

CURRICULUM VITA

GENERAL INFORMATION

Name: Anastasios A. Tsonis

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Member: American Meteorological Society
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EDUCATION

Degrees Held: a) B.Sc., Aristotle University Thessaloniki,
Greece (Physics and Mathematics, 1976)
b) M.Sc., Dept. of Meteorology, McGill
University, Montreal, Quebec, Canada (1979)
c) Ph.D., Dept. of Meteorology, McGill
University, Montreal, Quebec, Canada (1982)

WORK EXPERIENCE

1982-1985 Post-doctoral Fellow at the Atmospheric Environmental
Service, Cloud Physics Division, Downsview, Ontario,
Canada.

1985-1989 Assistant Professor, Department of Geosciences
University of Wisconsin-Milwaukee (UWM).

1989-1993 Associate Professor (UWM).

1993-2007 Full Professor. From 1993-1999 with the Department of
Geosciences and then with the Department of
Mathematical Sciences (UWM).

2007-2016 Distinguished Professor, Department of Mathematical
Sciences (UWM).

2016-present Emeritus Distinguished Professor, Department of Mathematical Sciences (UWM) and Adjunct Research Scientist, Hydrologic Research Center, San Diego, CA.

AWARDS

- 1) Two-year Fellowship awarded by the Natural Sciences and Engineering Research Council of Canada (1982-84).
- 2) UWM Foundation/Graduate School Research Award, 1996
- 3) UWM Distinguished Undergraduate Teaching Award, 2004.
- 4) **Recipient of 2022 American Geophysical Union's Ed Lorenz lecture award for significant contributions to Nonlinear Geosciences.**
- 5) **Elected member of the Academy of Athens (March 2023)**

UPPER LEVEL COURSES TAUGHT

Atmospheric Thermodynamics

Radiation

Statistical Methods in Geosciences

Introduction to Nonlinear Dynamics

Nonlinear Time Series Analysis

Seminar on Global Climate Change

AREAS OF INTEREST

Nonlinear Dynamics, Chaos

Climate Dynamics, Global Change

Nonlinear Prediction, Predictability

PUBLICATIONS

A. Theses, Reports, and Notebooks

- A1) A.A. Tsonis, 1979: Increased Meridionalities and Weather Anomalies (Based on the study of the winter 1976-77 over N. America) M.S. thesis, McGill University, Montreal, Canada. 100 pp.
- A2) A.A. Tsonis, 1982: The Evaluation of Extrapolation Schemes for the Growth or Decay of Rain Area and Applications. Ph.D. thesis, McGill University, Montreal, Canada. 126 pp.
- A3) A.A. Tsonis, 1983: Examination of the Spectral and Spatial Characteristics of the Visible and Infrared GOES Images and Applications. Atmospheric Environment Service, Environment Canada, Internal Report N. ARPB 116P39. 84 pp.
- A4) A.A. Tsonis and G.L. Austin, 1984: "A Role for the Short-term Predictions in the Design and Evaluation of Cloud Seeding Experiments." PEP Report No. 30, WMO Geneva, February, 1984. 39 pp.
- A5) A.A. Tsonis, 1994: Principles and Forecasting the Weather. Wm. C. Brown Publishers, Dubuque, Iowa. 100 pp.
- A6) A.A. Tsonis, 1988: Atmospheres of the Planets. Notebook for the course 190-100 of UWM with the same title. 103 pp.
- A7) K.P. Georgakakos, D. Tsintikidis, S. Schwartz, A.A. Tsonis, and S. Nickovic, 1998: Calibration of Bispectral Satellite Rainfall Estimation Algorithm and Implementation of ETA Model Over the Blue Nile Region. HRC Technical Note No.6. 70 pp.

- A8) K.P. Georgakakos and A.A. Tsonis, 1999: On the Observation of Extremes in the Lorenz Model. HRC Technical Note No.9. 20 pp.

B. Conferences

I have participated in over 100 national and international meetings. In over 50 of those I was an invited speaker.

C. Refereed Journal Papers

- C1) A.A. Tsonis and G.L. Austin, 1981: An Evaluation of Extrapolation Techniques for the Short-term Prediction of Rain Amounts, Atmosphere-Ocean. 19, 54-65.
- C2) A.A. Tsonis, G.L. Austin and S. Lovejoy, 1984: A Proposal for a New Statistic and Technique Development for the Design and Evaluation of Cloud Seeding Experiments. Atmosphere-Ocean. 22, 67-82.
- C3) A.A. Tsonis, 1984: On the Separability of Various Classes from the GOES Visible and Infrared Data. J. Climate Appl. Meteor. 23, 1393-1410.
- C4) A.A. Tsonis, 1984: Determination and Correction of the Relative Shift Between the Visible and Infrared GOES Images. Int. J. Remote Sensing. 5, 975-979.
- C5) A.A. Tsonis and G.A. Isaac, 1985: On a New Approach for Instantaneous Rain Area Delineation in the Midlatitudes Using GOES Data. J. Climate Appl. Meteor. 24, 1208-1218.
- C6) R.S. Schemenauer and A.A. Tsonis, 1985: Comments on: "Physical interpretation of results from the HIPLEX-1 experiment." J. Climate Appl. Meteor. 24, 1269-1274.

