

## **Kathleen (Kathy) Pegion**

George Mason University, Dept of Atmospheric, Oceanic and Earth Sciences  
4400 University Drive, MS6C5, Fairfax, VA 22030

Phone: 301-526-4151 | Email: [kpegion@gmu.edu](mailto:kpegion@gmu.edu)

Web: <http://kathypegion.com> | Twitter: @KPegion | Github: <https://github.com/kpegion>

### **Education**

Ph.D. Climate Dynamics, George Mason University, Fairfax, VA (2007)

*Dissertation Title: The impact of air -sea coupling on tropical intraseasonal variability: simulation and predictability*

M.S. Meteorology, Florida State University, Tallahassee, FL (1999)

*Thesis Title: Double Ensemble Estimates of Precipitation in the Southeastern US for Extreme ENSO events*

B.S. Meteorology, Florida State University, Tallahassee, FL (1998)

B.S. Computer Science, Florida State University, Tallahassee, FL (1998)

### **Current Appointments**

Associate Professor, Dept. Atmospheric Oceanic and Earth Sciences, George Mason University, Aug 2020-

Associate Chair for Research, Dept. Atmospheric Oceanic and Earth Sciences, George Mason University, Feb 2020-

Affiliate Faculty, GMU Institute for Digital Innovation, Aug 2020-

Research Scientist, Center for Ocean-Land Atmosphere Studies, Aug 2014-

Visiting Scientist, National Center for Atmospheric Research, Oct 2019-

### **Previous Appointments**

Assistant Professor, Dept. Atmospheric Oceanic and Earth Sciences, George Mason University, Aug 2014-Aug 2020

Affiliate Scientist, CIRES/University of Colorado, Mar 2015-2019

Visiting Scientist, NOAA/Earth System Research Laboratory, Jun 2016-Apr 2020

Research Scientist I/II, CIRES/University of Colorado & NOAA/Earth System Research Laboratory, Feb 2009 – Mar 2015

Research Scientist, Center for Ocean-Land-Atmosphere Studies, May 2007-Jan 2009

Graduate Research Assistant, Climate Dynamics Department, George Mason University, Dec 2002–May 2007

Meteorologist, NOAA/NWS/Meteorological Development Laboratory, Feb 2001 – Dec 2002

Scientific Programmer/Analyst, General Sciences Corporation-Science Applications International Corporation, Aug 1999 – Feb 2001

### **Funded Proposals**

#### **Summary**

Total (\$): Career: \$7.1M; Home Institution: \$2.9M

Total (#): 13; PI: 7; Co-PI: 6

1. Subseasonal NMME Forecasts: Skill, Predictability, and Multi-model Combinations, NOAA/CPO, Total: \$354K, GMU: \$354K, Role: Co-PI, 8/1/2014-7/31/2016
2. Identifying and Assessing Gaps in Subseasonal to Seasonal Prediction Skill, NOAA/CPO, Total: \$70K, GMU: \$70K, Role: PI, 8/1/2015-7/31/2016
3. Accelerating Development of NOAA's Next-Generation Coupled System for Week-3 and Week-4 Weather Predictions, NOAA/NWS, Total: \$560K, GMU: \$560K, Role: Co-PI, PI: Kinter, 5/1/2015-4/30/2017
4. Developing a Real-Time Multi-Model Sub-Seasonal Predictive Capability, NOAA/CPO, Total: \$1.2M, GMU: \$240K, Role: PI, 7/1/2016-6/30/2020 (under no-cost extension)
5. Sub-Seasonal Prediction with CCSM4, NOAA/CPO, Total: \$342K, GMU: \$102K, Role: PI, 7/1/2016-6/30/2020 (under no-cost extension)
6. Predictability of storm surge and Chesapeake Bay flooding: from days to weeks, COS-VSE Seed Fund, Total: \$21K, GMU: \$21K, Role: Co-PI, PI: Burls, 4/1/2018-3/31/2019
7. Investigating the attributes of Predicting Western U.S. Hydrological Response to Tropical Forcing During the Winters of 2015-2016 and 2016-2017, NOAA/Innovim, Inc., Total: \$200K, GMU: \$200K, Role: Co-PI, PI: Kinter, 5/1/2018-9/19/2018
8. Decadal Prediction and Predictability of Extremes in Ocean Eddy Resolving Coupled Models, DOE/U. Miami, Total: \$1M, GMU: \$283K, Role: PI, 9/1/2018-8/31/2021
9. SubX Continuation, NOAA/U. Miami, Total: \$120K, GMU: \$120K, Role: PI, 8/1/2018-7/31/2020 (under cost extension)
10. Ensemble Prediction and Predictability of Extreme Weather via Circulation Regimes, NOAA/OWAQ, Total: \$697K, GMU: \$697K, Role: Co-PI, PI: Straus, 9/1/2019-8/31/2022
11. Multi-model Ensemble Prediction with CFS and CCSM, NOAA/CPO, Total: \$206K, CIRES/ESRL: \$95K, Role: PI
12. A US National Multi-Model Ensemble ISI Prediction System, NOAA/CPO, Total: \$1.9M, CIRES/ESRL: \$145K, Role: PI
13. Seasonal to Decadal-Scale Climate Predictions for Marine Resource Management, NOAA, Total: \$420K, CIRES/ESRL: \$95K, Role: Co-PI

## Proposals in Preparation or Under Review

Compressing development of NOAA weather forecast systems through shared interface for analysis of distributed experiments, NOAA HPC, PI, \$40K, *submitted*.

SubX Continuation, NOAA/WPO/CISESS, PI, \$100K, *submitted*.

## Publications (<sup>+</sup>Student, primary advisor; <sup>^</sup>Student, committee member, <sup>\*</sup>Postdoc advised; #Highly cited)

Google Scholar: H-index 19; Citations 2053 [Apr 6, 2021]

### In Prep

1. Manthos, Z.<sup>+</sup>, **K. Pegion**, C. Stan, P. Dirmeyer, Connecting Surface Weather over North America to the Mid-latitude Seasonal Oscillation, *to be submitted to Dynamics of Atmospheres and Oceans*.
2. Huang, K.<sup>+</sup>, **K. Pegion**, The relative roles of westward propagating waves and seasonal mean background state in shaping MJO propagation.
3. Becker, E., Kirtman, B.P., **K. Pegion**, Extreme Events in the NMME.
4. **Pegion, K.**, S. Larson, S., J. Furtado, E. Becker, The Impact of the Extratropics on ENSO in the CESM Large Ensemble.

