Michael Wiltberger

Curriculum Vita

Education

Degrees

1998	Ph.D (Physics), University of Maryland, College Park, MD
1997	M.S. (Physics), University of Maryland, College Park, MD
1993	B.S. (Physics), Clarkson University, Potsdam, NY

Ph.D. Thesis

Global Magnetohydrodynamic Simulations of Magnetospheric Substorms

Post-Degree Appointments

2016 – Present	Adjunct Associate Professor, Department of Physics and Astronomy, Rice University
2013 – Present	Atmosphere-Ionosphere-Magnetosphere Section Head, High Altitude Observatory, National Center for Atmospheric Research
2009 – Present	Scientist III, High Altitude Observatory, National Center for Atmospheric Research
2006 – 2009	Scientist II, High Altitude Observatory, National Center for Atmospheric Research
2007 - Present	Assistant Adjoint Professor, Astrophysical & Planetary Sciences Department, University of Colorado at Boulder
2003 - 2006	Scientist I, High Altitude Observatory, National Center for Atmospheric Research
1999 – 2003	Research Assistant Professor, Dept. of Physics and Astronomy, Dartmouth College
2001 - 2001	Visiting Assistant Professor, Dept. of Physics and Astronomy, Dartmouth College
1998 - 1999	Faculty Research Assistant, Space Plasma Physics Group, University of Maryland

Scientific and Technical Accomplishments

Scientific Accomplishments

2012 – Present	Investigated the impacts of high-speed flows in the magnetotail in ultra-high resolution simulations of the magnetosphere. Created statistical methods for comparing simulation and observations. Demonstrated that simulations reproduce key features of BBF observations. Proved connection between localized reconnection and BBFs in simulation results. *Led effort of research team*

	including a graduate student. 2.117, 8.62, 8.64, 8.66-67, 8.70-71, 8.73
2011 – Present	Statistical analysis of global simulation results. Paper for fast calibration of model parameters won Wilcoxon award for best publication. Implemented machine-learning algorithms for current comparisons across resolutions. Discovered that current-voltage relationship converges in LFM-MIX results as resolution increases. *Worked with an interdisciplinary team with statisticians on the development of tools. Provided mentoring to CISM graduate student T. Guild.* 2.50-51, 2.88, 2.95, 2.97, 2.99, 2.109, 2.123, 2.127, 8.63
2009 – Present	Studied the impact of ionospheric outflow on magnetosphere dynamics using MLFM simulations. Pioneered the methods for including ionospheric outflow. Discovered connection between outflow and sawtooth events. Conducted first simulations to show connection between outflow and multiple substorm onsets. Revealed that mass loading of magnetopause can affect global reconnection rates. *Advised graduate students and post-docs on the development of empirical and physical models of outflow.* 2.66-7, 2.74, 2.75, 2.95, 2.114, 2.128, 3.9, 8.40, 8.43, 8.48, 8.55-8.58, 8.60, 8.75
2007 – Present	Quantified the roll of ionospheric conductance in magnetosphere-ionosphere dynamics. Used LFM simulations to discover connection between seasonal EUV conductance and substorm onset in simulations as expected by observations. *Co-advised ASP graduate student B. Zhang in the development of a new empirical conductance model. Led International Space Science Institute Team in developing methods for determining global conductance distribution.* 2.61, 2.106, 2.119-120, 8.15, 8.34-35, 8.59
2001 – Present	MHD/Particle studies of radiation belt dynamics. Showed ULF pulsations in the magnetosphere enhance radial diffusion of radiation belt electrons. Statistically modeled dependence of radiation belt on multiple SW parameters. Simulated loss of radiation belt electrons via magnetopause shadowing. *Oversaw efforts of HAO post-doc E. Rigler. Continuing collaboration with M. Hudson and S. R. Elkington.* 2.15, 2.23, 2.39, 2.44, 2.65, 2.70, 2.110-111, 2.124,
2009 – 2011	Simulations of space weather system from Sun-to-Earth. Definitively showed that L1 driven simulation results are quantitatively better than those driven by solar wind simulation for High Speed Stream (HSS) Intervals. Demonstrated effectiveness if HSS in driving responses in magnetosphere, ionosphere, and thermosphere. *Coordinated efforts of team for WHI interval.* 2.79, 2.81, 2.84, 2.89, 2.91-2, 8.44, 8.46, 8.52-3
2006 – 2009	Illustrated connection between solar wind fluctuations and ULF pulsations in the inner magnetosphere. First global simulations to

	show direct coupling between Kelvin-Helmholtz instabilities along magnetopause and ULF waves. First simulations to show resonant Ultra Low Frequency waves driven by fluctuations in the solar wind. *Co-advised CU graduate student S. Claudepierre as part of his thesis research.* 2.47, 2.62, 2.121
2001 – 2006	Examined solar wind influence on magnetosphere-ionosphere coupling. Explained the role of night-side current systems in contributing to magnetopause erosion. Utilized simulations to show solar wind density affects energy transfer to the magnetosphere by impacting the bow shock. Discovered roll for solar wind Mach number as fundamental parameter controlling polar cap saturation.. *Collaboration with R. Lopez and his graduate students including visits to NCAR. Numerous papers with students as first authors.* 2.19, 2.28-29, 2.32-6, 2.38, 8.17
1998 – 2010	Use of LFM simulations to study magnetospheric substorms. Conducted the first global scale simulations of substorms which showed how the mid-tail reconnection process transfers energy and momentum into the inner magnetosphere. During recovery phase showed that natural line retreat is driven by solar wind. *Ph.D thesis and subsequent studies. Later directed the efforts graduate student Nathan Farr to study dynamics of substorm recovery phase.* 2.2, 2.4-7, 2.10-11, 2.21-22, 2.49, 2.68, 8.1, 8.3, 8.5, 8.12

