL. *Engineering Water Sustainability: Leveraging Sources of Predictability of Water States*. Lincoln, NE. September 10, 2014.

Department of Civil Engineering-UNL. *Engineering Water Sustainability in a Changing Climate*. Lincoln, NE. February 21, 2014.

Department of Statistics-UNL. *Diagnosis and Prognosis of Extreme Events through the Atmosphere-to-aquifer Continuum*. Lincoln, NE. November 6, 2013.

Centro de Investigaciones en Materiales Avanzados-Mexico. *Water Sustainability and Climate*. Chihuahua, Mexico. October 26, 2013.

Centro de Investigaciones en Meteriales Avanzados y Gobierno del Estado de Chihuahua. *Water and Food under Climate Variability and Change*. Chihuahua, Mexico. December 6, 2012.

Wageningen University and Research Center. *Modeling the Terrestrial Hydrological Cycle*. Wageningen, The Netherlands. September 25, 2012.

University of Nebraska, Lincoln. *Hydrological Perspective of the Water-Food-Energy-Climate Nexus in the Era of Information Technology*. Lincoln, NE. September 20, 2012.

New Mexico State University. *Modeling the Hydrologic Cycle for Integrated Water Resources Management*. Las Cruces, NM. September 12, 2012.

Consejo Nacional de Ciencia y Tecnología. *Hydroclimatological Networks: Current Status and Future Enhancement*. Hydrometeorological and Climate Disasters Network Meeting, Puerto Vallarta, México. November 9, 2011.

Universidad Nacional Autónoma de México. *Water Resources Sustainability: Science and Engineering*. Centro de Geociencias, Juriquilla, Queretaro. México, September 8, 2011.

Universidad Autónoma de Baja California. *Modeling the Hydrological Cycle*. Instituto de Investigaciones Oceanológicas, Ensenada, BC. México, June 15th 2011.

Colegio de Postgraduados. *Hydrological Perspective of Climate Variability and Change in Mexico*. Texcoco Estado de México. April 11<sup>th</sup> 2011.

Centro de Investigaciones Científicas y Educación Superior de Ensenada. *Water System: Science and Engineering*. Ensenada, BC, México. April 8th 2011.

Centro de Investigaciones Científicas y Educación Superior de Ensenada. *Hidrometeorología: Ciencia y Tecnología para el Estudio de los Recursos Hídricos en México*. Ensenada, BC, México. July 9th 2010.

Scripps Institution of Oceanography, University of California, San Diego. *Toward a Scientific and Technological Hydrological Framework in North America: Implementing Hydroclimatological Monitoring, Modeling, and Forecast Tools in Mexico*. San Diego CA. July 6<sup>th</sup> 2010.

University of Washington. *Water Resources in México: A Historical Perspective of Multi-scale Hydrology*. Environmental/Water Resources Seminar at the Department of Civil and Environmental Engineering. Seattle, WA. April 29 del 2010.

University of Washington. *Hydroclimatology in Mexico: Past, Present, and Future*. Climate Impacts Group Seminar Series. Seattle, WA. Feb. 23<sup>rd</sup> 2010.

Universidad Autónoma de Baja California. *Hydrology in Mexico: Applications and Perspectives*. Instituto de Investigaciones Oceanológicas, Ensenada, BC. México, May 27<sup>th</sup> 2009.

Universidad Autónoma de San Luis Potosí. *Hydrology in a Climatological and Meteorological Contexts*. Department of Engineering, San Luis Potosí, SLP, México. March 4<sup>th</sup> 2009.

Duke University. *Hydrological Response to Rainfall Uncertainty in Northwestern Mexico*. Graduate Students Seminar, Durham, NC, November 16<sup>th</sup> 2004.

Duke University. *Surface Hydrology in Northwestern Mexico: the case of Observational Variability in Precipitation*. Department of Civil and Environmental Engineering at Duke University. Graduate Students Seminar, Durham, NC, October 21<sup>th</sup> 2005.

## TEACHING/ADVISING/MENTORING EXPERIENCE

### UNIVERSITY OF NEBRASKA-LINCOLN

#### Courses

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##### *Graduate Program on Resilient Complex Landscapes Interdisciplinary courses*

*Living in our Changing Climate (Fall 2023)-Undergraduate Honors Program (17 students)*

*Water in Society (Spring 2023)-Undergraduate level (137 students)*

*Climate Adaptation and Mitigation for Resilience (Falls 2022)-Graduate level*

*Complexity Science in Food, Energy, Water, and Ecosystem Services Systems\* (Falls odd years, starting 2019)-Graduate level (5 instructors, 2 ecologists, 1 computer scientist, 1 policy scientist, and 1 Civil Engineer: 18 students, 8 students, respectively).*

*Attribution Science and Decision Making in Socioecological Systems\* (Falls even years, starting 2020)-Graduate level (co-taught with Dr. Romanelli, University of Sao Paul: 10 students).*

*Hydraulic Systems in Europe\* (Summers odd years, starting 2019; 3-week graduate field trip) – Graduate level (co-organized Laszlo Hayde, Delft Institute for Water Education: 9 UNL graduate students).*

##### *Disciplinary courses*

*Hydroclimatology\* (Springs, 2016, 2017, 2019, 2021, 2023)-Undergraduate and Graduate levels (~12 students).*

*Soil and Water Resources Engineering\* (Falls, 2015-2019)-Undergraduate level (~25 students).*

*Small Watershed Hydrologic Modeling (Spring 2015)-Graduate level (8 students)*

*Physical Hydrology (Spring 2014 and 2015)-Undergraduate and Graduate levels (~30 students).*

*Seminar I (Fall 2014)-Graduate level (15 students).*

##### *Exploratory courses (Special Topics)*

*Attribution Science (Spring 2019)-1 Graduate student*

*Statistics of Extremes in Water Resources (Fall 2016 and Spring 2017)- 1 Graduate student*

*\*Periodically taught*

#### Current Advising

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##### *Research Associates and Scientists*

Samuel Ortega Salazar (M. Sc. In Natural Resources). Remote sensing of Evapotranspiration.

