

CURRICULUM VITAE: Ward B. Manchester IV

*Associate Research Professor
Department of Atmospheric, Oceanic and Space Sciences
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Education

- Ph.D. Astronomy, University of Illinois, Urbana-Champaign, May 2000
Thesis: The Equilibria, Stability and Nonlinear Dynamics of Magnetically-Sheared Atmospheres with Applications to the Solar Environment
Supervisors: Prof. Dimitri Mihalas & Dr. Boon Chye Low
- B.S. in Physics & Astronomy, University of Illinois, Urbana-Champaign, 1990

Employment

- *Associate Research Professor*, University of Michigan, 2010–present.
- *Associate Research Scientist*, University of Michigan, 2007–2010.
- *Assistant Research Scientist*, University of Michigan, 2001–2007.
- *Postdoc*, University of Michigan, 2000–2001.
- *Newkirk Graduate Research Assistant*, High Altitude Observatory, Boulder, Colorado 1996–2000.
- *Research Assistant*, University of Illinois, Urbana-Champaign, 1994–1996.
- *Teaching Assistant*, University of Illinois, Urbana-Champaign, 1992–1994.

Publications

- Author or co-author of 51 papers in international refereed journals.
- 10 papers in conference proceedings of international conferences.
- 119 presentations at conferences and workshops,
- including 56 invited talks with 26 first author invited talks.
- Together 1443 times cited (ISI Web of Science)
h-index: 21
ResearcherID: I-9422-2012

Awards & Recognitions

- 2010 Research Faculty Recognition Award, University of Michigan

Adviser to PhD Students

- Meng Jin (University of Michigan) Thesis Defense: Spring 2014
- Fang Fang (University of Michigan) Thesis Defense: April 20, 2012
- Noé Lugaz (University of Michigan) Thesis Defense: November 10, 2006

Membership in Scientific Societies

- American Astronomical Society
- American Geophysical Union.
- American Physical Society.

Research Activity Highlights

My research interests concern solar magnetism and magnetic flux transport from the convection zone into the corona, and through the heliosphere. In this context, I have contributed to basic theory and modeling efforts with analytical work and large-scale numerical simulations. The topics that I am particularly interested in are: magnetic flux emergence, magnetohydrodynamic instabilities, coronal mass ejection (CME) initiation, propagation, and CME-driven shocks. Flux emergence was the topic of my Ph.D. thesis research, which demonstrated that the expansion of magnetic fields in a gravitationally stratified atmosphere naturally produces Lorentz forces that drive shear flows. These flows lead to the formation of highly energized coronal magnetic fields, which are observed to be at the epicenter of coronal eruptions. This work provides a fundamental explanation for shear flows, which for decades, have been prescribed as ad hoc boundary conditions in numerical models of CMEs, flares and filament eruptions. While at the University of Michigan, I have advanced this fundamental theory of CME initiation by simulating the eruption of both magnetic arcades and flux ropes by such self-induced shear flows. I have also simulated the propagation of CMEs from solar corona to Earth and Saturn, and in doing so discovered new aspects of CME interaction with the interplanetary medium including complex CME-driven shock structures.

Publications

Articles in Peer Reviewed Journals

1. Low, B.C., and Manchester IV, W., Equilibrium and Stability of Magnetostatic Atmospheres, I. Dungey Type Isothermal States, *Astrophysical Journal*, **528**, 1026, 2000.
2. Manchester IV, W., and Low, B.C., Magnetostatic Atmospheres Possessing Identical Invariants of Ideal Magnetohydrodynamics, *Physics of Plasmas*, **7**, 4, 1263, 2000.
3. Manchester IV, W., The Role of Nonlinear Alfvén Waves in Shear Formation During Solar Magnetic Flux Emergence, *Astrophysical Journal* **547**, 503, 2001.
4. Manchester IV, W., Buoyant Disruption of Magnetic Arcades with Self-Induced Shearing, *Journal of Geophysical Research*, **108**(A4), A01162, doi10.1029/2002JA009252, 2003.
5. Opher, M., Liewer, P., Gombosi, T., Manchester IV, W., DeZeeuw, D., Sokolov, I., and Toth, G., Probing the Edge of the Solar System: Formation of an Unstable Jet-Sheet *Astrophysical Journal*, **591**, L61, 2003.
6. Roussev, I., Gombosi, T., Sokolov, I., Velli, M., Manchester IV, W., DeZeeuw, D., Liewer, P., Toth, G., and Luhmann, J., A Three-dimensional model of the solar wind incorporating solar magnetogram observations *Astrophysical Journal*, **595**, L57, 2003.
7. Manchester IV, W., Gombosi, T., Roussev, I., DeZeeuw, D.L., Sokolov, I., Powell, K., Toth, G., and Opher, M. Three-Dimensional MHD Simulation of a Flux Rope Driven CME *Journal of Geophysical Research*, **109**, A01102, doi:10.1029/2003JA010150, 2004.
8. Manchester IV, W., Gombosi, T., Ridley, A., Roussev, I., DeZeeuw, D. L., Sokolov, I., Powell, K., and Toth, G., Modeling a Space Weather Event from the Sun to the Earth: CME Generation and Interplanetary Propagation. *Journal of Geophysical Research*, **109**, A02107, doi:10.1029/2002JA009672, 2004.
9. Gombosi, T., Powell, K., DeZeeuw, D., Hansen, K., Manchester IV, W., Ridley, A., Roussev, I., Sokolov, I., Stout, Q., and Toth, G., Solution Adaptive MHD for Space Plasma Simulations: Sun-to-Earth Simulations *Computing in Science and Engineering*, March/April 2004.
10. Manchester IV, W., Gombosi, T., DeZeeuw, D., and Fan, Y., Eruption of a Buoyantly Emerging Magnetic Flux Rope, *Astrophysical Journal* **610**, 588, 2004.
11. Opher, M., Liewer, P., Velli, M., Bettarini, L., Gombosi, T., Manchester IV, W., DeZeeuw, D., Toth, G., and Sokolov, I., Magnetic Effects at the Edge of the Solar System: MHD Instabilities, the de Laval nozzle Effect and an Extended Jet *Astrophysical Journal*, **611**, 575, 2004.
12. Sokolov, I., Roussev, I., Gombosi, T., Lee, M., Kota, J., Forbes, T., Manchester IV, W., and Sakai, J., A New Field Line Advection Model for Solar Particle Acceleration *Astrophysical Journal* **616**, L171, 2004.
13. Manchester IV, W., Gombosi, T., DeZeeuw, D., Sokolov, I., Roussev, I., Powell, K., Kota, J., Toth, G., and Zurbuchen, T. CME Shock and Sheath Structures Relevant to Particle Acceleration *Astrophysical Journal*, **622**, 1225, 2005.

