

Dr. Justin Christophe Kasper – Curriculum Vitae



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Biography: Justin Kasper is an Astrophysicist at the Smithsonian Astrophysical Observatory and a Lecturer in the Astronomy Department at Harvard University. He designs sensors for spacecraft that explore extreme environments in space from the surface of the Sun to the outer edges of the solar system. He is interested in understanding the forces that lead to solar flares and the solar wind, a stream of particles heated to millions of degrees in the Sun's atmosphere, or corona. His major results concern heating, instabilities, and helium in the solar corona and solar wind, and the impact of space weather on society. In 2007, he used measurements by the Voyager spacecraft to detect the termination shock, a massive shockwave surrounding our solar system. He has served on advisory committees for NASA, the National Science Foundation, and the National Academy of Sciences. He currently leads the SWEAP Investigation, an international team of scientists and engineers building sensors that will collect samples of the Sun for the NASA Solar Probe Plus spacecraft, a mission of exploration that will make history in 2018 as the first human-made object to plunge into the solar corona.

Education

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| 1999-2003 | Massachusetts Institute of Technology
Doctorate in Physics, Astrophysics Division
Thesis title: "Solar wind plasma: Kinetic properties and micro-instabilities"
Thesis advisers: Dr. Alan J. Lazarus, Prof. John Belcher, Prof. Bruno Coppi | Cambridge, MA |
| 1995-1999 | University of Chicago
AB with Special Honors, concentration in Physics
Thesis title: "Rare solar elements as probes of coronal acceleration mechanisms"
Thesis adviser: Prof. John Simpson | Chicago, IL |

Professional Experience

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| 2008- | Harvard University, Astronomy Department
Lecturer on Astronomy | |
| 2007- | Smithsonian Astrophysical Observatory
Astrophysicist, High Energy Astrophysics Division (Affiliations with Theoretical Astrophysics Divisions and Radio & Geoastronomy Division)
Promoted from Trust to Federal staff in 2010
Promoted to Permanent Federal staff in 2011 | |
| 2005-2009 | Boston University
Visiting Scholar, Center for Space Physics | |
| 2004-2005 | MIT Kavli Institute for Astrophysics and Space Research | |

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	Research Scientist
2003	Massachusetts Institute of Technology Lecturer, Department of Physics, 8.02T Electricity and Magnetism
2002-2004	MIT Kavli Institute for Astrophysics and Space Research Postdoctoral Researcher
2002	Massachusetts Institute of Technology, Department of Physics Teaching Assistant
1999-2002	Massachusetts Institute of Technology, Department of Physics Research Associate, Space Plasma Group
1995-1999	Enrico Fermi Research Institute, University of Chicago Student Data Technician, Simpson Cosmic Ray Group

Awards and Honors

- 2011 Popular Science Brilliant 10, awarded annually to ten researchers under the age of 40 who represent the best of what science can achieve and demonstrate America's continuing cutting-edge research
- 2010 Presidential Early Career Award for Scientists and Engineers (PECASE), the highest honor bestowed by the United States Government on science and engineering professionals in the early stages of their independent research careers. Citation: "For investigating why the solar corona is thousands of times hotter than the surface of the Sun, how the solar wind is accelerated, how the heliosphere connects to interstellar space, and for developing an experiment that will 'touch the Sun.'"
- Innovative Spirit Award, 2010 Smithsonian Secretary's Awards for Excellence
- NASA Group Achievement Award, Lunar Reconnaissance Orbiter (LRO) Exploration, 2011
- NASA Group Achievement Award, The LRO Mission Operations Team, 2011
- NASA Group Achievement Award, Lunar Reconnaissance Orbiter (LRO) Team, 2010
- Dean's Educational and Student Advising Award, MIT School of Science, 2004
- NASA Group Achievement Award, Triana Project, 2002
- American Geophysical Union Outstanding Student Paper Awards Spring 2002, Fall 2001, Spring 2001, Fall 2000