### *Graduate Students*

Rico, Daniel A. (PhD in Computer Sciences and Engineering: 08/2021 to now). *Robotics and unman aircraft development for cross-scale agrometeorological modeling*. Co-Advised with Dr. Carrick Detweiler. **Daugherty Water for Food Fellowship**.

Aslam, Hasnat (PhD in Natural Resources: start date 01/2021-now). Artificial Intelligence Applications to (re)Design Climate-Resilient Water Resources Infrastructure.

Jagriti, Jain (PhD in Civil Engineering: 08/2019-now). *Predictive and mining analytics of machine learning for flood-resilient water resources in small communities in India*. Indian Institute of Technology-Roorkee (Co-advised with Dr. Deepak Khare).

Greer, Hellen (in training for MSc in Natural Resources: Applied Climate Sciences; 07/2016-now). *Understanding and Communication and Attribution of Extreme Precipitation to Climate Changes*.

### *Undergraduate Research Experience*

Espinosa, Michelle (Bs. Computer Sciences and Engineering 09/2022 to now). Development climate analytics for action using Python.

## Mentoring

### *Research Associates & Faculty*

Kausik Ghosh, Vidyasagar University (Department of Geography and Environmental Management, Assistant Professor, 05/2022-now)

Rubi Quiñones, Southern Illinois University, Edwardsville (Department of Computer Sciences, 08/2022-now)

### *Graduate Students*

Daniel A. Rico, University of Nebraska-Lincoln (now Ph.D. in Computer Sciences and Engineering, 2013-now)

### *Undergraduate Students*

Duke Alumni program

## Visiting Scholars

Adarsh D. (Faculty at TKM College of Engineering Kollam, India: December 2023)  
Collaboration in Hydroinformatics.

Arathy Nair (Ph.D. student at TKM College of Engineering Kollam, India: December 2023)  
Flood risk analytics

## Former Members

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### Graduated

Cronk, Jonathan (MSc in Biological Systems Engineering: November 19, 2023). Modeling resilient groundwater quality in agricultural landscapes (Co-advised with Dr. Sorab Panday).

Zarco, Armando (MSc in Biological Systems Engineering: start date May 15, 2023). Socio-environmental drivers of adaptive water resources management. **Veteran Post 9/11 GI Bill assistantship; Daugherty Water for Food Fellowship.**

Quiñones, Rubi (PhD in Computer Sciences and Engineering: April 22, 2022). Unsupervised cosegmentation and phenotypes for multi-modal, -view, and -state imagery. (Co-advised with Dr. Ashok Samal and Dr. Sruty Das Choudhury). **National Science Foundation Research Training program.**

Sarzaeim, Parisa (PhD in Biological Systems Engineering: April 22, 2022). *Hydroclimate controls of phenotype predictability.* Climate data and analytics for maize phenotype predictability and uncertainty assessment.

Espinoza García, Carlos Alonso (MSc in Engineering: August 5, 2021). *Gestión de datos heterogéneos asociados al COVID-19 en México.* Co-Advised with Gabriel Lopez-Morteo, Instituto de Ingeniería at Universidad Autónoma de Baja California, México). **Consejo Nacional de Ciencia y Tecnología Fellow.**

Rico, Daniel A. (MSc/PhD in Computer Sciences and Engineering: July 19, 2021). *Robotics and unman aircraft development for cross-scale agrometeorological modeling.* Co-Advised with Dr. Carrick Detweiler. **National Science Foundation Research Training program.**

Kumar, Ashish<sup>1</sup> (PhD in Civil Engineering: April 19, 2021). *Machine Learning Approach for Improving Near Real Time Satellite Rainfall Estimates and Streamflow Simulations.* Indian Institute of Technology-Bombay (Co-advised with Dr. RAAJ Ramsankaran).

Amaranto, Alessandro (PhD in Biological Systems Engineering: January 7, 2019). *Hydroclimatic Controls in Predictability of Conjunctive Use of Surface Water and Ground Water.* Co-Advised with Dimitri Solomatine (IHE-Hydroinformatics, The Netherlands). **Robert B. Daugherty Water for Food Institute PhD-Fellow.**

Jaimes-Correa, Juan C. (PhD in Civil Engineering: July 25, 2017). *Modeling the Sensitivity of Emerging Contaminants to Drought and Extreme Precipitation.* Co-Advised with