- C7) A.A. Tsonis and W.R. Leitch, 1986: Minimum Detectable Pollution Levels from Satellite Imagery. Geophys. Res. Letters. 13, 56-59.
- C8) A.A. Tsonis, 1987: Determining Rainfall Intensity and Type From the GOES Imagery in the Midlatitudes. Remote Sensing of Environment. 21-36.
- C9) S. Lovejoy, D. Schertzer and A.A. Tsonis, 1987: Functional Box Counting and Multiple Elliptical Dimensions in Rain. Science. 235, 1036-1038.
- C10) A.A. Tsonis and P.A. Tsonis, 1987: Fractals: A New look at Biological Shape and Patterning. Perspect. Biol. Medic. 30, (3) 355-361.
- C11) A.A. Tsonis and J.B. Elsner, 1987: Fractal Characterization and Simulation of Lightning. Beitr. Phys. Atmosph. (Contributions to Atmospheric Physics). 60, 187-192.
- C12) A.A. Tsonis, W.R. Leitch and M. Couture, 1987: The Effect of the Sizing Calibration of the FSSP Probe on Cloud Droplet Measurements. J. Atmos. Oceanic Technol. 4, 518-526.
- C13) A.A. Tsonis, 1987: Some Probabilistic Aspects of Fractal Growth. Journal of Physics A. 20, 5025-5028.
- C14) A.A. Tsonis, 1987: A Method for Inferring Aerosol Properties from Satellite Data. Atmospheric Environment. 21, 2467-2471.
- C15) A.A. Tsonis, 1988: Single Thresholding and Rain Area Delineation from Satellite Imagery. J. Appl. Meteor. 27, 1302-1306.
- C16) A.A. Tsonis and J.B. Elsner, 1988: The Weather Attractor Over Very Short-Time Scales. Nature. 333, 545-547.
- C17) A.A. Tsonis and J.B. Elsner, 1989: Chaos, Strange Attractors and Weather. Bull. Amer. Meteor. Soc. 70, 16-23.
- C18) A.A. Tsonis, 1989: Chaos and Unpredictability of Weather. Weather. 44, 258-263.

- C19) P.A. Tsonis and A.A. Tsonis, 1989: Chaos: Concepts and Implications in Biology. Comp. Appl. Biosc. 5, 27- 32.
- C20) A.A. Tsonis, J.B. Elsner and P.A. Tsonis, 1989: On the Dynamics of a Forced Reaction-Diffusion Model for Biological Pattern Formation. Proc. Natl. Acad. Sci. U.S.A. 86, 4938-4942.
- C21) A.A. Tsonis and J.B. Elsner, 1989: Testing the Global Warming Hypothesis. Geophys. Res. Lett. 16, 795-797.
- C22) J.B. Elsner, J.R. Mecikalski, and A.A. Tsonis, 1989: A Shore-parallel Cloud Band Over Lake Michigan. Mon. Wea. Rev. 117, 2822-2823.
- C23) A.A. Tsonis, 1990: Review of the book "The modern radar" Bull. Amer. Meteor. Soc. 71 719-720.
- C24) A.A. Tsonis and J.B. Elsner, 1990: Multiple Attractors Fractal Basins and Long-term Climate Dynamics. Beitr. Phys. Atmosph. 63, 171-176.
- C25) A.A. Tsonis and J.B. Elsner, 1990: Comments on "Dimension analysis of climatic data". J. of Climate. 3, 1502-1505.
- C26) A.A. Tsonis and J.B. Elsner, 1991: Multiple Fractal Dimensions in Snow. Atmospheric Research 26, 13-17.
- C27) A.A. Tsonis, 1991: The effect of truncation and round- off on computer generated chaotic trajectories. Computers and Mathematics with applications. 21, 93-94.
- C28) A.A. Tsonis, J.B. Elsner and P.A. Tsonis, 1991: Periodicity in DNA sequences: Implications in gene evolution. J. Theor. Biol. 151 (3), 323-331.
- C29) J.B. Elsner and A.A. Tsonis, 1991: A comparison of Northern hemispheric observed surface air temperature trends from three different data sets. Geoph. Res. Lett. 18, 1229-1232.
- C30) A.A. Tsonis, 1991: Sensitivity of global climate

system on the initial conditions. EOS. 72, 313 and 328.

- C31) J.B. Elsner and A.A. Tsonis, 1991: Do bidecadal oscillations exist in the global temperature record? Nature. 353, 551-553.
- C32) A.A. Tsonis, and J.B. Elsner, 1991: The spatial-temporal scaling properties of rain and the validity of Taylor's hypothesis in the atmosphere. Bulgarian J. Meteor. Hydrol. (BJMH). 2, No. 324, 98-103.
- C33) J.B. Elsner and A.A. Tsonis, 1992: A note on spatial structure of the covariability of observed Northern hemisphere surface air temperature. Pageoph. 132, 133-146.
- C34) J.B. Elsner and A.A. Tsonis, 1992: Nonlinear Prediction, Chaos, and Noise. Bull. Amer. Meteor. Soc. 73, 49-60.
- C35) A.A. Tsonis and J.B. Elsner, 1992: Nonlinear prediction as a way of distinguishing chaos from random fractal sequences. Nature. 358, 217-220.
- C36) G.P. Pavlos, A.A. Kyriakou, A.G. Rigas, P.I. Liatsis, P.C. Trochoutos, and A.A. Tsonis, 1992: Evidence for strange attractor structures in space plasma. Annales Geophysicae. 10, 309-322.
- C37) A.A. Tsonis and J.B. Elsner, 1992: Oscillating global temperature. Nature. 356, 751.
- C38) A.A. Tsonis, J.B. Elsner and K.P. Georgakakos, 1993: Estimating the dimension of weather and climate attractors: Important issues about the procedure and interpretation. J. Atmos. Sci. 50, 2549-2555.
- C39) J.B. Elsner and A.A. Tsonis, 1993: Complexity and predictability of hourly precipitation. J. Atmos. Sci. 50, 400-405.
- C40) J.B. Elsner and A.A. Tsonis, 1993: Nonlinear dynamics established in the ENSO. Geophys. Res. Lett. 20, 213- 216.