14. Lugaz, N., Manchester IV, W., and Gombosi, T., The Evolution of CME Density Structures, *Astrophysical Journal*, **627**, 1019, 2005.
15. Toth et al., Space Weather Modeling Framework: A new tool for the space science community, *Journal of Geophysical Research*, **110**, A12226, doi:10.1029/2005JA011126, 2005.
16. Lugaz, N., Manchester IV, W., and Gombosi, T., Numerical Simulation of the Interaction of Two Coronal Mass Ejections from Sun to Earth, *Astrophysical Journal*, **634**, 651, 2005.
17. Manchester IV, W., and Zurbuchen, T., Are High-Latitude Forward-Reverse Shock Pairs Driven by Over-Expansion? *Journal Geophysical Research*, **111**, A05101, doi:10.1029/2005JA011461, 2006.
18. Manchester IV, W., Ridley, A., Gombosi, T., and DeZeeuw, D., Modeling the Sun-Earth Propagation of a Very Fast CME, *Advances in Space Research*, **38**, 253, 2006.
19. Ridley, A., DeZeeuw, D., Manchester IV, W., and Hansen, K., The Magnetospheric and Ionospheric Response to a Very Strong Interplanetary Shock and Coronal Mass Ejection, *Advances in Space Research*, **38**, 263, 2006.
20. Cohen, O., Sokolov, I., Roussev, I., Arge, C., Manchester IV, W., Gombosi, T., Frazin, R., Park, H., Butala, M., Kamalabadi, F., and Velli, M., A Semi-empirical Magnetohydrodynamic Model of the Solar Wind, *Astrophysical Journal*, **654**, L163, 2007.
21. Manchester IV, W., and Zurbuchen, T., Reply to comment by P. Riley and J.T. Gosling on Are High-latitude Forward-reverse Shock Pairs Driven by Overexpansion?, *Journal of Geophysical Research*, **112**, A07103, doi:10.1029/2007JA012272, 2007.
22. Lugaz, N., Manchester IV, W., Roussev, I., Toth, G., and Gombosi, T., Numerical Simulation of the Homologous CMEs From Active Region 9236, *Astrophysical Journal*, **659**, 788, 2007.
23. Toth, G., DeZeeuw, D., Gombosi, T., Manchester IV, W., Ridley, A., Sokolov, I., Sun to Thermosphere Simulation of the October 28-30, 2003 Storm with the Space Weather Modeling Framework, *Space Weather*, **5**, S06003, doi:10.1029/2006SW000272, 2007.
24. Liu, Y., Kasper, J., Manchester IV, W., Richardson, J., and Belcher, J., Determining the Magnetic Field Orientation of Coronal Mass Ejections from Faraday Rotation, *Astrophysical Journal*, **665**, 1439, 2007.
25. Manchester IV, W., Solar Atmospheric Dynamic Coupling Due to Shear Motions Driven by the Lorentz Force, *Astrophysical Journal*, **666**, 532, 2007.
26. Aschwanden, M., et al., Theoretical Modeling For the Stereo Mission, *Space Science Reviews*, **136**, 565, DOI 10.1007/s11214-0006-9027-8, 2008.
27. Lugaz, N., Manchester IV, W., Roussev, I., and Gombosi, T., Observational Evidence of CMEs Interacting in the Inner Heliosphere Based on MHD Simulations, *Journal of Atmospheric and Solar-Terrestrial Physics*, **70**, 598, 2008.
28. Cohen, O., Sokolov, I., Roussev, I., Lugaz, N., Manchester IV, W., Gombosi, T., Arge, C., Validation of a Global 3D Heliospheric Model with Observations for the May 12, 1997 CME Event, *Journal of Atmospheric and Solar-Terrestrial Physics*, **70**, 583, 2008.

29. Evans, R. M., Opher, M., Manchester IV, W., and Gombosi, T. I., Alfvén Profile in the Lower Corona: Implications for Shock Formation, *Astrophysical Journal*, **687**, 1355, 2008.
30. Liu, Y., Manchester IV, W., Richardson, J. D., Luhmann, J. G., Lin, R. P., and Bale, S. D., Deflection Flows Ahead of ICMEs as an Indicator of Curvature and Geoeffectiveness, *Journal of Geophysical Research*, **113**, A00B03, doi:10.1029/2007JA012996, 2008.
31. Vaázquez, A. M., Frazin, R. A., Hayashi, K. Cohen, O. and Kamalabadi, F., Combined Tomographic and MHD Analysis of the Solar Corona in the Period May 2005, *Astrophysical Journal*, **682**, 1328, 2008.
32. Manchester IV, W., Vourlidis, A., Toth, G., Lugaz, N., Roussev, I., Sokolov, I., Gombosi, T., De Zeeuw, D. Opher, M., Three-dimensional MHD Simulation of the 2003 October 28 Coronal Mass Ejection: Comparison with LASCO Coronagraph Observations, *Astrophysical Journal*, **684**, 1448, 2008.
33. Lugaz, N., Vourlidis, A., Roussev, I., Jacobs, C., Manchester IV, W., Cohen, O., The Brightness of Density Structures at Large Solar Elongation Angles: What is Being Observed by STEREO SECCHI?, *Astrophysical Journal*, **684**, L111, 2008.
34. van der Holst, B., Manchester IV, W., Sokolov, I.V., Toth, G., Gombosi, T., De Zeeuw, D.L., Cohen, O., Breakout Coronal Mass Ejection or Streamer Blowout: The Bugle Effect *Astrophysical Journal*, **693**, 1178, 2009.
35. Frazin, R. A., Jacob, M., Manchester IV, W., Morgan, H., Wakin, M.B., Reconstruction of CME Density From Only Three Points of View, *Astrophysical Journal*, **695**, 636, 2009.
36. Jia, Y.D., Russell, C.T., Manchester IV, W., Cohen, O., Hansen, K.C., Combi, M. R., Gombosi, T., Study of the April 20, 2007 CME-Comet Interaction Event with an MHD Model, *Astrophysical Journal*, **696**, L56, 2009.
37. Cohen, O., Kashyap, V. L., Drake, J. J., Saar, S. H., Sokolov, I.V. Manchester IV, W., Hansen, K. C., Gombosi, T., Interactions of the Magnetosphere of Stars and Close-In Giant Planets, *Astrophysical Journal*, **704**, L85, 2009.
38. Cohen, O., Attrill, G. D. R., Manchester IV, W., Wills-Davey, M.J., Numerical Simulation of an EUV Coronal Wave Based on the February 13, 2009 CME Event Observed by STEREO, *Astrophysical Journal*, **705**, 587, 2009.
39. Fang, F. Manchester IV, W., Abbett, W.P., van der Holst, B., Simulation of Flux Emergence from the Convection Zone to the Corona, *Astrophysical Journal*, **714**, 1649, 2010
40. Vasquez, A.M., Frazin, R., Manchester IV, W., The Solar Minimum Corona from Differential Emission Measure Tomography, *Astrophysical Journal*, **715**, 1352, 2010
41. van der Holst, B., Manchester IV, W., Frazin, R., Vasquez, A. M., Toth, G., Gombosi, T.I., A Data-Driven, Two-Temperature Solar Wind Model with Alfvén Waves, *Astrophysical Journal*, **725**, 1373, 2010
42. Vasquez, A. M., Huang, Z., Manchester IV, W., Frazin, R. A., The WHI Corona from Differential Emission Measure Tomography, *Solar Physics*, DOI 10.1007/s11207-010-9706-1, 2011

