

# Andrés MUÑOZ-JARAMILLO

## SouthWest Research Institute

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### EDUCATION

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AUG 2010 | Doctor of Philosophy in PHYSICS  
**Montana State University**, Bozeman, USA.  
MAY 2007 | Master of Science in PHYSICS  
**Montana State University**, Bozeman, USA.  
MAY 2005 | Undergraduate Degree in ELECTRONIC ENGINEERING  
**Universidad de los Andes**, Bogotá, Colombia.  
DEC. 2004 | Undergraduate Degree in PHYSICS  
**Universidad de los Andes**, Bogotá, Colombia.

### WORK EXPERIENCE

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MAR 2017 to PRESENT | Senior Research Scientist, SouthWest Research Institute, Boulder, USA.  
Visiting Scholar, High Altitude Observatory & National Solar Observatory, Boulder, USA.  
JUN 2015 to MAR 2017 | Senior Research Scientist, Georgia State University, Atlanta, USA.  
Visiting Scholar, University of California, Berkeley, & Stanford University, Stanford, USA.  
SEP 2013 to MAY 2015 | Research Associate, Montana State University, Bozeman, USA.  
Visiting Scholar, University of California, Berkeley, & Stanford University, Stanford, USA.  
JUL 2011 to AUG 2013 | LWS - Jack Eddy Postdoctoral fellow,  
Harvard-Smithsonian Center for Astrophysics, Cambridge, USA.  
SEP 2010 to JUL 2011 | Visiting Postdoctoral Fellow,  
Harvard-Smithsonian Center for Astrophysics, Cambridge, USA.  
JAN 2005 to AUG 2010 | Graduate Research Assistant,  
Montana State University, Bozeman, USA.

### SCHOLARSHIPS AND AWARDS

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2011 [Fred L. Scarf Award](#) granted by the Space Physics and Aeronomy section of the American Geophysical Union for outstanding dissertation research that contributes directly to solar-planetary science, USA.  
2011 [Jack Eddy Postdoctoral Fellowship](#) of the NASA - Living With a Star program, USA.  
2008 Studentship Award granted by the Solar Physics Division of the American Astronomical Society, USA.  
1998 Undergraduate Scholarship of the Neme Foundation, Colombia.

### RESEARCH GRANTS

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Title: Geophysically Relevant Prediction of Solar Cycle 25.  
Role: PI.  
Total Budget: \$445,076.  
Performance Period: May 2016 to May 2019.

## RESEARCH GRANTS (CONTINUED)

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Title: Data Driven 3D Dynamo Simulations for Cycle Forecasts.  
Role: Co-I.  
Total Budget: \$1,178,526.  
Performance Period: Sep 2014 to Aug 2018.

Title: A Tale of Two Dynamos: Understanding the Connection Between Global and Small  
-Scale Magnetism.  
Role: Co-I.  
Total Budget: \$524,462.  
Performance Period: Jun 2018 to Mar 2021.

## TEACHING EXPERIENCE

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|----------------|---|
| JUL 2018       | <i>From the Sun to the Earth: Much More than Light and Heat.</i><br>Space Weather Summer School, Boulder, USA.  |
| JAN 2018       | IAU Symposium 340 Summer School, Jaipur, India.   |
| JUL 2017       | CISM Summer School, Boulder, USA.   |
| JUL 2015       | <i>Solar Cycle &amp; Dynamo (Including Extended Minima and Maxima), and the Large-Scale Field.</i><br>NASA's Living With a Star Summer School, Boulder, USA |
| SEP 2015       | International School of Space Science, L'Aquila, Italy.   |
| SPRING<br>2013 | <i>The Solar System</i><br>PHYS/ASTR 1050 Introductory level astronomy course.<br>University of Utah, Salt Lake City, USA.                                  |
| SEP 2012       | <i>The Solar Cycle: Observations, Characteristics, Understanding, and Theory.</i><br>ISWI & MAGDAS School on Space Science, Bandung, Indonesia.             |