### Submitted or Under Revision

1. Khalid, A.<sup>^</sup>, T. Miesse, E. Erfani, S. Thomas, C. Ferreira, **K. Pegion**, N. Burls, and J. Manganello, Evaluation of Storm Surge Predictability on Subseasonal Timescales for Flood Forecasting Applications: A Case Study for Hurricane Isabel and Katrina, *Weather and Climate Extremes*, *under revision*
2. Zelinsky, R.<sup>^</sup>, B. Kirtman, and **K. Pegion**, Forecasting DYNAMO MJO Events with the Subseasonal Experiment (SubX), *Weather and Forecasting*, *under revision*

### Published, In Press, or Accepted

1. Meehl, G. and Co-authors, Initialized Earth system prediction from subseasonal to decadal timescales, *Nature Reviews Earth and Environment*, <http://doi.org/10.1038/s43017-021-00155-x>.
2. Richter, J. H., **K. Pegion**, L. Sun, H. Kim, J. M. Caron, A. Glanville, S. Yeager, W. Kim, and Ahmed Tawfik., Subseasonal Prediction with CESM1 and the role of stratospheric

variability on subseasonal prediction skill, *Weather and Forecasting*, 35(6), <https://doi.org/10.1175/WAF-D-20-0029.1>

3. Ross, A. C., Stock, C. A., Dixon, K. W., Friedrichs, M. A. M., Hood, R. R., Li, M., **K. Pegion**, V. Saba, G. A. Vecchi (2020). Estuarine forecasts at daily weather to subseasonal time scales. *Earth and Space Science*, 7, e2020EA001179. <https://doi.org/10.1029/2020EA001179>
4. Becker, E., Kirtman, B. P., and **Pegion, K.**, 2020: Evolution of the North American multi-model ensemble. *Geophysical Research Letters*, 47, e2020GL087408. <https://doi.org/10.1029/2020GL087408>
5. **Pegion, K., Selman, C.M.\***, Larson, S., Furtado, J. C., and E. Becker, 2020: The impact of the extratropics on ENSO diversity and predictability. *Clim Dyn* 54, 4469–4484. <https://doi.org/10.1007/s00382-020-05232-3>
6. Merryfield, W. J., and Coauthors, 2020: Current and emerging developments in subseasonal to decadal prediction. *Bull. Amer. Meteor. Soc.*, doi: <https://doi.org/10.1175/BAMS-D-19-0037.1>.
7. Lang, A. L., **Pegion, K.**, and Barnes, E. A., 2020: Introduction to special collection: “Bridging weather and climate: Subseasonal-to-seasonal (S2S) prediction”. *Journal of Geophysical Research: Atmospheres*, 125, e2019JD031833. <https://doi.org/10.1029/2019JD031833>
8. Larson, S. and **K. Pegion**, 2019: Do asymmetries in ENSO predictability arise from different recharged states?, *Climate Dynamics*, doi:10.1007/s00382-019-05069-5
9. Kim, H. M. A. Janiga, and **K. Pegion**, 2019: MJO Propagation Processes and Mean Biases in the SubX and S2S Reforecasts, *Journal of Geophysical Research: Atmospheres*, 124. <https://doi.org/10.1029/2019JD031139>
10. **Pegion, K.** and Co-authors, 2019: The Subseasonal Experiment (SubX): A multi-model subseasonal prediction experiment, BAMS, <https://doi.org/10.1175/BAMS-D-18-0270.1>
11. Mariotti, A., E. A. Barnes, E. Chang, A. Lang, P. Dirmayer, **K. Pegion**, D. Barrie, C. Baggett, 2018: Bridging the weather-to-climate prediction gap: progress by the NOAA S2S Prediction Task Force, *EOS*, 100, <https://doi.org/10.1029/2019EO115819>.
12. Bombardi, R.J., L. Trenary, **K. Pegion**, B. Cash, T. DelSole, and J.L. Kinter, 2018: Seasonal Predictability of Summer Rainfall over South America. *J. Climate*, 31, 8181–8195, <https://doi.org/10.1175/JCLI-D-18-0191.1>

13. Larson, S., **K. Pegion**, and B. P. Kirtman, 2018: The South Pacific Meridional Mode as a thermally-driven source of ENSO amplitude modulation and uncertainty, *J. Climate*, <https://doi.org/10.1175/JCLI-D-17-0722.1>
14. Trenary, L., DelSole, T., Tippett, M. K., & **Pegion, K.**, 2018: Monthly ENSO forecast skill and lagged ensemble size. *Journal of Advances in Modeling Earth Systems*, 10, 1074–1086. <https://doi.org/10.1002/2017MS001204>.
15. Fosu, B., S. Y. Wang, and **K. Pegion**, 2018: Synoptic and Climate Attributions of the December 2015 Extreme Flooding in Missouri, USA, *Water* 10(4), 350; doi:[10.3390/w10040350](https://doi.org/10.3390/w10040350)
16. Tippett, M.K., L. Trenary, T. DelSole, **K. Pegion**, and M. L’Heureux, 2018: Sources of Bias in the Monthly CFSv2 forecast climatology, *Journal of Applied Meteorology and Climatology*, <https://doi.org/10.1175/JAMC-D-17-0299.1>
17. **Pegion, K.** and **C. Selman\***, 2017: Patterns of Climate Extremes: Trends and Mechanisms, Extratropical Precursors of the El Niño Southern Oscillation. S. –Y. Wang, R. Gillies, J –H Yoon, and C. Funk, Eds., AGU/Wiley-Blackwell. (Book received Prose Award Honorable Mention in Environmental Science)
18. **Elders, A.+** and **K. Pegion**, 2017: Diagnosing Sea Ice from the North American Multi Model Ensemble and Implications on Mid-latitude Winter Climate, *Climate Dynamics*, DOI: 10.1007/s00382-017-4049-3
19. **Pegion, K.**, T. Delsole, E. Becker, and **T. Cicerone+**, 2017: Assessing the Fidelity of Predictability Estimates, *Climate Dynamics*, DOI: 10.1007/s00382-017-3903-7
20. Trenary, L., T. DelSole, M. K. Tippett, and **K. Pegion**, 2017: A new method for determining the optimal lagged ensemble, *J. Adv. Model. Earth Syst.*, 9, 291–306, doi:10.1002/2016MS000838
21. #Tommasi, D. and Co-authors, 2017: Managing living marine resources in a dynamic environment: The role of seasonal to decadal climate forecasts, *Progress in Oceanography*, 152, 15-49, <https://doi.org/10.1016/j.pocean.2016.12.011>.
22. Tommasi, D., Stock, C. A., **Pegion, K.**, Vecchi, G. A., Methot, R. D., Alexander, M. A. and Checkley, D. M. (2017), Improved management of small pelagic fisheries through seasonal climate prediction. *Ecol Appl*, 27: 378–388. doi:10.1002/eap.1458
23. DelSole, T., L. Trenary, M. K. Tippett, and **K. Pegion**, 2016: Predictability and Temperature of Precipitation at 3-4 Weeks over the Contiguous United States, *Journal of Climate*, doi:10.1175/JCLI-D-16-0567.1 (*Highlighted in Inside Science*)

