

# Dr. Antonios Mamalakis



Research Scientist at Colorado State University

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## Education:

**University of California, Irvine (UCI) (Sep. 2016 – Sep. 2020)** *Irvine, California, USA*

PhD in Civil and Environmental Engineering.

Dissertation title: *Links of climate variability and change with regional hydroclimate: Predictability, trends, and physical mechanisms on seasonal to decadal scales*

Advisor: Prof. Efi Foufoula-Georgiou

GPA: 4.0/4.0

**University of Patras (UPatras) (Sep. 2014 - Feb. 2016)** *Patras, Greece*

MSc in Water Resources and Environmental Engineering.

Thesis title: *Modeling Rainfall statistics in a changing climate: Comparing and improving existing approaches.*

Advisor: Prof. Andreas Langousis

GPA: 9.54/10

**University of Patras (UPatras) (Sep. 2008 - Feb. 2014)** *Patras, Greece*

Diploma in Civil Engineering (5-year degree)

Thesis title: *Parameter Estimation in Groundwater models based on PEST algorithm (in Greek)*

Advisor: Prof. Vassilios Kaleris

GPA: 7.93/10 (2<sup>nd</sup> in the class of 2014)

## Academic Appointments:

**Assistant Professor (2023 – present)** *Charlottesville, Virginia, USA*

Department of Environmental Sciences, University of Virginia

School of Data Science, University of Virginia

**Research Scientist I (2022 – 2023)** *Fort Collins, Colorado, USA*

Department of Atmospheric Science, Colorado State University

Supervisors: Prof. Elizabeth Barnes and Prof. James W. Hurrell

**Postdoctoral Researcher (2020 – 2022)** *Fort Collins, Colorado, USA*

Department of Atmospheric Science, Colorado State University

Supervisors: Prof. Elizabeth Barnes and Prof. Imme Ebert-Uphoff

**Graduate Research Assistant (2016 – 2020)** *Irvine, California, USA*

Department of Civil and Environmental Engineering, University of California, Irvine.

Supervisor: Prof. Efi Foufoula-Georgiou

**Graduate Research Assistant (2014 – 2016)** *Patras, Greece*

Department of Civil and Environmental Engineering, University of Patras.

Supervisor: Prof. Andreas Langousis

## Teaching experience:

**TAI4ES Summer School (2022)** *virtual*

Lecturer, June 2022

4-day school: *Trustworthy Artificial Intelligence for Environmental Science*

**Colorado State University, Fort Collins (2022)**

*virtual*

Lecturer, May 2022

2-day course: *Tutorial: Applied Machine Learning for Earth Scientists*

**Colorado State University, Fort Collins (2022)**

*Fort Collins, Colorado, USA*

Teaching Assistant, Winter 2022

Course: *Objective Analysis* (graduate studies)

**University of California, Irvine (2020)**

*Irvine, California, USA*

Teaching Assistant, Fall 2020

Course: *Stochastic Hydrology* (graduate studies)

**University of Patras (2014-2015)**

*Patras, Greece*

Teaching Assistant, Fall 2014, Fall 2015

Course: *Hydraulic Structures* (5<sup>th</sup> year of undergraduate studies)

## Funding and Projects:

- **TRIPODS+X:RES: Data Science Frontiers in Climate Science** *USA, 2019*  
Role: *Co-Investigator*  
I participated in the proposal preparation and was an active researcher in the project  
Funds: \$300,000  
Awarded by NSF; DMS-1839336
- **Doctoral Fellowship in UCI (Henry Samueli Endowed Fellowship)** *USA, 2018*  
Role: Principal Investigator  
Funds: *award amounts vary*
- **Research Seed Funding in UCI** *USA, 2017*  
Role: Co-Investigator  
I participated in the proposal preparation and was an active researcher in the project  
Funds: \$150,000

## Professional Activities:

### Editorial Service

Associate Editor, *Artificial Intelligence for the Earth Systems* (2022 – present)

Associate Editor, *Stochastic Environmental Research and Risk Assessment* (2020 – present)

### Referee Service

*Nature Climate Change, Nature Machine Intelligence, Scientific Reports, Science Advances, Geophysical Research Letters, Earth's Future, Journal of Climate, Water Resources Research, Artificial Intelligence for the Earth Systems, Journal of Advances in Modeling Earth Systems, Advances in Water Resources, Journal of Hydrology, Journal of Hydrometeorology, Stochastic Environmental Research and Risk Assessment, Hydrology and Earth System Sciences, Remote Sensing, Weather and Forecasting*