## MENTORING EXPERIENCE (UNDERGRADUATE STUDENTS)

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|-------------------------|--|
| MAY 2018 to<br>AUG 2018 | Sam Hollenbachn,<br>Boulder Solar Alliance REU mentor, Boulder, USA.<br>Reconstruction of historic solar activity levels.  |
| OCT 2015 to<br>PRESENT  | <a href="#">Juan P. Vargas-Acosta</a> ,<br>Independent Studies mentor at the Universidad Nacional, Bogotá, Colombia.<br>REU mentor at Montana State University, Bozeman, USA.<br>Automatic detection, and characterization, of bipolar magnetic regions. Cycle 24. |
| JUN 2014 to<br>AUG 2014 | <a href="#">Michael D. DeLuca</a> ,<br>REU mentor at Montana State University, Bozeman, USA.<br>Automatic detection, and characterization, of bipolar magnetic regions. Cycle 23.  |
| JUN 2013 to<br>AUG 2013 | Ryan R. Senkpeil,<br>REU mentor at the Harvard-Smithsonian Center for Astrophysics, Cambridge, USA.<br>Characterization of the statistical properties of sunspot group sizes.  |

## MENTORING EXPERIENCE (GRADUATE STUDENTS)

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| JAN 2016 to<br>PRESENT  | Sushant S. Mahajan,<br>PhD Co-Mentor with Piet Martens at Georgia State University, Atlanta, USA.<br>Measurement of the solar meridional flow during the last 40 years using feature tracking.  |
| NOV 2015 to<br>PRESENT  | Tim Whitbread,<br>PhD Co-Mentor with Anthony Yeates at Durham University, Durham, UK.<br>Application of genetic algorithms to dynamo models for efficient phase space exploration.  |
| JUN 2015 to<br>JUN 2018 | <a href="#">Zachary A. Werginz</a> ,<br>Research supervisor at Georgia State University.<br>Independent studies mentor at St. Norbert College, De Pere, USA.<br>REU mentor at Montana State University, Bozeman, USA.<br>Automatic detection, and characterization, of bipolar magnetic regions. Cycles 21 & 22. Calibration of 40 years of full disk magnetograms. |

## SYNERGISTIC ACTIVITIES & PROFESSIONAL SERVICES

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- Chair of the Metcalf Award committee of the SPD/AAS, 2018-present.
- Committee of the Solar Physics Division of the American Astronomical Society, 2017-present.
- Steering committee of NASA's Living With a Star's Jack Eddy Fellowship, 2017-present.
- [EPO Facebook live event on solar magnetism with the SETI Institute \(48K views\)](#).
- Review panelist for NASA's Heliophysics Supporting Research program, Washington, DC, 2015.
- External reviewer for the NASA-LWS' Targeted Research & Technology program and NASA's Solar and the Heliospheric Supporting Research program. 2012, 2014, 2015.
- Referee for *Nature Geoscience*, *Nature Astronomy*, the *Astrophysical Journal*, *Astronomy & Astrophysics*, the *Geophysical Research Letters*, *Space Science Reviews*, *Advances in Space Research*, *Solar Physics*, the *Journal of Space Weather and Space Climate*, and the *Journal of Atmospheric and Solar-terrestrial Physics*.
- Member of the LOC of the 4<sup>th</sup> Space Climate Symposium, Goa, India, 2011.
- Development, in collaboration with NASA artist Tom Bridgman, of movies for education and outreach of the solar magnetic cycle <http://svs.gsfc.nasa.gov/search/Series/SolarDynamo.html>. 2008.
- Member of the LOC of the NASA-CAWSES International Workshop on "Solar Variability, Earth's Climate and the Space Environment", hosted by Montana State University in Bozeman, USA, 2008.

## LIST OF PUBLICATIONS

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1. *The Long-Term Sunspot Number Series: Challenges and Limitations*. **A. Muñoz-Jaramillo** & J. M. Vaquero, **Submitted** (2018).
2. *How many active regions are necessary to predict the solar dipole moment?* T. Whitbread, A. R. Yeates, & **A. Muñoz-Jaramillo**, **Submitted** (2018).
3. *FlareNet: A Deep Learning Framework for Solar Phenomena Prediction*. S. McGregor, D. Dhuri, A. Berea, & **A. Muñoz-Jaramillo**, **NIPS Workshop on Deep Learning for Physical Sciences** (2017).
4. *Parameter optimization for surface flux transport models*. T. Whitbread, A. R. Yeates, **A. Muñoz-Jaramillo**, & G. J. D. Petrie, **A&A** 607, A76 (2017).
5. *The best of both worlds: Using automatic detection and limited human supervision to create a homogenous magnetic catalog spanning four solar cycles*. **A. Muñoz-Jaramillo**, Z. A. Werginz, J. P. Vargas-Acosta, M. D. DeLuca, J. C. Windmueller, J. Zhang, D. W. Longcope, D. A. Lamb, C. E. DeForest, S. Vargas-Dominguez, J. W. Harvey, & P. C. H. Martens, **2016 IEEE International Conference on Big Data**, 3194 (2016).