Current Projects

- Principal Investigator, Solar Wind Electrons Alphas and Protons (SWEAP) Investigation for the NASA Solar Probe Plus mission
- Instrument lead for Faraday Cup on the Deep Space Climate Observatory (DSCOVR), Principle Investigator, Technical Support for the Refurbishment of the DSCOVR Faraday Cup
- Co-Investigator, FIELDS experiment for the NASA Solar Probe Plus mission
- Solar Wind Experiment Faraday Cup Instrument Lead, Wind spacecraft
- Project Scientist and Co-Investigator of the Cosmic Ray Telescope for the Effects of Radiation (CRaTER) on Lunar Reconnaissance Orbiter (LRO) spacecraft
- Co-Investigator and Institutional PI for Strofio, a neutral gas mass spectrometer for the BepiColombo mission to Mercury

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- Official builder of the ground based Murchison Wide-Field Array (MWA) radio telescope. Has previously lead solar coronal Faraday Rotation effort and served as Chair of the MWA Science Council and Chair of the MWA Solar Heliospheric and Ionospheric Sciences Consortium.
- Co-I of the Lunar University Network for Astrophysics Research (LUNAR), a component of the NASA Lunar Science Institute charged with identifying astrophysics experiments to be conducted at the moon. Heads the LUNAR Heliophysics Radio key project focused on a simple solar radio array as an early lunar sortie science experiment and serves on the LUNAR Steering Committee
- Member of the STEREO/WAVES and Solar Orbiter RPW experiment teams
- PI of several NASA and NSF research grants to conduct investigations into the fundamental physics of solar corona and solar wind including heating, instabilities, composition, shocks, magnetic reconnection, and particle acceleration

Professional Activities

- Service
 - 2012 Member of time allocation committee for European LOFAR radio array
 - 2011- Secretary's Awards Committee, Smithsonian Institution
 - 2009 - 2012 NRC Decadal Survey on Solar and Space Physics, Steering Committee
 - 2008 - 2009 NASA Heliophysics Division Roadmap, Steering Committee
 - 2009 - 2012 NASA Solar and Heliospheric Management and Operations Working Group (MOWG)
- Professional Membership
 - American Geophysical Union (AGU) – Space Physics and Aeronomy
 - American Astronomical Society
 - American Physical Society
- Review Panels
 - NASA Living With a Star Targeted Research and Technology Proposal Review Panel
 - NASA Heliophysics Theory Review Panel
 - NASA Solar and Heliospheric Physics Supporting Research and Technology Review Panel
 - National Science Foundation National Space Weather Program Review Panel
 - National Science Foundation Solar Heliospheric and Interplanetary Environment Review Panel
- Editorial Work
 - Active journal reviewer (reviewed at least one article within the last year) for Science, Nature, Physical Review Letters, Physics of Plasmas, Astrophysical Journal, Journal of Geophysical Research, Geophysical Research Letters, Solar Physics, and Space Science Reviews
 - Reviewing proceedings for Solar Wind 12 conference held summer 2009.

Students

- Graduate students
 - Current, Thesis Committee Member, Lauren Woolsey, Harvard University
 - 2012, Thesis Supervisor, Bennett Maruca, now Townes Postdoctoral Fellow at UC Berkeley

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- 2011, Thesis Committee Member, Anthony Case, Boston University, now research staff at Smithsonian Astrophysical Observatory
- 2012, Thesis Committee Member, Nicholeen Vial, Boston University, now permanent staff at NASA/GSFC
- Undergraduates: Supervised research by twelve undergraduates at MIT, and three at Harvard

Recent Invited Talks

Heliophysics from the surface of the Moon, American Astronomical Society, Anchorage, June 2012

Solar Probe Plus: Mission to the Corona, Solar Wind 13, Hawaii, June 2012

Solar Probe Plus: Instruments for a Solar Encounter Mission, Princeton Plasma Physics Laboratory, Department Colloquium, January 2012

Exploration of the Sun, Smithsonian Congress of Scholars, National Museum of Natural History, January, 2012

Understanding the Origin and Evolution of Turbulence in the Inner Heliosphere with Solar Probe Plus, Fall 2011 American Geophysical Union, San Francisco, December 2011

Collecting Samples of Coronal and Solar Wind Plasma with Solar Probe Plus, Fall 2011 American Geophysical Union, San Francisco, December 2011

Solar Probe Plus: Mission to the Sun, Dartmouth College, Physics Department Colloquium, November 2011

Solar wind ion and electron distribution functions and the transition from fluid to kinetic behavior, Isaac Newton Institute, Cambridge University, June 2010

Fluid/Kinetic: Investigations of the Dynamic Solar Wind, Invited Plenary Lecture, American Astronomical Society 216th Meeting, Miami, 2010

Publications

Dr. Kasper has 68 published peer-reviewed publications in the literature, along with 180 published conference abstracts. According to the ISI Web of Knowledge he has a Hirsch index of 20 and more than 1350 citations to his publications in the peer-reviewed literature.