- C41) A.A. Tsonis, J.B. Elsner and P.A. Tsonis, 1993: On the existence of scaling in DNA sequences. Bioch. Bioph. Res. Comm. 197, 1288-1295.
- C42) G.N. Triantafyllou, R. Picard and A.A. Tsonis, 1994: Exploiting geometric signatures to accurately derive properties of attractors. Appl. Math. Lett., 7, 19-24.
- C43) A.A. Tsonis, G.N. Triantafyllou and J.B. Elsner, 1994: Searching for determinism in observed data: a review of the issues involved. Nonlinear Processes in Geophysics, 1, 12-25.
- C44) J.B. Elsner and A.A. Tsonis, 1994: Empirically derived climate predictability over the extratropical Northern Hemisphere. Nonlinear Processes in Geophysics, 1, 41- 44.
- C45) A.A. Tsonis, G.N. Triantafyllou, J.B. Elsner, J.J. Holdzkom II, and A.D. Kirwan, Jr. 1994: An investigation on the ability of nonlinear methods to infer dynamics from observables. Bull. Amer. Meteor. Soc. 75, 1623-1633.
- C46) A.A. Tsonis and G.N. Triantafyllou, 1994: On the limitations of the Koppen system in delineating the general world pattern of climates. Geophys. Res. Lett., 21, 2809-2812.
- C47) J.B. Elsner and A.A. Tsonis, 1994: Low-frequency oscillation, Nature, 372, 507-508.
- C48) G.N. Triantafyllou, J.B. Elsner, A. Lascaratos, C. Koutitas and A.A. Tsonis, 1995: Structure and properties of the attractor of a marine dynamical system. Mathematical and Computer Modeling, 21, 73-86.
- C49) A.A. Tsonis and J.B. Elsner, 1995: Testing for scaling in natural forms and observables. J. Stat. Phys., 81, 869-880.
- C50) A.A. Tsonis and J.B. Elsner, 1996: Mapping the channels of communication between the tropics and higher latitudes in the atmosphere. Physica D, 92, 237-244.

- C51) A.A. Tsonis, P. Kumar, J.B. Elsner and P.A. Tsonis, 1996. Wavelet analysis of DNA sequences. Physical Review E, 53, 1828-1834.
- C52) A. A. Tsonis, G.N. Triantafyllou and K.P. Georgakakos, 1996: Hydrological applications of satellite data. PART I: Rainfalls estimation. J. Geophys. Res., 101, 26,517- 26,525.
- C53) A. Guetter, K.P. Georgakakos and A.A. Tsonis, 1996: Hydrological applications of satellite data. PART II: Flow Prediction. J. Geophys. Res., 101, 26,527-26,538.
- C54) A.A. Tsonis, 1996: Dynamical systems as models for physical processes. Complexity, 1(5), 23-33
- C55) A.A. Tsonis, 1996: Widespread increases in low-frequency variability of precipitation over the last century. Nature, 382, 700-702.
- C56) A.A. Tsonis, and J.B. Elsner, 1997: Global temperature as a regulator of climate predictability. Physica D, 108, 191-196.
- C57) A.A. Tsonis, J.B. Elsner, and P.A. Tsonis, 1997: Is DNA a Language? J. Theor. Biol, 184, 25-29.
- C58) P.A. Tsonis and A.A. Tsonis, 1997: Simplicity and complexity in gene evolution. Complexity, 2(5), 23-30.
- C59) P.J. Roebber, A.A. Tsonis and J.B. Elsner, 1997: Do climate simulations from sea surface temperature forced models represent actual dynamics? Nonlinear Processes in Geophysics, 4(2), 93-100.
- C60) A.A. Tsonis, C. Schultz and P.A. Tsonis, 1997: A re-evaluation of Zipf's Law. Complexity, 2(5), 12-13.
- C61) A.A. Tsonis, 1998: Review of the book "Fractal River Basins: Chance and Self-organization". Science, 280, 1210.
- C62) A.A. Tsonis, 1998: Fractality in Nature. Science (Letter to the editor), 279, 1614-1615.

