Michael K. Tippett
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Education

Ph.D. Mathematics, New York University, New York, 1992.
"Tokamak transport based in the 13-moment model", Advisor: Harold Weitzner.
M.S. Mathematics, New York University, New York, 1990.
B.S. Mathematics, North Carolina State University, Raleigh, 1987.
B.S. Electrical Engineering, North Carolina State University, Raleigh, 1987.

Professional experience

Department of Applied Physics and Applied Mathematics, Columbia University.
Associate Professor, July 2016 - present.
Lecturer in the Discipline of Applied Mathematics, July 2013 - June 2016.
Chief Data Scientist, Initiative on Extreme Weather and Climate, Feb 2015 - present.

Center of Excellence for Climate Change Research, King Abdulaziz University, Jeddah, Saudi Arabia.
Adjunct Professor, Dec 2011 - present.

International Research Institute for Climate and Society, Columbia University.
Senior Research Scientist, 2013.
Leader global forecast development, 2008-2013.
Research Scientist, 2003–2013.
Associate Research Scientist, 1999–2003.

Center for Weather Prediction and Climate Studies (CPTEC), Cachoeira Paulista, SP, Brazil.
Visiting Scientist, 1996–1999.

Max Planck Institute for Plasma Physics, Garching, Germany.
Post-Doctoral Researcher, 1992–1995.

Publications (Google Scholar 1/9/17: Total citations = 2554, H-index = 24) [postdocs and students]

[1] X. Yan, T. DelSole, and M. K. Tippett. Climate detection with space-only fingerprints. *J. Climate*, 2017. Submitted.

[2] A. G. Barnston, M. K. Tippett, M. Ranganathan, and M. L. L'Heureux. Deterministic skill of ENSO predictions from the North American Multimodel Ensemble. *Clim. Dyn.*, 2016. Submitted.

[3] X. Yan, T. DelSole, and M. K. Tippett. Does land precipitation data improve detectability of aerosol cooling? *J. Climate*, 2016. Submitted.

[4] M. A. Ehsan, M. Almazroui, A. Yousef, O. Enda, M. K. Tippett, F. Kucharski, I.-S. Kang, and A. A. Alkhalaf. Sensitivity of AGCM simulated regional summer precipitation to different convective parameterizations. *Int. J. Climatol.*, 2016. Submitted

[5] M. K. Tippett, M. Ranganathan, M. L'Heureux, A. G. Barnston, and T. DelSole. Assessing probabilistic predictions of ENSO phase and intensity from the North American Multimodel Ensemble. *Clim. Dyn.*, 2016. Submitted.

[6] T. DelSole, L. Trenary, M. K. Tippett, and K. Pegion. Predictability of week 3-4 average temperature and precipitation over the contiguous United States. *J. Climate*, 2016. Submitted.

[7] L. Trenary, T. DelSole, M. Tippett, and K. Pegion. A new method for determining the optimal lagged ensemble. *J. Adv. Model. Earth Syst.*, 2017. doi:10.1002/2016MS000838

[8] T. Hall and M. K. Tippett. Pacific Hurricane Landfalls on Mexico and SST. *J. Appl. Meteor. Climatol.*, 2016. doi:10.1175/JAMC-D-16-0194.1

[9] M. A. Ehsan, M. K. Tippett, M. Almazroui, M. Ismail, A. Yousef, F. Kucharski, M. Omar, M. Hussein, and A. A. Alkhalaf. Skill and predictability in multimodel ensemble forecasts for northern hemisphere regions with dominant winter precipitation. *Clim. Dyn.*, 2016. doi:10.1007/s00382-016-3267-4.

[10] M. L'Heureux, M. K. Tippett, and A. G. Barnston. Reply to "Comment on 'Characterizing ENSO coupled variability and its impact on North American seasonal precipitation and temperature'". *J. Climate*, 30, 437–441, 2017. doi:10.1175/JCLI-D-16-0080.1.