Reprints of publications are available here: <http://www.cfa.harvard.edu/~jkasper/publications.html>.

1. Isenberg, P. A., B. A. Maruca, and J. C. Kasper, 2013, Self-Consistent Ion Cyclotron Anisotropy-Beta Relation for Solar Wind Protons, *Astrophysical Journal*, submitted.
2. Case, A. W., et al., 2013, The deep-space galactic cosmic ray lineal energy spectrum at solar minimum, *Space Weather*, accepted, in press.
3. Looper, M., et al., 2013, The radiation environment near the lunar surface: CRaTER observations and Geant4 simulations, *Space Weather*, accepted, in press.
4. Bowman, J. D., et al., 2013, Science with the Murchison Widefield Array, *Publications of the Astronomical Society of Australia*, 30, 10.1017/pas.2013.009, <http://arxiv.org/abs/1212.5151>.
5. Le Chat, G., et al., 2013, Interplanetary Nanodust Detection by the Solar Terrestrial Relations Observatory/WAVES Low Frequency Receiver, *Solar Physics*, 10.1007/s11207-013-0268-x, <http://arxiv.org/abs/1303.1109>
6. Kasper, J. C., et al., 2013, A sensitive test for strong ion-cyclotron resonant heating in the solar wind, *Phys. Rev. Lett.*, 110, 9, 091102, 10.1103/PhysRevLett.110.091102.

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7. Wilson, L. B., III, et al., 2013, Electromagnetic waves and electron anisotropies downstream of supercritical interplanetary shocks, *J. Geophys. Res.*, 118, 5-16, doi: 10.1029/2012JA018167, arXiv:1207.6429.
8. Wilson, L. B., III, et al., 2013, Shocklets, SLAMS, and field-aligned ion beams in the terrestrial foreshock, arXiv:1207.5561, *Journal of Geophysical Research*, 118, 3, 957-966, doi:10.1029/2012JA018186.
9. Tingay, S. J., et al., 2013, The Murchison Widefield Array: the Square Kilometre Array Precursor at low radio frequencies, *Publications of the Astronomical Society of Australia*, 30, doi:10.1017/pasa.2012.007, arXiv:1206.6945.
10. Beardsley, A. P., et al., 2013, The EoR Sensitivity of the Murchison Widefield Array, *Monthly Notices of the Royal Astronomical Society: Letters*, 429, Issue 1, L5-L9, doi:10.1093/mnrasl/sls013, arXiv:1204.3111.
11. McKinley, B. et al., 2013, Low-frequency Observations of the Moon with the Murchison Widefield Array, *Astronomical Journal*, 145, 1, 23, doi: 10.1088/0004-6256/145/1/23, <http://arxiv.org/abs/1211.1433>.
12. Sullivan, I. S., et al., 2012, Fast Holographic Deconvolution: A New Technique for Precision Radio Interferometry, *The Astrophysical Journal*, 759, 17, doi:10.1088/0004-637X/759/1/17
13. Beardsley, A. P., et al., 2013, A new layout optimization technique for interferometric arrays, applied to the Murchison Widefield Array, *Monthly Notices of the Royal Astronomical Society*, 425, 1788-1781, doi:10.1111/j.1365-2966.2012.20878.x
14. Williams, C. L., et al., 2012, Low-frequency Imaging of Fields at High Galactic Latitude with the Murchison Widefield Array 32 Element Prototype, *The Astrophysical Journal*, 755, 47, doi:10.1088/0004-637X/755/1/47
15. Wilson, J. K., et al., 2012, The first cosmic ray albedo proton map of the Moon, *Journal of Geophysical Research (Planets)*, 117, 0, doi:10.1029/2011JE003921
16. Zaslavsky, A., et al., 2012, Interplanetary dust detection by radio antennas: Mass calibration and fluxes measured by STEREO/WAVES, *Journal of Geophysical Research (Space Physics)*, 117, 5102, doi:10.1029/2011JA017480
17. Wilson, L. B., III, et al., 2012, Observations of electromagnetic whistler precursors at supercritical interplanetary shocks, *Geophysical Research Letters*, 39, 8109, doi:10.1029/2012GL051581
18. Maruca, B. A., et al., 2012, Instability-driven Limits on Helium Temperature Anisotropy in the Solar Wind: Observations and Linear Vlasov Analysis, *The Astrophysical Journal*, 748, 137, doi:10.1088/0004-637X/748/2/137
19. Schwadron, N. A., et al., 2012, Lunar radiation environment and space weathering from the Cosmic Ray Telescope for the Effects of Radiation (CRaTER), *Journal of Geophysical Research (Planets)*, 117, 0, doi:10.1029/2011JE003978
20. Kasper, J. C., et al., 2012, Evolution of the Relationships between Helium Abundance, Minor Ion Charge State, and Solar Wind Speed over the Solar Cycle, *The Astrophysical Journal*, 745, 162, doi:10.1088/0004-637X/745/2/162
21. Martens, P. C. H., et al., 2012, Computer Vision for the Solar Dynamics Observatory (SDO), *Solar Physics*, 275, 113-79, doi:10.1007/s11207-010-9697-y
22. Lazio, T. J. W., et al., 2011, The Radio Observatory on the Lunar Surface for Solar studies, *Advances in Space Research*, 48, 1957-1942, doi:10.1016/j.asr.2011.07.006