- C63) A.A. Tsonis, P.J. Roebber and J.B. Elsner, 1998: A characteristic time scale in the global temperature record. Geophys. Res. Lett., 25, 2821-2823.
- C64) A.A. Tsonis and J.B. Elsner, 1998: Comments on "The Southern Oscillation as an example of a simple, ordered subsystem of a complex chaotic system" J. of Climate, 11, 2453-2454.
- C65) J.B. Elsner, X. Niu, and A.A. Tsonis, 1998: Multi-year prediction model of North Atlantic hurricane activity. Meteorol. Atmos. Phys., 68, 43-51.
- C66) A.A. Tsonis, P.J. Roebber and J.B. Elsner, 1999: Long-range correlations in the extratropical atmospheric circulation: origins and implications. J. of Climate, 12, 1534-1541.
- C67) A.A. Tsonis and J.B. Elsner, 1999: The autocorrelation function and human influences on climate. Science, 285,495 (view it at www.sciencemag.org/cgi/content/full/285/5427/495a).
- C68) D. Tsintikidis, K.P. Georgakakos, G. Artan, and A.A. Tsonis, 1999: Mean areal rainfall estimation and hydrologic response using METEOSAT data over the Blue Nile region. J. Of Hydrology, 221, 97-116.
- C69) A.G. Hunt and A.A. Tsonis, 2000: The Pacific Decadal Oscillation and long-term climate prediction. EOS, 81(48), 581.
- C70) A.A. Tsonis and C.C. Young-Molling, 2001: The effect of precipitation variability on ENSO/ precipitation teleconnections in the contiguous United States. J.Geophys. Res., 106, 14,235-14,243.
- C71) A.A. Tsonis and P.A. Tsonis, 2001: Information transfer and home field advantage. Mathematics Today, 37, 24-25.
- C72) A.A. Tsonis, F.L. Heller, H. Takayasu, K. Maruno, and T. Shimizu, 2001: A characteristic time scale in dollar-yen exchange rates. Physica A, 291, 574-582.

- C73) A.A. Tsonis, 2001: The impact of nonlinear dynamics in the atmospheric sciences. Int. J. Bifurcation & Chaos, 11(4), 881-902.
- C74) A.A. Tsonis, 2001: Probing the linearity and nonlinearity in the transitions of the atmospheric circulation. Nonlinear Processes in Geophysics, 8, 341-345.
- C75) A.A. Tsonis, F.L. Heller, and P.A. Tsonis, 2002: Probing the linearity and nonlinearity in DNA sequences. Physica A, 312, 458-468.
- C76) A.A. Tsonis, 2002: On the problem of extracting precipitation information in the tropics from the UWM/COADS data set. J. Appl. Meteor., 41, 1153-1162.
- C77) P.A. Tsonis and A.A. Tsonis, 2002: Linguistic features of eukaryotic genomes. Complexity, 7, 13-15.
- C78) A.A. Tsonis, A.G. Hunt, and J.B. Elsner, 2003: On the relation between ENSO and global climate change. Meteor. Atmos. Phys., 84(3-4), 229-242.
- C79) A.A. Tsonis and P.A. Tsonis, 2003: On words and genes. Complexity, 8(5), 12-13.
- C80) P.A. Tsonis and A.A. Tsonis, 2004: A 'small-world' network hypothesis for memory and dreams. Prespect. Biol. Medic., 47, 176-180.
- C81) A.A. Tsonis and P.J. Roebber, 2004: The architecture of the climate network. Physica A, 333, 497-504.
- C82) A.A. Tsonis, 2004: Is global warming injecting randomness into the climate system? EOS, 85(38), 361-364.
- c83) A.A. Tsonis and P.A. Tsonis, 2005: Exploring nonlinearity to identify genes and intergenic regions in genomes. Physica A, 348, 339-348.
- C84) A.A. Tsonis and K.P. Georgakakos, 2005: Observing Extreme events in incomplete state spaces with applications to rainfall estimation from satellite images. Nonlinear Processes in Geophysics, 12, 195-200.

- C85) P.J. Roebber and A.A. Tsonis, 2005: On a method to improve prediction of atmospheric flow transitions. J. Atmos. Sci., 62, 3818-3824.
- C86) A.A. Tsonis, J.B. Elsner, A.G. Hunt and T.H. Jagger, 2005: Unfolding the relation between global temperature and ENSO. Geophys. Res. Lett., doi:10.1029/2005GL022875.
- C87) A.A. Tsonis and K.L. Swanson, 2006: What do networks have to do with climate? Bull. Amer. Meteor. Soc., doi:10.1175/BAMS-87-5-585.
- C88) J.B. Elsner, A.A. Tsonis and T.H. Jagger, 2006: High frequency variability in hurricane power dissipation and its relationship to global temperature. Bull. Amer. Meteor. Soc., doi:10.1175/BAMS-87-6-763.
- C89) J.B. Elsner, T.H. Jagger and A.A. Tsonis, 2006: Return periods for hurricane Katrina. Geophys. Res. Lett., L09701, doi:10.1029/2005GL025452.
- C90) A.A. Tsonis, 2007: Reconstructing dynamics from observables: The issue of the delay parameter revisited. Int. J. Bifurcation & Chaos, 17, 4229-4243.
- C91) A.A. Tsonis, K.L. Swanson, and S. Kravtsov, 2007: A new dynamical mechanism for major climate shifts. Geophys. Res. Lett., 34, L13705, doi:10.1029/2007GL030288.
- C92) L.M.V. Carvalho, A.A. Tsonis, C. Jones, H.R. Rocha, and P.S. Polito, 2007. Anti-persistence in the global temperature anomaly field. Nonlinear Processes in Geophysics, 14, 723-733.
- C93) A.A. Tsonis, K.L. Swanson, and G. Wang, 2008. On the role of atmospheric teleconnections in climate. J.Climate, 21, 2990-3001.
- C94) A.A. Tsonis and K.L. Swanson, 2008: Topology and predictability of El Nino and La Nina networks. Phys. Rev. Lett., 100(22), 228520.
- C95) A.A. Tsonis, K.L. Swanson, and G. Wang, 2008: Estimating the clustering coefficient in scale-free

networks on lattices with local correlation structure. Physica A, 387, 5287-5294.