[11] L. Trenary, T. DelSole, M. K. Tippett, and B. Doty. Extreme eastern US winter of 2015 not symptomatic of climate change [in "Explaining Extremes of 2015 from a Climate Perspective"]. *Bull. Am. Meteor. Soc.*, 97, S31–S35, 2016. doi:10.1175/BAMS-D-16-0156.1.

[12] M. K. Tippett, C. Lepore, and J. E. Cohen. More tornadoes in the most extreme U.S. tornado outbreaks. *Science*, 354, 1419–1423, 2016. doi:10.1126/science.aah7393. Reported by: [NPR] [The Christian Science Monitor] [Climate Central] [Bloomberg] [Altmetric score]

[13] C.-Y. Lee, M. K. Tippett, A. H. Sobel, and S. J. Camargo. Autoregressive modeling for tropical cyclone intensity climatology. *J. Climate*, 29, 7815–7830, 2016. doi:10.1175/JCLI-D-15-0909.1.

[14] A. H. Sobel, S. J. Camargo, T. M. Hall, C.-Y. Lee, M. K. Tippett, and A. A. Wing. Human influence on tropical cyclone intensity. *Science*, 353, 242–246, 2016. doi:10.1126/science.aaf6574. [Altmetric score]

[15] T. DelSole, X. Yan, and M. Tippett. Inferring aerosol cooling from hydrological sensitivity. *J. Climate*, 29, 6167–6178, 2016. doi:10.1175/JCLI-D-15-0364.1.

[16] A. H. Sobel, S. J. Camargo, A. G. Barnston, and M. K. Tippett. Northern hemisphere tropical cyclones during the quasi-El Niño of late 2014. *Nat. Hazards*, 83, 1717–1729, 2016. doi: 10.1007/s11069-016-2389-7.

[17] G. W. Carbin, M. K. Tippett, S. P. Lillo, and H. E. Brooks. Visualizing long-range severe thunderstorm environment guidance from CFSv2. *Bull. Am. Meteor. Soc.*, 97, 1021–1031, 2016. doi: 10.1175/BAMS-D-14-00136.1.

[18] S. D. Ditchek, W. R. Boos, S. J. Camargo, and M. K. Tippett. A genesis index for monsoon disturbances. *J. Climate*, 29, 5189–5203, 2016. doi:10.1175/JCLI-D-15-0704.1.

[19] X. Yan, T. DelSole, and M. Tippett. What surface observations are important for separating the influences of anthropogenic aerosols from other forcings? *J. Climate*, 29, 4165–4184, 2016. doi: 10.1175/JCLI-D-15-0667.1.

[20] C. Lepore, J. T. Allen, and M. K. Tippett. Relationships between extreme precipitation and atmospheric variables over the contiguous United States. *J. Climate*, 29, 3181–3197, 2016. doi: 10.1175/JCLI-D-15-0331.1.

[21] M. K. Tippett and J. E. Cohen. Tornado outbreak variability follows Taylor's power law of fluctuation scaling and increases dramatically with severity. *Nat. Commun.*, 7, 10668, 2016. doi: 10.1038/ncomms10668. Reported by: [time.com] [slate.com] [Columbia Spectator] [Altmetric score]

[22] C.-Y. Lee, M. K. Tippett, A. H. Sobel, and S. J. Camargo. Rapid intensification and the bimodal distribution of tropical cyclone intensity. *Nat. Commun.*, 7, 10625, 2016. doi:10.1038/ncomms10625.

[23] T. DelSole and M. K. Tippett. Forecast comparison based on random walks. *Mon. Wea. Rev.*, 144, 615–626, 2016. doi:10.1175/MWR-D-15-0218.1.

[24] J. T. Allen, M. K. Tippett, and A. H. Sobel. Influence of the El Niño/Southern Oscillation on tornado and hail frequency in the United States. *Nat. Geosci.*, 8, 278–283, 2015. doi:10.1038/ngeo2385. Reported by: [USA Today] [Insurance Journal] [Bloomberg] [Scientific American] [Altmetric score]

[25] J. T. Allen and M. K. Tippett. The characteristics of United States hail reports: 1955-2014. *Electronic J. Severe Storms Meteor.*, 10, 1–31, 2015.