Technical Accomplishments

2012 – Present	Python based analysis tools for users of the LFM and related models. Includes modules for import, analysis and application of machine-learning techniques. *Overall coordinator of pyLTR package.*
2008 – Present	Development of mulit-fluild extensions to the LFM global magnetosphere model. Implemented boundary condition routines to support ion outflow. *Coordinated version control and software development activities.* 8.60
2003 – Present	Evaluation of the space weather capabilities of global geospace models. Showed that LFM simulations do better than empirical models during extreme solar wind driving. *Led geospace community in utilization of modern metrics. Coordinated efforts of LFM team to participate in community-wide studies.* 2.18, 2.40, 2.77, 2.78, 2.96, 2.100-101, 2.108, 2.126, 8.9, 8.12, 8.33, 8.69
2007 – 2012	Transfer of the LFM global scale magnetosphere model to the Community Coordinated Modeling Center. *Oversaw model implementation, interacted with model users, and assisted in developing documentation.*
2005 – 2012	Integration of RCM ring current model into the LFM global magnetospheric resulting in improved geospace simulations. *Led multi-institution development team including graduate student A.*

	Pembroke who was lead author paper introducing this model. 2.90, 8.68
2004 – 2012	Released of the CISM-DX visualization and analysis package. Includes data import modules, analysis networks, and tutorials for CISM and community usage. *Overall coordinator of CISM-DX project.* 2.37, 2.104, 8.30, 8.54
2002 – 2006	Developed the Coupled Magnetosphere-Ionosphere-Thermosphere Model. *Lead verification and validation of magnetospheric results along with writing coupling routines.* 2.30-2.31, 8.11, 8.13-4, 8.18, 8.26, 8.31
2002 – 2006	Development of the Center for Integrated Space Weather (CISM) model coupling framework. Includes support for combining models with minimal changes to existing codebase. *Coordinated usage amongst geospace development team and wrote coupling software.* 2.64, 8.21, 8.23-4, 8.32

Community Service

Professional Service:

2016	Member Scientific Organizing Committee for Quo Vadis meeting
2015 – present	Member Intelligence Science and Technology Experts Group **(**ISTEG**)** of the National Academies of Sciences, Engineering, and Medicine
2016 – 2017	Vice-chair American Meteorological Society (AMS) Science and Technology Committee (STAC) on Space Weather
2015 – 2016	Member AGU Congressional Visit Team
2014 – 2015	Member American Meteorological Society (AMS) Science and Technology Committee (STAC) on Space Weather
2013 – 2017	Elected by GEM steering committee to serve as chair-elect and then chair of the GEM program
2013	Member SPA Richard Carrington Education and Public Outreach Award Committee
2013	Member SPA Section AGU Fellows Nominating Committee
2011	Member NASA Living with a Star (LWS) TR&T Steering Committee
2010 – 2012	Vice-Chair Solar Wind Magnetosphere Interactions Panel of the NRC Solar and Space Physics Decadal Survey
2009 – 2012	At-Large Member of Geospace Environment Modeling (GEM) Steering Committee
2008 – 2010	Member AGU SPA Section Executive Committee
2008	Organizing committee for the Defining a Program for Space Weather Modeling Meeting, Zermatt, UT.
2006	Program committee member for the High Performance Computing in the Geosciences Workshop, Boulder, CO.
2006 – 2009	GGCM Research Area Coordinator for NSF GEM Steering Committee
2006	Chair GEM General Geospace Science Steering Committee

2005 – 2006	Guest Editor ASR Special Issue
2004	Main Scientific Organizer of Session D3.1 at COSPAR
2003	Member NSF Space Weather Proposal Review Panel
2003 – 2005	Member GEM General Geospace Science Steering Committee
1999 – Present	Proposal reviewer for the NSF and the NASA
1999 – Present	Reviewer of papers submitted to JGR, GRL, ASR, and JASTP

Management Activities:

2015 – Present	Member HAO Director's Strategic Advisory Committee
2013 – Present	Section head for AIM
2013 – 2015	Supervised Software Engineer II Chris Fischer
2010 – 2014	Member HAO Scientific Advisory Committee (SAC)
2010 – 2014	Member HAO Director's Advisory Committee (DAC)
2009 – 2013	Chair HAO Computer Advisory Group
2009 – 2011	Director for Code Coupling in the CISM Program
2008 – 2013	Supervised Software Engineer II Peter Schmitt
2007 – 2013	Member CISL HPC Advisory Panel
2006 – 2009	Member HAO Computer Advisory Group
2003 - 2007	Co-chair HAO colloquia series

Educational Activities

2016 – Present	Adjunct Professor Department of Physics and Astronomy at Rice University
2016 – Present	Co-advisor for Dartmouth graduate student Wondwossen Eshetu
2016 – Present	Supervised HAO Post Doctoral Research Binzheng Zhang
2015 – Present	Co-advisor for UT-San Antonio graudate student Kevin Genestreti
2015	Member Ph.D Thesis Committee for Sheng Xi
2013 – 2018	Dean of the CISM Space Weather Summer School
2012	Member Ph.D Thesis Committee for Binzheng Zhang
2011 – Present	Co-advisor for CU graduate student Joshua Murphy
2010	Member Ph.D. Thesis Committee for Manny Presicci
2010	Member Ph.D. Thesis Committee for James McCollough
2010	Member Ph.D. Thesis Committee for Nathan Farr
2008	Member Ph.D. Thesis Committee for Seth Claudepierre
2007 – Present	Adjunct Professor APS Department University of Colorado
2006 – 2010	Co-advisor for CU graduate student Nathan Farr
2006	Presenter NCAR Super Science Saturday
2005 – 2008	Co-advisor for CU graduate student Seth Claudepierre
2005 – 2007	Supervised HAO Post Doctoral Researcher E. Joshua Rigler
2003 – 2004	Contributor to HAO/COMET Physics of the Auroras Module
2000 – Present	Instructor CISM Space Weather Summer School
1999 – Present	Collaborated with or assisted many additional Masters and Ph.D. students including: Jodie Baker-Ream (UCLA), Shanshan Bao (Rice University), Oliver Brambles (Dartmouth College), Sandra Brogl (Florida Institute of Technology), Robert Bruntz (University of Texas at Arlington), Timothy Guild (Boston University),

Salvador Hernandez (Florida Institute of Technology), James McCollough (University of Colorado), Tian Lou(Dartmouth College), Paul Melanson (Dartmouth College), Elizabeth Mitchell (University of Texas at Arlington), Joshua Murphy (University of Colorado), Jeremy Ouellette (Dartmouth College), Maulik Patel (Dartmouth College), Xi Shao (University of Maryland), Sheng Xi (Dartmouth College) Binzheng Zhang (Dartmouth College)

Professional Affiliations

Member American Geophysical Union
Member American Association for the Advancement of Science
Member American Meteorological Society