- C96) G. Wang and A.A. Tsonis, 2008: On the variability of ENSO at millennial timescales. Geophys. Res. Lett., 35, L17702, doi:10.1029/2008GL035092.
- C97) A.A. Tsonis, 2009: Dynamical changes in the ENSO system in the last 11,000 years. Clim. Dyn., 33, 1069-1074, doi: 10.1007/s00382-008-0469-4.
- C98) G. Wang, K.L. Swanson, and A.A. Tsonis, 2009: The pacemaker of major climate shifts. Geophys. Res. Lett., doi:10.1029/2008GL03684.
- C99) K.L. Swanson and A.A. Tsonis, 2009: Has the climate recently shifted? Geophys. Res. Lett., doi:10.1029/2008GL037022.
- C100) K.L. Swanson, G. Sugihara, and A.A. Tsonis, 2009: Long-term natural variability and 20th century climate change. Proc. Natl. Acad. Sci (USA), doi/10.1073/pnas0908699106.
- C101) A.A. Tsonis, G. Wang, K.L. Swanson, F.A. Rodrigues, and L. da F. Costa, 2010: Community structure and dynamics in climate networks. Clim. Dyn., 37, 933-940, doi:10.1007/s00382-010-0874-3.
- C102) A.A. Tsonis and P.A. Tsonis, 2010: Climate change and the demise of Minoan civilization. Clim. Past, 6, 525-530, doi:10.5194/cp-6-525-2010.
- C103) A.A. Tsonis and K.L. Swanson, 2011: Climate mode co-variability and climate shifts. Int. J. Bifurcation & Chaos, 21(12), 3549-3556, doi:10.1142/S0218127411030714.
- C104) M.G. Wyatt, S. Kravtsov, and A.A. Tsonis, 2011: Atlantic multidecadal oscillation and northern hemisphere's climate variability. Clim. Dyn., DOI 10.1007/s00382-011-1071-8.
- C105) A.A. Tsonis, 2012: Climate subsystems: Pacemakers of decadal climate variability. In Extreme Events and Natural Hazards: The Complexity Perspective. Geophysical Monograph Series 196, American

Geophysical Union, A.S. Sharma, A. Bunde, V.P. Dimri, and D.N. Baker, Eds. 10.1029/2011GM001053.

- C106) A.A. Tsonis and K.L. Swanson, 2012: Review article "On the origins of decadal climate variability: a network perspective". Nonlin. Processes Geophys., 19, 559-568, doi:10.5194/npg-19-559-2012.
- C107) G. Wang, P. Yang, X. Zhou, K.L. Swanson, and A.A. Tsonis, 2012: Directional influences on global temperature prediction. Geophys. Res. Lett., 39, L13704, doi:10.1029/2012GL052149.
- C108) J. van Ravensway, M.E. Benbow, A.A. Tsonis, S.J. Pierce, L.P. Campbell, J.A.M. Fyfe, J.A. Hayman, P.D.R. Johnson, J.R. Wallace, and J. Qi, 2012: Climate and Landscape Factors Associated with Buruli Ulcer Incidence in Victoria, Australia. PLoS ONE, 7(12): e51074, doi:10.1371/journal.pone.0051074.
- C109) K. Steinhäuser and A.A. Tsonis, 2013: A climate model intercomparison at the dynamics level. Clim. Dyn., doi: 10.1007/s00382-013-1761-5.
- C110) A.A. Tsonis, 2013: Geoengineering carries unknown consequences. Physics Today, 66(8), 8-9.
- C111) D.E. Raitzos, G. Triantafyllou, E. Tzanatos, S. Somarakis, and A.A. Tsonis, 2013: Indications of a climate effect on Mediterranean fisheries, 2014: Climatic Change, 122, 41-54, doi:10.1007/s10584-013-0972-4.
- C112) S. Kravtsov, M.G. Wyatt, J.A. Curry, and A.A. Tsonis, 2014: Two contrasting views of multidecadal climate variability in the 20th century. Geophys. Res. Lett., doi: 10.1002/2014 GL061416.
- C113) A.A. Tsonis, E.R. Deyle, R. M. May, G. Sugihara, K.L. Swanson, J.D. Verbeten, and G. Wang, 2015: Dynamical evidence for causality between galactic cosmic rays and global temperature, 2015: Proc. Natl. Acad. Sci. USA, doi: 10.1073/pnas.1420291112.
- C114) A.A. Tsonis, 2015: Randomness: A property of the mathematical and physical systems. Hydrol. Sci. Journal, doi: 10.1080/02626667.2014.992434.