24. Hervieux, G., M. A. Alexander, C. Stock, M. Jacox, **K. Pegion**, E. Becker, F. Castruccio, and D. Tommasi, 2017: More Reliable Coastal SST Forecasts from the North American Multimodel Ensemble, *Climate Dynamics NMME Special Issue*, doi:10.1007/s00382-017-3652-7
25. #White, C. and Co-authors, 2017: Applications of subseasonal-to-seasonal (S2S) predictions, *Meteorological Applications*, doi:10.1002/met.1654
26. Bombardi RJ, **Pegion KV**, Kinter JL, Cash BA and Adams JM (2017) Sub-seasonal Predictability of the Onset and Demise of the Rainy Season over Monsoonal Regions. *Front. Earth Sci.* 5:14. doi: 10.3389/feart.2017.00014
27. DelSole, T., C. Monteleoni, S. McQuade, M. K. Tippett, **K. Pegion**, and J. Shukla, 2015: Tracking Seasonal Prediction Models, Proceedings of the Fifth International Workshop on Climate Informatics: CI 2015. J. G. Dy, J. Emile-Geay, V. Lakshmanan, Y. Liu (Eds.) September 2015. ISBN: 978-0-9973548-0-5.
28. Stock, C. A., **K. Pegion**, G. A. Vecchi, M. A. Alexander, D. Tommasi, N. A. Bond, P. S. Fratantoni, R.G. Gudgel, T. Kristiansen, T. D. O'Brien, Y. Xue, X. Yang, 2015: Seasonal sea surface temperature anomaly prediction for coastal ecosystems, *Progress in Oceanography*, 137, Part A, 219-236. doi:10.1016/j.pocean.2015.06.007.
29. #Kirtman, B. P and Coauthors, 2014: The North American Multi-Model Ensemble (NMME): Phase-1 Seasonal to Interannual Prediction, Phase-2 Toward Developing Intra-Seasonal Prediction, *Bull. Amer. Met. Soc.*, 95, 585-601.
30. **Pegion, K.** and M. Alexander, 2013: The Seasonal Footprinting Mechanism in CFSv2: Simulation and Impact on ENSO Prediction, *Climate Dynamics*, 41, 1671-1683.
31. **Pegion, K.**, and A. Kumar, 2013: Does an ENSO-Conditional Skill Mask Improve Seasonal Predictions?, *Mon. Wea. Rev.*, **141**, 4515–4533. doi: 10.1175/MWR-D-12-00317.1.
32. **Pegion, K.** and P. Sardeshmukh, 2011: Prospects for Improving Subseasonal Predictions, *Mon. Wea. Rev.*, 139, 3648-3666.
33. Shin, S., P. D. Sardeshmukh, and **K. Pegion** 2010, Realism of local and remote feedbacks on tropical sea surface temperatures in climate models, *J. Geophys. Res.*, 115, D21110, doi:10.1029/2010JD013927.
34. Hu, Z. –Z, B. Huang, and **K. Pegion**, 2009: Biases and the Most Predictable Patterns in the NCEP CFS over the Tropical Atlantic Ocean. Atlantic and Indian Oceans: New Oceanographic Research, E. S. Askew and J. P. Bromley, Eds., Nova Science Publishers, Inc., 1-14.

35. Wu, R., B. P. Kirtman, and **K. Pegion**, 2008: Local rainfall-SST relationship on subseasonal time scales in satellite observations and CFS. *Geophys Res Letters*, 34, L22706, doi:10.1029/2008GL035883
36. **Pegion, K.** and B. P. Kirtman, 2008: The Impact of Air-Sea Interactions on the Simulation of Tropical Intraseasonal Variability. *J. Climate*, 21, 6616-6635.
37. **Pegion, K.** and B. P. Kirtman, 2008: The Impact of Air-Sea Interactions on the Predictability of the Tropical Intraseasonal Oscillation. *J. Climate*, 21, 5870-5886.
38. Hu, Z. -Z., B. Huang, and **K. Pegion**, 2008: Low Cloud Errors over the Southeastern Atlantic in the NCEP CFS and their Association with Lower-Tropospheric Stability and Air-Sea Interaction. *J. Geophys. Res.*, 113, D12114, doi: 10.1029/2007JD009514.
39. Hu, Z. -Z., B. Huang, and **K. Pegion**, 2008: Leading patterns of the tropical Atlantic variability in a coupled general circulation model. *Clim. Dyn.*, 30, 703-726.
40. Wu R., B. P. Kirtman, and **K. Pegion**, 2007: Surface latent heat flux and its relationship with sea surface temperature in the National Centers for Environmental Prediction Climate Forecast System simulations and retrospective forecasts, *Geophys. Res. Letters*, 34, L17712, doi:10.1029/2007GL030751.
41. Kirtman, B. P., **K. Pegion**, and S. Kinter, 2005: Internal atmospheric dynamics and Tropical Indo-Pacific Climate Variability. *J. Atmos. Sci.*, 62, 2220-2233.
42. Wu, R., B. P. Kirtman, and **K. Pegion** 2005: Local Air-Sea Relationships in Observations and Model Simulations. *J. Climate*, 19, 4913-4932.
43. Smith, S.R., D. M. Legler, and **K.V. Verzone**, 2001: Quantifying Uncertainties in NCEP-Reanalysis Using High-Quality Research Vessel Observations. *J. Climate*, 14, 4062-4072.