Honors and Awards

2015	Walter O Roberts Scientific and Technical Advancement Award for the WACCM-X Development Team
2014	Wilcoxon Award for best practical application paper appearing the 2013 issues of Technometrics
2012	National Aeronautics and Space Administration Group Achievement Award for NAIRAS Team
1998	National Aeronautics and Space Administration Group Achievement Award for Theory Investigation Team/University of Maryland Global Geospace Science Investigations Team
1998	American Geophysical Union Outstanding Student Paper Award
1993	Phalanx Clarkson University Highest Honor Society
1992	Commendable Leadership Award Clarkson University
1992	Commendable Service Award Clarkson University

Research Grants

2015 – 2018	CoI and NCAR PI - ULF wave modulated radiation belt loss to the atmosphere during geomagnetic storms, NASA:HGI.
2014 – 2017	PI – GEM: Exploring the Relative Influence of Different Classes of Ion Outflow on the Coupled Dynamics of the Magnetosphere-Ionosphere-Thermosphere System, NSF:GEM
2014 – 2017	CoI - Including Macroscopic Effects of Small-Scale E-Region Turbulence in Global Magnetosphere-Ionosphere-Thermosphere Models, NASA:HGCR
2014 – 2018	CoI and NCAR PI - Transport and Trapping of Electrons from the Magnetotail to the Inner Magnetosphere, NASA:LWS-TRT
2012 – 2017	PI – CISM Space Weather Summer School, NSF:AGS
2011 – 2014	CoI - Observational and Modeling Investigation of the Harang Discontinuity, NASA:Geo
2011 – 2014	CoI and NCAR PI – Impacts of Ionospheric Outflows on Magnetospheric Transport Modes, NASA:Geo
2011 – 2014	CoI and NCAR PI – Dyanmics of Magnetosphere-Ionosphere Coupling, NASA:Theory
2009 – 2013	CoI and NCAR PI – Solar wind - Magnetosphere Coupling During Periods with Large IMF, NASA:Geo.
2009 – 2012	CoPI - CMG collaborative research: Models, tools and analysis for studies of the upper atmosphere and magnetosphere.
2008 – 2011	CoI and NCAR PI - Nowcast of Atmospheric Ionizing Radiation for Aviation Safety, NASA:LRC.
2007 – 2010	CoI and NCAR PI - Effects of Stormtime Plasma Redistribution on Magnetosphere-Ionosphere Coupling, NASA:LWS.
2006 – 2009	CoI and NCAR PI - Parametric Investigations of ULF Wave Structure in the Earth's Magnetosphere, NASA:Geo.
2004 – 2007	CoI and NCAR PI - Characteristics of substorm injection of energetic particles into the inner magnetosphere, NASA:GIP.
2002 – 2012	CoI – Center for Integrated Space Weather Modeling, NSF Science Technology Center
2002 – 2005	CoI I - Integrated Numerical Simulation of the Solar Terrestrial Environment for the LWS Program, NASA:LWS.
2002 – 2005	CoI - GEM: Transport and trapping of the energetic plasma sheet electrons in the outer zone radiation belts, NSF:GEM.
2000 – 2003	PI - GEM: A Parametric Study of Geomagnetic Storms During Magnetic Cloud Intervals Using Global MHD Simulations, NSF:GEM.
2000 – 2003	CoI - Radiation Belt Particle Acceleration by ULF wave drift resonance, NASA:LWS.

Publications

ORICID - 0000-0002-4844-3148
Citation metrics are available at http://www.researcherid.com/rid/B-8781-2008
As of 7/6/2016 138 refereed publications with 1838 citations and an h-index of 25.

Thesis

Title: Global Magnetohydrodynamic Simulations of Magnetospheric Substorms
Date: 1998
Institution: University of Maryland
Adviosr: K. Papadoploulos

Publications in Refereed Journals

2.1. Roberts, D. Aaron and Michael J. Wiltberger (1995), Nonequilibrium, large-amplitude MHD fluctuations in the solar wind, *J. Geophys. Res., 100,* 3045-3415.

2.2. *Lyon, J., R. E. Lopez, C. , M. Wiltberger, and K. Papadopoulos (1998), Simulation of the March 9, 1995 substorm: Auroral brightening and the onset of lobe reconnection, *Geophys. Res. Lett., 25,* 3039-3042.

2.3. Goodrich, C. C., M. Wiltberger, R. E. Lopez, K. Papadopoulos and J. G. Lyon, An overview of the impact of the January 10-11, 1997 magnetic cloud on the magnetosphere via global MHD simulation, *Geophys. Res. Lett., 25,* 2537-2540.

2.4. Papadopoulos, K., C. C. Goodrich, M. Wiltberger, R. E. Lopez, and J. G. Lyon, Physics of substorms as revealed by ISTP (1998), *Physics and Chemistry of the Earth, 24*, 189-202.

2.5. Pulkkinen, T. I., D. N. Baker, M. Wiltberger, C. C. Goodrich, R. E. Lopez and J. G. Lyon (1998), Pseudobreakup and substorm onset: Observations and MHD simulations compared, *J. Geophys. Res., 103*, 14847-14854.

2.6. Pulkkinen, T. I. and M. Wiltberger, Global magnetospheric response to IMF driving: ISTP observations, empirical modeling, and MHD simulations (1999), *Physics and Chemistry of the Earth, 24*, 163-166.

2.7. Curtis, S., J. Raeder, C. Goodrich, M. Wiltberger, R. Greenwald, K. Baker and R. Roble (1999), A global view of the role of acceleration processes in Solar-Terrestrial coupling as provided by the ISTP Theory and Ground-based experiments, *Physics and Chemistry of the Earth, 24*, 239-246, 1999.

2.8. Lopez, R. E, M. Wiltberger, J. G. Lyon, C. C. Goodrich, and K. Papadopoulos (1999), MHD simulations of the response of high-latitude potential patterns and polar cap boundaries to sudden southward turnings of the interplanetary magnetic field, *Geophys. Res. Lett., 26,* 967-970.

2.9. Lopez, R. E., C. Goodrich, M. Wiltberger, and J. Lyon (2000), Solar wind - magnetosphere energy coupling under extreme interplanetary conditions: MHD simulations, *J. Atmos. Solar Terr. Physics, 62,* 865-874, 2000.

