Michael L. Goodman
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Birthplace and Citizenship: USA
Security Clearance: Secret

Summary of Experience: 30 years. Theoretical modeling, computation, algorithm development and optimization in plasma physics/magnetohydrodynamics (MHD) of partially and fully ionized plasmas, electromagnetics, multi-fluid dynamics, and signal processing. Numerical solution of systems of differential equations to model fluid plasma systems. Areas of application include linear and nonlinear waves, anisotropic transport processes in plasmas (electrical and thermal conduction, viscosity, and thermoelectric effects), multi-spectral remote sensing, direct and inverse scattering, radar cross section prediction and reduction, satellite electric propulsion, and ionospheric, magnetospheric, solar, and fusion plasma physics. PI on 5 NSF funded projects totaling about $1.6 M, and on ONR, NASA, and IRAD funded projects. Science lead/CO-I on a NASA Phase I SBIR. Administrative management of groups of scientists and engineers. Programming experience in Matlab, IDL, and Fortran, and use of Unix workstations.

Education

Ph.D. Physics, 1986, New York University. Plasma physics/MHD
M.A. Physics, 1978, Stonybrook University.
B.A. Physics, 1976, University of Chicago.

Employment

1. 4/2014 - Present: Independent Consultant. (1) Consultant to Applied Research, LLC. Developed a solar flare prediction algorithm for a NASA Phase 1 SBIR grant. Proposed concept, developed physics based model, guided model implementation, and interpreted model output. (2) Consultant to West Virginia High Technology Consortium Foundation. Developing a multi-million dollar NOAA space weather modeling and simulation proposal with the CEO.

2. 11/2006-3/2014: Distinguished Scientist, West Virginia High Technology Consortium Foundation. Served as PI on multiple projects including: (i) NSF funded projects involving the mathematical formulation and numerical solution of MHD models of the solar atmosphere including effects of anisotropic and inhomogeneous transport processes such as electrical and thermal conduction, thermoelectric effects, and viscosity; (ii) A NASA funded project involving the design, construction, and simulation of prototype pulsed inductive plasma thrusters for spacecraft propulsion; (iii) An ONR funded project involving the development of MEMS gyroscopes and accelerometers, chaos based signal processing algorithms, and non-destructive evaluation of structures such as airframes. Served as lead mathematical algorithm developer for a Navy funded ship detection project involving the development of probabilistic locater algorithms that use position data from a radar and a passive sensor.

3. 4/2002-11/2006: Principal Scientist and Manager, Institute for Scientific Research. This company was closed, and I was transferred to the West Virginia High Technology Consortium Foundation (WVHTCF). Worked on the same projects described above. Those projects were transferred to WVHTCF. Served as Science Branch Supervisor, and as Manager of the Science and Systems Engineering Group for a total of 3 years, responsible for advising and evaluating approximately 15 scientists and engineers matrixed out to multiple projects.

4. 10/2000-4/2002: Principal Scientist for Algorithm Development, Verity Instruments Inc.. Development of signal processing algorithms in Matlab for analysis of remotely sensed multi-wavelength spectrometer data. Mathematical development of electromagnetics models of the scattering of multi-spectral

radiation from multi-layered absorbing materials with complex surface structure. Application to the real time control of plasma etching of semiconductor wafers. Determination of wavelength dependent complex indices of refraction of layered materials from time dependent reflection data. Code optimization for reduced memory requirements and greater speed. Served as consultant to software developers to facilitate integration of algorithms into company products.

5. 10/1999-10/2000: Senior Scientist, ITT Industries, Advanced Engineering and Sciences Division. Development of signal processing algorithms in Matlab for the analysis of radar data. Development of Prony type algorithms for analysis of two dimensional images. Studies of the effects of additive noise on Cohen class time-frequency representations of signals. Hybrid antenna design using the calculus of variations.

6. 10/1991-10/1999: Senior Research Scientist, Contractor at the NASA Goddard Space Flight Center. Theoretical and computational space plasma physics applied to solar, magnetospheric, and ionospheric physics. MHD models of solar chromospheric and transition region heating, ionosphere-magnetosphere coupling, and the Earth's ring current. Oracle relational database and Unix system administration to support satellite scientific instrument command processing.