### **Datasets Produced**

Kirtman, B. P., **Pegion, K.**, DelSole, T., Tippett, M., Robertson, A. W., Bell, M., Burgman, R., Lin, H., Gottschalck, J., Collins, D. C., Li, W., Sinsky, E., Guan, H., Zhu, Y., Becker, E. J., Lajoie, E., MacRitchie, K., Min, D., Fu, R., ... Green, B. W. (2017). *The Subseasonal Experiment (SubX)* [Data set]. IRI Data Library. <https://doi.org/10.7916/D8PG249H> [<http://iridl.ldeo.columbia.edu/SOURCES/.Models/.SubX/>]

### **Open Source Software**

- *SubX*: Software for accessing Subseasonal Experiment Data, multi-language, primary developer, (<https://github.com/kpegion/SubX>)
- *Climpred*: A Python package for performing skill calculations on decadal hindcast datasets. I contributed to the addition of functionality for daily, weekly, monthly, and

seasonal data, making climpred a valuable tool for Earth System Prediction across timescales, contributor, (<https://climpred.readthedocs.io/en/stable/#>)

- *Pangeo at AOES*: Documentation and example Jupyter notebooks for setting up and using Python for climate data analysis (<https://kpegion.github.io/Pangeo-at-AOES/>)
- *CESM-ESPWG*: Codes for calculating skill of NCAR hindcast experiments for the NCAR/Earth System Prediction Working Group (<https://github.com/kpegion/CESM-ESPWG>)
- *COLA Data Catalog*: An intake catalog of climate datasets used in my Department/Center along with software for producing such a catalog to support FAIR data standards and individual project data cataloging (<https://kpegion.github.io/COLA-DATASETS-CATALOG/>)

### **Computational Skills and Experience**

- *Machine Learning/AI*: Coursera Machine Learning Course (completed Aug 2019), Coursera Deep Learning Specialization
- *Weather & Climate Models*: NCEP CFS, NCEP/UFS, NCAR/CESM, NASA/GEOS
- *Programming*: Python, Matlab, R, IDL, Fortran 77/90, C, C++, Unix shell-scripting
- *Data Analysis Tools*: GrADS, NCL
- *Operating Systems*: Unix/Linux, MacOS
- *High Performance Computing*: NCAR, NOAA, NASA, University of Colorado
- *Revision Control and Continuous Integration*: git, Github, Travis-CI
- *Web*: html, css, bootstrap, Jekyll, sphinx
- *Other*: JupyterLab

### **Teaching Activities**

#### **Courses Taught**

*CLIM 102 Introduction to Global Climate Change Science (SP2017, SP2018, SP2019, SP2020)\**  
A Mason Core Course which meets undergraduate requirements to take a science class with lab. I teach multiple sections of the lab component of this course in collaboration with my colleague Dr. Natalie Burls who teaches the lecture component. Since taking over this course we have grown the enrollment of this course from 23 to 72 students, with plans for 100 students in SP2020, including an online lab section. I have developed two new lab assignments to improve student learning of difficult concepts. In collaboration with Dr. Burls and our colleague Dr. John Cook, we introduced a misconception-based learning approach designed to improve critical thinking skills. We also incorporated a graduate lecturer and STEM Accelerator Learning Assistant into this course to provide students a team focused around their success.

*\*In Spring 2019, this course was recognized by students for being an outstanding Mason Core Natural Science with Lab course (above a 4.75 out of 5 on the element "My overall rating of teaching" from the Student Ratings of Instruction).*



*CLIM 713 Atmosphere-Ocean Interactions (SP2015, SP2018)*

An advanced graduate course focused on understanding how the ocean and atmosphere interact to determine the Earth's climate. I have transitioned this course from primarily lecture focused to a combination of lecture and interactive data sessions in which students make graphs of the equations that are derived and of observations-based datasets of the atmosphere and ocean.

*CLIM 670/CLIM 759 Special Topics in Climate Dynamics, Earth System Modeling (FA2015, SP2019, FA 2020-online, FA2020-online)*

A graduate course I developed and have taught as a special topics course. Most of our PhD students work with climate models for their research. This course was developed to give our students practical hands on experience to learn how to work with climate models in preparation for using models in their Dissertation research. In this course, students demonstrate knowledge of climate model architecture, use a climate model to address a scientific or technical question, extract information from model results, and communicate their methodology and results in a clear manner. The course consists of mini-lectures and hands-on activities in which students run a global climate model. The course has been approved as a regular course (CLIM 670) and will be part of the new MS Climate Science degree program. This course is open source in The Carpentries style (<https://kpegon.github.io/CLIM670-Earth-System-Modeling/>)

*CLIM 680 Climate Data (FA2020-online, FA2021-online)*

This is a new course designed for the MS Climate Science and proposed as an optional computational course for our PhD students. This course will accelerate student research skills and prepare students for highly prized skills needed for employment upon graduation. In this course, students will demonstrate knowledge of data analysis techniques, use such techniques to address a scientific question with climate data, draw conclusions from their analysis to the extent possible, and communicate their methodology and results in a clear manner. The course is designed as a practical, hands-on course in which students learn data analysis methods and skills working with prepared climate datasets in class and then apply them to their own research datasets. Students will complete this course with a "toolbox" of codes and methods for analysis of observational and climate model data. This course is open source in The Carpentries style (<https://kpegon.github.io/CLIM680-Climate-Data/>)

## Curriculum Development

*Master's of Science in Climate Science*

As a member of the MS Climate Science Committee, I contributed to curriculum development for the new MS degrees, which has been approved by SCHEV and is expected to begin in Fall 2020. Specifically, CLIM 759 Special Topics in Climate Dynamics, Earth System Modeling which I developed, has been approved as a regular course (CLIM 670) and is the primary course to meet the MS program student learning outcome "Operate and use climate models". Another new course I developed for the MS Climate Science curriculum, Climate Data (CLIM 680) is the

primary course to meet the student learning outcome to “Process and statistically analyze climate data”.