### Outstanding Student Presentation Award; OSPA Judge

*AGU Fall Meeting 2022*

## Honors and Awards:

- Paper included in [Editors' highlights](#) (Nature Communications, 2023)
- Top downloaded article (Geophysical Research Letters; 2021)
- Paper included in [the 50 most read articles](#) (Nature Communications, 2018)
- Henry Samueli Endowed [Fellow](#) (2018-2019)

- Outstanding Reviewer, Journal of Hydrology (January 2018)
- Paper included in [Editors' highlights](#) (Water Resources Research, 2017)

## Science communication – Media and press coverage:

- Participation in Panel Discussion: Model Interpretability in the Earth and Space Sciences, 10<sup>th</sup> International Conference on Learning Representations (ICLR), April 2022.
- Interview with the AGU precipitation technical committee: [Precip Folks, January 2022](#).
- Media coverage for the study “Zonally contrasting shifts of the tropical rain belt in response to climate change” by Mamalakis et al. (2021).  
*Climate change could shift Earth’s tropical rain belt, threatening food security for billions, [Science alert](#), January 2021.*  
*Climate Change will cause a shift in Earth’s tropical rain belt – threatening water and food supply for billions, study says, [CBS News](#), January, 2021.*  
*Climate Change will alter the position of the Earth’s tropical rain belt, [Science Daily](#), January 2021.*  
*Food Security for billions threatened by shifting tropical rain belt, climate change to blame, [Energi Media](#), February 2021.*  
 Full list of all (43) news outlets can be found [here](#).  
 Video summary of the study can be found [here](#).
- Media coverage for the study “A new interhemispheric teleconnection increases predictability of winter precipitation in southwestern US” by Mamalakis et al. (2018).  
*To forecast winter rainfall in Los Angeles, look to New Zealand in the summer, [NSF News Release](#), June 2018.*  
*To forecast winter rainfall in the Southwest, look to New Zealand in the summer, [UCI News](#), June 2018.*  
 Full list of all (13) news outlets can be found [here](#).

## Publications:

### Journal articles and Book Chapters

- Mamalakis, A.,** E.A. Barnes and J.W. Hurrell, Quantifying climate similarities under Stratospheric Aerosol Injection using eXplainable Artificial Intelligence, *in revision*.
18. McGovern, A., **et al.** (2023) Trustworthy Artificial Intelligence for Environmental Sciences: Summer School Meeting Report, *BAMS*, **104**(6), <https://doi.org/10.1175/BAMS-D-22-0225.1>.
  17. Le, V.V.P., **et al.** (2023) Climate-driven changes in the predictability of seasonal precipitation, *Nature Communications*, **14**, 3822, <https://doi.org/10.1038/s41467-023-39463-9>.
  16. **Mamalakis, A.,** E.A. Barnes and I. Ebert-Uphoff, (2023) Carefully choose the baseline: Lessons learned from applying XAI attribution methods for regression tasks in geoscience, *Artificial Intelligence for the Earth Systems*, **2**(1), <https://doi.org/10.1175/AIES-D-22-0058.1>.
  15. **Mamalakis, A.,** E.A. Barnes and I. Ebert-Uphoff, (2022) Investigation of the fidelity of explainable artificial intelligence methods in applications of convolutional neural networks in geoscience, *Artificial Intelligence for the Earth Systems*, **1**(4), <https://doi.org/10.1175/AIES-D-22-0012.1>.
  14. **Mamalakis, A.,** I. Ebert-Uphoff and E.A. Barnes, (2022) “Explainable Artificial Intelligence in Meteorology and Climate Science: Model fine-tuning, calibrating trust and learning new science” in *Beyond explainable Artificial Intelligence* by Holzinger et al. (Editors), Springer Lecture Notes on Artificial Intelligence, open access at: [https://link.springer.com/chapter/10.1007/978-3-031-04083-2\\_16](https://link.springer.com/chapter/10.1007/978-3-031-04083-2_16)