7. 4/1990-10/1991: Research Faculty, Department of Physics, Dartmouth College. Theoretical and computational modeling of driven, dissipative, energy conserving MHD equilibria using number density, temperature, and magnetic field dependent transport coefficients for a Coulomb collision dominated plasma. Determined effects of anisotropic and inhomogeneous ion thermal conductivity, electron resistivity, viscosity, and thermoelectric effects in electrically driven plasmas with flow. Application to modeling fusion plasmas in tokamaks.

8. 4/1989-4/1990: Advanced Study Program Fellow, High Altitude Observatory, National Center for Atmospheric Research. Theoretical solar physics. Developed ideal MHD equilibrium models of the solar corona. Numerical construction of coronagraph images from exact solutions of the ideal MHD equations. Developed models of current sheets in the corona that are in equilibrium with magnetic and gravitational forces. Determined effects of modifying ideal MHD by including Hall electric field and electron pressure gradient effects in Ohm's law.

9. 12/1986-1/1989: Research Scientist, Corporate Research Center, Grumman Aerospace Corporation. Theoretical and computational electromagnetic scattering and wave propagation. Radar cross section (RCS) prediction and reduction. Development of method of moments integral equation codes for computing the RCS of arbitrarily shaped bodies with an inhomogeneous, anisotropic, impedance boundary condition. Two codes were developed, one using an electric field integral equation formulation, the other using a combined electric and magnetic field integral equation formulation. The Mie series solution for the scattered field of a sphere with a homogeneous, anisotropic impedance boundary condition was derived to serve as an analytic test case for the method of moments code. Other work included determining scattered fields from layered media, and the development of a rapidly convergent series representation for the Maliuzhinets function describing the field scattered by an impedance wedge, for use in the numerical modeling of scattering from bodies with sharp edges such as aircraft wings. Served as lead on a two year project to upgrade an RCS code.

10. 10/1985-11/1986: Electromagnetics Engineer, N.J. Damaskos, Inc.. Theoretical and computational electromagnetic scattering and wave propagation. RCS prediction and reduction. Solution of problems in electromagnetic scattering from thin film magnetic and complex dielectric absorbers, and from surfaces with isotropic or anisotropic impedance boundary conditions. Modeling of wave propagation in perfectly and finitely conducting waveguides.

Other Consulting Work

12/2001-12/2002: Tanner Research Laboratories. Theoretical and computational modeling of elastic surface wave propagation for sensor development.
7/1985: Pacific Sierra Research Corporation. Theoretical modeling of underground nuclear explosion induced wall ablation in test chambers.

Research Grants

1. NASA Phase I SBIR: “A New Class of Flare Prediction Algorithms: A Synthesis of Data, Pattern Recognition Algorithms, and First Principles Magnetohydrodynamics”. Position: CO-I. Duration: 6/2014 - 12/2014. Amount: $125 K.

2. National Science Foundation. “A First Principles Test of the Current Sheet Heating Hypothesis for the Solar Corona”. Position: PI. Duration: 4/2012 - 4/2013. Amount: $75 K.

3. National Science Foundation. “Magnetohydrodynamic Modeling of Current Sheet Structure and Magnetic Reconnection Using a Realistic Description of Transport Processes”. Position: PI. Duration: 7/2009 - 7/2012. Amount: $475 K.

4. National Science Foundation. “Multi-Dimensional Magnetohydrodynamic Simulations of Chromospheric Dynamics Using a Complete Electrical Conductivity Tensor”. Position: PI. Duration: 5/2007 - 5/2011. Amount: $500 K.

5. National Science Foundation. “Identifying Magnetohydrodynamic Mechanisms of Chromospheric Heating and Flow Generation Using Models With a Realistic Description of Transport Processes”. Position: PI. Duration: 7/2003 - 7/2006. Amount: $341 K.

6. National Science Foundation. “Quantitative MHD Modeling of the Solar Transition Region using Realistic Transport Coefficients”. Position: PI. Duration: 1/1999 - 12/2002. Amount: $198 K.

Pending Proposal

NASA:“Testing a New Proposed Flare Prediction Algorithm Based on an HMI Data Driven MHD Model”. Position: Science PI. Proposed duration: 12/1/2015 - 11/30/2018.

Refereed Journal Publications

1. “Acceleration of Type 2 Spicules in the Solar Chromosphere - 2: Viscous Braking and Upper Bounds on Coronal Energy Input”, Goodman, M.L. 2014, ApJ, 785, 87. http://arxiv.org/abs/1403.2694

2. “Acceleration of Type 2 Spicules in the Solar Chromosphere”, Goodman, M.L. 2012, ApJ, 757, 188.