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23. Maruca, B. A., et al., 2011, What Are the Relative Roles of Heating and Cooling in Generating Solar Wind Temperature Anisotropies?, *Physical Review Letters*, 107, 201101, doi:10.1103/PhysRevLett.107.201101
24. McIntosh, S. W., et al., 2011, Solar Cycle Variations in the Elemental Abundance of Helium and Fractionation of Iron in the Fast Solar Wind: Indicators of an Evolving Energetic Release of Mass from the Lower Solar Atmosphere, *The Astrophysical Journal*, 740, L23, doi:10.1088/2041-8205/740/1/L23
25. Schwadron, N. A., et al., 2011, Coronal Electron Temperature from the Solar Wind Scaling Law throughout the Space Age, *The Astrophysical Journal*, 739, 9, doi:10.1088/0004-637X/739/1/9
26. Mazur, J. E., et al., 2011, New measurements of total ionizing dose in the lunar environment, *Space Weather*, 9, 7002, doi:10.1029/2010SW000641
27. Oberoi, D., et al., 2011, First Spectroscopic Imaging Observations of the Sun at Low Radio Frequencies with the Murchison Widefield Array Prototype, *The Astrophysical Journal*, 728, L27, doi:10.1088/2041-8205/728/2/L27
28. MacDowall, R. J., et al., 2011, Observing Solar Radio Bursts from the Lunar Surface, *Planetary, Solar and Heliospheric Radio Emissions (PRE VII)*, 550-541, doi:
29. Wilson, L. B., III, et al., 2010, Large-amplitude electrostatic waves observed at a supercritical interplanetary shock, *Journal of Geophysical Research (Space Physics)*, 115, 12104, doi:10.1029/2010JA015332
30. Ord, S. M., et al., 2010, Interferometric Imaging with the 32 Element Murchison Wide-Field Array, *Publications of the Astronomical Society of the Pacific*, 122, 1366-1353, doi:10.1086/657160
31. Case, A. W., et al., 2010, GCR access to the Moon as measured by the CRaTER instrument on LRO, *Geophysical Research Letters*, 37, 19101, doi:10.1029/2010GL045118
32. Pulupa, M. P., et al., 2010, Langmuir waves upstream of interplanetary shocks: Dependence on shock and plasma parameters, *Journal of Geophysical Research (Space Physics)*, 115, 4106, doi:10.1029/2009JA014680
33. Breech, B., et al., 2010, Heating of the solar wind with electron and proton effects, *Twelfth International Solar Wind Conference*, 1216, 217-214, doi:10.1063/1.3395840
34. Spence, H. E., et al., 2010, CRaTER: The Cosmic Ray Telescope for the Effects of Radiation Experiment on the Lunar Reconnaissance Orbiter Mission, *Space Science Reviews*, 150, 284-243, doi:10.1007/s11214-009-9584-8
35. Viall, N. M., et al., 2009, Are periodic solar wind number density structures formed in the solar corona?, *Geophysical Research Letters*, 36, 23102, doi:10.1029/2009GL041191
36. Bale, S. D., et al., 2009, Magnetic Fluctuation Power Near Proton Temperature Anisotropy Instability Thresholds in the Solar Wind, *Physical Review Letters*, 103, 211101, doi:10.1103/PhysRevLett.103.211101
37. Wilson, L. B., III, et al., 2009, Low-frequency whistler waves and shocklets observed at quasi-perpendicular interplanetary shocks, *Journal of Geophysical Research (Space Physics)*, 114, 10106, doi:10.1029/2009JA014376
38. Breech, B., et al., 2009, Electron and proton heating by solar wind turbulence, *Journal of Geophysical Research (Space Physics)*, 114, 9103, doi:10.1029/2009JA014354
39. Cranmer, S. R., et al., 2009, Empirical Constraints on Proton and Electron Heating in the Fast Solar Wind, *The Astrophysical Journal*, 702, 1614-1604, doi:10.1088/0004-637X/702/2/1604