2.10. Pulkkinen, T. I. and M. Wiltberger (2000), Thin current sheet evolution as seen in observations, empirical models, and MHD simulations, *Geophys. Res. Lett., 27,* 1363-1366.

2.11. Wiltberger, M., T. I. Pulkkinen, J. G. Lyon, and C. C. Goodrich (2000), MHD simulation of the magnetotail during the December 10, 1996 substorm, *J. Geophys. Res., 105*, 27649-27663.

2.12. Guzdar, P. N., X. Shao, C. C. Goodrich, K. Papadopoulos, M. J. Wiltberger and J. G. Lyon (2001), Three-dimensional MHD simulations of the steady state magnetosphere with northward interplanetary magnetic field, *J. Geophys. Res., 106,* 275-288.

2.13. Milikh, G. M., Y.S. Dimant, X. Shao, P. N. Guzdar, A. S. Sharma, K. Papadopoulos, E. M. Burns, C. C. Goodrich, T. J. Rosenberg, A. T. Weatherwax, M. Wiltberger, J. G. Lyon, J. A. Fedder (2001), Modeling ionospheric absorption modified by anomalous heating during substorms, *Geophys. Res. Lett., 28,* 487-490.

2.14. Shao, X., P. N. Guzdar, K. Papadopoulos, C. C. Goodrich, A. S. Sharma, G. M. Milikh, M. J. Wiltberger and J. G Lyon (2001), Three-dimensional MHD simulations of the Earth's magnetosphere on Feb 9-10 1995 for northward interplanetary magnetic field and comparison of the lobe field with Geotail observations, *Geophys. Res. Lett., 28,* 3835-3838.

2.15. Elkington, S. R., M. K. Hudson, M. Wiltberger and J. G. Lyon (2001), MHD/Particle simulations of radiation belt dynamics, *J. Atmos. Solar Terr. Phys., 64,* 607-615.

2.16. Shao, X., P. N. Guzdar, G. M. Milikh, K. Papadopoulos, C. C. Goodrich, A. Sharma, M. Wiltberger, and J. G. Lyon (2002), Comparing ground magnetic field perturbations from global MHD simulations with magnetometer data for the 10 January 1997 magnetic storm event, *J. Geophys. Res., 107,* doi:10.1029/2000JA000445.

2.17. Wing, S., D. G. Sibeck, M. Wiltberger, and H. Singer (2002), Geosynchronous magnetic field temporal response to the solar wind and IMF variations, *J. Geophys. Res., 107,* doi:10.1029/ 2001JA009156.

2.18. Wiltberger, M., J. G. Lyon, and C. C. Goodrich (2003), Results from theLyon-Fedder-Mobarry global magnetospheric model for the electrojet challenge, *J. Atmos. Solar Terr. Phys., 65*, 1213-1222.

2.19. Wiltberger, M., R. E. Lopez, and J. G. Lyon (2003), Magnetopause erosion: A global view from MHD simulation, *J. Geophys. Res., 108,* doi:10.1029/2002JA009564.

2.20. Lopez, R. E., E. Benitez-Marquez, M. Wiltberger, and J. G. Lyon (2003), Evidence for quasi-steady near-Earth magnetotail reconnection during magnetic storms using global MHD simulation results and magnetic field observations, Proceedings of the COSPAR Colloquium, *Adv. Space Res., 31*, 1167-1176.

2.21. Pulkkinen, T. I., E. L. Tanskanen, M. Wiltberger, J. A. Slavin, T. Nagai, G. D. Reeves, L. A. Frank, and J. B. Sigwarth (2003), Magnetotail flows can dissipate as much energy as a substorm, *J. Geophys. Res, 108,* doi:10.1029/2001JA009132.

2.22. Shao, X., M. I. Sitnov, S. A. Sharma, K. Papadopoulos, C. C. Goodrich, P. N. Guzdar, G. M. Milikh, M. Wiltberger, and J. G. Lyon (2003), Phase transition-like behavior of magnetospheric substorms: Global MHD simulation results, doi:10.1029/2001JA009237.

2.23. Elkington, S. R., M. Wiltberger, A. A. Chan, and D. N. Baker (2004), Physical models of the geospace environment and the Center for Integrated Space Weather Modeling, *J. Atmos. Solar Terr. Phys., 66,* 1371, doi:10.1016/j.jastp.2004.03.023.

2.24. Eriksson, S., S. R. Elkington, T. D. Phan, S. M. Petrinec, H. Reme, M. W. Dunlap, M. Wiltberger, A. Balogh, R. E. Ergun, and M. Andre (2004), Cluster observations of the

dawnside flank magnetopause reconnection: Evidence for the global control of merging by the interplanetary magnetic field, *J. Geophys. Res. 109,* A12203, doi:10.1029/2003JA010346.

2.25. Guild, T., H. Spence, L. Kepko, M. Wiltberger, C. C. Goodrich, J. G. Lyon, and W. J. Hughes (2004), Plasma sheet climatology: Geotail observations and LFM model comparisons, *J. Atmos. Solar Terr. Phys., 66,* 1351, doi:10.1016/j.jastp.2004.03.021.

2.26. Korth, H., M. Wiltberger, B. J. Anderson, J. G. Lyon, and P. C. Anderson (2004), Intercomparision of ionospheric electrodynamics from the Iridium constellation with global MHD simulations, *J. Geophys. Res., 109,* A07307, doi:10.1029/2004JA010428.

2.27. Luhmann, J. G., S. C. Solomon, J. A. Linker, J. G. Lyon, Z. Mikic, D. Odstrcil, W. Wang, and M. Wiltberger (2004), Coupled model simulation of a Sun-to-Earth space weather event, *J. Atmos. Solar Terr. Phys., 66,* 1243, doi:10.1016/j.jastp.2004.04.005.

2.28. Lopez, R. E., M. Wiltberger, and J. G. Lyon (2004), Coupling between the solar wind and the magnetosphere during strong driving: MHD Simulations, *IEEE Trans. Plasma Sci., 32,* 1439, doi:10.1109/ TPS.2004.834037.

2.29. Lopez, R. E., M. Wiltberger, S. Hernandez, and J. G. Lyon (2004), Solar wind density control of energy transfer to the magnetosphere, *Geophys. Res. Lett. 31,* L08804, doi:10.1029/2003GL018780, 2004.