- C115) H. Ye, G. Sugihara, E.R. Deyle, R.M. May, K.L. Swanson, and A.A. Tsonis, 2015: Robustness of causal effects of galactic cosmic rays on interannual variation in global temperature. Proc. Natl. Acad. Sci.USA., doi: 10.1073/pnas.1511080112.
- C116) S. Kravtsov, M.G. Wyatt, J.A. Curry, and A.A. Tsonis, 2015: Comments on "Atlantic and Pacific multidecadal oscillations and Northern Hemisphere temperatures. Science, 350, 1326, doi:10.1126/science.aab3570.
- C117) N. Jaykay, J. Hlinka, S. Kravtsov, A.A. Tsonis, and M. Palus, 2016: Time-scales of the European surface air temperature variability: The role of the 7-8 year cycle. Geophys. Res. Lett., 43, 902-909, doi: 10.1002/2015GL067325.
- C118) C. Essex and A.A. Tsonis, 2018: Model falsifiability and climate slow modes. Physica A, 502, 554-562, doi:10.1016/j.physa.2018.02.090.
- C119) N. Jaykay, S. Kravtsov, G. Sugihara, A.A. Tsonis, and M. Palus, 2018: Synchronization and causality across time-scales in El Nino/Southern Oscillation. npj Climate and Atmospheric Science, doi:10:1038/s41612018-0043-7.
- C120) N. Zhang, G. Wang, and A.A. Tsonis, 2018: Dynamical evidence for causality between northern hemisphere annular mode and winter surface air temperature over northeast Asia. Clim. Dyn., 52(5), 3175-3182 doi:10:1007/s00382-018-4317-x.
- C121) A.A. Tsonis, X. Pan, G. Wang, and C. Nicolis, 2019: On the min-max estimation of daily temperature. Clim. Dyn., doi: 10.1007/s00382-019-04757-6.
- C122) X. Pan, G. Wang, P. Yang, J. Wang, and A.A. Tsonis, 2020: On the interconnections among major climate modes and their common driving factors. Earth Syst.Dynam., 11 525-535, <https://doi.org/10.5194/esd-11-525-2020> and <https://doi.org/10.5194/esd-11-525-2020-supplement>
- C123) G.R. Ghimire, N. Jadidoleslam, W.F. Krajewski, and

- A.A. Tsonis, 2020: Insights on streamflow predictability across scales using horizontal visibility graph based networks. Frontiers in Water. doi: 10.3389/frwa.2020.00017
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- C125) S. Stathopoulos, A.A. Tsonis, and K. Kourtidis, 2021: On the cause-and-effect relations between aerosols, water vapor, and clouds over East Asia. Theoretical and Applied Climatology. <https://doi.org/10/1007/s00704-021-03563-7>
- C126) A.A. Tsonis, G. Wang, W. Lu, S. Kravtsov, C. Essex, and M. Asten, 2021. On time scales of intrinsic oscillations in the climate system. Entropy, 23(4), 459, doi:10.3390/e23040459
- C127) A.A. Tsonis, G. Wang, L. Zhang, W. Lu, A. Kayafas, and K. Del Rio-Tsonis, 2021. An application of slow feature analysis to the genetic sequences of coronaviruses and influenza viruses. Human Genomics, 15:26, doi:10.1186/s40246-021-00327-2
- C128) S. Kravtsov and A.A. Tsonis, 2021. Lorenz-63 model as a metaphor for transient complexity in climate. Entropy, 23, 951, <https://doi.org/10.3390/e23080951>.
- C129) G.-Fivos Sargentis, D. Koutsogiannis, A. Angelakis, J. Christy and A.A. Tsonis, 2022. Environmental determinism vs social dynamics: Prehistorical and historical examples. World, 3, 357-388. <https://doi.org./10.3390/world3020020>.
- C130) A.A. Tsonis and A.D. Kirwan, Jr., 2023: Geoengineering from the standpoint of uncertainty and related risks: Science or science fiction? Stochastic Environmental Research and Risk Assessment. <https://doi.org/10.1007/s00477-023-02454-9>

D. Referred Papers in Books

- D1) A.A. Tsonis, 1990: A Fractal Study of Dielectric Breakdown in the Atmosphere. In Scaling, Fractals and Nonlinear Variability in Geophysics (Eds. Lovejoy, S. and D. Schertzer), Kluwer.
- D2) A.A. Tsonis and J.B. Elsner, 1992: What do data analyses tell us about the variability of global temperature? In Geophysical/Geochemical aspects of global warming, CRC Press, Boca Raton.
- D3) G.P. Pavlos, A.G. Rigas, D. Dialetis, E.T. Sarris, L.P. Karakatsanis and A.A. Tsonis, 1992: Evidence for chaotic dynamics in the outer solar plasma and the earth magnetosphere. In Chaotic Dynamics: Theory and Practice, Plenum Press, New York.
- D4) A.A. Tsonis, 1996: Climate and its features. In Encyclopedia of Climate and Weather, Stephen H. Schneider, Editor. Oxford University Press, Oxford.
- D5) A.A. Tsonis, P.J. Roebber and J.B. Elsner, 2000: On the existence of spatially uniform scaling laws in the climate system. In Paradigms of Complexity, Miroslav M. Novak, Editor, World Scientific, Singapore.
- D6) A.A. Tsonis, 2002: System dynamics. In Encyclopedia of Global Change, Oxford University Press, Oxford.
- D7) K.P. Georgakakos and A.A. Tsonis, 2002: Observing extreme variability in nonlinear systems. In Emergent Nature, Miroslav M. Novak, Editor, World Scientific, Singapore.
- D8) A.A. Tsonis, F.L. Heller, H. Takayasu, K. Maruno and T. Shimizu, 2005: A characteristic time scale in dollar-yen exchange rates. In: International Finance: From Macroeconomics to Econophysics, Sergio Da Silva, Editor, Nova Publishers, Hauppauge, NY.
- D9) A.A. Tsonis, K. Nakada and H. Takayasu, 2005: Dynamics and predictability of fluctuations in dollar-yen exchange rates. In Practical Fruits of Econophysics, Hideki Takayasu, Editor, Springer Verlag, Tokyo.