[26] L. Trenary, T. DelSole, M. K. Tippett, and B. Doty. Are eastern US winter temperatures becoming more variable? [in "Explaining Extremes of 2014 from a Climate Perspective"]. *Bull. Am. Meteor. Soc.*, 96, S10–S15, 2015. doi:10.1175/BAMS-D-15-00138.1. Reported by [Climate Central]

[27] J. T. Allen, M. K. Tippett, and A. H. Sobel. An empirical model relating U.S. monthly hail occurrence to large-scale meteorological environment. *JAMES*, 7, 226–243, 2015. doi:10.1002/2014MS000397.

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[29] A. G. Barnston, N. Vigaud, L. N. Long, M. K. Tippett, and J.-K. E. Schemm. Atlantic tropical cyclone activity in response to the MJO in NOAA's CFS model. *Mon. Wea. Rev.*, 143, 4905–4927, 2015. doi:10.1175/MWR-D-15-0127.1.

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[31] T. DelSole and M. K. Tippett. Laplacian eigenfunctions for climate analysis. *J. Climate*, 28, 7420–7436, 2015. doi:10.1175/JCLI-D-15-0049.1.

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[33] C.-Y. Lee, M. K. Tippett, S. J. Camargo, and A. H. Sobel. Probabilistic prediction of tropical cyclone intensity from a multiple-linear regression model. *Mon. Wea. Rev.*, 143, 933–954, 2015. doi:10.1175/MWR-D-14-00171.1.

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[37] M. K. Tippett, M. Almazroui, and I.-S. Kang. Extended-range forecasts of areal-averaged Saudi Arabia rainfall. *Wea. Forecasting*, 30, 1090–1105, 2015. doi:10.1175/WAF-D-15-0011.1.

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[97] S. J. Camargo, M. K. Tippett, and I. L. Caldas. Nonmodal energetics of resistive drift waves. *Phys. Rev. E*, 58, 3693–3704, 1998. doi:10.1103/PhysRevE.58.3693.

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[102] M. K. Tippett and R. Ziolkowski. A bidirectional wave transformation of the cold plasma equtions. *J. Math. Phys.*, 32, 488–492, 1991.

[103] G. M. Zaslavsky and M. K. Tippett. Connection between recurrence time statistics and anomalous transport. *Phys. Rev. Lett.*, 67, 3251–3254, 1991.

[104] R. Ziolkowski and M. K. Tippett. Collective effect in an electron plasma system catalyzed by a localized electromagnetic wave. *Phys. Rev. A*, 43, 3066–3072, 1991.

Postdoctoral researchers supervised

John T. Allen, Feb 2013 – Feb 2016. Promoted to Associate Research Scientist. Assistant Professor at Central Michigan University.

Chi-Ying Lee, Oct 2013 – Sep 2016. Promoted to Associate Research Scientist.

Mengqian Lu, Sep 2014 – Jan 2016. Assistant Professor at Hong Kong University of Science & Technology.

Courses taught

APMA 2101 Introduction to Applied Mathematics

2014 [126 students], 2015 [103 students], 2015 [109 students], 2016 [107 students]

APMA 3101 Linear Algebra

2013 [20 students], 2014 [18 students], 2015 [46 students], 2015 [42 students]

APMA 3900 Undergraduate Research in Applied Mathematics

Spring 2016 [Maya Chandrasekaran], Fall 2016 [Alek Anichowski, Sara Edelman-Munoz]

APAM E6650 Research project

Fall 2016 [Saurabh Kumar, Julien Maudet, Aditya Garg]