2.30. Wang, W., M. Wiltberger, A. G. Burns, S. Solomon, T. L. Killeen, N. Maruyama, and J. G. Lyon (2004), Initial results from the Coupled Magnetosphere Ionosphere Thermosphere Model: Thermosphere-ionosphere responses, *J. Atmos. Solar Terr. Phys., 66,* 1425, doi:10.1016/ j.jastp.2004.04.008.

2.31. Wiltberger, M., W. Wang, A. Burns, S. Solomon, J. G. Lyon, and C. C. Goodrich (2004), Initial results from the Coupled Magnetosphere Ionosphere Thermosphere Model: Magnetospheric and ionospheric responses, *J. Atmos. Solar Terr. Phys., 66,* 1411, doi:10.1016/ j.jastp.2004.04.026.

2.32. Arceo, R., R. E. Lopez, M. Wiltberger, and J. G. Lyon (2005), Polar cap potential during magnetic storms: MHD simulations, *Adv. Space Res., 36,* doi:10.1016/j.asr.2005.07.063, 2005.

2.33. Bruntz, R., R. E. Lopez, N. E. Turner, M. Wiltberger, and J. G. Lyon (2005), Ring current development in MHD simulations, *Adv. Space Res., 36,* doi:10.1016/j.asr.2005.07.082.

2.34. Hernandez, S., R. E. Lopez, and M. Wiltberger (2005), Ionospheric joule heating during magnetic storms: MHD simulations, *Adv. Space Res., 36,* doi:10.1016/j.asr.2005.05.132.

2.35. Krastev, P., R. E. Lopez, S. Hernandez, and M. Wiltberger (2005), Convection during strong driving in MHD simulations: Evolution of flux tube volume, *Adv. Space Res., 36,* doi:10.1016/ j.asr.2005.07.061.

2.36. Merkin, V. G., G. Milikh, K. Papadopoulos, A. S. Sharma, J. G. Lyon, C. C. Goodrich, Y. S. Dimant, and M. Wiltberger (2005), Effect of anomalous electron heating on the transpolar potential in the LFM global MHD model, *Geophys. Res. Lett., 32,* doi:10.1029/2005GL023315.

2.37. Wiltberger, M., R. S. Weigel, M. Gehmeyr, and T. Guild (2005), Analysis and visualization of space science model output and data with CISM-DX, *J. Geophys. Res., 110,* doi:10.1029/2004JA010956.

2.38. Wiltberger, M., R. E. Lopez, J. G. Lyon (2005), Results from magnetospheric gedanken experiments Using the LFM, *Adv. Space Res., 36,* doi:10.1016/j.asr.2004.11.043.

2.39. Fei, Y., A. A. Chan, S. R. Elkington, and M. Wiltberger (2006), Radial diffusion simulation of relativistic electron transport by ULF waves the Sept. 1998 storm, *J. Geophys. Res., 111,* doi:10.1029/2005JA011211.

2.40. Lopez, R. E., S. Hernandez, M. Wiltberger, J. G. Lyon, and C. C. Goodrich (2006), Initial results from the simulation of the Halloween 2003 storms, *Advances in Geosciences, 2,* 191-200.

2.41. Baker, D. N., M. J. Wiltberger, R. S. Weigel, S. R. Elkington (2007), Present status and future challenges of modeling the Sun-Earth end-to-end system, *J. Atmos. Solar Terr. Phys., 69,* 3-17.

2.42. Burns, A. G., W. Wang, T. L. Killeen, S. C. Solomon, and M. Wiltberger (2007), Vertical variations in the N2 mass mixing ratio during a thermospheric storm that have been simulated using a coupled magnetosphere - ionosphere - thermosphere model, *J. Geophys. Res., 111,* A11309, doi:10.1029/2006JA011746.

2.43. Lopez, R. E., S. Hernandez, M. Wiltberger, C. -L. Huang, E. L. Kepko, H. Spence, C. C. Goodrich, and J. G. Lyon (2007), Predicting magnetopause crossings at geosynchronous orbit during the Halloween storms, *Space Weath., 5*, S01005, doi:10.1029/2006SW000222.

2.44. Rigler, E. J., M. Wiltberger, and D. N. Baker (2007), Radiation belt electrons respond to multiple solar wind inputs, *J. Geophys. Res., 112,* doi:10.1029/2006JA012181.

2.45. Wang, W., A. G. Burns, M. Wiltberger, S. C. Solomon, and T. L. Killeen (2007), An analysis of neutral wind generated currents during geomagnetic storms, *J. Atmos. Solar Terr. Phys., 67,* doi:10.1016/j.jastp.2006.06.014.

2.46. Burns, A. G., W. Wang, M. Wiltberger, S. C. Solomon, H. Spence, T. L. Killeen, R. E. Lopez, and J. E. Landivar (2008), An event study to provide validation of TING and CMIT geomagnetic middle-latitude electron densities at the F2 peak, *J. Geophys. Res., 113,* doi:10.1029/2007JA012931.

2.47. Claudepierre, S. G., S. R. Elkington and M. Wiltberger (2008), Solar wind driving of magnetospheric ULF waves: Pulsations driven by velocity shear at the magnetopause, *J. Geophys. Res., 113,* doi:10.1029/2007JA012890.

2.48. Doxas, I., W. Horton, J. Lyon, M. Wiltberger, R. S. Weigel, Branch prediction and speculative execution: A magnetospheric data assimilation scheme for space weather forecasting (2008), *Space Weath., 5,* S11001, doi: 10.1029/2006SW000236.

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3.9. Wiltberger, M. (2015), Review of global simulation studies of the effect of ionospheric outflow on the magnetosphere-ionosphere system dynamics, in *Magnetotails in the Solar System, Geophys. Monogr. Ser*., edited by A. Keiling et al., Washington, D. C., doi:10.1002/9781118847572.ch22.

3.10. Wiltberger, M. (2016), Aviation and Space Weather, *The Journal of Air Traffic Control,* accepted.

Papers Submitted to Refereed Journals

4.1. Murphy, J. J., S. R. Elkington, M. Wiltberger, and D. N. Baker, Impact of Observational Uncertainties on CME Predictions, *Space Weather,* submitted.