- D10) P.J. Robber and A. A. Tsonis, 2007: Reducing forecast uncertainty to improve understanding of atmospheric flow transitions. In Advances in Nonlinear Geosciences, Eds. A.A. Tsonis and J.B. Elsner, Springer, New York, pp. 517-535.
- D11) A.A. Tsonis, 2007: Introducing networks in climate studies. In Advances in Nonlinear Geosciences, Eds. A.A. Tsonis and J.B. Elsner, Springer, New York, pp. 1-15.
- D12) L.M.V. Carvahlo, A.A. Tsonis and C. Jones, 2007: On The spatiotemporal variability of the temperature anomaly field. In Advances in Nonlinear Geosciences, Eds. A.A. Tsonis and J.B. Elsner, Springer, New York, pp. 393-406.
- D13) E.A. Fogarty, J.B. Elsner, T.H. Jagger, and A.A. Tsonis, 2009: Network analysis of U.S. hurricanes. In Hurricanes and climate change, Eds. J.B. Elsner and T.H. Jagger, Springer, New York, pp. 153-167.
- D14) A.A. Tsonis, 2010: The use and misuse of science-An example. In International Seminar on Nuclear War and Planetary Emergencies, 42nd session, Eds A. Zichichi and R. Ragaini, World Scientific, Singapore, pp 813-815.
- D15) A.A. Tsonis, 2014: Why geoengineering and climate don't go together. In International Seminar on Nuclear War and Planetary Emergencies, 46nd session, Eds A. Zichichi and R. Ragaini, World Scientific, Singapore, pp 155-157.
- D16) A.A. Tsonis, 2017: The Little Boy: El Nino and natural climate change. Global Warming Policy Forum Report 26, ISBN 978-0-9931189-7-5.
- D17) A.A. Tsonis and M.D. Madsen, 2018: On the range of frequencies of intrinsic climate oscillations. In: Advances in Nonlinear Geosciences, Ed. A.A. Tsonis, Springer Nature, New York, pp 651-660.

E. Books

- E1) A.A. Tsonis, 1992: Chaos: From Theory to Application. Plenum, New York, 274 pp.
- E2) J.B. Elsner and A.A. Tsonis, 1996: Singular Spectrum Analysis: A new tool for time series analysis. Plenum, New York, 164 pp.
- E3) A.A. Tsonis, 2002: An Introduction to Atmospheric Thermodynamics. Cambridge University Press, Cambridge, 172 pp.
- E4) A.A. Tsonis, 2008: Randomnicity: Rules and randomness in the realm of the infinite. Imperial College Press, 196 pp.
- E5) A.A. Tsonis, and J.B. Elsner, Eds., 2007: Nonlinear Dynamics in Geosciences. Springer, New York, 604 pp.
- E6) P.A. Tsonis and A.A. Tsonis, 2008: Aristotelis Valaoritis' epic poem KYRA FROSINI. Translated from Greek into English. NOSTOS books, 146 pp.
- E7) A.A. Tsonis, 2007: An Introduction to Atmospheric Thermodynamics. Second Edition. Cambridge University Press, Cambridge, 187 pp.
- E8) A.A. Tsonis, 2012: Weather Stricken (A textbook for an introductory course in atmospheric sciences), 232 pp.
- E9) A.A. Tsonis, 2014: Parallel (a mathematical novel, published by amazon.com, and Kindle), 130 pp.
- E10) A.A. Tsonis, Ed., 2018: Advances in Nonlinear Geosciences, Springer Nature, New York, 707 pp.
- E11) A.A. Tsonis and C. Zerefos, 2020: Aristotle's Μετεωρολογικά: Meteorology then and now. Archaeopress Publishing, Oxford, 120 pp. The book was chosen by the Bulletin of the American Meteorological Society (BAMS) in the Readings section for an interview, with the title "**A Philosopher's Words on Weather**".
- E12) A.A. Tsonis, 2020: Translation of An Introduction to Atmospheric Thermodynamics, Second Edition, into

Chinese. Cambridge University Press and China Meteorological Press, 140 pp.

- E13) A.A. Tsonis, 2023: Scars: Some very short stories or maybe (random) poems. In Press.

F. Miscellaneous

- F1) A.A. Tsonis, 1990 and 2004: Chaos and Fractal Forms: Irregularity in Nature. Video and DVD, Blue Skies Associates, Mequon, WI.
- F2) Contributing author in the book *Global Deserts Outlook* United Nations Environmental Programme, Nairobi, Kenya, 2006.
- F3) Contributing author in: Twenty Years of Nonlinear Dynamics in Geosciences. EOS, 88, 29, (2007).
- F4) Review of the book Nonlinear Dynamics and Statistical Theories for Basic Geophysical Flows by A.J. Majda and X. Wang. Bull. Amer. Meteor. Soc., 88, 1810, (2007).
- F5) Review of the book: Megadisasters: The science of predicting the next catastrophe by F. Diacu. Bull. Amer. Meteor. Soc., 92(4), 496, (2011).

Notable research and other achievements

I was one of the first scientists to promote the application of Chaos theory and nonlinear data analysis in Atmospheric Sciences. I and my post-doctoral fellow Jim Elsner in a series of papers in the late 1980s popularized and introduced this theory to meteorologists. Our research has led to the *Tsonis criterion*, a method bearing our names, and a statistical test bearing our names. The *Tsonis Criterion* refers to the necessary number of points required in attractor reconstructions (publications C43, E1). The *Tsonis-Elsner method* is a method used to distinguish low-dimensional chaos

from random fractal processes (publications C47, E2). The *Elsner-Tsonis test* is a statistical test designed to assess the significance of climate oscillations. In addition, we have introduced the notion of connected subsystems in the climate system (publications C17, C54, C56, and C64).