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40. Richardson, J. D., et al., 2009, Plasma flows in the heliosheath, *Geophysical Research Letters*, 36, 10102, doi:10.1029/2009GL038421
41. Kasper, J. C., et al., 2008, Hot Solar-Wind Helium: Direct Evidence for Local Heating by Alfvén-Cyclotron Dissipation, *Physical Review Letters*, 101, 261103, doi:10.1103/PhysRevLett.101.261103
42. Richardson, J. D., et al., 2008, Cool heliosheath plasma and deceleration of the upstream solar wind at the termination shock, *Nature*, 454, 66-63, doi:10.1038/nature07024
43. Richardson, J. D. & J. C. Kasper, 2008, Solar cycle variations of solar wind dynamics and structures, *Journal of Atmospheric and Solar-Terrestrial Physics*, 70, 225-219, doi:10.1016/j.jastp.2007.08.039
44. Richardson, I. G., et al., 2007, Correction to "Major geomagnetic storms (Dst ≤ -100 nT) generated by corotating interaction regions", *Journal of Geophysical Research (Space Physics)*, 112, 12105, doi:10.1029/2007JA012332
45. Zhang, J., et al., 2007, Correction to "Solar and interplanetary sources of major geomagnetic storms (Dst ≤ -100 nT) during 1996-2005", *Journal of Geophysical Research (Space Physics)*, 112, 12103, doi:10.1029/2007JA012891
46. Zhang, J., et al., 2007, Solar and interplanetary sources of major geomagnetic storms (Dst ≤ -100 nT) during 1996-2005, *Journal of Geophysical Research (Space Physics)*, 112, 10102, doi:10.1029/2007JA012321
47. Liu, Y., et al., 2007, Determining the Magnetic Field Orientation of Coronal Mass Ejections from Faraday Rotation, *The Astrophysical Journal*, 665, 1447-1439, doi:10.1086/520038
48. Wilson, L. B., III, et al., 2007, Waves in Interplanetary Shocks: A Wind/WAVES Study, *Physical Review Letters*, 99, 041101, doi:10.1103/PhysRevLett.99.041101
49. Stevens, M. L. & J. C. Kasper, 2007, A scale-free analysis of magnetic holes at 1 AU, *Journal of Geophysical Research (Space Physics)*, 112, 5109, doi:10.1029/2006JA012116
50. Kasper, J. C., et al., 2007, Solar Wind Helium Abundance as a Function of Speed and Heliographic Latitude: Variation through a Solar Cycle, *The Astrophysical Journal*, 660, 910-901, doi:10.1086/510842
51. Chin, G., et al., 2007, Lunar Reconnaissance Orbiter Overview: The Instrument Suite and Mission, *Space Science Reviews*, 129, 419-391, doi:10.1007/s11214-007-9153-y
52. Liu, Y., et al., 2007, Temperature Anisotropy in a Shocked Plasma: Mirror-Mode Instabilities in the Heliosheath, *The Astrophysical Journal*, 659, L68-L65, doi:10.1086/516568
53. Bowman, J. D., et al., 2007, Field Deployment of Prototype Antenna Tiles for the Mileura Widefield Array Low Frequency Demonstrator, *The Astronomical Journal*, 133, 1518-1505, doi:10.1086/511068
54. McFadden, J. P., et al., 2007, In-Flight Instrument Calibration and Performance Verification, *ISSI Scientific Reports Series*, 7, 385-277, doi:
55. Liu, Y., et al., 2006, Constraints on the global structure of magnetic clouds: Transverse size and curvature, *Journal of Geophysical Research (Space Physics)*, 111, 12, doi:10.1029/2006JA011890
56. Richardson, J. D., et al., 2006, Correlation between energetic ion enhancements and heliospheric current sheet crossings in the outer heliosphere, *Geophysical Research Letters*, 33, 21112, doi:10.1029/2006GL027578
57. Liu, Y., et al., 2006, Plasma depletion and mirror waves ahead of interplanetary coronal mass ejections, *Journal of Geophysical Research (Space Physics)*, 111, 9108, doi:10.1029/2006JA011723