3. “Radiating Current Sheets in the Solar Chromosphere”, Goodman, M.L. and Judge, P.G. 2012, ApJ, 751, 75. http://arxiv.org/abs/1406.1211

4. “Conditions for Photospherically Driven Alfvénic Oscillations to Heat the Solar Chromosphere by Pedersen Current Dissipation”, Goodman, M.L., 2011, ApJ, 735, 45. http://arxiv.org/abs/1410.8519

5. “Analytic Solutions for Current Sheet Structure Determined by Self-Consistent, Anisotropic Transport Processes in a Gravitational Field”, Goodman, M.L., 2011, ApJ, 731, 19.

6. “Anisotropic Transport Processes in the Chromosphere and Overlying Atmosphere”, Goodman, M.L. & Kazeminezhad, F. 2010, Journal of the Italian Astronomical Society (Memorie della Societa Astronomica Italiana), 81, 631.

7. “Simulation of Magnetohydrodynamic Shock Wave Generation, Propagation, and Heating in the Photosphere and Chromosphere Using a Complete Electrical Conductivity Tensor”, Goodman, M.L. & Kazeminezhad, F. 2010, ApJ, 708, 268-287.

8. “Magnetohydrodynamic Simulations of Solar Chromospheric Dynamics Using a Complete Electrical Conductivity Tensor”, Kazeminezhad, F. & Goodman, M.L., 2006, ApJS, 166, 613-633

9. “Self Consistent Magnetohydrodynamic Modeling of Current Sheet Structure and Heating Using Realistic Descriptions of Transport Processes”, Goodman, M.L., 2005, ApJ, 632, 1168-1175.

10. “On the Creation of the Chromospheres of Solar Type Stars”, Goodman, M.L., 2004, Astron. & Astrophys., 424, 691-712.

11. “On the Efficiency of Pedersen Current Dissipation From the Photosphere to the Upper Chromosphere”, Goodman, M.L. 2004, Astron. & Astrophys., 416,11591178.

12. Invited Paper: “The Necessity of Using Realistic Descriptions of Transport Processes in Modeling the Solar Atmosphere, and the Importance of Understanding Chromospheric Heating”, Goodman M.L. 2001, Space Sci. Rev., 95, 79-93.

13. “On the Mechanism of Chromospheric Network Heating, and the Condition for its Onset in the Sun and Other Solar Type Stars”, Goodman M.L. 2000, ApJ, 533, 501-522.

14. “A Class of Driven, Dissipative, Energy Conserving Magnetohydrodynamic Equilibria with Flow”, Goodman M.L. 1998, J. Plasma Phys., 60, 587-626.

15. “Quantitative MHD Modeling of the Solar Transition Region”, Goodman M.L. 1998, ApJ, 503, 938-952.

16. “Convection Driven Heating of the Solar Middle Chromosphere by Resistive Dissipation of Large Scale Electric Currents - part 2”, Goodman M.L. 1997, Astron. & Astrophys., 325, 341-351.

17. “Convection Driven Heating of the Solar Middle Chromosphere by Resistive Dissipation of Large Scale Electric Currents”, Goodman M.L. 1997, Astron. & Astrophys., 324, 311-323.

18. “Heating of the Solar Middle Chromospheric Network and Internetwork by Large Scale Electric Currents in Weakly Ionized Magnetic Elements”, Goodman M.L. 1996, ApJ, 463, 784-796.

19. “A Three Dimensional, Iterative Mapping Procedure for the Implementation of an Ionosphere-Magnetosphere Anisotropic Ohm’s Law Boundary Condition in Global MHD Simulations”, Goodman M.L. 1995, Ann. Geophysicae, 13, 843-853.

20. “Heating of the Solar Middle Chromosphere by Large Scale Electric Currents”, Goodman M.L. 1995, ApJ, 443, 450-459.

21. “Driven, Dissipative, Energy Conserving Magnetohydrodynamic Equilibria II - The Screw Pinch”, Goodman M.L. 1993, J. Plasma Phys., 49, 125-159.

22. “On Driven, Dissipative, Energy Conserving Magnetohydrodynamic Equilibria”, Goodman M.L. 1992, J. Plasma Phys., 48, 177-207.

23. “Scattering By A Sphere With An Anisotropic Impedance Boundary Condition- Mie Series Solution And Uniqueness Conditions”, Goodman M.L. 1990, J. Opt. Soc. Am. A, 7, 1817-1823.