13. **Mamalakis, A.**, I. Ebert-Uphoff and E.A. Barnes, (2022) Neural network attribution methods for problems in Geoscience: A novel synthetic benchmark dataset, *Environmental Data Science*, DOI: 10.1017/eds.2022.7.
12. **Mamalakis, A.**, A. AghaKouchak, J.T. Randerson and E. Foufoula-Georgiou, (2022) Hotspots of Predictability: Identifying regions of high precipitation predictability at seasonal timescales from limited time series observations, *Water Resources Research*, 58(5), e2021WR031302.
11. Le, V.V.P., C. Guilloteau, C., **A. Mamalakis** and E. Foufoula-Georgiou (2021) Underestimated MJO variability in CMIP6 models, *Geophysical Research Letters*, 48, e2020GL092244, <https://doi.org/10.1029/2020GL092244> (**Top downloaded article, 2021**)
10. **Mamalakis, A.**, J.T. Randerson, J.-Y. Yu, M.S. Pritchard, G. Magnusdottir, P. Smyth, P.A. Levine, S. Yu and E. Foufoula-Georgiou (2021) Zonally contrasting shifts of the tropical rain belt in response to climate change, *Nature Climate Change*, 11, 143-151. <https://doi.org/10.1038/s41558-020-00963-x>
9. Guilloteau, C., **A. Mamalakis**, L. Vulis, T. Georgiou and E. Foufoula-Georgiou (2020) Rotated spectral principal component analysis (rsPCA) for identifying dynamical models of variability in climate systems, *J. Climate*, doi: <https://doi.org/10.1175/JCLI-D-20-0266.1>.
8. Stevens A., R. Willett, **A. Mamalakis**, E. Foufoula-Georgiou, J. Randerson, P. Smyth, S. Wright and A. Tejedor (2020) Graph-guided regularized regression of Pacific Ocean climate variables to increase predictive skill of southwestern winter US precipitation, *J. Climate*, doi: <https://doi.org/10.1175/JCLI-D-20-0079.1>.
7. **Mamalakis, A.**, J.-Y. Yu, J.T. Randerson, A. AghaKouchak, and E. Foufoula-Georgiou (2019) Reply to: A critical examination of a newly proposed interhemispheric teleconnection to Southwestern US winter precipitation, *Nature Communications*, <https://doi.org/10.1038/s41467-019-10531-3>
6. **Mamalakis, A.** and V. Kaleris (2019) Estimation of seawater retreat timescales in homogeneous and confined coastal aquifers based on dimensional analysis, *Hydrological Sciences Journal*, doi:10.1080/02626667.2018.1552787
5. **Mamalakis, A.** and E. Foufoula-Georgiou (2018) A multivariate probabilistic framework for tracking the intertropical convergence zone: Analysis of recent climatology and past changes, *Geophysical Research Letters*, doi:10.1029/2018GL079865
4. **Mamalakis, A.**, J.-Y. Yu, J.T. Randerson, A. AghaKouchak, and E. Foufoula-Georgiou (2018) A new interhemispheric teleconnection increases predictability of winter precipitation in southwestern US, *Nature Communications*, doi: 10.1038/s41467-018-04722-7 ([50 most read articles](#))
3. **Mamalakis A.**, A. Langousis, R. Deidda and M. Marrocu (2017) A parametric approach for simultaneous bias correction and high-resolution downscaling of climate model rainfall, *Water Resour. Res.*, doi: 10.1002/2016WR019578 ([included in Editors' highlights](#)).
2. Langousis A., **A. Mamalakis**, M. Puliga and R. Deidda (2016) Threshold detection for the generalized Pareto distribution: Review of representative methods and application to the NOAA NCDC daily rainfall database *Water Resour. Res.*, doi: 10.1002/2015WR018502.
1. Langousis A., **A. Mamalakis**, R. Deidda and M. Marrocu (2016) Assessing the relative effectiveness of statistical downscaling and distribution mapping in reproducing rainfall statistics based on climate model results, *Water Resour. Res.*, doi:10.1002/2015WR017556.

## White papers, datasets, tutorials, etc

Arcodia, M., et al. (2022) Applied Machine Learning Tutorial for Earth Scientists, Zenodo: <https://doi.org/10.5281/zenodo.6686879>. Github: [https://github.com/eabarnes1010/ml\\_tutorial\\_csu](https://github.com/eabarnes1010/ml_tutorial_csu).