4.2. Varney, R. H., M. Wiltberger, B. Zhang, W. Lotko, J. Lyon, Influence of Ion Outflow in Coupled Geospace Simulations: 1. Physics-Based Ion Outflow Model Development and Sensitivity Study, *J. Geophys. Res.*, submitted.

4.3. Varney, R. H., M. Wiltberger, B. Zhang, W. Lotko, J. Lyon, Influence of Ion Outflow in Coupled Geospace Simulations: 2. Sawtooth Oscillations Driven by Physics-Based Ion Outflow, *J. Geophys. Res.*, submitted.

4.4. Xi, S., W. Lotko, B. Zhang, M. Wiltberger, J. Lyon, Effects of Auroral Potential Drops on Plasma Sheet Dynamics, *J. Geophys. Res.*, submitted.

Internally Refereed Publications

6.1. None

Non-Refereed Publications

7.1. Goodrich, C., M. Wiltberger, Lopez, R., K. Papadopoulos, and J. Lyon (1998), Global MHD simulations of actual magnetospheric events, in *Proc. International Conference on Substorms-4*, edited by S. Kokubun and Y. Kamide, 645-650.

7.2. Lopez, R, C. Goodrich, M. Wiltberger, K. Papadopoulos, and J. Lyon (1998), Substorm onset and evolution: Coupling between tail regions in MHD simulations, in *Physics of Space Plasmas, 15*, edited by T. Chang, MIT Center for Theoretical Geo/Cosmo Plasma Physics, Cambridge, MA, 227-232.

7.3. Lopez, R., C. Goodrich, M. Wiltberger, K. Papadopoulos, and J. Lyon (1998), Coupling between local and global activity during the substorm expansion phase: Results from MHD simulations and comparison to observations, in *Proc. International Conference on Substorms-4*, edited by S. Kokubun and Y. Kamide, 169-174.

7.4. Wiltberger, M. , K. Papadopoulos, R. E. Lopez, C. C. Goodrich and J. G. Lyon (1998), Effects of northward turnings on the initiation of substorms in global MHD simulations, in *Proc. International Conference on Substorms-4*, edited by S. Kokubun and Y. Kamide, 287-290.

7.5. R. L. McNutt Jr., J. G. Lyon, C. C. Goodrich, and M. Wiltberger (1999), 3D MHD simulations of the Heliosphere-VLISM interaction, in *Proc. Solar Wind Nine*, edited by S. R. Habbal, R. Esser, J. V. Hollweg, and P. A. Isenberg, 823-826.

Selected Conference Papers

~276 presentations at conferences and symposia, including the following invited first-author presentations:

8.1. Wiltberger, M., S. Sharma, C. C. Goodrich, R. E. Lopez, K. Papadopoulos, J. A. Valdivia, D. Vassiliasdis, and J. G. Lyon, Comparison Between Global MHD Simulations and NLD Methods for Storm and Substorm events, presented at the American Geophysical Union Fall Meeting, San Francisco, CA, 1998.

8.2. Wiltberger, M., C. C. Goodrich, R. E. Lopez, and J. G. Lyon, Global MHD Simulations of Magnetic Cloud Interactions with the Earth's Magnetosphere, presented at the 'The New Millennium Magnetosphere' Sixth Huntsville Modeling Workshop, Lake Guntersille AL, 1998

8.3. Wiltberger, M. and J. G. Lyon, Global MHD Simulations of Magnetospheric Substorms, presented at the Cambridge Symposium Workshop on the Physics of Space Plasmas - Theme: Multi-Scale Phenomena II - Cascais, Portugal, 1998.

8.4. Wiltberger, M., J. G. Lyon and C. C. Goodrich, MHD Simulations of the Earth's Magnetosphere with Virtually no Solar Wind, presented at the Fall AGU meeting, San Francisco, CA, 1999.

8.5. Wiltberger, M. J. G. Lyon, C. C. Goodrich, R. E. Lopez, K. Papadopoulos, T. I. Pulkkinen, Quantitative Comparison Between Global MHD simulations of the Earth's Magnetosphere and Observations, presented at the IUGG meeting, Brimingham, UK, 1999.

8.6. Wiltberger, M., C. C. Goodrich, and J. G. Lyon, Using a Global MHD Code to Predict Space Weather in Real Time, presented at National Space Weather Week, Boulder, CO, 1999.

8.7. Wiltberger, M. and J. G. Lyon, Numerical Methods Used in the Lyon-Fedder-Mobarry global MHD Code to Model the Magnetosphere, presented at the National Radio Science Meeting, Boulder, CO, 1999.

8.8. Wiltberger, M., J. G. Lyon and C. C. Goodrich, Validation of MHD Models Through data Comparisons, presented as part NASA/LEP seminar series, Greenbelt, MD, 2000.

8.9. Wiltberger, M., J. G. Lyon and C. C. Goodrich, Results from the Lyon-Fedder-Mobarry Global MHD Code for the Electrojet Challenge, presented at Space Weather Week, Boulder, CO, 2000.

8.10. Wiltberger, M., M. K. Hudson, and J. G. Lyon, Global MHD Simulations of Magnetic Storms Driven by Magnetic Clouds, presented at ISEC meeting, Queenstown, NZ, 2001.

8.11. Wiltberger, M., W. Wang, A. Burns, J. G. Lyon, S. Solomon, Initial results from the coupled LFM-TING model, presented at the Fall AGU meeting, San Francisco, CA, 2003.

8.12. Wiltberger, M., S. R. Elkington, D. Baker, J. G. Lyon, R. E. Lopez, and T. Guild, Comparison of MHD simulations of Isolated Substorms and Those During Magnetic Storms, presented at the Chapman Conference on Inner Magnetosphere Modeling, Helsinki, FI, 2003.

8.13. Wiltberger, M., and the CISM Team, Initial results from the CISM coupling of the LFM and TING models, presented at CEDAR meeting, Longmont, CO, 2003.

8.14. Wiltberger, M., W. Wang, J. G. Lyon, A. Burns, Initial Results from the CMIT Model, presented at the 1st Annual Asia Oceania Geophysical Society Meeting, Singapore, 2004.

8.15. Wiltberger, M., C. C. Goodrich, J. G. Lyon, T. Guild, Results from the CMIT model for the Halloween Storms, presented at the 1st Annual Asia Oceania Geophysical Society Meeting, Singapore, 2004.