### *CLIM 761 Advanced Predictability and Prediction of the Atmosphere*

This is the revival of a previous course taught by Dr. David Straus. The course covers the theory and practice of predicting atmospheric circulation from daily weather to subseasonal weather regimes to seasonal climate. Discusses atmospheric data assimilation, the dynamics of rapidly amplifying modes, the role of large-scale instability and weather regime dynamics, and the role of boundary conditions. Students will design and carry out ensemble forecasts using a range of numerical models. This course will be co-taught by myself and Dr. Straus. My contribution will be the hand-on part of the course to teach the students how to carry out the ensemble forecast experiments.

### Graduate Students Advised

1. Kai Huang, PhD Climate Dynamics, GMU (FA2019-Present)
  - 2020 NCAR ASP Graduate Visitor Program (postponed to 2021 due to COVID-19)
2. Mary Korendyke (Co-advised with D. Straus), PhD Climate Dynamics, GMU (FA2019-Present)
3. Zachary Manthos (Co-advised with C. Stan, P.Dirmeyer), MS Climate Science, GMU (FA2019-Present)
4. Akiko Elders, PhD Climate Dynamics, GMU (FA2015-SP2019)
  - PhD Dissertation Title: Atmospheric Response to Arctic Sea ice loss
  - SU2018 Provost Research Award Recipient
  - Current Position: University Space Research Association, NASA/GSFC
5. Kathrin Alber, MS Geoscience, Meteorology Concentration, U. Basel, Switzerland, (FA2017-SU2018)
  - MS Thesis Project: Prediction and predictability of the North Atlantic Oscillation
  - Top MS Thesis grade in Switzerland
  - Awarded Graduate Research Fellowship for PhD Program, U. Albany
  - Current Position: PhD Student, University of Albany
6. Teresa Cicerone, PhD Candidate, Climate Dynamics (FA2015-SP2019)
  - PhD Dissertation Topic: The Link Between the Mixed Layer Depth in the Seychelles-Chagos Thermocline Ridge and the Initiation of the Madden-Julian Oscillation
  - FA2018 Graduate Student Travel Fund Recipient
  - FA2018 Chandran J. Shukla Fellowship Recipient
  - Transferred to another advisor after SP2019
7. Patrick Staton, MS Earth System Science, GMU (FA2014-SP2016)
  - MS Thesis Project: A Shift in Attitudes for a Shift in Climate
  - Current Position: Research Associate II, University of Alabama-Huntsville

### Undergraduate Students Advised

Jacquelyn Crowel, GMU Atmospheric Sciences Major (FA2018-SP2021)

- Project Title: Tropical Cyclones in SubX

Riley Freeland, GMU Atmospheric Sciences Major (SP2019-FA2020)

- Project Title: Winter Storms in SubX

Research Scientists, Postdoctoral Scientists, and/or Technical Support Staff Advised

Noushin Behboudi, Research Technical Support Staff/Data Scientist (2020-Present)

Christopher Selman, Postdoctoral Researcher (2015-2017)

Graduate Student Committees

Thesis Committee Member, GMU Earth System Science, M.S. Student, David Benson (2017)

Dissertation Committee Member, GMU Climate Dynamics PhD Student, Jiexia Wu (2017-2018)

Dissertation Committee Member, GMU Climate Dynamics PhD Student Sara Amini (2015-2018)

Dissertation Committee Member, GMU Climate Dynamics PhD Student Holly Norton (2015-2018)

Dissertation Committee Member, GMU Climate Dynamics PhD Student Ralph Getzandanner (2016-2019)

Dissertation Committee Member, GMU Climate Dynamics PhD Student Nick Lybarger (2016-2019)

Dissertation Committee Member, GMU Climate Dynamics, PhD Student Abdullah Fahad (2018-2020)

Dissertation Committee Member, U. Miami RSMAS, PhD Student Kurt Hansen (2018-)

Dissertation Committee Member, GMU ESGS, PhD Student Danielle Brant (2019-)

Dissertation Committee Member, GMU Climate Dynamics, PhD Student David Benson (2019-)

Dissertation Committee Member, GMU Climate Dynamics, PhD Student Paul Buchmann (2019-)

Dissertation Committee Member, GMU Civil Engineering, PhD Student Arslaan Khalid (2019-2020)

Dissertation Committee Member, U. Miami RSMAS, PhD Student Rachel Sodowsky (2019)

Dissertation Committee Member, GMU Climate Dynamics, PhD Student Rachel Gaal (2020-)

Dissertation Committee Member, U. Miami RSMAS, PhD Student Kayla Besong (2020-)

Education Research

Proposal Submitted, GP-GPO: Modernizing Atmosphere, Ocean, and Earth Science Graduate Education to Incorporate New Data Science and Technologies, NSF Improving Undergraduate STEM Education: Pathways into the Earth, Ocean, Polar and Atmospheric & Geospace Sciences (IUSE:GEOPATHs), PI, \$300K, Feb 2020 (Status: not funded)

IRB Approved Project, Cook, J., N. Burls, and K. Pegion, Assessing effectiveness of climate science course material in CLIM102, Jan 2019.

Burls, N., K. Pegion, and J. Cook, Misconception-based learning to cement understanding, 2019 GMU Innovations in Teaching & Learning (ITL) Conference, "Teaching the Whole Student."

Proposal Submitted, Improving Critical Thinking about Climate Change through Mobile Gaming, May 2019, Co-PI, PI: John Cook (GMU), GMU Institute for a Sustainable Earth Seed Funding, \$40K (Status: not funded)

## Service Activities

### Departmental Committees

- AOES AGU Bridge Committee Chair (Jan 2021-)
- AOES Strategic Planning Committee (Oct 2020-)
- AOES TTIP Cluster Hire Proposal Committee (Oct 2020)
- AOES Admissions Committee (Oct 2019–Jan 2021)
- AOES Web Committee, (June 2019-Nov 2020)
- AOES Twitter Account Creator and Administrator (Dec 2019-)
- Climate Dynamics, Chandran J. Shukla Fellowship Committee (graduate student travel fund) (Fall 2015- Present)
- Climate Science MS Program Development Committee (Fall 2017-Spring 2020)
- Department P&T Workload Documents Committee (Dec 2016-Jan 2019)
- AOES Provost PhD Award proposal committee (Fall 2015, 2016, 2017, 2020)
- Hiring Committee, Postdoctoral Research Fellow/ENSO Precursors (Dec 2014)
- Hiring Committee, Postdoctoral Research Fellow/Climate Dynamics (Dec 2014)
- Hiring Committee, Postdoctoral Research Fellow/Subseasonal Prediction (Feb 2015)
- Hiring Committee, Research Assistant Professor, Center for Ocean-Land-Atmosphere Studies (Feb 2017)
- Hiring Committee, Research Assistant Professor (Jun 2018)
- Hiring Committee, AOES Office Assistant (Aug 2020)