6. *The Minimum of solar cycle 23: As deep as it could be?* A. Muñoz-Jaramillo, R. R. Senkpeil, D. W. Longcope, A. G. Tlatov, A. A. Pevtsov, L. A. Balmaceda, E. E. DeLuca, & P. C. H. Martens, **ApJ**, 804, 68 (2015).
7. *Small-scale and global dynamos, and the area and flux Distributions of active regions, sunspot groups, and sunspots: A multi-database study.* A. Muñoz-Jaramillo, R. R. Senkpeil, J. C. Windmueller, E. C. Amouzou, D. W. Longcope, A. G. Tlatov, Y. A. Nagovitsyn, A. A. Pevtsov, G. A. Chapman, A. M. Cookson, A. R. Yeates, F. T. Watson, L. A. Balmaceda, E. E. DeLuca, & P. C. H. Martens, **ApJ**, 800, 48 (2015).
8. *Polar network index as a magnetic proxy for the solar cycle studies.* M. Priyal, D. Banerjee, B. B. Karak, A. Muñoz-Jaramillo, B. Ravindra, A. R. Choudhuri, & J. Singh, **ApJL**, 793, L4 (2014).
9. *Kinematic active region formation in a three-dimensional solar dynamo model.* A. R. Yeates, & A. Muñoz-Jaramillo, **MNRAS**, 436, 3366 (2013).
10. *Helioseismic perspective of the solar dynamo.* A. Muñoz-Jaramillo, P. C. H. Martens, & D. Nandy, **ASP Conference Series**, 478 (2013).
11. *Using the dipolar and quadrupolar moments to improve solar cycle predictions based on the polar magnetic fields.* A. Muñoz-Jaramillo, L. A. Balmaceda, & E. E. DeLuca, **PRL** 111, 041106 (2013).
12. *Solar cycle propagation, memory, and prediction: insights from a century of magnetic proxies.* A. Muñoz-Jaramillo, M. Dasi-Espuig, L. A. Balmaceda, & E. E. DeLuca, **ApJL** 767, L25 (2013).
13. *Calibrating 100 years of polar faculae measurements: implications for the evolution of the heliospheric magnetic field.* A. Muñoz-Jaramillo, N. R. Sheeley Jr., J. Zhang, & E. E. DeLuca, **ApJ** 753, 146 (2012).
14. *All quiet on the solar front: origin and heliospheric consequences of the unusual minimum of solar cycle 23.* D. Nandy, A. Muñoz-Jaramillo, & P. C. H. Martens, **Sun & Geosph.** 7(1), 16 (2012).
15. *“El misterio de un Sol inmaculado” (The mystery of a spotless Sun).* A. Muñoz-Jaramillo, Invited letter for **Investigación y Ciencia**, Spanish edition of the Scientific American 420, 8 (2011).
16. *The unusual minimum of sunspot cycle 23 caused by meridional plasma flow variations.* D. Nandy, A. Muñoz-Jaramillo, & P. C. H. Martens, **Nature** 471, 80 (2011).
17. *Magnetic quenching of turbulent diffusivity: reconciling mixing-length theory estimates with kinematic dynamo models of the solar cycle.* A. Muñoz-Jaramillo, D. Nandy, & P. C. H. Martens, **ApJL** 727, L23 (2011).
18. *A double-ring algorithm for modeling solar active regions: unifying kinematic dynamo models and surface flux-transport simulations.* A. Muñoz-Jaramillo, D. Nandy, P. C. H. Martens, & A. R. Yeates, **ApJL** 720, L20 (2010).
19. *Helioseismic data assimilation in solar dynamo models.* A. Muñoz-Jaramillo, D. Nandy, & P. C. H. Martens, **ApJ** 698, 461 (2009).

## INVITED PRESENTATIONS

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1. *Uncertainty, Under-counting, and Survey Inconsistency: Overlooked Issues While Working With Sunspot Area Data.*
  - IAU Symposium 340, Jaipur, India, February 2018.
2. *When Push Comes to Shove, Size isn't Everything.*
  - Solar Cycle 25 Prediction workshop, Nagoya, Japan, December 2017.
3. *Deep Learning: Teaming up Machines and Humans to Peek into the Black Box.*
  - Committee of Solar and Space Physics, National Academy of Science, Irvine, CA, October 2017.
4. *Theoretical and Observational Constrains on the Poloidal Signature of Active Regions and Their Origin Within the Convection Zone.*
  - Dynamo Focus Meeting at the National Solar Observatory, Boulder, CO, USA, March 2017.