Grants and contracts

1. *Development a real-time multi-model sub-seasonal predictive capability.* co-PI. National Oceanic and Atmospheric Administration. NA16OAR4310145. Award Period: 08/01/2016 - 07/31/2018. $367,250 Lamont. $42,750. SEAS.
2. *Development and testing of a multi-model ensemble prediction system for sub-monthly forecasts*. co-PI. National Oceanic and Atmospheric Administration. NA15NWS4680014. Award Period: 05/01/2015 - 04/30/2017. $26,982. SEAS.
3. *Assessment of CFS predictions of severe weather activity.* PI. National Oceanic and Atmospheric Administration. NA14OAR4310185. Award Period: 08/01/2014 - 07/31/2016. $130K. SEAS.
4. *Subseasonal NMME Forecasts: Skill, Predictability, and Multi-model Combinations*. co-PI. National Oceanic and Atmospheric Administration. PI. NA14OAR4310184. Award Period: 08/01/2014 - 07/31/2016. $80K. SEAS.
5. *Improved Probabilistic Forecast Products for the NMME Seasonal Forecast System*. co-PI. $246K. Award Period: 8/1/14 - 7/31/16. IRI/EI.
6. *Development and analysis of environmental indices for the spatial distribution of hail occurrence and size*. PI. FM Global. Award Period: 05/22/2014 - 05/21/2015. $79,567.00. SEAS.
7. *AXA Award research project*. Co-PI. Award Period: 10/15/13-10/14/15. co-PI. $332,500. EI/SEAS.
8. *Predictability of Atlantic hurricane activity by the NMME coupled models*. co-PI. National Oceanic and Atmospheric Administration. Award Period: 8/1/12-7/31/16. $220K. IRI/EI.
9. *Developing an optimum multi-model ENSO prediction*. co-PI. National Oceanic and Atmospheric Administration. Award Period: 8/1/12-7/31/15. $275K. IRI/EI.
10. *U.S. National Multi-Model Ensemble ISI Prediction System*. PI. National Oceanic and Atmospheric Administration. Award Period: 08/01/2012 - 07/31/2015. $174,925. IRI/EI.
11. *Towards long-range prediction of tornado activity.* PI. Columbia Research Initiatives for Science and Engineering (RISE). $160K. 7/1/12. IRI/EI.
12. *Extended-Range Prediction with Low-Dimensional, Stochastic-Dynamic Models: A Data-driven Approach*. PI. Office of Naval Research. Award Period: 06/01/2012 - 05/31/2015. $2,800,000. IRI/EI.
13. *Incorporating scale and predictability information in multi-model ensemble climate predications*. PI. National Oceanic and Atmospheric Administration. Award Period: 8/1/10 - 7/31/13. $53K.
14. *Separating forced and unforced decadal predictability in models and observations*. PI. Department of Energy. Award Period: 7/1/10 - 6/30/13. $96K. IRI/EI.
15. *Recalibrating and Combining Ensemble Predictions*. Co-PI. National Oceanic and Atmospheric Administration. Award Period: 08/01/09 - 07/31/11. $285K. IRI/EI.

16. *Linking seasonal forecasts into Riskview to enhance food security contingency planning*. co-PI. UN World Food Program. Award Period: 11/23/09 - 8/31/10. $14K. IRI/EI.
17. *Collaborative Research: Hydrology of Central and Southwest Asia: Connections between regional atmospheric circulation and large-scale climate variability.* co-PI. NSF. Award Period: 2003-2006. $56K.