In 2004 I was the first scientist in the world to apply the new concepts of 'small-world' networks to atmospheric sciences (publications C81, C82, C87, and C91, among others). By now there are special sessions on climate networks in both AGU and EGU general assemblies, as well as individual workshops solely dedicated to this subject. My research in this area has led to the discovery of a new dynamical mechanism for major climate shifts. This mechanism explains all major global temperature shifts in the 20th and 21st century. These findings have led to a study, which was able for the first time to make an objective attribution of magnitude of anthropogenic effects on global temperature.

My contributions in the area of nonlinear science are recognized in the letter of Jim Elsner's promotion to full professor written by Edward Lorenz (one of the founders of Chaos theory and member of the National Academy of Sciences, USA), which states that "*I am most familiar with his work on chaos, some of which was done with A.A. Tsonis. Aside from being of exemplary scientific quality, the papers have gone a long way toward familiarizing the meteorological community with the general aspects of chaos. Thus they have served an important purpose*".

I have done significant research in the area of global change, where I have developed and published a theory about the relationship of global temperature and the frequency of El Nino (publications C63, C73, C78, and C86).

Early in my career I developed a method for rainfall estimation from satellite images that is still being applied today. In fact, this method has been implemented into a real-time system to predict the flooding of the Nile River in Egypt (publications C5, C52, and C68).

My interdisciplinary efforts and collaborations have resulted in over 16 papers in Biology, Economics, Linguistics and Psychology. Notably, with my brother (a biologist) we have published several important papers on the mathematical properties of DNA sequences as well as a hypothesis (publication C80) regarding the mathematical framework for

memories and dreams, which has been recently verified experimentally.

Administration

I have been instrumental in the development of the atmospheric Sciences program at UWM. In 1988, due to several coincidences, I found myself as the only remaining member of the Atmospheric Sciences Group (then with the Department of Geosciences). Rather than leaving, I accepted the challenge provide by Dean William Halloran to design and oversee the development of an Atmospheric Sciences program at UWM. I was then offered four new faculty positions and freedom to design the program as I thought appropriate. I did just that and, while it took some time to stabilize the program, the Atmospheric Sciences program became very healthy, with the number of faculty increasing to seven (all internationally recognized scientists). In 2000 the group moved to the Department of Mathematical Sciences as I and the rest of the members of the group realized that we are a better fit within the Math rather than the Geosciences Department. At that point we set out to re-design our curricula to include more mathematics courses. This way our program became one of the most mathematical oriented atmospheric sciences programs in the USA. Our group was one of the most successful research groups at UWM and one of the top in research funding per capita.

In addition I have served in several departmental and University-wide committees, with most notable the Divisional Committee, which evaluates and makes decisions on tenure and promotions. I have chaired this committee twice.

As a member of the Distinguished Professors Group we acted as advisory to the Vice-Chancellor and we also evaluate applications for promotion to Distinguished Professor status.

At the national level my administrative experience includes membership in the Board of Directors of the Hydrologic Research Center, located in San Diego, CA. I am in the board since its establishment in 1993. The main focus of the Center is global flash flooding forecasting. The Board oversees the activities of the Center and makes decisions about research and development and future planning. Over the years the Center has become a Center of excellence with a worldwide reputation.

In addition, I was UWM's representative to the Cooperation for Atmospheric Research (UCAR) from 1985 to 1998. During this time I was elected for a three-year term (1989-1992) member of UCAR's University Relations Committee and member of the Membership Committee (1995-1998).

Additional information-Distinctions

As indicated in the section B of publications I have been an invited speaker in over 50 national and international meetings.

Co-organizer second conference on Nonlinear Variability in Geophysics. Paris, France, 27 June - 1 July 1988.

Organizer, AGU 1992 Spring meeting session on Complexity in precipitation. May, 1992, Montreal, Canada.

Co-organizer, the first ever "Short course on Nonlinear Dynamics, Fractals and Chaos in Geophysics", Sponsored by the American Geophysical Union. 29 May 1990, Baltimore, M.D.

Co-organizer, 5th International Conference on Precipitation Elounda, Crete, Greece. June 14-16, 1995.

Organizer of the international conference, 20 Years of Nonlinear Dynamics in Geosciences, Rhodes, Greece, June 11-16, 2006.

Organizer of the international conference, 30 Years of Nonlinear Dynamics in Geosciences, Rhodes, Greece, July 3-7, 2016.

Organized numerous sessions in the General Assemblies of the American Geosciences Union (AGU) and the European Geosciences Union (EGU)

Member of the AGU committee on Precipitation (1990-1992).

Editorial board of the journal Nonlinear Process in Geophysics. (Published by the European Geosciences Union)

Member of AGU Committee on Nonlinear Geophysics, 1998-2000.

Included in the Milwaukee Journal's list of "90 for the nineties".

Research featured in many newspaper articles and TV interviews around the world like Le Monde (Paris), London Times, Proini (Greek), To Vima (Greek), Proto Thema (Greek), Chicago Tribune, Milwaukee Journal, Science, The Camera (Boulder, Co.), Science News, Daily News, Fox News, BBC, Boston Globe, Washington Times, and elsewhere.

Served in several international Ph.D. committees in Canada, Brazil, Greece, New Zealand, and Norway.

Reviewed more than 300 papers and proposals.

Since becoming a Professor at UWM I have received close to 4 million dollars in research funding.