43. Loesch, C., Opher, M., Alves, M. V., Evans, R. M. and Manchester IV, W. B., Signatures of Two Distinct Driving Mechanisms in the Evolution of Coronal Mass Ejections in the Lower Corona, *Journal of Geophysical Research*, **116**, A04106, doi:10.1029/2010JA015582, 2011
44. Toth, G., van der Holst, B., Sokolov, I.V., De Zeeuw, D.L., Gombosi, T.I., Fang, F., Manchester IV, W.B., Meng, X., Najib, D., Powell, K.G., Stout, Q.F., Glocer, A., Ma, Y.-J., and Opher M., Adaptive Numerical Algorithms in Space Weather Modeling, *Journal of Computational Physics*, **231**, 3, 870, 2012, doi:10.1016/j.jcp.2011.02.006
45. Landi, E., Alexander, R.L., Gruesbeck, J.R., Gilbert, J.A., Lepri, S.T., Manchester IV, W.B., and Zurbuchen, T.H., Carbon Ionization Stages as a Diagnostic of the Solar Wind, *Astrophys.J.*, **744**, 100, 2012, 10.1088/0004-637X/744/2/100
46. Jin, M., Manchester IV, W.B., van der Holst, B. Gruesbeck, J.R., Frazin, R.A. , Landi, E., Vasquez, A.M., Lamy, P.L. Llebaria, A., Fedorov, A., Toth, G., and Gombosi, T.I., A Global Two-Temperature Corona and Inner Heliosphere Model: a Comprehensive Validation Study, *Astrophys.J.*, **745**, 6, 2012, doi:10.1088/0004-637X/745/1/6
47. Fang, F., Manchester IV, W.B., Abbett, W.P. and van der Holst, B., Dynamic Coupling of Convective Flows and Magnetic Field during Flux Emergence, *Astrophys.J.* **745**, 37, 2012, doi:10.1088/0004-637X/745/1/37
48. Fang, F., Manchester IV, W.B., Abbett, W.P. and van der Holst, B., Buildup of Magnetic Shear and Free Energy During Flux Emergence and Cancellation, *Astrophys.J.* **754**, 15, 2012, doi:10.1088/0004-637X/754/1/15
49. Huang, Zhenguang, Frazin, R.A., Landi, E., Manchester IV, W.B., Vasquez, A.M., and Gombosi, T.I., Newly Discovered Global Temperature Structures in the Quiet Sun at Solar Minimum, *Astrophys.J.* **755**, 86, 2012, doi:10.1088/0004-637X/755/2/86
50. Manchester IV, W.B., van der Holst, B., Toth, G., and Gombosi, T.I., The Coupled Evolution of Electrons and Ions in CME-Driven Shocks, *Astrophys.J.* **756**, 81, 2012, doi:10.1088/0004-637X/756/1/81
51. Sokolov, I.V., van der Host, B., Oran, R., Downs, C., Roussev, I.I., Jin, M., Manchester IV, W.B., Evans, R.M., and Gombosi, T.I., Magnetohydrodynamic Waves and Coronal Heating: Unifying Empirical and MHD Turbulence Models, *Astrophys.J.* **764**, 23, 2013, doi:10.1088/0004-637X/764/1/23

Articles in Conference Proceedings, Books or Part of Books

1. Opher, M., Liewer, P., Velli, M., Gombosi, T., Manchester IV, W., DeZeeuw, D., Toth, G., and Sokolov, I., Magnetic Effects Change our View of the Heliosheath, in Physics of the Outer Heliosphere, *AIP Conference Proceedings* vol. 719, pp. 105-110, 2004.
2. Zurbuchen, T., von Steiger, R., Manchester IV, W., Fisk, L., Heliospheric Magnetic Field Configuration at Solar Maximum Conditions, in Physics of the Outer Heliosphere, *AIP Conference Proceedings*, vol. 719, pp. 70-80, 2004.
3. Fan, Y., Gibson, S.E., Manchester IV, W. "The Emergence and Evolution of Twisted Magnetic Flux Ropes in the Solar Corona", Proceedings of the International Scientific Conference

- on Chromospheric and Coronal Magnetic Fields, 30 August - 2 September 2005, Eds. D. Innes, A. Lagg, S. Solanki, D. Danesy, ESA SP-596, pp. 26, November 2005.
4. Kota, J., Manchester IV, W., Jokipii, J. R., DeZeeuw, D., and Gombosi, T., Simulation of SEP Acceleration and Transport at CME Driven Shocks, in in *The Physics of Collisionless Shocks*, *AIP Conference Proceedings*, eds. G. Li, G. Zank and C.T. Russel, vol. 781, pp. 201-206, 2005.
 5. Palanhandalam-Madapusi, H., Edamana, B., Bernstein, D., Manchester IV, W., Ridley, A., NARMAX Identification for Space Weather Prediction Using Polynomial Radial Basis Functions, in *Proceedings of the 46th IEEE Conference on Decision and Control*, pp. 3622-3627, 2007.
 6. Manchester IV, W., Shear Flows Driven by the Lorentz Force: An Energy Source for Coronal Mass Ejections and Flares, in *Subsurface and Atmospheric Influences on Solar Activity*, *ASP Conference Proceedings*, Eds. R. Howe, R. W. Komm, K. S. Balasubramaniam, and G. J. D. Petrie, vol. 383, pg. 91, 2008.
 7. Manchester IV, W., MHD Simulations of CME-Driven Shocks: Structures Relevant to Particle Acceleration, in *Particle Acceleration and Transport in the Heliosphere and Beyond*, *AIP Conference Proceedings*, Eds. G. Li, Q. Hu, O. Verkhoglyadova, G. P. Zank, R. P. Lin, and J. Luhmann, vol. 1039, pg. 273, 2008.
 8. Oran, R., Sokolov, I.V., Roussev, I.I., van der Holst, B., Manchester IV, W., Gombosi, T. 4D Model for the Solar Environment in Numerical Modeling of Space and Plasma Flows, *ASP Conference Proceedings*, Eds. N. Pogorelov, E. Audit, P. Colella, G. P. Zank, vol. 406, 2009.
 9. Nuevo, F.A., Vasquez, A.M., Frazin, R.A., Huang, Z., Manchester IV, W., The 3D Solar Corona Cycle 24 Rising Phase from SDO/AIA Tomography, *Proceedings IAU Symposium No. 286*, Eds. C.H. Mandrini and D. Webb, vol. 286, 2011.
 10. Vasquez, A.M., Frazin, R.A., Huang, Z., Manchester IV, W., Shearer, P., The 3D Solar Minimum with Differential Emission Measure Tomography, *Proceedings IAU Symposium No. 286*, Eds. C.H. Mandrini and D. Webb, vol. 286, 2011.

First Author Invited Talks

1. Manchester, W. B., Roussev, I., Sokolov, I., Ridley, A., Gombosi, T., De Zeeuw, D., Hansen, K., Tóth, G., Modeling the May 1, 1998 CME propagation from the Sun to the Earth, *2003 Fall AGU Meeting*, San Francisco, CA, December 8-12, 2003.
2. Manchester IV, W., D. De Zeeuw, T. Gombosi, A. Ridley, I. Sokolov, G. Toth, Modeling the Carrington Event: sun-to-earth propagation of a very fast CME Presented at Spring AGU, Montreal Canada, May, 2004
3. Manchester IV, W., I. Roussev, I. Sokolov, A. Ridley, T. Gombosi, D. De Zeeuw, K. Hansen, G. Toth, Modeling the May 1, 1998 CME propagation from the Sun to the Earth Presented at Fall AGU, San Francisco CA, December, 2004
4. Manchester IV, W., N. Lugaz, T. Gombosi, D. De Zeeuw, I. Sokolov, G. Toth, 3D Density Structure and LOS Observations of a Model CME Presented at Fall AGU, San Francisco CA, December, 2004