- Shannon Bartelt-Hunt (Civil Engineering). **Fulbright Fellow**. Entrepreneur, now consultant at *Innovator*.
- Osornio-Hernandez, Jesus-Donaldo (MSc in Computer Sciences: June 16, 2018). *Desarrollo de una plataforma de software para la gestión de datos climáticos*. Co-Advised with Gabriel Lopez-Morteo, Instituto de Ingenieria at Universidad Autonoma de Baja California, México. **Consejo Nacional de Ciencia y Tecnologia Fellow**.
- Herrera-Leon, Luis-Alejandro (MSc in Computer Sciences: June 16, 2018). *Desarrollo de una plataforma para el analisis de extremos y su incertidumbre*. Co-Advised with Gabriel Lopez-Morteo, Instituto de Ingenieria at Universidad Autonoma de Baja California, México). **Consejo Nacional de Ciencia y Tecnologia Fellow**.
- Smith, Katherine. (M. Sc. in Agricultural and Biological Systems Engineering). *Extreme Hydrometeorological and Climate Event Resiliency*. April 20, 2016. Water Resources Planning and Management. Research experience-**NASA Fellowship**. Now at the US Army Corp of Engineers.
- Williams, Gregory. (M. Sc. In Advanced Water Management for Food Production). *Effects of Drought on Water Management in Protected Areas of Guayana*. May 2015. University of Nebraska-Lincoln and UNESCO's Institute of Water Education (The Netherlands). **IHE-UNL Fellowship**. Consultant.

### *Graduated (Committee member)*

- Osman, Ahmed (M Sc Hydroinformatics: April 14, 2021). Exploring the Use of an Artificial Intelligence Chatbot Mobile Application for Providing Early Flood Awareness. External Reviewer (Committee Member; Advised by Dimitri Solomatine and Gerald Corzo; IHE-Delft, The Netherlands).
- Sanchez Hernandez, Karel Adrian (M Sc Hydroinformatics: April 6, 2021). Machine Learning methods for characterizing and tracking spatiotemporal drought events in the Central America Dry Corridor. External Reviewer (Committee Member; Advised by S.J. van Andel and Gerald Corzo; IHE-Delft, The Netherlands).
- Cantú, Joel (M Sc Hydroinformatics: October 30, 2018). *Spatiotemporal analysis of groundwater levels in Nebraska, USA*. Committee Member (Advised by Dimitri Solomatine; IHE-Hydroinformatics, The Netherlands). **Delft Institute for Water Education and Consejo Nacional de Ciencia y Tecnologia Fellow**.
- Ernest, Jason C. (M Sc Hydroinformatics: April 3, 2018). Online Flood Information System for the Yuna River Basin Dominican Republic. (Committee Member; Advised by Dimitri Solomatine and Gerald Corzo; IHE-Delft, The Netherlands).
- Singh, Jasreman (M. Sc. in Agricultural and Biological Systems Engineering). *Soil Water Proximal Sensing and Optimal Irrigation*. November 21, 2017. Committee Member.
- Valles, Jose (M Sc Hydroinformatics: April, 2017). *Fuzzy Committees of conceptual hydrological models, and impact of the mean areal rainfall calculation on their*



- performance, Case study: Jiboa catchment in El Salvador. (Committee Member; Advised by Dimitri Solomatine and Gerald Corzo; IHE-Delft, The Netherlands).
- Suridwerianto, Yogi (M Sc Hydroinformatics: 4/2017). *Flash Flood Modelling using Data-driven Models: Case studies of Kathmandu Valley (Nepal) and Yuna Catchment (Dominican Republic)*. Committee Member.
- Avery, William (M. Sc. Natural Resources). *Improving the Operability of the Cosmic-ray Neutron Probe Method for Estimating Field Scale Soil Moisture*. May 13, 2016. Committee Member.
- Mulet, Maria A. (M. Sc. Biological Systems Engineering). *Evapotranspiration and groundwater in Nebraska*. July 7, 2016. Committee Member.
- Perez Morga, Nancy (PhD in Geosciences). *Surface Hydrology of the Southern Mexico: Multi-scale Climate Interactions and Processes*. Centro de Investigación y Educación Superior de Ensenada, May 2013. Ensenada, Baja California. Mexico. Now faculty at Universidad Autónoma del Carmen, Mexico.

### *Undergraduate Research Experience*

- Moreno Lozano, Victor (Bs. Biological Systems Engineering 05/2021 to 05/2022). Engineering resilient socioenvironmental systems for water resources management.
- Lucas, Nora (Bs. Natural Resources: 03/2021 to 05/2022). Diagnostics of Drought and Infectious Disease as Compounded Events in Socio-Environmental Systems. UCARE fellow. **Undergraduate Honors Thesis. Joining University of Delaware.**
- Sinyigenga, Laetitia (Bs. Natural Resources: 03/2021 to 05/2022). Water and irrigation management in native American communities. UCARE Fellow. **Joining University of Delaware.**
- Seibel, Abbigail (Bs. Computer Sciences: 08/2020 to 05/2022). Decision support systems for groundwater management. **NOAA's Ernest F. Hollings Undergraduate Scholarship.**
- Shyaka, Mig (Bs. Natural Resources: 08/2020 to 05/2022). Hydroclimate analytics in Rwanda. Joining University of Nebraska-Lincoln. Carter, Joseph (Bs. Computer Sciences and Engineering: 08/2019 to 07/2021). Software development for phenotype predictability.
- Ntaganda, Pascal (Bs. Natural Resources: 08/2019 to 03/2021). Data science for climate and water resources in Rwanda.
- Williams, Garret (Bs. Biological Systems Engineering: 08/2019 to 03/2021). Data science for phenotype predictability. **UCARE fellowship.**
- Tanghanwaye, E. (Bs. Computer Sciences: 10/2020 to now). AWS applications for phenotype predictability.