Selected Presentations

1. *Monthly predictions of severe weather indices in CFSv2*. Workshop on Sub-Seasonal to Seasonal Predictability of Extreme Weather and Climate. IRI, Dec 6-7, 2016. Invited.
2. *Characterizing hazardous convective weather risk*, Extreme events in the Earth and planetary sciences Workshop, Mathematics Institute, Warwick University, UK, July 4 - 8, 2016. Invited.
3. *Comparing forecast skill*, 13th International Meeting on Statistical Climatology, Canmore, Canada, June 6-10, 2016. Invited.
4. *Variability in US tornado reports and environments*, Workshop on Extreme Environmental Risks: Statistical Modeling and Insurability, ETH, Zurich, Switzerland. March 14-15, 2016. Invited.
5. *Changing tornado statistics*, Workshop in Severe Convection and Climate, Columbia University, New York, NY. March 9-10, 2016. Invited.
6. *Characterizing hazardous convective weather risk*, Atmosphere, Oceans, Climate Dynamics Seminar Series, Department of Geology & Geophysics, Yale University November 20, 2015. Invited.
7. *Hazardous convective weather risk: Big and small data problems*, 5th International Workshop on Climate Informatics, NCAR, Boulder, CO. September 24-25, 2015. Invited.
8. *Modeling Hazardous Convective Weather Risk*, RiskLab, ETH, Zurich, Switzerland. August 25, 2015. Invited.
9. *Modeling Hazardous Convective Weather Risk*, Extreme Weather and Climate: Hazards, Impacts, Actions, Columbia University, New York, NY. May 6, 2015. Invited.
10. *Assessment of CFS Predictions of U.S. Severe Weather Activity*, Climate and Severe Weather Workshop, NCWCP Conference Center, College Park, MD, March 11-12, 2015. Invited.
11. *Seasonal Prediction – Statistical Aspects I, II*, The First Seasonal Climatic Prediction Workshop, Center of Excellence for Climate Change Research, King Abdulaziz University , Jeddah, Kingdom of Saudi Arabia. Dec 29, 2014 - Jan 1, 2015.
12. *Toward seamless prediction of severe weather activity*, 26th Conference on Climate Variability and Change, 94th American Meteorological Society Annual Meeting, Atlanta, GA. February 02 - 06, 2014.
13. *Modeling Hazardous Convective Weather Risk*, Climate, Risk and Statistics Workshop, Columbia University, New York, NY, Dec 11-12, 2014. Invited.
14. *Toward seamless prediction of severe weather activity*, Climate Prediction Center NOAA / National Centers for Environmental Prediction. College Park, MD. Jul 23, 2014. Invited.
15. *Toward seamless prediction of severe weather activity*, World Weather Open Science Conference 2014. Montreéal, Canada. August 16-21, 2014.
16. *CFSv2 forecasts of a U.S. monthly tornado index*, NOAA's 37th Climate Diagnostics and Prediction Workshop, Fort Collins, Colorado, October 22-25, 2012.
17. *Association of Tornado Occurrence with Environmental Parameters*, School of Marine and Atmospheric Sciences, Stony Brook University, September 12, 2012. Invited.
18. *Association of Tornado Occurrence with Environmental Parameters*, NASA Goddard Institute for Space Studies, New York, NY. May 4, 2012. Invited.
19. *Association of Tornado Occurrence with Environmental Parameters*, Center for Ocean-Land-Atmosphere Studies, Fairfax, Virginia. May 3, 2012. Invited.
20. *Associating U.S. monthly tornado activity with environmental parameters*, 25th Conference on Climate Variability and Change, 93rd American Meteorological Society Annual Meeting. Jan 7, 2013.
21. *Regression-based methods for finding coupled patterns*, 19th Conference on Probability and Statistics,

88th American Meteorological Society Annual Meeting, 20-24 January 2008.

22. *Potentially predictable components of African summer rainfall in SST-forced GCM simulations*, 18th Conference on Climate Variability and Change, 86th American Meteorological Society Annual Meeting, Atlanta, GA. January 27 - February 03, 2006.
23. *Potential predictability, ensemble forecasts and tercile probabilities*, Center for Ocean-Land-Atmosphere Studies, Fairfax, Virginia. June 30, 2005. Invited.
24. *The use of large-scale climate information to predict Central Asia river flows at one and two season leads*, 16th Conference on Climate Variability and Change 85th American Meteorological Society Annual Meeting. 11 January 2005.
25. *Predictability of Indian monsoon rainfall variability*, Symposium on Forecasting the Weather and Climate of the Atmosphere and Ocean, 84th American Meteorological Society Annual Meeting, 15 January 2004.
26. *Statistical correction of Central Southwest Asian winter precipitation simulations*, 14th Symposium on Global Change and Climate Variations, 83rd American Meteorological Society Annual Meeting, Feb 12, 2003.
27. *Predictability of linear stochastic dynamics*, Symposium on Observations, Data Assimilation, and Probabilistic Prediction, 82nd American Meteorological Society Annual Meeting, Jan 16, 2002.