**Mamalakis A.**, I. Ebert-Uphoff and E. A. Barnes (2022) CSU Synthetic Attribution Benchmark Dataset, Version 1.0, Radiant MLHub. <https://doi.org/10.34911/rdnt.8snx6c>

## Invited talks or Lectures

12. **Mamalakis, A.**, (2023) Introduction to explainable artificial intelligence for climate applications, National Renewable Energy Laboratory, (virtual) April, 2023.
11. **Mamalakis, A.**, (2023) A brief introduction to explainable artificial intelligence, KI-Forum Deutscher Wetterdienst, (virtual) February, 2023.
10. **Mamalakis, A.**, (2022) Explainable Artificial Intelligence for Deep Learning, Trustworthy Artificial Intelligence for Environmental Science (TAI4ES), Summer School, (virtual) June, 2022.
9. **Mamalakis, A.**, (2022) Explainable Artificial Intelligence for Environmental Science: Using idealized attribution benchmarks to derive best practices, Seminar at the journal club for LEAP, Columbia University, (virtual) June, 2022.
8. **Mamalakis, A.**, (2022) Lecture on: Methods of Explainable Artificial Intelligence (XAI) for Artificial Neural Networks (ANNs), Lecture for Course ATS 780A7: Machine Learning for Atmospheric Sciences, Colorado State University, March, 2022.
7. **Mamalakis, A.**, (2021) [Assessing methods of explainable artificial intelligence \(XAI\) by using attribution benchmark datasets](#), 2<sup>nd</sup> Workshop on Knowledge Guided Machine Learning (KGML2021, virtual), August, 2021.
6. **Mamalakis, A.**, (2021) [Tutorial: A benchmark for Explainable AI method](#), Trustworthy Artificial Intelligence for Environmental Science (TAI4ES), Summer School (virtual) July, 2021.
5. **Mamalakis, A.**, (2021), [Explainable AI for Environmental Science: Insights on strengths and weaknesses of different neural network attribution maps](#), Follow-up lecture on the XAI for Environmental Science short course (virtual), June, 2021.
4. Fofoula-Georgiou, E. and **A. Mamalakis** (2020) SWUS Seasonal Precipitation Prediction & the New Zealand Index (NZI), 2020 Colorado River Hydrology Research Symposium webinar series, October, 2020.
3. **Mamalakis, A.**, J.-Y. Yu, J.T. Randerson, A. AghaKouchak, and E. Fofoula-Georgiou (2019) Drivers of winter precipitation variability over the southwestern US: Interdecadal changes and new physical mechanisms, Data Analytics for Climate and Earth (DANCE): Causality, patterns and prediction, March, 27-29, 2019, Arrowhead, CA (USA).
2. **Mamalakis, A.**, J.-Y. Yu, J.T. Randerson, A. AghaKouchak, and E. Fofoula-Georgiou (2018) Interdecadal changes in the climatic drivers of regional hydroclimatology in southwestern US: A new inter-hemispheric teleconnection increases predictability of winter precipitation, American Geophysical Union, AGU Fall Meeting, Washington D.C., USA, December 2018.
1. **Mamalakis, A.** (2018) A newly identified inter-hemispheric teleconnection increases predictability of winter precipitation, Water Student Forum, UCI, October 2018.

## Conferences

**Mamalakis, A.**, Elizabeth A. Barnes and Imme Ebert-Uphoff (2023) Explainable Artificial Intelligence for Environmental Science: The choice of baseline matters, American Meteorological Society, 103<sup>rd</sup> Annual Meeting, Denver, CO, USA, January 2023.

**Mamalakis, A.**, Elizabeth A. Barnes and Imme Ebert-Uphoff (2023) Using different XAI baselines to answer different science questions, American Geophysical Union, AGU Fall Meeting, Chicago, IL, USA, December 2022.

**Mamalakis, A.**, Imme Ebert-Uphoff and Elizabeth A. Barnes (2022) Explainable Artificial Intelligence for Environmental Science: Introducing Objectivity into the Assessment of Neural Network Attribution Methods, American Meteorological Society, 102<sup>nd</sup> Annual Meeting, January 2022.

Le, V.V.P., C. Guilloteau, C., **A. Mamalakis** and E. Foufoula-Georgiou (2022) Underestimated MJO variability in CMIP6 models, American Meteorological Society, 102<sup>nd</sup> Annual Meeting, January 2022.

Le, V.V.P., C. Guilloteau, C., **A. Mamalakis** and E. Foufoula-Georgiou (2021) Variability of tropical intraseasonal oscillations in CMIP6 models, American Geophysical Union, AGU Fall Meeting, December 2021.