Hauger, Allison (Bs. Biological Systems Engineering: 10/2018 to 04/2019). Decision support systems for groundwater mapping.

Zimmer, Carly E. (Bs. Biological Systems Engineering: 10/2016 to 12/2018). *Energy-Water Nexus: Water Quality*. **IANR Undergraduate Research Experience Fellowship**.

Bowman, Erika (Bs. Biological Systems Engineering: 08/2017 to now). *Soil Moisture Measurements: from Field to Remote Sensing*. **NASA Fellowship**.

Rico, Daniel (Bs. Now in Electrical Engineering: 09/2013-12/2017). *Software Development for Semi-seasonal Forecast of Water Availability*. **AMS-travel award, 2015; IANR, MacNair, and UCARE Fellowships**.

Pamperin, Megan (Bs. Biological Systems Engineering: 08/2017 to 01/2018). *Statistical Predictability of Extreme Precipitation*.

Woldstad, Patrick (Bs. Biological Systems Engineering: 2016 to 2017). *Modeling Nitrogen Responses to Hydroclimatic Pulses*. **IANR fellowship**.

Lane, Merrett (Bs. Biological Systems Engineering: 2016 to 2017). *Nexus Water-Energy: Hydropower generation*. **UCARE Fellowship**.

Frischmeyer, Mitchell (Bs. Biological Systems Engineering: Spring of 2017). *Energy-Water Nexus: Wind scaling*.

Tang, Wei (Bs. Natural Resources: 09/2015-05/2016). *Mechanisms of Streamflow Generation in the Platte and the Sacramento River Basins*. **IANR-Fellowship**. Lab Technician at University of Nebraska-Lincoln.

Lindsey Hollmann (Bs. Biological Systems Engineering: 2016). *Engineering Water Availability and Quality Integration Based on Sensitivity of Nitrogen Levels to Fluctuating Hydroclimatological Events in the Platte River Basin*. **UCARE Fellowship**.

Maguire, Mitchel (Bs. Biological Systems Engineering: 09/2015-08/2016). *Large-scale Parameterization of Irrigation*. **UCARE-Fellowship**. Graduate student at University of Nebraska-Lincoln.

Qiu, Ling (Bs. Electrical Engineering: 09/2015-08/2016). *Modes of Variability of Extreme Precipitation in the High Plains*. **UCARE-Fellowship**. Graduate Student at Clemson University.

Guzek, Paulina (Bs. Biological Systems Engineering: 09/2015-05/2016). *Nexus Water-Food-Energy in Irrigation*.

Grier, Devin (Bs. Biological Systems Engineering: 09/2015-08/2016). *Soil Moisture Active Passive (SMAP) sensor*. **NASA Fellowship**.

Yun, Xiaoming (Natural Resources: 05/2015-10/2015). *Hydrologic and Agricultural Drought in the San Joaquin River Basin*. Graduate student Wageningen University (The Netherlands).

Morton, Mallory (Bs. In Biological Systems Engineering: 09/2013-12/2014). *Ecosystem's Resilience to Droughts and Floods in the Platte River Basin*. **Best student poster AMS 2015; NASA and UCARE Fellowship**. Olson Associates (consultant).

### *Undergraduate Senior Design advisees*

Hohbein, Hallie, Anna Zhang, Zoe Trautman, David Brecic, and Joseph Carter (2020). Prototype of the GENetics by ENvironment (*GEEN*): A Phenotype Predictive System. Department of Computer Sciences and Engineering.

Isaak Arslan<sup>4</sup>, Jake Field<sup>4</sup>, Cale Harms, Hallie Hohbein, Miracle Modey (2019). NEO-SAT: An information support system for flood-disaster management. Department of Computer Sciences and Engineering.

Klimisch, Emily, Megan Lush, Tu Doan, and Amy Fosler. Lake Zorinsky Water Quality Basin Design. Department of Biological Systems Engineering.

### *Research Associates and Scientists*

Alves de Oliveira, Luciano (08/2019-05/2020). *Predictive analytics of surface water-groundwater interactions using machine learning in irrigated landscapes*. Now Postdoc at University of Illinois Urbana-Champaign.

Otte, Martin (07/2016-12/31/2017). *Climate Modeling and Extreme Precipitation Forecast: model improvement*.

Ou, (Michael) Gengxin (Postdoc: 04/2017-04/2018). *Irrigation Sustainability, Model-parameterization, and Forecast*. Co-advised with Craig Allen and Derrel Martin. Now Research Assistant Professor at University of Nebraska-Lincoln.

Uden, Daniel (Postdoc: 02/2017-02/2018). *Systems Resiliency Theory and Applications*. Co-advised with Craig Allen and Nancy Shank. Now Assistant Professor at University of Nebraska-Lincoln.

Carrillo Cruz, Carlos (Postdoc: 03/2015-07/2016). *Climate Modeling and Analytics for Water and Agricultural Resources in Nebraska*. Now postdoc at Cornell University.

Castro Garcia, Lorena (Postdoc: 03/2014-06/2015). *Development of Information Technologies for Water and Agricultural Resources in Nebraska*. Now postdoc at University of Iowa.

## Mentoring

### *Research Associates*

Diego Jarquin, University of Nebraska-Lincoln (Postdoc Agronomy and Horticulture, 2016-2017)

### *Graduate Students*

Four graduate students of the Society of Hispanic Professional Engineers (SHPE, 10/2022-11/2022).