Workshops organized

The First International Workshop on Climate Informatics, August 26, 2011
The New York Academy of Sciences, Information Web site

Workshop on Severe Convection and Climate, March 14-15, 2013
Columbia University, Palisades, NY, [Agenda] [Description]

2nd Workshop on Severe Convection and Climate, March 9-10, 2016
Columbia University, New York, NY [Web site]

Professional Service

Associate Editor, npj Climate and Atmospheric Science, 2016-present.
Associate Editor, Earth Systems and Environment, 2016-present.
Journal reviewer: Journal of Climate, Monthly Weather Review, Geophysical Research Letters, Climate Dynamics, Science, Journal of Applied Meteorology and Climatology, IEEE Transactions on Automatic Control, Journal of Geophysical Research, Tellus, Weather and Forecasting, Journal of Hydrology, Ocean Modelling, Quarterly Journal of the Royal Meteorological Society, Climatic Change, Physica D: Nonlinear Phenomena, Journal of Atmospheric and Oceanic Technology, Journal of the Atmospheric Sciences, International Journal of Climatology, Theoretical and Applied Climatology.

Invited participant, Extreme Weather Events and Climate Change Attribution Workshop, National Academy of Sciences, Oct 22-23, Washington DC, 2015.

Review Panels: NOAA Modeling, Analysis, Predictions, and Projections, NOAA CLIVAR Pacific, Research Opportunities and Approaches to Data Science (ROADS) Review Committee.

NOAA Climate Prediction Task Force 2012-2014. NOAA S2S Task Force 2016-2018.

Invited Lecturer. Targeted Training Activity: Statistical Methods in Seasonal Prediction, Abdus Salam International Centre for Theoretical Physics, Trieste, Italy. 2 August 2010 - 13 August 2010.

Designed and developed the statistical methods and software used to correct the output of physics-based numerical models and produce monthly seasonal climate forecasts at the International Research Institute for Climate and Society. These forecasts are disseminated and used around the world. [IRI Climate Forecasts]

Developed many of the statistical routines (canonical correlation analysis) used in the Climate Predictability Tool, which is "designed to assist National Meteorological Services to produce their own tailored, down-

scaled seasonal climate forecasts."

Our approach of associating tornado and hail activity with favorable atmospheric environments was the basis of an experimental seasonal tornado forecast issued in 2015.

University and departmental service

1. Applied Mathematics Program Committee.
2. Class of 2019 AM Undergraduate Advisor (M-Z).
3. Class of 2016 AM Undergraduate Advisor (A-L).
4. Ph.D. thesis committee: Aditi Dandapani. May 2016.
5. Ph.D. thesis committee: Chen Chen (DEES). Dec 2015.
6. Research Conference coordinator. Fall 2015.
7. Oral exam committee: Mark England. June 2015.
8. Ph.D. thesis committee: Usama Anber. June 2015.
9. Ph.D. thesis committee (chair): William Martin. June 2014.

Media interaction

1. A seasonal outlook for tornadoes?, Feb 22, 2012
   earthsky.org
2. What if we could predict tornadoes a month out?, Jan 27, 2012
   csmonitor.com
3. Scientists a step closer to predicting tornadoes, Feb 14, 2012
   usatoday.com
4. Forecasting is a challenge as tornado season looms, February 23, 2012
   foxnews.com
5. U.S. Tornado Chasers Prepare for High Season, Feb 24, 2012
   claimsjournal.com
6. Tornado Clusters on the Rise in the U.S., Oct 20 2014
   weather.com
7. Tornado seasons peaking earlier, becoming more volatile, Sep 17, 2014
   washingtonpost.com
8. Tornado Days Decreasing, but Number Per Day Rising, October 16th, 2014
   climatecentral.org
9. Experimental Forecast Projects Tornado Season, March 16th, 2015
   climatecentral.org
10. El Niño Can Predict Tornado Season's Severity, March 16, 2015
    livescience.com
11. Is El Niño behind our record-slow start to tornado season?, March 24, 2015
    washingtonpost.com
12. Tornadoes: El Niño may give Canada's twister season a boost, Aug 4, 2015
    cbc.ca