**Mamalakis, A.**, Imme Ebert-Uphoff and Elizabeth A. Barnes (2021) Explainable Artificial Intelligence for Environmental Sciences: A benchmark to assess and compare neural network attribution methods, 3<sup>rd</sup> NOAA Workshop on Leveraging AI in Environmental Sciences (virtual), September, 2021.

Stevens, A., R., Willett, **A. Mamalakis**, E. Foufoula-Georgiou, P.V.V. Le, A. Tejedor, J. Randerson, S. Wright, P. Smyth (2020) Graph-guided regularized regression to improved predictive skill of precipitation at seasonal timescales, American Geophysical Union, AGU Fall Meeting (virtual), December 2020.

Le, V.V.P., C. Guilloteau, C., **A. Mamalakis** and E. Foufoula-Georgiou (2020) Multi-scale evaluation of dynamical modes of climate variability in CMIP6 models, American Geophysical Union, AGU Fall Meeting (virtual), December 2020.

Foufoula-Georgiou, E., **A. Mamalakis**, A. AghaKouchak and J.T. Randerson (2020) Probabilistic assessment of the practical predictability of extreme wet and dry years in the southwestern US in observed and CMIP6 climates, American Geophysical Union, AGU Fall Meeting (virtual), December 2020.

**Mamalakis, A.**, E. Foufoula-Georgiou, J.T. Randerson, J.-Y. Yu, M.S. Pritchard, G. Magnusdottir, P.A. Levine, S. Yu, and P. Smyth, (2020) Zonally variable response of the intertropical convergence zone and energy flux equator in CMIP6 future climate, American Geophysical Union, AGU Fall Meeting (virtual), December 2020.

**Mamalakis, A.**, E. Foufoula-Georgiou, J.T. Randerson, J.-Y. Yu, M.S. Pritchard, G. Magnusdottir, P.A. Levine, S. Yu, and P. Smyth, (2019) Zonally asymmetric response of the intertropical convergence zone to the RCP8.5, American Geophysical Union, AGU Fall Meeting, San Francisco, CA, USA, December 2019.

Stevens, A., R., Willett, **A. Mamalakis**, E. Foufoula-Georgiou, J. Randerson, S. Wright, P. Smyth and A. Tejedor (2019) Graph-Guided Regularization for Improved Forecasting of Southwestern US Winter Precipitation, American Geophysical Union, AGU Fall Meeting, San Francisco, CA, USA, December 2019.

**Mamalakis, A.**, J.T. Randerson, J.-Y. Yu, M.S. Pritchard, G. Magnusdottir, P. Smyth, P.A. Levine and E. Foufoula-Georgiou (2019) Evidence for diverging regional responses of the intertropical convergence zone under global warming, Large ENsembles (LENS) Workshop, NCAR, Boulder, CO, USA, July 2019.

Stevens, A., R., Willett, **A. Mamalakis**, E. Foufoula-Georgiou, J. Randerson, P. Smyth and S. Wright (2019) Graph-Guided Regularization for Improved Seasonal Forecasting, Large ENSEMBLES (LENS) Workshop, NCAR, Boulder, CO, USA, July 2019.

**Mamalakis, A.**, J.T. Randerson, J.-Y. Yu, M.S. Pritchard, G. Magnusdottir, P. Smyth, P.A. Levine and E. Foufoula-Georgiou (2019) Future response of the intertropical convergence zone under global warming, International Precipitation Conference 12 (IPC12), Irvine, CA, USA, June 2019.

**Mamalakis, A.** and E. Foufoula-Georgiou (2019) A longitudinally explicit, multivariate probabilistic framework for tracking the Intertropical Convergence Zone on seasonal to multi-decadal scales, European Geosciences Union General Assembly, Vienna, Austria, April 2019.

**Mamalakis, A.**, J.-Y. Yu, J.T. Randerson, A. AghaKouchak, and E. Foufoula-Georgiou (2019) Drivers of winter precipitation variability over the southwestern US: Interdecadal changes and new physical mechanisms, Data Analytics for Climate and Earth (DANCE): Causality, patterns and prediction, March, 27-29, 2019, Arrowhead, CA (USA).

**Mamalakis, A.** and E. Foufoula-Georgiou (2018) A multivariate probabilistic approach for tracking seasonally and longitudinally the Intertropical Convergence Zone, American Geophysical Union, AGU Fall Meeting, Washington D.C., USA, December 2018.