5. Manchester IV, W., T. H. Zurbuchen, J. Kota, T. I. Gombosi, D. L. DeZeeuw, I. V. Sokolov, G. Toth Post-shock compression and forward-reverse shock pair resulting from CME interaction with a bimodal solar wind Presented at the SHINE Meeting, Kona Hawaii, July 11-15, 2005
6. Manchester IV, W., The Source of Magnetic Shear That Drives CMEs, Presented at the SHINE Meeting, Kona Hawaii, July 11-15, 2005
7. Manchester IV, W., T.I. Gombosi, G. Toth, I.I Sokolov, D.L. De Zeeuw, and A.J. Ridley Simulations of the Sun-Earth System: Modeling the Halloween Events with SWMF, Presented at the CAWSES International Workshop on Space Weather Modeling, Earth Simulator Center, Yokohama, Japan, November 14 to 17, 2006.
8. Manchester IV, W.B., T.T. Gombosi, I.V. Sokolov, O. Cohen, Simulated CMEs and predictions for STEREO, 2007 EGU General Assembly, Vienna, Austria, April 16-20, 2007
9. Manchester IV, W., Shear Flows Driven by the Lorentz Force During Flux Emergence: An Initiation Mechanism for Coronal Mass Ejections and Flares, Presented at Flux Emergence Workshop, St. Andrews Scotland, June 12-15, 2007
10. Manchester IV, W., Shear Flows Driven by the Lorentz Force During Flux Emergence: An Initiation Mechanism for CMEs and Flares, Presented at the SHINE Meeting, Whistler Canada, August 2, 2007
11. Manchester IV, W. Energetic Coupling Between the Convection Zone and Corona by Lorentz-Force-Driven Shear Flows: An Explanation For CMEs and Two-ribbon Flares, Presented at the Symposium on Earth Sun System Exploration: Energy Coupling Within and Between Plasma Regimes, Kona Hawaii, January 14-18, 2008
12. Manchester IV, W. et al., MHD Simulations of CME Driven Shocks and Their Structure Relevant to Particle Acceleration, Presented at the 7th IGPP Astrophysics Conference on Particle acceleration and transport in the heliosphere and beyond, Kauai Hawaii, March 7-13, 2008
13. Manchester IV, W., 3D MHD Simulations of Flux Emergence Producing Eruptions, Flux Emergence Workshop, Kyoto Japan, October 8, 2008
14. Manchester IV, W., et al., Comparison of Models and Observations of CME-Driven Shocks, to be presented at the 8th Annual International Astrophysics Conference, Kona Hawaii, May 1-7, 2009
15. Manchester IV, W. & D. Applbaum, Comparing NLFFF Extrapolations to MHD Simulations NLFFF Workshop, Saint Andrews Scotland, June 23-25, 2009
16. Manchester IV, W. and Fang, F., Flux EmergenceL Conditions that Produce Coronal Mass Ejections, Presented at the SHINE meeting, Wolfville Nova Scotia, Canada, August 3-7, 2009
17. Manchester IV, W. Simulating CME-Driven Shocks and SEP Acceleration LWS Planning Meeting, Greenbelt, Maryland October 22-23
18. Manchester IV, W. Can We Predict All Clear Periods? CCHM/CCMC Meeting Maui Hawaii, February 23-23, 2009

19. Manchester, W. Stellar Magnetic Eruptions, presented at AOSS/Astronomy Joint Symposium, Ann Arbor, MI, April 2010
20. Manchester IV, W., B. van der Holst, R. Frazin, A. Vasquez, O. Cohen, I. Sokolov, and T. Gombosi, Improved Modeling of the 2005 May 13 CME Event with a Two-Temperature Corona Model, Presented at the SHINE meeting, Sante Fe, New Mexico, July 26-30, 2010
21. Manchester IV, W., B. van der Holst, R. Frazin, A. Vasquez, G. Toth and T. Gombosi, Numerical Simulation of Earth Directed CMEs with an Advanced Two-Temperature Coronal Model, Presented at Fall AGU meeting, San Fransico, December 2010
22. Manchester IV, W., B. van der Holst, R. Frazin, A. Vasquez, G. Toth and T. Gombosi, The Coupled Evolution of Electrons and Ions in CME-Driven Shocks, Presented at Annual International Astrophysics Conference, Maui, Hawaii, March 13-18, 2011
23. Manchester IV, W., B. van der Holst, R. Frazin, A. Vasquez, G. Toth and T. Gombosi, The Coupled Evolution of Electrons and Ions in CME-Driven Shocks, Presented at the Sun360 (SDO 2) Meeting, Kiel, Germany, July 25-29, 2011
24. Manchester IV, W., B. van der Holst, G. Toth, and T. Gombosi, Shock Heating of Protons by CME-driven Shocks: Implications for Particle Seed Populations, Annual International Astrophysics Conference, Palm Springs, CA, March 18-23, 2012
25. Manchester IV, W. Emergence and Eruption of Magnetic Flux Ropes, a Mechanism for Coronal Mass Ejections, American Physical Society, Division of Plasma Physics, Providence RI, October 29-November 2, 2012
26. Manchester IV, W., M. Jin, B. van der Holst, R. Frazin, A. Vasquez, Incorporating observations in global models of the solar atmosphere, SHINE Workshop, Maui, Hawaii, June 25-29, 2012

CoAuthored Invited Talks

1. K.G. Powell, T. Gombosi, D. DeZeeuw, W. Manchester, I. Roussev, I. Sokolov, G. Tóth, From the Corona to the Magnetosphere: Development of a Parallel, Adaptive, Coupled Model for the Inner Heliosphere, *Solar Wind 10*, Pisa, Italy, June 18-21, 2002.
2. T.I. Gombosi, C.R. Clauer, D.L. De Zeeuw, K.C. Hansen, W.B. Manchester, K.G. Powell, A.J. Ridley, I. Roussev, I.V. Sokolov, G. Tóth, R.A. Wolf, S. Sazykin, T.E. Holzer, B.C. Low, A.D. Richmond, R.G. Roble, Towards an Operational Sun-to-Earth Model for Space Weather Forecasting, *2002 Spring AGU Meeting*, Washington, D.C., May 28-31, 2002.
3. T.I. Gombosi, W.B. Manchester, D.L. De Zeeuw, I. Roussev, I.V. Sokolov, G. Tóth, K.G. Powell, 3D global MHD simulations of geoeffective CMEs, *10th European Solar Physics Meeting*, Prague, Czech Republic, September 9 - 14, 2002.
4. T.I. Gombosi, I. Roussev, I.V. Sokolov, D.L. De Zeeuw, W.B. Manchester, P. Liewer, J.G. Luhmann, Synoptic map driven simulations of a 3D solar wind powered by WKB Alfvén waves Magnetopause Reconnection, *2003 Spring AGU/EGS Meeting*, Nice, France, April 7-11, 2003.