8.16. Wiltberger, M. Introduction to magnetohydrodynamic modeling of the magnetosphere, presented as part of the Center for Integrated Space Weather Modeling summer school on Space Weather, Boston, MA, 2004.

8.17. Wiltberger, M., J. G. Lyon, S. R. Elkington, and R. E. Lopez, Modeling the Response of the Magnetosphere - Ionosphere System to Interplanetary Coronal Mass Ejections, presented at the Challenges to Modeling the Sun-Earth System Meeting, Huntsville Alabama, 2004.

8.18. Wiltberger, M., W. Wang, A. Burns, J. G. Lyon, S. Solomon, and V. G. Merkin, Initial results from the Coupled Magnetosphere Ionosphere Thermosphere Model, presented as part of the BU/CSP seminar series, Boston, MA, 2004.

8.19. Wiltberger, M. and J. G. Lyon, Numerical methods used in the Lyon-Fedder-Mobarry global MHD code to model the magnetosphere, presented at the URSI meeting, Boulder CO, 2005.

8.20. Wiltberger, M. Modeling Geospace, presented as part of the FIT seminar series, Melbourne, FL, 2005.

8.21. Wiltberger, M. and the CISM Team, Coupled model simulation of a Sun-to-Earth space weather event, presented at University of Leicester, Leicester, UK, 2005.

8.22. Wiltberger, M. Magnetohydrodynamic Modeling of the Magnetosphere, presented at Lancaster University, Lancaster, UK 2005.

8.23. Wiltberger, M. End to Endo Numerical Modeling of the Sun-Earth System, presented as part of the NCAR Space Weather Symposium, Boulder, CO, 2005.

8.24. Wiltberger, M. and the CISM Team, Numerical simulation for the Sun-Earth System, presented at the International Space Science Institute workshop on Solar dynamics and its effects on the heliosphere and Earth, Bern, Switzerland, 2005.

8.25. Wiltberger, M. Space Weather, presented as part of Super Science Saturday in Boulder, CO. 2005.

8.26. Wiltberger, M. Modeling Interactions between the Magnetosphere, Ionosphere, and Thermosphere, presented at the Joint GEM/CEDAR meeting, Santa Fe, NM, 2005.

8.27. Wiltberger, M. Introduction to magnetohydrodynamic modeling of the magnetosphere, presented as part of the Center for Integrated Space Weather Modeling summer school on Space Weather, Boston, MA, 2006.

8.28. Wiltberger, M., J. Ouellette, B. Rodgers, M. Shay, and J. G. Lyon, Magnetopause Reconnection in the LFM, presented at the GEM Meeting, Snowmass, CO 2006.

8.29. Wiltberger, M. Neutral Wind Effects on MI Coupling, presented as part of the LASP seminar series, Boulder, CO 2006.

8.30. Wiltberger, M., Analysis and Visualization of Space Science Data, presented at Numerical Modeling of Space Plasma Flows, Palm Springs, CA 2006.

8.31. Wiltberger, M., Implementation of magnetosphere-ionosphere coupling in MHD simulations of the magnetosphere, presented at Chinese Academy of Sciences, Bejing, China, 2006.

8.32. Wiltberger, M. and the CISM Team, End-to-End modeling of the Sun-Earth System, presented at 11th Quadrennial STP Symposium (STP-11) on Sun, Space Physics and Climate, Rio de Janeiro, Brazil, 2006.

8.33. Wiltberger, M. Metrics and Space Weather, presented at the LWS-CDA Workshop, Melbourne, FL, 2007.

8.34. Wiltberger, M. Seasonal Effects in Magnetosphere - Ionosphere Coupling, presented as part of the CISM Seminar Series, Access Grid, 2007.

8.35. Wiltberger, M., R. S. Weigel, Simulations of seasonal variations in MI coupling, presented at the IUGG Meeting, Perugia, Italy, 2007.

8.36. Wiltberger, M. Future of Global Magnetospheric Modeling, presented at the Roratonga, Energic Particle Workshop, Roratonga, Cook Islands, 2007.

8.37. Wiltberger, M. and the CISM Team, High Performance Computing and Space Weather, presented at the Symposium on Turbulence and Dynamos at Petaspeed, Boulder, CO, 2007.

8.38. Wiltberger, M. Non-classical Generators in the Global Electric Circuit, presented at the Fall AGU meeting, San Francisco, CA, 2007.

8.39. Wiltberger, M. and the CISM Team, Space Weather forecasting and Petascale Computing, at the AMS Meeting, New Orleans, LA, 2008.

8.40. Wiltberger, M., W. Lotko, J. G. Lyon, and P. Damiano, Modeling the impacts of ionospheric oxygen on magnetic reconnection, presented at the Spring AGU meeting, Ft. Lauderdale, FL, 2008.

8.41. Wiltberger, M., Division III Reporter Review: Global Dynamics, presented at the IAGA meeting, Sopron, Hungry, 2009.

8.42. Wiltberger, M., S. C. Solomon, R. Wagoner, L. Nance, and B. Brown, Results from the NCAR Space Weather Prediction Testbed Study, presented at the Space Weather Workshop, Boulder, CO, 2009.

8.43. Wiltberger, M., Issues in Modeling Outflow or What's a poor modeler to do?, presented at the Ionospheric-Magnetospheric Plasma Redistribution During Storms: Causes and Consequences Workshop, Boulder, CO, 2009.

8.44. Wiltberger, M, and the CISM Team, End to End Modeling of the Whole Heliosphere Interval, presented at the WHI workshop, Boulder, CO 2009.

8.45. Wiltberger, M., J. G. Lyon, and C. C. Goodrich, Global Modeling of Different Modes of Geomagnetic Activity, presented at the AGU Fall Meeting, San Francisco, CA, December 2009.

8.46. Wiltberger, M., W. B. Wang, J. G. Lyon and V Merkin, Simulations of the Earth's Magnetosphere-Ionosphere-Thermosphere during the Whole Heliosphere Interval, presented at the Asia Oceania Geophysical Society Meeting, Hydrabad, India, July 2010.

8.47. Wiltberger, M. A Modeler's Perspective on Space Weather Forecasting, presented at the AGU Fall Meeting, San Francisco, CA, December, 2010.

8.48. Wiltberger, M. Theremosphere-Ionosphere-Magnetosphere Coupling and Mass Outflow: The Magnetosphere-Ionosphere Perspective, AGU Fall Meeting, San Francisco, CA, December 2010.