Katia Carranza, University of Nebraska-Lincoln (M. Sc. Natural Resources, 2020-2023)

Rubi Quiñones, University of Nebraska-Lincoln (PhD Computer Sciences and Engineering, 02/2020-05/2022)

Kevin Peng, Duke University (M. Sc. Mechanical Engineering, 11/2021-03/2022)

### *Undergraduate Students*

Juana Paramo, University of Nebraska-Lincoln (B.Sc. Business, 2016-2017)

Karen A. Gomez, University of Nebraska-Lincoln (B.Sc., Psychology 2014-2015)

Daniel A. Rico (B.Sc. Electrical and Computer Engineering, 2013-2017)

### Visiting Scholars

Ghosh, Kausik (PhD students and Faculty in the Department of Geography and Environment at Vidyasar University, India: June-December 2019) *Sediment and streamflow sensitivity to climate change in the shared basins (India and Bangladesh)*. **Funded by the Water Advance Research and Innovation** (2019).

Ramsankaran, RAAJ (PhD and Associate Professor in Civil and Environmental Engineering, Indian Institute of Technology-Bombay: June-August 2018) *Operational Meteorological Drought Monitoring across India using Multisatellite High Resolution Grid*. **Funded by the Water Advance Research and Innovation** (2018).

Lopez-Morteo, Gabriel (PhD and Professor in Computer Science, Universidad Autónoma de Baja California, Campus Mexicali: September 2017-August 2018). *Data Science and Engineering for Non-computer Science/Engineering Majors*. **Funded by Consejo Nacional de Ciencia y Tecnología-México**. Cantú, Joel (M Sc Hydroinformatics: 02/2018 to 04/2018). *Big data analysis to understand the interaction of irrigation and groundwater levels on a real time online system in Nebraska, USA*. Committee Member. Funded by the Delft Institute for Water Education and Consejo Nacional de Ciencia y Tecnología.

Shaik, Rehana (Assistant Professor, International Institute of Information Technologies, Hyderabad, India: May-July 2017). *Water Quality changes in a Changing Climate*. Funded by Indian Department of Science and Technology, the Government of India, the University of Nebraska-Lincoln, the Water for Food Institute, and the Indo-US Science and Technology Forum.

Romanelli, Thiago (Associate Professor, Universidad de Sao Paulo, Brazil August-December 2017). *Sociotechnical drivers in cropping systems for food and energy production*. Funded by Fulbright.

- Grag, Swati (PhD student in Energy and Climate, Banaras Hindu University: May-October 2017). *Improving Drought Monitoring and Forecasting: Assimilation of Satellite-based Soil Moisture into a Hydrological Model*. Funded by Indian Department of Science and Technology, the Government of India, the University of Nebraska-Lincoln, the Water for Food Institute, and the Indo-US Science and Technology Forum.
- Kumar, Ashish (PhD student in Civil Engineering, Indian Institute of Technology- Bombay: May-October 2017). *Real Time Flood Estimation using Satellite based Rainfall Estimates for Krishna Basin (India) and Upper Missouri Basin (USA)*. Funded by Indian Department of Science and Technology, the government of India, the University of Nebraska-Lincoln, the Water for Food Institute, and the Indo-US Science and Technology Forum.
- Goyal, Manish-Kumar (Assistant Professor, Indian Institute of Technology- Guwahati). *Assessment of Water Quantity and Quality in Testa River Basin using Remote Sensing Data and Hydrologic Modeling*. Funded by Indian Department of Science and Technology, the government of India, the University of Nebraska-Lincoln, the Water for Food Institute, and the Indo-US Science and Technology Forum.
- Mishra, Vimal (Assistant Professor, Indian Institute of Technology- Gandhinagar). *Enhancing Agricultural Water Management through High Resolution Remotely Sensed Drought Monitoring*. Funded by Indian Department of Science and Technology, the government of India, the University of Nebraska-Lincoln, the Water for Food Institute, and the Indo-US Science and Technology Forum.
- Gomez-Perez, Yessica (2<sup>nd</sup> year M. Sc student in Irrigation Engineering: 05/2016-09/2016). *Groundwater costs and risks in the Mexican Valley*. Funded by the Consejo Nacional de Ciencia y Tecnología.
- Lobato Sanchez, René (Researcher, Instituto Mexicano de Tecnología del Agua-Mexico: 11/2015). *Drought Monitoring and Forecast*. Funded by the Mexican Commission of Water.
- Ancona, Carlos E. (1<sup>st</sup> year M.Sc. in Computer Sciences at Universidad Autónoma de Baja California-Mexico: 01/2015-05/2015). *Information Technologies in Climate Modeling*. Funded by the Consejo Nacional de Ciencia y Tecnología.
- Rosales, Antonio A. (1<sup>st</sup> year M.Sc. in Computer Sciences at Universidad Autónoma de Baja California-Mexico: 01/2015-05/2015). *Information Technologies for Water and Agricultural Resource Management*. Funded by the Consejo Nacional de Ciencia y Tecnología.
- Gonzalez Sosa, Enrique (Full Professor in Civil Engineering at Universidad Autónoma de Queretaro-Mexico: 03/2014). *Land Surface-Atmosphere Interactions*. Funded by the Consejo Nacional de Ciencia y Tecnología.