5. T.I. Gombosi, R. Clauer, K. Powell, Q. Stout, D. Chesney, D. De Zeeuw, K. Hansen, K.Kane, J. Kozyra, M. Liemohn, W. Manchester, A. Ridley, I. Roussev, I. Sokolov, G. Tóth, O. Volberg, Center for Space Environment Modeling (CSEM), *2003 GEM Meeting*, Snowmass, Colorado, June 23-27, 2003.
6. T.I. Gombosi, W.B. Manchester, A.J. Ridley, D.L. De Zeeuw, K.C. Hansen, I.V. Sokolov, G. Tóth, K.G. Powell, Modeling a space weather event from the Sun to the Earth, *2003 IUGG Meeting*, Sapporo, Japan, June 30 - July 11, 2003.
7. Ridley, A. J., Manchester, W., Roussev, I., Gombosi, T., Magnetospheric, Ionospheric, and Thermospheric Results for the May 1-4, 1998 CME Using a Coupled Sun to Earth Model, *2003 Fall AGU Meeting*, San Francisco, CA, December 8-12, 2003.
8. Tóth, G., I. V. Sokolov, T. I. Gombosi, D. L. De Zeeuw, K. C. Hansen, W. B. Manchester, K. G. Powell, A. J. Ridley, I. Roussev, Q. F. Stout The Space Weather Modeling Framework, *ISSS-7: 7th International School/Symposium on Space Simualations*, Kyoto, Japan, March 26-31, 2005.
9. T.I. Gombosi, D.L. De Zeeuw, I.V. Sokolov, G. Tth, A.J. Ridley, K.C. Hansen, W.B. Manchester, I.I. Roussev, C.R. Clauer, K.G. Powell, Q.F. Stout, B. van Leer, P.L. Roe, Parallel, Adaptive, Coupled Plasma Simulations, *Multiscale Processes in Fusion Plasmas*, IPAM UCLA, Los Angeles, CA, January, 2005.
10. Tóth, G., I. V. Sokolov, T. I. Gombosi, D. L. De Zeeuw, K. C. Hansen, W. B. Manchester, K. G. Powell, A. J. Ridley, I. Roussev, Q. F. Stout The Space Weather Modeling Framework: A New Community Tool, *Space Weather Week*, Broomfield, CO, April 5-8, 2005.
11. Gombosi, T. I., Tóth, G., Sokolov, I. V., Stout, Q. F., Clauer, C. R., De Zeeuw, D. L., Hansen, K. C., Manchester, W. B., Powell, K. G., Ridley, A. J., Roussev, I. I., Cross-Disciplinary Modeling of Heliospheric Phenomena with the Space Weather Modeling Framework, *2005 Spring AGU Meeting*, New Orleans, LA, May 23-27, 2005.
12. Gombosi, T. I., D. L. De Zeeuw, C. R. Clauer, K. C. Hansen, W. B. Manchester, K. G. Powell, A. J. Ridley, I. I. Roussev, I. V. Sokolov, Q. F. Stout, G. Tth, End-to-end simulations of CMEs and SEPs, *2005 SHINE Workshop*, Kona, Hawaii, July 11-15, 2005.
13. T. I. Gombosi, G. Tóth, I. V. Sokolov, W. B. Manchester, A. J. Ridley, I. I. Roussev, D. L. De Zeeuw, K. C. Hansen, K. G. Powell, and Q. F. Stout, Halloween Storm Simulations with the Space Weather Modeling Framework, *44th AIAA Aerospace Sciences Meeting*, Reno, Nevada, January 9-12, 2006.
14. T. Gombosi, D.L. De Zeeuw, W.B. Manchester, I.I. Roussev, I.V. Sokolov, and G. Tóth, Integrated model of solar-heliospheric disturbances, *Earth-Sun System Exploration: Energy Transfer*, Kona, Hawaii, January 16-20, 2006.
15. Tóth, G., Ridley, A., Gombosi, T., De Zeeuw, D., Manchester, W., and Sokolov, I., Sun-to-Earth Simulations with the Space Weather Modeling Framework, *2006 EGU General Assembly*, Vienna, Austria, April 3-7, 2006.
16. T.I. Gombosi, G. Tóth, I.V. Sokolov, D.L. De Zeeuw, A.J. Ridley, W.B. Manchester, Sun-to-Earth Simulations with the Space Weather Modeling Framework, *International Symposium on Recent Observations and Simulations of the Sun-Earth System (ISROSES)*, Varna, Bulgaria, September 17-22, 2006.

17. T.I. Gombosi, G. Tóth, I.V. Sokolov, D.L. De Zeeuw, Y. Ma, A.J. Ridley, K.C. Hansen and W.B. Manchester, New Adventures with the Space Weather Modeling Framework, *8th International School/Symposium for Space Simulations*, Kauai, HI, February 25-March 3, 2007.
18. T.I. Gombosi, G. Tóth, I. Sokolov, D.L. De Zeeuw, W.B. Manchester, A.J. Ridley, R.A. Frazin, B. van der Holst, O. Cohen, A. Glocer, D. Welling, Validation Studies with the Space Weather Modeling Framework, *Space Weather Workshop*, Boulder, CO, April 29-May 2, 2008.
19. Gombosi, T.I., G. Tóth, I.V. Sokolov, D.L. De Zeeuw, B. van der Holst, O. Cohen, A. Glocer, W.B. Manchester, A.J. Ridley, Multi-physics simulations of space weather, *37th COSPAR Scientific Assembly*, Montreal, Canada, July 13-26, 2008.
20. T. I. Gombosi, D. L. De Zeeuw, W. B. Manchester, A. J. Ridley, I. V. Sokolov, G. Tóth, B. van der Holst, The Space Weather Modeling Framework: Progress and Challenges, *11th IAGA Scientific Assembly*, Sopron, Hungary, Aug 23-30, 2009.
21. T. I. Gombosi, D. L. De Zeeuw, W. B. Manchester, A. J. Ridley, I. V. Sokolov, G. Tóth, B. van der Holst, Is SWMF ready for R2O?, *Space Weather Workshop*, Boulder, CO, April 29, 2010.
22. T.I. Gombosi, G. Tóth, I.V. Sokolov, D.L. De Zeeuw, B. van der Holst, A.J. Ridley, W.B. Manchester, The Space Weather Modeling Framework (SWMF): Models and validation, *38th COSPAR Scientific Assembly*, Bremen, Germany, July 18-25, 2010.
23. B. van der Holst, M. Jin, W.B. Manchester, R.A. Frazin, A.M. Vasquez, P.L. Lamy, A. Llebaria, T.I. Gombosi, Partition of Proton and Electron Heating in the Solar Wind, *2010 Fall AGU Meeting*, San Francisco, CA, December 13-17, 2010.
24. B. van der Holst, M. Jin, W.B. Manchester, R.A. Frazin, A.M. Vasquez, P.L. Lamy, A. Llebaria, T.I. Gombosi, Multispacecraft Validation of a Global Two-Temperature Corona and Inner Heliosphere Model, *2010 Fall AGU Meeting*, San Francisco, CA, December 13-17, 2010.
25. R.A. Frazin, A.M. Vasquez, B. van der Holst, W.B. Manchester, R. Oran, Z. Huang, M. Jin, T.I. Gombosi, Integrating Tomography and Global Simulation, *2011 Fall AGU Meeting*, San Francisco, CA, December 5-9, 2011.
26. B. van der Holst, W.B. Manchester IV, Using Synoptic Magnetograms: Trials and Tribulations, HAO Workshop on Coronal Magnetism: Connecting Models to Data and the Corona to the Earth, Boulder, CO, May 21, 2012
27. F. Fang, W. Manchester W. ABBETT, B. van der Holst, Buildup of Free Energy for Eruptive Events during Flux Emergence, SHINE meeting, Maui Hawaii, June 25-29, 2012.
28. G. Toth, B. van der Holst, W.B. Manchester, A.J. Ridley I. V. Sokolov, D. L. DeZeeuw, A. Glocer, L.K.S. Daldorff, F. Fang, M. Jin, X. Meng, T.I. Gombosi, Space Weather Modeling from the Convection Zone to the Upper Atmosphere (keynote), *Frontiers in Computational Physics: Modeling the Earth System*, Boulder, CO, December 16-20, 2012.
29. T.I. Gombosi, G. Toth, B. van der Holst, I.V. Sokolov, W.B. Manchester, L.K.S. Daldorff, D.L. DeZeeuw, D.T. Welling, A.J. Ridley, M.W. Liemohn, R. Oran, X. Meng, M. Jin, New

Adventures with the Space Weather Modeling Framework, AGU fall meeting 2012, San Francisco, CA, December 3-7, 2012.

30. T.I. Gombosi, B. van der Holst, I. Sokolov, W.B. Manchester, R. Oran, and M. Jin, A new two-temperature model of the solar wind and CMEs, *5th Earth-Sun System Exploration Conference*, Kona, Hawaii, January 14–18, 2013.