8.49. Wiltberger, M. Potential Space Weather Applications of the Coupled-Magnetosphere-Ionsophere-Thermosphere Model, Space Weather Workshop, Boulder, CO, 2011.

8.50. Wiltberger, M., Space Weather: Connections with ground-based solar observations, presented at Community Workshop on Ground Based Solar Research, Boulder, CO 2011.

8.51. Wiltberger, M., Division III Reporter Review: Global Dynamics, presented at the IAGA Conference, Melbourne Australia, 2011.

8.52. Wiltberger, M., W. B. Wang, S. C. Solomon, S. R. Elkington, J. G. Lyon, and V. Merkin, Coupled Magnetosphere-Ionosphere-Thermosphere Simulations of the Whole Heliosphere Interval, presented at the IAGA Conference, Melbourne Australia, 2011.

8.53. Wiltberger, M., L. Qain, C. L. Huang, W. Wang, R. E. Lopez, A. G. Burns, S. C. Solomon, Y. Deng, Y. Huang. CMIT Study of CR2060 and CR2068 Comparing L1 and MAS Solar Wind Drivers, presented at the CISM All Hand Meeting, Jackson Hole, WY 2011

8.54. Wiltberger, M. P. Schmitt, and R. Weigel, Lessons Learned from the CISM-DX Open Source Visualization and Data Analysis Experience, presented at the Fall AGU meeting San Francisco, CA, 2012.

8.55. Wiltberger, M. Review of Global Simulation Studies of the Effect of Ionospheric Outflow on Magnetotail Dynamics, presented at the Chapman Conference on Fundamental Properties and Processes of Magnetotails, Reykjavik, Iceland, 2013.

8.56. Wiltberger, M., W. Lotko, B. Zhang, O. J. Brambles, J. G. Lyon, V. G. Merkin, K. Garcia-Sage, Studying the impacts of ionospheric plasma on magnetotail dynamics using multifluid MHD simulations, presented at the 23rd Cluster Workshop, Tromso Norway, 2013

8.57. Wiltberger, M. The Effects of Ionospheric Flows on the Terrestrial Magnetosphere, presented at the ISSI Workshop on Plasma Sources in Solar System Magnetospheres, Bern Switzerland, 2013.

8.58. Wiltberger, M. and R. Varney, Review of global simulation studies of the effects of ionospheric outflow on the magnetosphere-ionosphere system dynamics, presentation the AGU Chapman Conference on MI Coupling, Yosmite, CA, 2013.

8.59. Wiltberger, M. Role of global conductance in Magnetosphere-Ionosphere Coupling, given as a tutorial lecture at the GEM Meeting, Norfolk, VA, 2014.

8.60. Wiltberger, M., R. Varney, O. J. Brambles, J. Ouellete, W. Lotko, B. Zhang, J. G. Lyon, V. G. Merkin, Comparison of Multi-fluid Lyon-Fedder-Mobarry global magnetosphere simulations with observations, presented at the Fall AGU meeting San Francisco, CA, 2014.

8.61. Wiltberger, M., Modeling Space Weather, NCAR Day of Networking and Discovery, Boulder, CO, 2015.

8.62. Wiltberger, M., High resolution global magnetohydrodynamic simulation of bursty bulk flows, presented at Astronnum 2015, Avignon, France, 2015.

8.63. Wiltberger, M., Structure and Dynamics of Polar Cap Currents in Magnetosphere-Ionosphere Models, presented as part of the ISSI Workshop "Earth's Magnetic Field", Bern, Switzerland, 2015.

8.64. Wiltberger, M., High resolution global magnetohydrodynamic simulation of bursty bulk flows, presented as part of Friends of the Magnetosphere Seminar Series, Boulder, CO , 2015.

8.65. Wiltberger, M. Modeling Space Weather, presented as part of NCAR Advanced Study Program Seminar Series, Boulder, CO 2015.

8.66. Wiltberger, M., High resolution global magnetohydrodynamic simulation of bursty bulk flows, Inner Magnetosphere III Conference, Los Angeles , CA , 2015.

8.67. Wiltberger, M., High resolution global magnetohydrodynamic simulation of bursty bulk flows, presented as part of Dartmouth Space Physics Seminar Series, Hanover, NH, 2015.

8.68. Wiltberger, M., Initial Results from the March 17-18 2013 LFM Simulation, GEM 2015, Snowmass, Colorado, 2015.

8.69. Wiltberger, M. Magnetopause Position in LFM, GEM 2015, Snowmass, Colorado, 2015.

8.70. Wiltberger, M., High resolution global magnetohydrodynamic simulation of bursty bulk flows, GEM 2015, Snowmass, Colorado, 2015.

8.71. Wiltberger, M., K. Pham, V. G. Merkin, S. Ohtani, J. G. Lyon, Effects of solar wind and IMF on BBF in high-resolution MHD simulations of the magnetotail, Magnetic Reconnection Onset and Dipolarization Fronts, Laurel, MD, 2015.

8.72. Wiltberger, M. What is Space Weather?, NBAA Business Aviation Convention and Exhibition, Las Vegas, NV, November 2015.

8.73. Wiltberger, M. K. Pham, V. Merkin, J. Lyon, S. Ohtani, Effects of solar wind and IMF on BBFs in high-resolution LFM simulations of the magnetotail, , presented at the Fall AGU meeting San Francisco, CA, December 2015.

8.74. Wiltberger, M. Space Weather: A low frequency high impact space age hazard, presented at the American Association for the Advancement of Science Annual Meeting, Washington, DC, February, 2016.

8.75. Wiltberger, M., R. Varney, B. Zhang, W. Lotko, V. Merkin, and J. Lyon, Impacts of Ionospheric Outflow on Simulations of the Magnetosphere, presented at the 2016 SHEILDS Workshop: Shielding Society from Space Weather, Santa Fe, NM, April 2016.

8.76. Wiltberger, M. Opportunities for CCMC support of GEM Focus Groups, presented as part of the CCMC Workshop, Annapolis MD, April 2016.

8.77. Wiltberger, M., J. G. Lyon, V. Merkin, B. Zhang, and W. Wang, CMIT/LFM – Status and Plans, presented as part of the CCMC Workshop, Annapolis MD, April 2016.