24. “Alfven Type Wave Motion Induced By The Hall Effect”, Goodman M.L. 1989, Phys. Fluids B, 1, 2305-2311.

Visitor Appointments

- Visiting Scientist, High Altitude Observatory, National Center for Atmospheric Research - October 2010, and June-July 2011.

Invited Talks

- 2015 - “Solar Aspects of Plasma-Neutral Coupling” - AGU/AAS Triennial Earth-Sun Summit.

- 2011 - Heliophysics Science Seminar - NASA Goddard Space Flight Center. Presentation: “Photospherically Driven Alfvenic Oscillations as a Driver of Pedersen Current Dissipation in the Solar Chromosphere”.

- 2008 - Panelist & Speaker: Forum on “Forging the Future of Space Science - The Next 50 Years”, sponsored by The National Academies’ Space Studies Board. Presentation: “Space Weather - From Understanding to Prediction - The Current and Future Role of Global Computer Simulations”.
- 2005 - “Chromospheric Heating, Transport Processes, and Small Scale Magnetic Fields”, Spring AGU/SPD Meeting.

NASA Project Reports

1. Kwan, C. & Goodman, M.L. 2014. Final Report for NASA Phase 1 SBIR Grant NNX14CG30P: “A New Class of Flare Prediction Algorithms: A Synthesis of Data, Pattern Recognition Algorithms, and First Principles Magnetohydrodynamics”. Accepted by the NASA Technology Transfer System on December 22, 2014, Case No. GSC-17381-1.
2. Goodman, M.L. & Rose, M.F. 2008. Final Project Report for NASA Grant NNM06AA17G: “Pulsed Powertrain and Computational Modeling Development for Plasma Applications”. Project PI: M.L. Goodman.
3. Kazeminezhad, F., Goodman, M.L. & Owens, T.L. 2008, Part 2 of Final Project Report for NASA Grant NNM04AA67G. “Pulsed Plasma Accelerator (PPA) Modeling Report”. Project PI: M.L. Goodman.
4. M.L. Goodman, F. Kazeminezhad, T. L. Owens, M.F. Rose, Z. Shotts, Z. Roberts, R. Miller, M. Zorn, B. Freeman & S. Best 2007. Part 1 of Final Project Report for NASA Grant NNM04AA67G. NASA/CR2007-215070: “Powertrain Topology for Pulsed Plasma Accelerators”. Project PI: M.L. Goodman.

Electromagnetics Projects in Industry

1. “Electromagnetic Scattering By Surfaces Of Arbitrary Shape Characterized By An Arbitrary, Inhomogeneous, Anisotropic Surface Impedance: Combined Field Integral Equation Formulation”, Goodman, M.L. & Crugnale, E. 1988, Grumman Corporate Research Center.
2. “Electromagnetic Scattering By Surfaces Of Arbitrary Shape Characterized By An Arbitrary, Inhomogeneous, Anisotropic Surface Impedance: Electric Field Integral Equation Formulation”, Goodman, M.L. & Crugnale, E. 1988, Grumman Corporate Research Center.
3. “Scattering From A Sphere With An Anisotropic Impedance Boundary Condition- Mie Series Solution And Uniqueness Conditions”, Goodman, M.L. 1988, Grumman Corporate Research Center.
4. ”On Some Hybrid Theories In Electromagnetic Scattering That Do Not Involve Ray Tracing”, Goodman, M.L. 1988, Grumman Corporate Research Center.
5. “A New Exact Representation For The Maliuzhinet’s Function In The Theory Of Scattering From An Impedance Wedge”, Goodman, M.L. 1987, Grumman Corporate Research Center.
6. “Electromagnetic Scattering By Perfectly Conducting Surfaces Of Arbitrary Shape In The Presence Of A Perfectly Conducting Plane”, Goodman, M.L. 1987, Grumman Corporate Research Center.
7. “Dispersion Relation For A Double Plane Layer Of Lossy Magnetodielectric Material On A Perfectly Conducting Plane”, Goodman, M.L. 1987, Grumman Corporate Research Center.
8. “Boundary Element Solution For The Scattered Field Of An Infinite Plane Periodic Array Of Squares With Finite Conductivity On A Dielectric Substrate Of Finite Thickness”, Goodman, M.L. 1986, N.J. Damaskos, Inc.
9. “Boundary Element Solution For The Effective Electric Permittivity Of An Infinite Periodic Array Of Perfectly Conducting Plates With Nonzero Thickness Embedded In A Dielectric Medium”, Goodman, M.L. 1986, N.J. Damaskos, Inc.