Lopez-Morteo, Gabriel (Full Professor in Computer Sciences at Universidad Autónoma de Baja California-Mexico: 06/2013). *Information Technologies and Education and Research*. Funded by the Consejo Nacional de Ciencia y Tecnología.

Lopez-Lopez, Alberto (Researcher in Power-generation Infrastructure at Instituto de Investigaciones Eléctricas-Mexico). *Power-generation Risks to Extreme Weather*. Funded by the Consejo Nacional de Ciencia y Tecnología.

## UNIVERSITY OF WASHINGTON

### Department of Civil and Environmental Engineering

#### *Instructor*

*Second Hydrologic Modeling and Forecast Workshop/Course*. Instituto Mexicano de Tecnología del Agua, Cuernavaca, México. April 2009. Theoretical and practical 40-hours course to researchers and professionals (10 students).

*First Hydrologic Modeling and Forecast Workshop/Course*. Instituto Mexicano de Tecnología del Agua (IMTA), Cuernavaca, México. December 2008. Theoretical and practical 40-hours course to researchers and professionals (30 students).

Development of a virtual center for hydrological modeling and forecast learning. Instituto Mexicano de Tecnología del Agua, Cuernavaca, México (México).

#### *Mentor*

Two postdoctoral fellows and a master student on hydrology modeling and forecast.

Coordinate two students in research, development, and operations of hydrological and drought forecast at the University of Washington.

Three Research Scientists on hydrological and hydrometeorological modeling and forecast at the Coordination of Hydrology at the Instituto Mexicano de Tecnología del Agua, Cuernavaca, México.

## DUKE UNIVERSITY

### Department of Civil and Environmental Engineering

#### *Mentoring/Teaching*

##### *Invited Lectures*

Water Resources. Taught three lectures (2004; Responsible: Miguel Medina Jr.).

Fluid Mechanics. Prepared and taught the laboratory class, graded assignments and lab reports of the course (2004 and 2007; Responsible: Zbigniew Kabala).

##### *Tutor*

Tutored undergraduate Spanish courses at different levels (2003-2004).

## UNIVERSIDAD DE SONORA

### Centro de Investigaciones Científicas y Tecnológicas de la Universidad de Sonora

#### *Mentoring/Teaching*

##### *Advisor*

Ramirez-Siqueiros, Maria G. (1997). Nutrient and Organic Matter Impacts in the Phytoplankton Communities in the Guaymas Bay, Sonora. Universidad de Sonora, Departamento de Ciencias Químico Biológicas, Universidad de Sonora. B.S. degree in Biological Chemist. 78 pp.

Tejeda-Valenzuela, Lourdes G. (1997). Effects of Nutrient and Organic Matter on the Benthos Communities in the Guaymas Bay, Sonora. Universidad de Sonora, Departamento de Ciencias Químico Biológicas, Universidad de Sonora. B.S. degree in Biological Chemist. 82 pp.

## UNIVERSIDAD AUTONOMA DE BAJA CALIFORNIA

### Instituto de Investigaciones Oceanológicas

#### *Mentoring/Teaching*

##### *Instructor*

Pigment Analysis in Phytoplankton Cultures Using High Performance Liquid Chromatography. Theoretical and practical course (1995).

## OUTREACH/EXTENSION EXPERIENCE

### Research Networks

*Indigenous Kinship Circle (IKC)*, member since 2022

*Red de Desastres Hidrometeorológicos y Climáticos-México (REDESCLIM)*, member 2010-2016. (2 Projects funded).

California Nevada Applications Program (CNAP), member since 2010.

*Climate Impacts Group-Washington (CIG)*, member from 2007 to 2010.

Climate Hydrology Academic Network for Governance and the Environment (CHANGE), member since 2009.

*North American Drought Briefing Network*, participation from 2008 to 2010.

*National Network on Hydrometeorological and Climate Disasters in México*, member since 2011.



National Network on Space Science and Technology in México, member since 2011.

## INVITED TALKS - EXTENSION/OUTREACH

- UNL-Extension Office. *Simplifying Information and Accessing Big Data for Climate-informed Decisions in Crop, Livestock, and Community*. Nebraska Extension's Eureka! 2016 conference. Lincoln, NE, March 16, 2016
- UNL-Extension Office. *Climate Science Introduction: What is weather and what is Climate*. Resiliency of Nebraska Agriculture and Communities to a Changing Climate. October 12, 2015.
- National Center of Disaster Prevention (Mexico). *Predictibilidad de Eventos Hidrometeorológicos y Climáticos Extremos en Mexico*. Mexico City. June 17<sup>th</sup> 2015.
- Instituto de Investigaciones Electricas. *Hydrometeorologic Extrem events and the Energy sector in México*. Experts meeting on the Energy in Mexico. Cuernavaca, Mexico. June 3, 2015.
- Nebraska Department of Natural Resources. *Leveraging Sources of Predictability to Achieve Water Sustainability*. Lincoln, NE. November 8, 2013.
- Nebraska Water Resources Association. *Hydroinformatics and Integrated Hydrology*. Lincoln, NE. October 9, 2013.
- Servicio Meteorológico Nacional. *National Program for the Advancement of Hydrologic Sciences and Engineering in México*. México City. March 27, 2013.
- Water for Food Robert B. Daugherty Institute. *Irrigation, Hydrology, and Drought monitoring and forecast: Implementing Technological Development and Transfer*. Middle East and North Africa Network of Water Centers of Excellence, Lincoln, NE. March 22, 2013.
- San Diego County Water Authority and The San Diego Foundation. *Climate Change: Evidence for Increased Dryness in Southern California*. Climate Change and Water Tour. San Diego, CA June 7, and 15, 2012.
- California and Nevada Applications Program. *Extreme Events and Water Resources in California's Central Valley*. San Diego, CA June 6, 2012.
- Comisión Nacional del Agua. *Hydrological Modeling in Mexico: Prediction and Forecast. Plan de Adaptación para la Gestión del Agua en la Cuenca del Río Yaqui*. Ciudad Obregon, Sonora. April 1, 2011.
- University of California, San Diego, International Visitor Leadership Program. *Implementing Research on Hydrology and Water Resources in Developing Countries: The Case of México*. San Diego, CA. September 27, 2010.
- Columbia River Forecast Group. *Hydrological Forecasts in the Pacific North West: ESP vs CPC Techniques*. Columbia River Forecast Group Annual Meeting. Portland, OR. December 15, 2009.