### Editing and Reviewing

- *Associate Editor*, Journal of Climate (Aug 2019-Present)
- *Guest Associate Editor* and Co-organizer of Special Journal Collection, JGR-Atmospheres & Geophysical Research Letters, *Seamless Prediction across Weather and Climate*
- *Expert Reviewer*, Colorado River Basin Climate and Hydrology—State of the Science: Chapter on Weather and Climate Forecasting (A synthesis of the state of the climate and hydrology science in the Colorado River Basin funded by Bureau of Reclamation and state and local water management agencies in the Upper and lower Colorado river basin)
- *Journals*: Climate Dynamics, Journal of Climate, Journal of Geophysical Research, Geophysical Research Letters, Monthly Weather Review, Weather and Forecasting, EOS, Journal of Atmospheric Sciences, Journal of Advances in Modeling Earth Systems, Quarterly Journal of the Royal Meteorological Society
- *Funding Agencies*: National Science Foundation, NOAA/Climate Program Office, NASA, Natural Environmental Research Council (NERC- UK's main agency for research funding in the environmental sciences)

### National Committees

- Co-Chair NCAR/CESM Earth System Prediction Working Group (Mar 2020-present)
- Member, Weather Research Science Working Group, Federal Weather Enterprise, Office of the Federal Coordinator for Meteorology (June 2018-Nov 2020)
- Co-lead, NOAA/MAPP S2S Task Force (July 2017-2020)
- Member, NOAA/MAPP S2S Task Force (Sep 2016- 2020)
- NASA-SERVIR Technical Assistance Group (Jul-Sep 2016)
- Member, US Clivar Scientific Steering Committee (Jan 2015-Dec 2016)
- Member, US Clivar, Predictability, Prediction, Applications Interface Panel (Jan 2013-Dec 2016)
- Co-Chair, US Clivar, Predictability, Prediction, Applications Interface Panel (Jan 2015-Dec 2016)
- Member, NOAA/Climate Program Office Climate Prediction Task Force (2012-2015)

### Session Convener at Conferences

- Convener, Subseasonal to Seasonal Climate Prediction, Processes, and Services, AGU Fall Meeting, online, Dec 2020
- Convener, Advances in Earth system prediction across timescales, AGU Fall Meeting, online, Dec 2020
- Convener, Sub-seasonal to seasonal prediction of weather and climate, AGU Fall Meeting, Washington, DC, Dec 2018
- Convener, Multi-model Predictability and Prediction on Subseasonal to Seasonal Timescales, AMS Annual Meeting, Austin, TX, Jan 2018
- Convener, Climate Dynamics: Theory, Modeling and Breakthroughs, AGU Fall Meeting, San Francisco, CA, Dec 2017
- Convener, Sub-seasonal to Seasonal Forecasting of High-Impact Weather and Climate Events, AGU Fall Meeting, San Francisco, CA, Dec 2016
- Convener, Understanding and Predicting Subseasonal Extremes, Poster Cluster, Clivar Open Science Conference, Qingdao, China, Sep 2016
- Convener American Meteorological Society Annual Meeting Session, Multi-model Predictability and Prediction on Subseasonal to Seasonal Timescales, New Orleans, La, Jan 2016
- Convener American Geophysical Union Fall Meeting Session, The El Niño - Southern Oscillation continuum, San Francisco, CA, Dec 2015

### Workshops/Training Organized

- SubX Users Workshop, Aug 2021
- NCAR ASP Summer School on S2S predictions and S2S Science, Jul 2021
- Python for Atmosphere/Ocean Scientists, Short Course Instructor American Meteorological Society Meeting, Mar 2021
- 1<sup>st</sup> NMME/SubX Science Workshop, Sep 2017
- ESWN Science Communications Workshop, July 2017
- NMME Subseasonal Forecast System Exploratory Workshop, Mar 2015

### Diversity, Equity, Inclusion, and Justice

- AOES AGU Bridge Committee Chair (Jan 2021-)
- AOES AGU Bridge proposal Lead (program to recruit and mentor under-represented minority graduate students), lead successful proposal and department participation as AGU Bridge Partners.
- Organized and lead discussion of increasing diversity in AOES Department during #BlackoutSTEM
- Proposed educational component to provide data analysis and coding skills intake training to underrepresented graduate students

### **Workshops/Training Attended**

- Neural Networks and Deeplearning, Improving Deep Neural Networks, Hyperparameter tuning, Regularization and Optimization, Structuring Machine Learning Projects, Convolutional Neural Networks, Sequence Models, Coursera/deeplearning.ai, Online (Jan 2021)
- The Carpentries Instructor Training, Online (May 2020)
- Stanford Machine Learning Course, Coursera Online (Aug 2019)
- Building Leadership and Management Skills for Success, Earth Science Women's Network, Providence, RI (2013)
- Communicating and Networking, Earth Science Women's Network, Madison, WI (2012)
- Defining Your Research Identity, Earth Science Women's Network, Boulder, CO (2011)
- NATO Advanced Study Institute on Seasonal to Interannual Climate Variability: its Prediction and Impact on Society, Gallipoli, Italy, (2005)
- NCAR/IMAGE Theme-of-the-Year Workshop on Multi-Scale Interactions in the Tropics to Midlatitudes: Mathematical Theory, Observations, and Numerical Models, Boulder, CO (2005)

### **Management and Leadership**

- Researcher Management and Leadership Training, Coursera (2021)
- Leading Without Formal Authority, LinkedIn Learning (2021)
- Managing Technical Professionals, LinkedIn Learning (2021)
- Building Leadership and Management Skills for Success, Earth Science Women's Network, Providence, RI (2013)
- Communicating and Networking, Earth Science Women's Network, Madison, WI (2012)
- Defining Your Research Identity, Earth Science Women's Network, Boulder, CO (2011)