10. "Frequency Dependent Electric Permittivity Of A Two Component Plasma Produced By Ionizing Radiation Emitted By A Plane Radioactive Surface", Goodman, M.L. 1986, N.J. Damaskos, Inc.

11. "Surface Magnetic Field On A Permanently Magnetized Thin Rectangular Plate With Inhomogeneous Magnetization", Goodman, M.L. 1986, N.J. Damaskos, Inc.

12. "Dispersion Relation For TE and TM Modes In A Double Plane Layer Of Anisotropic Magnetodielectric Material Separated By An Anisotropic Impedance Sheet", Goodman, M.L. 1986, N.J. Damaskos, Inc.

13. "Fourier Series Solution For The Effective Dielectric Tensor Of An Infinite Periodic Array Of Perfectly Conducting Thin Plates Embedded In A Dielectric Medium", Goodman, M.L. 1985, N.J. Damaskos, Inc.

14. "Fourier Series Solution For The Magnetic Field Of An Infinite Periodic Array Of Permanently Magnetized Thin Plates With Inhomogeneous Magnetization", Goodman, M.L. 1985, N.J. Damaskos, Inc.

Conference and Workshop Papers

1. "Acceleration of Type II Spicules in the Solar Chromosphere", Goodman, M.L. 2012, Fall AGU Meeting.

2. "Radiating Current Sheets in the Solar Chromosphere", Goodman, M.L. & Judge, P.G. 2012, SPD/AAS Meeting.

3. "Conditions for Photospherically Driven Alfvenic Oscillations to Heat the Chromosphere by Pedersen Current Dissipation", Goodman, M.L. 2011, SPD Meeting.

4. "Simulation of MHD Shock Wave Generation, Propagation, and Heating in the Photosphere and Chromosphere Using a Complete Electrical Conductivity Tensor", Goodman, M.L. & Kazeminezhad, F. 2009, NSO Workshop #25 - Chromospheric Structure and Dynamics: From Old Wisdom to New Insights, Sunspot, NM, Aug.-Sept. 2009.

5. "MHD Simulations of Shock Wave Generation, Propagation, and Heating in the Photosphere and Chromosphere Using a Complete Electrical Conductivity Tensor", Kazeminezhad, F. & Goodman, M.L. 2008 Fall AGU Meeting.

6. "MHD Model Estimates of the Contribution of Driven, Linear, Non-Plane Wave Dissipation to Chromospheric Heating Using a Complete Electrical Conductivity Tensor", Goodman, M.L. 2008 Fall AGU Meeting.

7. "A Self Consistent, First Principles, Bi-Directional Power Circuit - Plasma Coupling Algorithm for Pulsed Inductive Thruster Simulations", Kazeminezhad, F., Goodman, M.L. & Owens, T.L. 2007, Joint Army-Navy-NASA-Air Force (JANNAF) Spacecraft Propulsion Conference, May 14-17, Denver, CO.

8. "A High-Efficiency Light-Weight Pulsed-Power System For Long-Duration Electric Thruster Missions", Owens, T.L., Goodman, M.L., Kazeminezhad, F. & Ice, B. 2007, Joint Army-Navy-NASA-Air Force (JANNAF) Spacecraft Propulsion Conference, May 14-17, Denver, CO.

9. "Magnetohydrodynamic Simulations of Solar Chromospheric Dynamics Using a Complete Electrical Conductivity Tensor", Kazeminezhad, F. and Goodman, M.L. 2006 Spring AGU/SPD Meeting.

10. "Self Consistent Modeling of Current Sheet Structure and Transport Processes", Goodman, M.L. 2005 Spring AGU/SPD Meeting.

11. "Investigation of Solar Coronal Heating Using a Time Dependent MHD Model with Full Conductivity Tensor", Kazeminezhad, F. & Goodman, M.L. 2005 Spring AGU/SPD Meeting.

12. "On the Creation of the Chromospheres of Solar Type Stars", Goodman, M.L., 2004 AAS/SPD Meeting.