University of Washington and Idaho Department of Water Resources. *Snake River Basin Seasonal Outlooks for Hydrology and Water Resources: Forecasting under El Niño Conditions*. CIG Annual Fall Forecast Meeting: Idaho Climate and Water Forecast for 2010. Boise, ID. October 22, 2009.

University of Washington. *Seasonal Outlooks for Hydrology and Water Resources at the Columbia River Basin*. CIG Annual Fall Forecast Meeting: Washington Climate and Water Forecast for 2010. Seattle, WA. October 6, 2009.

Secretaría de Agricultura Ganadería Recursos Pesqueros y Medio Ambiente. *Global Climate and Hydrological Predictability*. IX Foro de Expectativas del Sector Agroalimentario y Pesquero 2009, Mexico City, March 25, 2009.

Servicio Meteorológico Nacional. *The Most Suitable Evapotranspiration Database for México*. México City, México. December 5, 2008.

University of Washington and Idaho Department of Water Resources. *Idaho seasonal outlooks for hydrology and water resources: Streamflow, reservoir, and hydropower forecasts for major western U.S. River systems: the case of the Snake River basins*. Climate and Water Forecast for 2009 Water Year. Boise, ID. October 16, 2008.

University of Washington. *Washington and Oregon Seasonal outlooks for hydrology and water resources: Columbia River Basin streamflow, reservoir, and hydropower forecasts*. CIG Annual Fall Forecast Meeting: Washington Climate and Water Forecast for 2009. Vancouver, WA. October 2, 2008.

Instituto Mexicano de Tecnología del Agua. *Extended University of Washington Seasonal Hydrological Forecast System*. Jiutepec, Morelos, México. January 16, 2008.

Instituto Mexicano de Tecnología del Agua. *West-wide Seasonal Hydrologic Prediction System in the NAME Tier 1 core area*. Jiutepec, Morelos, México. August 16, 2007.

## DIVERSITY, INCLUSION, AND EQUITY

Member of the College of Engineering Council for Diversity, Equity, and Inclusion (CDEI), 2020 to July 2023).

Co-organizer of the *Faculty of Color Symposium*, 20121, 2022, 2023, 2024.

Member of the College of Engineering *Task Force – Diversity and Inclusion*, 2019-2020.

Contributor to the *Breakthrough Recruitment for Inclusive Diversity Growth and Excellence* (guidelines to recruit and retain URM Faculty), 2018-2019.

Mentor Latina/o Graduate Student Association, 2016-2017.

## SERVICE TO THE PROFESSION

## AFFILIATIONS

*American Geophysical Union (AGU), since 2005*

*American Meteorological Society (AMS), since 2008*

*American Association for the Advancement of Science (AAAS), since 2010*

*European Geosciences Union (EGU), since 2017*

*International Association of Hydrogeologists (IAH), since 2019*

*American Society of Agricultural and Biological Engineers (ASABE), since 2017*

*Association of California Water Agencies (ACWA), since 2011-2012*

*Groundwater Resources Association (GRA), since 2011-2015*

*Union Geofísica Mexicana (UGM), since 2008-2016*

## COMMITTEES

*American Meteorological Society 2023 Annual Conference, co-Chair for Water Security. January 8 – 12, 2023.*

*American Meteorological Society 2022 Annual Conference, co-Chair for Water Security. January 25 and 27 2022.*

*American Meteorological Society 2022 Annual Conference, co-Chair for Food Security. January 25 and 27 2022.*

*Graduate Program Committee, Department of Biological Systems Engineering, UNL, 2013-2019*

*Search Committee Member for: Data Scientist in Policy, Limnologist, Geohydrologist, Watershed Hydrologist, Hydrogeology and Climate Change, Instrumentation and Sensing Engineer, and Business Administration Officer.*

## REFEREE ACTIVITIES

### Journal Reviewer

*Proceedings of the National Academy of Science, Water Resources Research, Agricultural Systems, Journal of Hydrometeorology, Journal of Geophysical Research Atmospheres, Journal of Climate, Journal of Hydrology, Hydrology and Earth System Sciences, Journal of the American Water Resources Association, Groundwater, Natural Hazards and Earth System Sciences, International Journal of Climatology, Journal of Arid Environments, Atmosfera, Journal of Earth System Sciences, Journal of Climate Change, Ingeniería del Agua.*

### Associate Editor

*Groundwater (a journal of the National Groundwater Association, Wiley), since 2020*

*GEO-Extreme* (for the 2021 ASCE International Conference in Geo-extremes proceedings), 2020-2021

*Ingenieria del Agua* (a journal of the International Water Association publishing), 2019-2023.