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58. Gopalswamy, N., et al., 2006, Comment on "Interplanetary shocks unconnected with earthbound coronal mass ejections" by T. A. Howard and S. J. Tappin, *Geophysical Research Letters*, 33, 11108, doi:10.1029/2005GL024983
59. Richardson, I. G., et al., 2006, Major geomagnetic storms ($Dst \leq -100$ nT) generated by corotating interaction regions, *Journal of Geophysical Research (Space Physics)*, 111, 7, doi:10.1029/2005JA011476
60. Hellinger, P., et al., 2006, Solar wind proton temperature anisotropy: Linear theory and WIND/SWE observations, *Geophysical Research Letters*, 33, 9101, doi:10.1029/2006GL025925
61. Kasper, J. C., et al., 2006, Physics-based tests to identify the accuracy of solar wind ion measurements: A case study with the Wind Faraday Cups, *Journal of Geophysical Research (Space Physics)*, 111, 3105, doi:10.1029/2005JA011442
62. Liu, Y., et al., 2006, Thermodynamic structure of collision-dominated expanding plasma: Heating of interplanetary coronal mass ejections, *Journal of Geophysical Research (Space Physics)*, 111, 1102, doi:10.1029/2005JA011329
63. Farrugia, C. J., et al., 2005, Interplanetary coronal mass ejection and ambient interplanetary magnetic field correlations during the Sun-Earth connection events of October-November 2003, *Journal of Geophysical Research (Space Physics)*, 110, 9, doi:10.1029/2004JA010968
64. Richardson, J. D., et al., 2005, Propagation of the October/November 2003 CMEs through the heliosphere, *Geophysical Research Letters*, 32, 3, doi:10.1029/2004GL020679
65. Oberoi, D. & J. C. Kasper, 2004, LOFAR: The potential for solar and space weather studies, *Planetary and Space Science*, 52, 1421-1415, doi:10.1016/j.pss.2004.09.009
66. Clack, D., et al., 2004, Wind observations of extreme ion temperature anisotropies in the lunar wake, *Geophysical Research Letters*, 31, 6812, doi:10.1029/2003GL018298
67. Tsyganenko, N. A., et al., 2003, Storm-time distortion of the inner magnetosphere: How severe can it get?, *Journal of Geophysical Research (Space Physics)*, 108, 1209, doi:10.1029/2002JA009808
68. Kasper, J. C., et al., 2002, Wind/SWE observations of firehose constraint on solar wind proton temperature anisotropy, *Geophysical Research Letters*, 29, 1-170000, doi:10.1029/2002GL015128
69. Jurac, S., et al., 2002, Geomagnetic disturbances and their relationship to Interplanetary shock parameters, *Geophysical Research Letters*, 29, 1-100000, doi:10.1029/2001GL014034
70. Lepping, R. P., et al., 2001, The Bastille day Magnetic Clouds and Upstream Shocks: Near-Earth Interplanetary Observations, *Solar Physics*, 204, 303-285, doi:10.1023/A:1014264327855