13. "Predictions of Heating Rates in Localized Magnetic Structures From the Photosphere to the Upper Chromosphere", Goodman, M.L. 2003 AAS/SPD Meeting.
14. "Physical Modeling of the Solar Radiation-Current Status and Prospects", Fontenla, J.M., Avrett, E.H., Goodman, M., White, O.W., Rottman, G., Fox, P. & Harder, J. 2003 AAS/SPD Meeting.
15. "Plasma Heating by Pedersen Current Dissipation From the Photosphere to the Upper Chromosphere", Goodman, M.L., 2002 Fall AGU Meeting.
16. "Proton Magnetization as the Triggering Mechanism for Chromospheric Network Heating by Pedersen Current Dissipation", Goodman M.L., 2000 AAS/SPD Meeting.
17. "The Onset of Proton Magnetization and Chromospheric Network Heating Driven by MHD Wave Generated Convection Electric Fields", Goodman M.L., 1999 Fall AGU Meeting.
18. "On the Mechanism of Chromospheric Network Heating, and the Condition for its Onset in the Sun and Other Solar Type Stars", Goodman M.L., 1999 AAS/SPD Meeting.
19. "Modification of Magnetic Cloud Model: Elliptical Cross Section", Lepping R.P., Berdichevsky D., Szabo A., Goodman M.L., Jones J., 1998 Fall AGU Meeting.
20. "Convection Driven Heating of the Solar Middle Chromosphere by Resistive Dissipation of Large Scale Electric Currents - 3", Goodman M.L., 1997 Fall AGU Meeting.
21. "MHD Modeling of the Solar Transition Region Using Realistic Transport Coefficients", Goodman M.L., 1997 AAS/SPD Meeting.
22. "Quantitative Estimates of Heating and Cooling Processes in the Solar Transition Region", Goodman M.L., 1997 Spring AGU Meeting.
23. "Classical Transport Processes in the Solar Transition Region", Goodman M.L., 1996 Fall AGU Meeting.
24. "Convection Driven Heating of the Solar Middle Chromosphere by Large Scale Electric Currents", Goodman M.L., 1996 AAS/SPD Meeting.
25. "Convection Driven Heating of the Solar Middle Chromosphere by Resistive Dissipation of Large Scale Electric Currents - 2", Goodman M.L., 1996 Spring AGU Meeting.
26. "Convection Driven Heating of the Solar Middle Chromosphere by Resistive Dissipation of Large Scale Electric Currents", Goodman M.L., 1995 Fall AGU Meeting.
27. "Pressure and Density Profiles in Resistively Heated Magnetic Elements in the Solar Chromosphere and Photosphere", Goodman M.L., 1995 Spring AGU Meeting.
28. "Driven, Energy Conserving MHD Screw Pinch Equilibria With Flow Determined By Classical Transport Processes", Goodman M.L., 1994 APS Division of Plasma Physics Meeting.
29. "Heating of the Solar Middle Chromosphere by Large Scale Electric Currents Flowing Across Magnetic Field Lines in Magnetic Canopies", Goodman M.L., 1994 Fall AGU Meeting.
30. "A Three Dimensional, Iterative Mapping Procedure for the Implementation of an Ionosphere-Magnetosphere Anisotropic Ohm's Law Boundary Condition in Global MHD Simulations", Goodman M.L., 1994 Spring AGU Meeting.
31. "Global Chromospheric Heating by Large Scale Currents", Goodman M.L., 1994 Spring AGU Meeting.
32. "Driven, Energy Conserving MHD Equilibria Determined By Classical Transport Processes", Goodman M.L., 1993 APS Division of Plasma Physics Meeting.
33. "Consistent, Driven, Dissipative, Current Profiles", Goodman M.L., 1990 APS Division of Plasma Physics Meeting.

Awards

2010: Outstanding Achievement Award - West Virginia High Technology Consortium Foundation
2004: Annual Service Award - Institute for Scientific Research
1998: Honorable Mention/Sciences Category - Computer Sciences Corporation- Systems Group Honorarium Paper Competition.
1998: NASA Group Achievement Award, presented to the Science Planning and Operations Facility of the Global Geospace Science Investigations Team.
1997: First Place/Sciences Category - Computer Sciences Corporation- Systems Group Honorarium Paper Competition.
1992: National Research Council Senior Research Fellowship/NASA Langley Research Center (appointment declined).
1979: Illinois Institute of Technology Graduate Research Fellowship (appointment declined).

Professional Service

Referee: Physics of Plasmas, Annales Geophysicae, Astrophysical Journal, Journal of Geophysical Research-Space Physics, Solar Physics, Space Science Reviews, Monthly Notices of the Royal Astronomical Society.
Proposal & Panel Reviewer: National Science Foundation, NASA.

Professional Memberships

American Geophysical Union, American Physical Society

References

Available on request.