### Proposal Panelist

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WATER4ALL. 2023

National Science Foundation (multiple programs), 2018 (1), 2019 (2), 2020 (3), 2021 (1), 2022 (1).

US Department of Agriculture-NIFA (multiple programs), 2018 (1), 2019 (2).

Foundation for Food and Agriculture Research, 2020

### Proposal Reviewer

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United States Geological Survey, 2013-2015.

*Ingenieria del Agua* (a journal of the International Water Association publishing), since 2019.

### Manuals and Report Reviewer

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Climate-Resilient Infrastructure: A Manual of Practice on Adaptive Design and Risk Management (CRI-MoP). American Society of Civil Engineers. Chapters 2 (A Changing Climate: Problem Definition) and Chapter 8 (Data and Information Sources). 2017.

### Sessions

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Joint Panel Discussion - *Water Security*. 103rd American Meteorological Society Annual Meeting, Virtual Meeting. January 9, 2023.

Chair: Francisco Munoz-Arriola, Department of Biological Systems Engineering, University of Nebraska-Lincoln, Lincoln, NE

Joint Panel Discussion JPD7 - *Food Security: Weather, Climate, and Global Food Security*. 102nd American Meteorological Society Annual Meeting, Virtual Meeting. January 25, 2022.

Chairs: Francisco Munoz-Arriola, Biological Systems Engineering, Univ. of Nebraska-Lincoln, Lincoln, NE and Lauren F. Stuart, Washington, DC.

Joint Panel Discussion JPD13A - *Water Security: Physical and Social Processes Responsible for Water and Food Security Risks*. 102nd American Meteorological Society Annual Meeting, Virtual Meeting. January 27, 2022.

Chairs: Rob Cifelli, NOAA/Physical Sciences Laboratory, Boulder, CO; Physical Sciences Laboratory, NOAA, Boulder, CO; Francisco Munoz-Arriola, Department of Biological Systems Engineering, University of Nebraska-Lincoln, Lincoln, NE; Annalise Blum, Johns Hopkins Advanced Academics Program, American Association for the

Advancement of Science, Washington, DC and Lauren F. Stuart, Oxfam America, Washington, DC.

## CONSULTING EXPERIENCE

World Bank. Consultant (finished in May 2010). *Identification and Preliminary Evaluation of Small and Mini Hydro Projects in the Piaxtla River Basin*. Research Responsible: Kerr Wood Leidal Associates LTD, Burnaby, B.C. Canada; co-participants: Francisco Munoz-Arriola, University of Washington and Andrew Wood.

AGROASEMEX. Consultant (finished in April 2009). *Hydrological Modeling in Mexico: Platform Development*. Research Responsible: Francisco Muñoz Arriola.

World Bank and Secretaria de Medio Ambiente y Recursos Naturales. Consultant (finished in December 2008). *The most Suitable Evapotranspiration Database for México*. Research Responsible: Eric F. Woods and Justin Sheffield, University of Princeton; Francisco Munoz-Arriola, University of Washington.

## TECHNICAL SKILLS

### Commercial and Public-Domain Numerical Models

#### Atmospheric Models

Ocean Land Atmosphere Model (OLAM)-coding and development

#### Land Surface Hydrology models

Variable Infiltration Capacity (VIC)-coding and development

Soil Water Assessment Tool (SWAT) – user

Hydrologic Modeling System (HEC-HMS) - user

#### Groundwater Models

MODFLOW (-FMP)-use

ArcGIS-hydrological applications

#### Data-driven Models

Applications in groundwater, hydrometeorological and climate variables-Coding and Development

#### Hydrological Forecast Systems

UNL's Seasonal Hydrologic Forecast System-Coding and Development

University of Washington's West-wide Hydrological Seasonal Forecast System (NHFS)-Coding

University of Washington's *Surface Water Monitor* (SWM)-coding

## Hydrological Forecast Systems

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NEO-SAT (see section of software development)

Dataplugin (see section of software development)

Groundwater and drought mapper (see section of software development)

## Programming Languages

Fortran

C

UNIX tools (Python, AWK and PERL)

Plotting platforms (NCAR-GRAPHICS, GraDS and GMT)

R

Matlab

## Operating Systems

UNIX

Windows

Mac

## Instrumentation

Federated Unmanned Tethered Aerial Vehicle System (under construction)

Tethersounde systems and meteorological stations.

High Pressure Liquid Chromatography, Atomic Absorption Spectrometry, Polarography, Gas Chromatography.

## FIELDWORK

*Cloud and Land Surface Interaction Experiment (CLASIC) 2007*. Measurement of meteorological variables in the Atmospheric Boundary Layer in the Southern Great Plains.

*Soil Moisture Experiment 2004 (SMEX04) and the North American Monsoon Experiment (NAME) (2004)*. Measurement of precipitation and Atmospheric Boundary Layer monitoring in mountainous areas in the Northwestern Mexico.

MEGAMARCO II (1997). Universidad Autónoma de Baja California. Geochemistry of Organic Matter in the Gulf of California.

ECOBAC (1991). Sampling of seawater and wastewater for physicochemical and contaminant analyses in the coastal zone of Baja California and Southern California.

## LANGUAGES

*English* (Proficient in writing, speaking, and reading)

*Spanish* (mother tongue).