Contributed Presentations: First Author and Student Presentations

1. Manchester IV, W., Topologically Equivalent Magnetostatic Atmospheres and MHD Simulations of Buoyancy Instabilities with Magnetic Shear Propagation by Alfvén Waves, Presented at American Astronomical Society meeting, Chicago IL, June 1999.
2. Manchester IV, W., The Disruption of Solar Magnetic Arcades by MHD Instabilities with Self-Induced Shearing, Presented at Ultraviolet Coronal Spectrograph meeting, Bar Harbor, ME, September 2000.
3. Manchester IV, W., T.I. Gombosi, D.L. DeZeeuw, and K. Powell, Coronal Mass Ejections in Global MHD Simulations, Presented at European Geophysical Society meeting, Nice, France March 2001.
4. Manchester IV, W., T.I. Gombosi, D.L. DeZeeuw, and K. Powell, Global Scale MHD Simulations of Coronal Mass Ejections, Presented at Space Weather Week meeting, Boulder CO, May 2001.
5. Manchester IV, W., T.I. Gombosi, D.L. DeZeeuw, K. Powell, B.C. Low, and S. Gibson, Dynamics of Expanding Flux Ropes in Coronal Mass Ejections, Presented at Spring AGU, Boston MA, May 2001
6. Manchester IV, W., T.I. Gombosi, D.L. DeZeeuw, K. Powell, G. Toth, B.C. Low, and S. Gibson, Global Scale MHD Simulations of CMEs Presented at SHINE meeting, Snow Mass, CO, June 2001.
7. Manchester IV, W., T.I. Gombosi, D.L. DeZeeuw, K. Powell, and G. Toth, 3D MHD Simulation of a Coronal Arcade Eruption by Self-Induced Shearing Presented at Fall AGU, San Francisco, CA, December 2001
8. Manchester IV, W., T.I. Gombosi, D.L. DeZeeuw, K. Powell, and G. Toth, 3D Global MHD Simulations of Flux Rope Driven CMEs Presented at Fall AGU, San Francisco, CA, December, 2001
9. Manchester IV, W., T.I. Gombosi, D.L. DeZeeuw, I.I. Roussev, I.V. Sokolov, G. Toth, K. Powell, P. Liewer, M. Opher, and J. Cook, SECCHI and IMPACT Teams Simulated Stereo/SECCHI White Light Images using 3D MHD Models of CMEs Presented at Spring STEREO Meeting, Paris, France, March 2002
10. Manchester IV, W., I.V. Roussev, M. Opher, T.I. Gombosi, D.L. DeZeeuw, P. Liewer, G. Toth, I.V. Sokolov, and K. Powell, Magnetically Driven CME for 3D Space Weather Simulations Presented at Space Weather Week, Boulder, CO, April 2002

11. Manchester IV, W., I.I. Roussev, M. Opher, T.I. Gombosi, D.L. DeZeeuw, G. Toth, I.V. Sokolov, and K. Powell, 3D MHD Simulations of Flux Rope Driven CMEs Presented at Spring AGU, Washington D.C., May 2002
12. Manchester IV, W., I.I. Roussev, M. Opher, T.I. Gombosi, D.L. DeZeeuw, G. Toth, I.V. Sokolov, and K. Powell, 3D Global MHD Simulations of Flux Rope Driven CMEs Presented at Solar Wind 10, Pisa, Italy, June 2002
13. Manchester IV, W., T.I. Gombosi, I.I. Roussev, M. Opher, D.L. DeZeeuw, G. Toth, I.V. Sokolov, K. Powell, 3D MHD Simulation of CME Propagation from Solar Corona to 1 AU Presented at Fall AGU, San Francisco, CA, December, 2002.
14. Manchester IV, W., D. DeZeeuw, T. Gombosi, I. Roussev, I. Sokolov, G. Toth, K. Powell, P. Liewer, M. Opher, J. Cook, Simulated STEREO/SECCHI White Light Images using 3D MHD models of CMEs Presented at Elmau CME workshop, Elmau, Germany, February, 2003
15. Manchester IV, W., D. De Zeeuw, T. Gombosi, K. Hansen, A. Ridley, I. Roussev, I. Sokolov, G. Toth, Modeling a space weather event from the sun to earth: CME generation and interplanetary propagation Presented at joint Spring AGU and EGS meeting, Nice, France, March 6-11, 2003
16. Manchester IV, W., D. De Zeeuw, T. Gombosi, K. Hansen, A. Ridley, I. Roussev, I. Sokolov, G. Toth, Modeling a space weather event from the sun to earth: CME generation and interplanetary propagation Presented at Space Weather Week, Boulder, CO, May 19-22, 2003
17. Manchester IV, W., M. Opher, P. Liewer, M. Velli, D. De Zeeuw, T. Gombosi, I. Roussev, I. Sokolov, G. Toth, K. Powell, J. Cook, Simulated Coronagraph Images using 3D MHD Models of CMEs Presented at SHINE meeting, Hawaiian Island of Maui, July 7-11, 2003
18. Manchester IV, W., D. De Zeeuw, T. Gombosi, K. Hansen, A. Ridley, I. Roussev, I. Sokolov, G. Toth, Modeling a space weather event from the sun to earth: CME generation and interplanetary propagation Presented at SHINE meeting, Hawaiian Island of Maui, July 7-11, 2003
19. Manchester IV, W., D. De Zeeuw, T. Gombosi, K. Powell, A. Ridley, I. Roussev, I. Sokolov, G. Toth, Modeling an Extremely energetic CME: the 1859 Carrington Event Presented at the Carrington Workshop, Ann Arbor, MI, October 2-3, 2003
20. Manchester IV, W., Y. Fan, T. Gombosi, D. De Zeeuw, I. Sokolov, G. Toth, Eruption of a Buoyantly Emerging Magnetic Flux Rope, Presented at Fall AGU, San Francisco CA, December 12, 2003
21. Manchester IV, W., I. Roussev, T. Gombosi, I.V. Sokolov, T. Forbes, 3D MHD simulations of the May 2, 1998 halo CME: Comparison of CME initiation models and their characteristics at L1 Presented at Spring AGU, Montreal Canada, May 16-21, 2004
22. Manchester IV, W., I. Roussev, T. Gombosi, I.V. Sokolov, T. Forbes, 3D MHD simulations of the May 2, 1998 halo CME: Comparison of CME initiation models and their characteristics at L1 Presented at 35th COSPAR Scientific Assembly, Paris France, July 18-25, 2004
23. Manchester IV, W., J. Kota, I. Roussev, T. Zurbuchen, N. Lugaz, D. De Zeeuw, T. Gombosi, I. Sokolov, G. Toth, Signatures of fast CME Propagation near 1 AU Presented at the SHINE Meeting, Big Sky Montana, June 20-25, 2004