**Mamalakis, A.**, J.-Y. Yu, J.T. Randerson, A. AghaKouchak, and E. Foufoula-Georgiou (2018) Interdecadal changes in the climatic drivers of regional hydroclimatology in southwestern US: A new inter-hemispheric teleconnection increases predictability of winter precipitation, American Geophysical Union, AGU Fall Meeting, Washington D.C., USA, December 2018.

**Mamalakis, A.**, J. Vrugt, A. AghaKouchak, and E. Foufoula-Georgiou (2018) A new methodology for fitting time-varying distributions to hydroclimatic extremes using data assimilation techniques, European Geosciences Union General Assembly, Vienna, Austria, April 2018.

**Mamalakis, A.**, J.-Y. Yu, J.T. Randerson, A. AghaKouchak, and E. Foufoula-Georgiou (2018) A newly discovered inter-hemispheric teleconnection increases predictability of precipitation extremes in southwestern US, European Geosciences Union General Assembly, Vienna, Austria, April 2018.

**Mamalakis, A.**, J.-Y. Yu, J.T. Randerson, A. AghaKouchak, and E. Foufoula-Georgiou (2017) A new inter-hemispheric teleconnection increases predictability of winter precipitation in southwestern US, American Geophysical Union, AGU Fall Meeting, New Orleans, USA, December 2017.

**Mamalakis, A.**, A. Langousis, R. Deidda and M. Marrocu (2017) Parametric bias correction and high-resolution downscaling of climate model rainfall, IAHS Scientific Assembly 2017, Port Elizabeth, South Africa, July 2017.

**Mamalakis A.**, A. Langousis, R. Deidda and M. Marrocu (2017) A parametric approach for simultaneous bias correction and high-resolution downscaling of climate model rainfall for practical applications, European Geosciences Union General Assembly, Vienna, Austria, April 2017.

**Mamalakis, A.**, A. Langousis and R. Deidda (2016) Threshold Detection for the Generalized Pareto (GP) Distribution: Critical Review and Hydrologic Application of Representative Methods, XXXV Convegno Nazionale di Idraulica e Costruzioni Idrauliche (IDRA16), Bologna, Italy, September 2016, (<http://www.idra16.it/>).

**Mamalakis A.**, A. Langousis and R. Deidda (2016) Critical review and hydrologic application of threshold detection methods for the generalized Pareto (GP) distribution, European Geosciences Union General Assembly, Vienna, Austria, April 2016.

**Mamalakis A.**, V. Kaleris and A. Dimas (2016) Estimating the timescale of the seawater retreat in coastal aquifers: Dimensional analysis and numerical investigations, European Geosciences Union General Assembly, Vienna, Austria, April 2016.

Langousis A., **A. Mamalakis**, R. Deidda and M. Marrocu (2015) Modeling daily rainfall conditional on large scale atmospheric forcing: Assessing rainfall statistics based on climate model results, 10<sup>th</sup> International Workshop, Precipitation in Urban Areas: Rainfall in Urban and Natural Systems, Pontresina, Switzerland, December 2015.

Deidda, R., **A. Mamalakis** and A. Langousis (2015) Comparison of Threshold Detection Methods for the Generalized Pareto Distribution (GPD): Application to the NOAA-NCDC Daily Rainfall Dataset, European Geosciences Union General Assembly, Vienna, Austria, April 2015.

Langousis A., **A. Mamalakis**, R. Deidda and M. Marrocu (2015) Rainfall Downscaling Conditional on Upper-air Atmospheric Predictors: Improved Assessment of Rainfall Statistics in a Changing Climate, European Geosciences Union General Assembly, Vienna, Austria, April 2015.

## **Dissertations**

**Mamalakis A.** (2020) *Links of climate variability and change with regional hydroclimate: Predictability, trends, and physical mechanisms on seasonal to decadal scales*, PhD Dissertation, 146 pages, Department of Civil and Environmental Engineering, University of California, Irvine, CA, USA.

**Mamalakis A.** (2016) *Modeling Rainfall statistics in a changing climate: Comparing and improving existing approaches*, MSc Thesis, 100 pages, Department of Civil Engineering, University of Patras, Greece.

**Mamalakis A.** (2014) *Parameter Estimation in Groundwater models based on PEST algorithm*, Diploma Thesis, 114 pages, Department of Civil Engineering, University of Patras, Greece.