### **Conference Presentations and Seminars (as lead author)**

78 Total; 29 Invited

*Invited*

1. Bridging the Gap between Weather and Climate Prediction with the Subseasonal Experiment (SubX), Colorado State University, Atmospheric Sciences Department, Apr 2021, online
2. The Subseasonal Experiment (SubX), SCRIPPS CASPO Seminar Series, Mar 2021, online
3. Computational Weather Prediction and Climate Projection: Challenges and Prospects, GMU School of Computing AI Tea Series, Feb 2021, virtual
4. Understanding the Impact of the Extratropics on ENSO using Machine Learning, AMS Annual Meeting, Jan 2021, virtual
5. Precipitation prediction and predictability, Limits and Sources of Predictability session of the NOAA-DOE Precipitation Processes and Predictability Workshop, Nov 30-Dec 2, virtual
6. Understanding the Impact of the Extratropics on ENSO Predictability and Diversity using Machine Learning, American Meteorological Society Annual Meeting (34th Conference on Climate Variability and Change), virtual
7. Multimodel coordinated experiments and S2S predictions, NCAR ASP Summer Colloquium on Subseasonal to Seasonal Science, Jul 2020, Boulder, CO (postponed to Jul 2021 due to COVID-19)
8. Bridging the Gap between Weather and Climate Predictions using Multi-model Ensembles, ECMWF Annual Seminar, Reading UK, Sep 2019
9. SubX Research Highlights, SubX Review, College Park, MD, Aug 2019
10. The Subseasonal Experiment (SubX), Dynamics Group Meeting/CSU, Fort Collins, CO Nov 2018
11. The Impact of the Extratropics on ENSO Diversity and Predictability, NCAR/CATALYST Group Meeting, Boulder, CO, Nov 2018
12. Metrics for S2S: Examples from SubX, National Earth System Prediction Capability Workshop on Metrics, Postprocessing, and Products for Subseasonal to Seasonal Timeframes, College Park, MD, Feb 2018
13. The Subseasonal Experiment, Central Weather Bureau, Taiwan, Oct 2017
14. Tropical cyclones in SubX, MAPP Webinar, Sep 2017
15. Assessing the Fidelity of Predictability Estimates, MAPP Webinar, Mar 2017

16. Workshop on Sub-Seasonal to Seasonal Predictability of Extreme Weather and Climate, International Research Institute for Climate and Society, Dec 2016
17. Extratropical Precursors of the El Niño Southern Oscillation, Stony Brook University, School of Marine and Atmospheric Sciences Seminar, Apr 2016.
18. Extratropical ENSO Precursors: The Elephant of Long-lead ENSO Prediction, Dept of Atmospheric, Oceanic, and Earth Sciences Seminar, George Mason University, Feb 2016.
19. Development of a Subseasonal North American Multi-Model Ensemble Prediction System, American Geophysical Union Fall Meeting, San Francisco, CA, Dec 2015.
20. The North American Multi-model Ensemble: Seasonal to Subseasonal Prediction, Workshop on Subseasonal Predictability, European Center for Medium Range Weather Forecasting, Reading, UK, Nov 2015.
21. NMME Subseasonal Demonstration Experiment, NMME Subseasonal Exploratory Workshop, National Centers for Environmental Prediction, College Park, MD, March 2015.
22. Towards Subseasonal Prediction with the NMME, 2nd Taiwan West Pacific Global Forecast System Planning Workshop, Central Weather Bureau, Taipei, Taiwan, May 2014.
23. Metrics for Quantifying Predictability limits, US CLIVAR Summit, Denver, CO, July 2014.
24. Untangling ENSO Precursors, Department of Geological Sciences, University of Indiana, Bloomington, Indiana, Mar 2013.
25. Untangling ENSO Precursors, Department of Atmospheric, Oceanic, and Earth Sciences, George Mason University, Fairfax, VA, Mar 2013.
26. Untangling ENSO Precursors, Dept of Meteorology, University of Oklahoma, Norman, OK.
27. The Seasonal Footprinting Mechanism in CFSv2: Simulation and Impact on ENSO Prediction, COLA Seminar Series, Calverton, MD, 2013.
28. Prospects for Improving Seasonal Predictions, COLA Seminar Series, Calverton, MD, 2011.



29. The Impact of Air-Sea Coupling on Tropical Intraseasonal Variability, Simulation and Predictability, Penn State University, Earth Science System Center Seminar Series, State College PA, 2007.

*Contributed*

1. The COLA Datasets Catalog, GMU/AOES Climate Dynamics Seminar, Aug 2020
2. Python, Pangeo, Jupyter, and Climpred: Useful tools to speed up your data analysis, GMU/AOES Climate Dynamics Seminar, Jan 2020
3. Advancing Subseasonal and Seasonal Predictions, GMU/AOES Climate Dynamics Seminar, Oct 2019
4. SubX Overview, NOAA/MAPP S2STF Telcon, Aug 2019
5. Earth System Prediction with the Subseasonal Experiment (SubX), NCAR CESM Workshop, CESM Climate Variability and Change Working Group, Boulder, CO, June 2019.
6. Ensemble Prediction and Predictability of Extreme Weather via Circulation Regimes, Workshop on Predictability, dynamics and applications research using the TIGGE and S2S ensembles, ECMWF, Reading, UK, Apr 2019
7. The Impact of the Extratropics on ENSO Diversity and Predictability, AGU Annual Meeting, Washington, DC, Dec 2018
8. The Subseasonal Experiment (SubX), NCAR/CGD Seminar, Boulder, CO, Nov 2018
9. The Subseasonal Experiment (SubX), NOAA/ESRL/GSD Seminar, Boulder, CO, Oct 2018
10. The Subseasonal Experiment (SubX), NOAA/Climate Diagnostic and Prediction Workshop, Santa Barbara, CA, Oct 2018
11. The Subseasonal Experiment (SubX), Second International Conference on Subseasonal to Seasonal Prediction (S2S), Boulder, CO, Sep 2018
12. The Subseasonal Experiment, NOAA/ESRL, Boulder, CO, Jan 2018
13. How Important are the Extratropics to ENSO Diversity and Predictability? 98<sup>th</sup> Annual AMS Meeting, Austin, TX, Jan 2018.
14. Multi-model MJO Simulation and Prediction in the Subseasonal Experiment (SubX), 98<sup>th</sup> Annual AMS Meeting, Austin, TX, Jan 2018