24. Lugaz, N., W. Manchester IV, I. Roussev, T. Gombosi, D. DeZeeuw, I. Sokolov, G. Toth, The line-of-sight Appearance of a CME near 1 AU Presented at the SHINE Meeting, Big Sky Montana, June 20-25, 2004
25. Manchester IV, W., T.I. Gombosi, D.L. DeZeeuw, I.V. Sokolov, I.I. Roussev, K.G. Powell, J. Kota, G. Toth, T.H. Zurbuchen, CME Shock and Sheath Structures Relevant to Particle Acceleration Presented at Fall AGU, San Francisco CA, December 13-17, 2004
26. Lugaz, N., W. Manchester IV, T. Gombosi, I. Roussev, Modeling Interactions of Coronal Mass Ejections in the Lower Heliosphere Presented at Fall AGU, San Francisco CA, December 13-17, 2004
27. Manchester IV, W., T. H. Zurbuchen, T. I. Gombosi, D. L. DeZeeuw I. V. Sokolov, G. Toth, Are high-latitude forward-reverse shock pairs driven by over-expansion? Presented at Spring AGU, New Orleans LA, May 23-27, 2005
28. Manchester IV, W., Y. Fan, T. I. Gombosi The Source of Magnetic Shear in CME Source Regions, Presented at Spring AGU, New Orleans LA, May 23-27, 2005
29. Manchester IV, W., and Y. Fan The Source of Magnetic Shear that Drives CMEs Presented at the SHINE Meeting, Kona Hawaii, July 11-15, 2005
30. Manchester IV, W., M. Opher, T. I. Gombosi, D. L. DeZeeuw, I. V. Sokolov, G. Toth Kelvin-Helmholtz Instability and Turbulence Forming Behind a CME-driven Shock Presented at Fall AGU, San Francisco CA, Dec 5-9, 2005
31. Manchester IV, W., The Source of Magnetic Shear that Drives Flares and Coronal Mass Ejections, Presented at the Solar Physics Division Meeting of the AAS, Durham, New Hampshire, June 2006.
32. Manchester IV, W., A. Vourlidas, G. Toth, N. Lugaz, I.I. Roussev, I.V. Sokolov, T.I. Gombosi, D.L. De Zeeuw 2003 October 28 CME Shock Structure: Comparison of 3D MHD Model Results and White-Light Observations, Presented at the SHINE Meeting, Midway UT, July 30-August 4, 2006
33. Manchester IV, W., Coupling of the Convection Zone to the Corona by Shearing Motions Driven by the Lorentz Force, Presented at the SHINE Meeting, Midway UT, July 30-August 4, 2006
34. Manchester IV, W., The Source of Magnetic Shear that Drives Flares and Coronal Mass Ejections, Presented at the General Assembly of the IAU meeting, Prague, Czech Republic, August 16-17, 2006.
35. Manchester IV, W., The Eruption of Emerging Magnetic Flux Ropes by Shear Flows Driven by the Lorentz Force: An Initiation Mechanism for CMEs, Presented at Fall AGU, San Francisco CA, Dec 9-14, 2006
36. Manchester IV, W., A. Vourlidas, G. Toth, T.I. Gombosi, I.V. Sokolov, O. Cohen, Simulated CMEs and Predictions for STEREO, Presented at Spring AGU, Acapulco Mexico, May 22-25, 2007

37. Manchester IV, W., A. Vourlidas, G. Toth, T.I. Gombosi, I.V. Sokolov, O. Cohen, Simulated CMEs and predictions for STEREO Presented at Spring EGU, Vienna Austria, April 15-20, 2007
38. Manchester IV, W., Shear Flows Driven by the Lorentz Force During Flux Emergence: The Energy Source for Coronal Mass Ejections and Flares Presented at National Solar Observatory workshop Subsurface and Atmospheric Influences on Solar Activity, Sunspot NM, April 16-20, 2007
39. Manchester IV, W., Partial Eruption of Magnetic Flux Ropes by Shear Flows: A Model for Coronal Mass Ejections, Presented at AAS-SPD meeting, Honolulu, HI, May 27-31, 2007
40. Manchester IV, W., How Magnetic Flux Emergence Causes the Buildup of Energy Necessary For CMEs and Flares, Presented at Living With A Star Workshop, Boulder, CO, September 10-13, 2007
41. Manchester IV, W., A. Vourlidas, T. Gombosi, O. Cohen, R. Frazin, I. Sokolov, Toth, G., Predicting the Three-Dimensional Heliosphere as viewed by STEREO, Presented at STEREO Working Group, Pasadena, CA, November 13-14, 2007
42. Manchester IV, W., A. Vourlidas, G. Toth, N. Lugaz, I.V. Sokolov, T.I. Gombosi, D.L. De Zeeuw, and M. Opher Modeling STEREO White-Light Observations of CMEs with 3D MHD Simulations Presented at Fall AGU, San Francisco CA, Dec 10-14, 2007
43. Manchester IV, W., A. Vourlidas, O. Cohen, B. Van der Holst, K.C. Hansen, T.I. Gombosi, I.V. Sokolov, G. Toth, Y-D. Jia, Simulating the 2007 April 19 CME, Presented at Spring EGU meeting, Viena Austria, April 13-18, 2008
44. Manchester IV, W., A. Vourlidas, G. Toth, N. Lugaz, I.V. Sokolov, T.I. Gombosi, D.L. De Zeeuw, and M. Opher, MHD Simulations of the Structure, Evolution and Appearance of CME-driven Shocks Presented at SHINE meeting, Zermatt Utah, June 23-27, 2008
45. Manchester IV, W., A. Vourlidas, O. Cohen, B. Van der Holst, K.C. Hansen, T.I. Gombosi, I.V. Sokolov, G. Toth, Y-D. Jia, Simulating the interaction of the 2007 April 19 CME with Comet Encke, Presented at the COSPAR meeting, Montreal Canada, July 13-20, 2008
46. Manchester IV, W., F. Fang, Shear Flows Driven by the Lorentz Force: An Energy Source for Coronal Mass Ejections and Flares, Presented at Fall AGU, San Francisco CA, Dec 13-17, 2008
47. Manchester IV, W., Flux Emergence: An Initiation Mechanism for Coronal Mass Ejections, Presented at the AAS, Solar Physics Division Meeting, Boulder CO, June 15-18, 2009
48. Manchester IV, W., F. Fang, B. van der Holst, Photospheric Flows During Flux Emergence that Drive Coronal Mass Ejections, Presented at the Flux Emergence Workshop, Tenerife, Spain, November 2-5, 2009
49. Manchester IV, W. F. Fang, B. van der Holst, Study of Flux Emergence: Photospheric Shear Flows That Produce Coronal Eruptions, Fall AGU Meeting, San Francisco, CA, December 14-18, 2009

50. Manchester IV, W., F. Fang, F., B. van der Holst, Emergence and Eruption of Magnetic Flux Ropes, a Model for Coronal Mass Ejections, AAS Solar Physics Division Meeting, May 23-28, 2010
51. Manchester IV, W., B. van der Holst, R. Frazin, T. Gombosi, A. Vourlidas, Y. Liu, A. Vasquez, MHD Simulation of the 2008 December 12 CME: Comparison with STEREO Observations, presented at 38th Scientific Assembly of the Committee on Space Research, Bremen Germany, July 18-24, 2010
52. Fang, F., W. Manchester IV, W. Abbett, B. van der Holst, and C. Schrijver, Simulation of Flux Emergence in Solar Active Regions, Presented at Fall AGU meeting, San Francisco CA, December 2010.
53. Fang, F., W. Manchester IV, W.P. Abbett, B. van der Holst, 'Coupling of Convective Flows and Emerging Magnetic Fields', oral at the 3rd SDO Workshop, Palo Alto CA, September 30-October 3, 2011 /item Fang, F., W. Manchester IV, W.P. Abbett, B. van der Holst, Simulation of Flux Emergence from the Convection Zone, oral at the 4th Flux Emergence Workshop, Berkeley CA, August 22-25, 2011.
54. Manchester IV, W., F. Fang, B. van der Holst, B. Abbett, Title: Patterns of Large-Scale Flux Emergence, 4th Flux Emergence Workshop, Berkeley CA, August 22-25, 2011.
55. Jin, M., W. Manchester IV, B. van der Holst, J. Gruesbeck, R. A. Frazin, A. M. Vasquez, P. L. Lamy, A. Llebaria, A. Fedorov, G. Toth, T. I. Gombosi, 'A Global Two-Temperature Corona and Inner Heliosphere Model: A Validation Study', poster at 2011 SHINE Workshop, Snowmass, CO, July 11-15, 2011
56. F. Fang, W. Manchester IV, W.P. Abbett, B. van der Holst, The Effect of Subsurface Flows during Flux Emergence, oral at fall AGU meeting 2011, San Francisco, CA, December 5-9, 2011
57. Jin, M., W. Manchester IV, B. van der Holst, J.R. Gruesbeck, R.A. Frazin, E. Landi, A.M. Vasquez, G. Toth, T.I. Gombosi, 'Modeling Solar Wind and Coronal Mass Ejection During Carrington Rotation 2107', oral at AGU fall meeting 2011, San Francisco, CA, December 5-9, 2011
58. Manchester IV, W. and B. van der Holst, 'CME Acceleration: A comparison Between Numerical Models and Observations', poster at AGU fall meeting 2011, San Francisco, CA, December 5-9, 2011
59. Manchester IV, W. and J. Kozyra, Modeling an Extremely Energetic CME: the 1859 Carrington Event, NASA/LWS Extreme Space Weather Events, Boulder CO, May 14-17, 2012
60. M. Jin, W. Manchester IV, B. van der Holst, R. Oran, I. Sokolov, G. Toth, T.I. Gombosi, Numerical Simulations of Coronal Mass Ejection on 2011 March 7: One-Temperature and Two-Temperature Model Comparison, SHINE meeting, Maui Hawaii, June 25-29, 2012.
61. M. Jin, W. Manchester IV, Simulate the Coronal Mass Ejection on 2011 March 7 from Chromosphere to 1 AU. Fall AGU, San Francisco, CA, December 3-7, 2012
62. Z. Huang, B. van der Holst, R. Frazin, W. Manchester, R. Oran, M. Jin, A. Vasquez, T. Gombosi, Inverted Temperature Loops in the Quiet Sun Corona With 3D, Global MHD Modeling, Fall AGU, San Francisco, CA, December 3-7, 2012