15. The Subseasonal Experiment, 42<sup>nd</sup> Annual Climate Diagnostics and Prediction Workshop, Norman, OK, Oct 2017
16. The Subseasonal Experiment, NMME/SubX Science Meeting, College Park, MD, Sep 2017
17. Assessing the Fidelity of Predictability Estimates, NMME/SubX Meeting, Sep 2017
18. Assessing the Fidelity of Predictability Estimates, 5<sup>th</sup> WGNE workshop on systematic errors in weather and climate, Montreal, Canada, Jun 2017
19. Which predictability estimates are most realistic?, NCAR CGD Seminar Series, Nov 2016
20. Understanding and Predicting Subseasonal Extreme Events: Identifying and Assessing Gaps in Subseasonal to Seasonal Prediction, CLIVAR Open Science Conference, Qingdao, China, Sep 2016
21. Diagnosing Sea Ice from the North American Multi Model Ensemble and Implications on Mid-latitude Winter, CLIVAR Open Science Conference, Qingdao, China, Sep 2016
22. Untangling ENSO Precursors, American Geophysical Union Fall Meeting, San Francisco, CA, Dec 2014.
23. Untangling ENSO Precursors, 39<sup>th</sup> Annual Climate Diagnostics and Prediction Workshop, St. Louis, Missouri, Oct 2014.
24. Forecasting Forecast Skill: Can an ENSO Conditional Skill Mask Improve Seasonal Predictions? NOAA Climate Program Office, Modeling Analysis Predictions and Projections Program Webinar on Intraseasonal to Interannual Prediction, 2013.
25. The Seasonal Footprinting Mechanism in CFSv2: Simulation and Impact on ENSO Prediction, Joint Climate Testbed Seminar Series, National Centers for Environmental Prediction, College Park, MD, 2013.
26. A Preliminary Assessment of MJO Skill in the NMME, 38<sup>th</sup> Climate Diagnostics and Prediction Workshop, College Park, MD, 2013.
27. The Seasonal Footprinting Mechanism in CFSv2: Simulation and Impact on ENSO Prediction, Clivar ENSO Diversity Working Group Workshop, Boulder, CO, 2013
28. The Seasonal Footprinting Mechanism in CFSv2: Simulation and Impact on ENSO Prediction, AGU Fall Meeting, San Francisco, CA, 2012

29. A Conditional Skill Mask for Improved Seasonal Predictions, 37<sup>th</sup> Climate Diagnostics and Prediction Workshop, Ft. Collins, CO, 2012
30. The Seasonal Footprinting Mechanism in CFSv2: Simulation and Impact on ENSO Prediction, CFSv2 Evaluation Meeting, poster, College Park, MD, 2012.
31. Understanding the Statistics of Climate Extremes, poster, AGU Fall Meeting, San Francisco, CA, 2011
32. Understanding the Statistics of Climate Extremes, World Climate Research Programme, Open Science Conference, Denver, CO, 2011.
33. Multimodel Ensemble Prediction on Intraseasonal Timescales, World Climate Research Programme, Open Science Conference, Denver, CO, 2011.
34. Prospects for Improving Seasonal Predictions, National Centers for Environmental Prediction, Climate Prediction Center, Development Branch Seminar, Camp Springs, MD, 2011.
35. Understanding the Statistics of Climate Extremes, NCAR/CCSM Workshop, Breckenridge, CO, 2011.
36. Understanding the Statistics of Climate Extremes, 36<sup>th</sup> Climate Diagnostics and Prediction Workshop, Ft. Worth, TX 2011.
37. Multi-Model Ensemble Prediction on Intraseasonal Timescales, 36<sup>th</sup> Climate Diagnostics and Prediction Workshop, Ft. Worth, TX, 2011.
38. Prospects for Improving Subseasonal Predictions. 35th Climate Diagnostics and Prediction Workshop, Raleigh, NC, 2010
39. Subseasonal Variability of Hurricane Activity, NOAA Climate Testbed Joint Seminar Series, Calverton, MD, 2009.
40. Simulation and Forecast of Subseasonal Variability of Hurricane Activity, 33rd Annual Climate Diagnostics and Prediction Workshop, Lincoln NE, 2008.
41. The Impact of Air-Sea Coupling on Predictability of Boreal Winter/Spring Precipitation in the Indo-Pacific, 88th Annual AMS Meeting, New Orleans, LA, 2008.
42. Sensitivity of MJO Predictability to SST, 32<sup>nd</sup> Climate Diagnostics Workshop, Tallahassee, FL, 2007

43. Sensitivity of MJO Predictability to SST, New Approaches to Understanding, Simulating, and Forecasting the Madden-Julian Oscillation, Irvine, CA, 2007.
44. Sensitivity of the MJO to SST: A Simulation and Predictability Study of the MJO using the CFS and GFS, Joint Climate Test Bed Seminar Series, Calverton, MD, 2007.
45. The Impact of Air-Sea Coupling on Tropical Intraseasonal Variability, Simulation and Predictability, Global Modeling and Assimilation Office Subseasonal to Decadal Group Seminar, Goddard Space Flight Center, Greenbelt, MD, 2007
46. The Impact of Air-Sea Coupling on Tropical Intraseasonal Variability in the CFS, 31st Annual Climate Diagnostics and Prediction Workshop, Boulder, CO, 2006.
47. Interannual and Intraseasonal Variability in the CFS Interactive Ensemble, 31st Annual Climate Diagnostics and Prediction Workshop, Boulder, CO, 2006
48. Potential Predictability of Tropical Intraseasonal Variability in the NCEP Climate Forecast System, AGU Joint Assembly, Baltimore, MD, 2006.
49. Simulation of Tropical Intraseasonal Variability in the CFS, 30th Annual Climate Diagnostics and Prediction Workshop, State College, PA, 2005
50. The Importance of Daily vs. Monthly SSTs in Seasonal Simulations, 84th Annual AMS meeting, Seattle, WA, 2004.