63. W. Manchester, F. Fang, C. Burns, A. Kosovichev, X. Sun, M. Cheung, M. DeRosa, Initiation of CMEs: A Comparison of AR11158 with a Simulation of Flux Cancellation, Fall AGU, San Francisco, CA, December 3-7, 2012

Seminars and Colloquia

1. Global MHD Simulations of Flux Rope Driven CMEs, Colloquium presented at High Altitude Observatory, Boulder, CO, April 17, 2002
2. 3D Simulations of Magnetically Driven Coronal Mass Ejections, Colloquium presented at University of Michigan, Ann Arbor, MI, June 07, 2002
3. Flux Rope Propagation from the Solar Convection Zone to the Earth, Colloquium presented at High Altitude Observatory, Boulder, CO, March 04, 2004
4. Flux Rope Emergence from the Solar Convection Zone, Colloquium presented at Lockheed-Martin, Palo Alto, CA, October 25, 2004
5. The Source of Magnetic Shear that Drives Solar Eruptions, Colloquium presented at JPL, Pasadena, CA, June 24, 2005
6. CME-driven Shock Structure and Reverse Shock Formation Resulting from Interaction with a Bimodal Solar Wind, Science Talk presented at High Altitude Observatory, Boulder, CO, August 17, 2005
7. Adaptive Solution of the Magnetohydrodynamic Equations with Finite Volume Upwind Schemes, Colloquium presented at Scientific Computing Division, Boulder, CO, August 25, 2005
8. The Source of Magnetic Shear that Drives Coronal Eruptions, Seminar presented at the University of Michigan, Ann Arbor, MI, December 19, 2005
9. The Source of Magnetic Shear that Drives Flares and Coronal Mass Ejections, Colloquium presented at Laboratory for Atmospheric and Space Physics, Boulder, CO, March 15, 2006
10. Simulations of the Sun-Earth System, Science Talk presented at High Altitude Observatory, Boulder, CO, March 17, 2006
11. The Source of Magnetic Shear that Drives Flares and Coronal Mass Ejections Colloquium presented at the Naval Research Laboratory, Washington D.C., April 18, 2006
12. The Source of Magnetic Shear that Drives Flares and Coronal Mass Ejections Colloquium presented at George Mason University, Fairfax, VA, April 19, 2006
13. A Source of Magnetic Shear and a Mechanism for Flares and Coronal Mass Ejections Science Talk presented at the High Altitude Observatory, Boulder, CO, July 7, 2006
14. The Source of Magnetic Shear that Drives Flares and Coronal Mass Ejections Seminar presented at the Center of Integrated Plasma Studies, Boulder, CO, July 7, 2006
15. Shear Flows Driven by the Lorentz Force During Flux Emergence: The Energy Source for Coronal Mass Ejections and Flares, Seminar presented at Michigan State University, East Lansing, MI, October 4, 2006

16. Shear Flows Driven by the Lorentz Force During Flux Emergence: The Energy Source for Coronal Mass Ejections and Flares, Seminar given at Massachusetts Institute of Technology, Cambridge, MA, October 13, 2006
17. The Source of Magnetic Shear that Drives Flares and Coronal Mass Ejections, Seminar presented at Center for Astrophysics, Harvard University, Cambridge, MA, October 16, 2006
18. Shear Flows Driven by the Lorentz Force During Flux Emergence: The Energy Source for Coronal Mass Ejections and Flares, Seminar presented at New Jersey Institute of Technology, March 27, 2007
19. Simulations of Stellar Magnetic Eruptions and their Interaction with Stellar Winds, Seminar presented at the University of Chicago, March 30, 2007
20. Shear Flows Driven by the Lorentz Force During Flux Emergence: The Energy Source for Coronal Mass Ejections and Flares, Seminar presented at Chinese Academy of Sciences, May 23, 2007
21. Simulating the Propagation of Coronal Mass Ejections from The Sun to The Earth Seminar presented at the University of Michigan, September 19, 2007
22. Shear Flows Driven by the Lorentz Force: An Initiation Mechanism for Coronal Mass Ejections and Flares Seminar presented at the University of Alabama Huntsville, April 4, 2008
23. Signatures of Emerging Magnetic Flux Ropes: Shear Flows and Electric Current, Seminar presented at LMATC Solar and Astrophysics Lab, May 7, 2008

Grants and Subcontracts Awarded as PI

Title: Evolution of CME Shocks in a Realistic Lower Corona
 Sponsor: NASA through subcontracts from JPL and George Mason University
 Period: 03/11/05-08/31/07
 Amount: \$109,000

Title: Tomographic Determination of Lower Boundary Conditions in the Corona
 Sponsor: NSF through a subcontract from the University of Illinois
 Period: 01/01/06-12/31/08
 Amount: \$87,000

Title: 3D MHD Numerical Simulations of Magnetic Flux Emergence with Comparisons to TRACE and MDI observations
 Sponsor: NASA SR&T Program
 Period: 02/15/2006-02/14/2009
 Amount: \$292,661

Title: Modeling the 3D Density Structure and White-Light Appearance of CME Events
 Sponsor: NASA LWS TR&T Program
 Period: 08/01/06-07/31/09
 Amount: \$260,000

Title: Modeling Magnetic Flux Emergence
Sponsor: NASA/SDO through subcontract by Lockheed
Period: 01/01/2010-12/31/2010
Amount: \$20,000

Title: Simulating CME-Driven Shocks and SEP Acceleration
Sponsor: NASA LWS TR&T Program
Period: 07/01/2009-06/30/2013
Amount: \$420,000

Title: Modeling CME Initiation with Magnetic Flux Emergence
Sponsor: NSF/Space Weather Program
Period: 10/01/2010 - 08/31/2013
Amount: \$360,000

Title: Remote Diagnosis of the Solar Wind: Interpreting Solar Wind
Sponsor: NASA through subcontract from UCLA
Period: 01/01/2010-12/31/2012
Amount: \$33,000

Title: Interaction of ICMEs with Mars Atmosphere and Ionosphere
Sponsor: NASA through subcontract from University of Colorado
Period: 03/01/2011-02/28/2014
Amount: \$112,000

Title: Exploring CME Initiation with Charge State Composition
Sponsor: NASA SR&T Solar & Heliospheric Physics
Period: 01/01/2013-02/28/2016
Amount: \$246,000

Title: Integrated Global-Sun Model of Magnetic Flux Emergence and Transport
Sponsor: NASA & NSF Strategic Capability Program subcontract from NASA Ames
Period: 01/01/2013-12/31/2017
Amount: \$505,000