5. *Advances on Our Understanding of Solar Cycle Propagation and Predictability.*
  - 2016 SDO Workshop, Burlington, VT, USA, October 2016.
6. *Advances on Our Understanding of Solar Cycle Propagation and Predictability.*
  - 2016 SDO Workshop, Burlington, VT, USA, October 2016.
7. *Demographics of the LWS heliophysics summer school(in Haiku form).*
  - 10th Anniversary Celebration of the LWS Heliophysics Summer School, Boulder, CO, USA, August 2016.
8. *Contextualizing Solar Cycle 24: Report on the Development of a Homogenous Database of Bipolar Active Regions Spanning Four Cycles.*
  - 2015 AGU Fall Meeting, San Francisco, CA, USA, December 2015.
9. *Modeling Active Region Emergence in 3D Flux-Transport Solar Dynamios.*
  - NASA LWS Workshop on Solar Dynamo Frontiers, Boulder, CO, USA, June 2015.
10. *One Model Doesn't Fit All: Recent Results of a Detailed Analysis of Sunspot Demographics.*
  - Sunspot Formation Workshop, Stockholm, Sweeden, March 2015.
11. *Insider's Perspectives of the Jack Eddy LWS Fellowship.*
  - Living with a Star: Past Accomplishments and Future Promise, Princeton, NJ, USA, September 2013.
12. *Helioseismic Perspective of the Solar Dynamo.*
  - "Fifty Years of Seismology of the Sun and Stars", NSO Workshop in Tucson, AZ, USA, May 2013.
13. *Implications of Changes to the SSN for Solar Dynamo Studies & Climate Change.*
  - Meeting of American Geophysical union in San Francisco, CA, USA, December 2013.
  - 3rd SSN Workshop in Tucson, AZ, USA, January 2013.
14. *Solar Surface Observations and their Role in Solar-cycle Predictions.*
  - Invited review for the 26th NSO Workshop in Sunspot, NM, USA, April 2012.
15. *Bridging the Gap: Recent Improvements of Kinematic Models of the Solar Magnetic Cycle.*
  - Fred L. Scarf Award presentation at the AGU Fall Meeting 2011 in San Francisco, CA, USA, December 2011.
16. *Forecasting the Solar Cycle: Lessons Learned from the Unusual Minimum of Solar Cycle 23.*
  - Invited panelist for the session "Solar Cycle Forecasting and Comparative Solar Minima - Maxima Studies" of the ILWS Science Workshop in Beijing, China, August 2011.
17. *Why was the Sun so quiet?*
  - Invited review for the ILWS Science Workshop in Beijing, China, August 2011.
18. *Origins and Manifestations of the Solar Cycle: What we know and what we don't.*
  - Invited discussion leader for the session "Bridging the Great Divide: Linking the Solar Dynamo to the Dynamic Heliosphere". SHINE Workshop in Snowmass, CO, USA, July 2011.
19. *Solar Internal Dynamics and the Unusual Minimum of Sunspot Cycle 23.*
  - Invited presentation at the AGU Meeting of the Americas, Foz do Iguazu, Brazil, September 2010.
20. *The unusual minimum of cycle 23: observations and interpretation.*
  - Keynote presentation at the Meeting of the Solar Physics Division in Boulder, CO, USA, June 2009.

## EDUCATIONAL PRESENTATIONS

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1. *From the Sun to the Earth: Much more than Light and Heat.*
  - REU introductory lecture, Boulder, CO, USA, May 2018.
  - IAU Symposium 340 – Summer school, Jaipur, India, February 2018.
  - Public Lecture at the University of Oulu, Finland, November 2017.
  - SETI Institute Seminar, Mountain View, CA, USA, July 2017.
  - CISM Summer school, Boulder, CO, USA, July 2017.
  - NASA-FDL Bootcamp, Mountain View, CA, USA, June 2017.
  - Bootcamp at NASA's Frontier Development Laboratory, Mountain View, CA, USA, June 2017.
  - Undergraduate Seminar at the University of Utah, Salt Lake City, UT, USA, September 2012.
  - Invited colloquium speaker at the Universidad de los Andes in Bogotá, Colombia, September 2010.
2. *Less is More: Ruminations on Data Mining and Analysis.*
  - Computer Science Seminar at Georgia State University, Atlanta, GA, USA, February 2016.
3. *Solar Cycle & Dynamo (Including Extended Minima and Maxima), and the Large-Scale Field.*
  - Solar Physics Invited Lecture at the Universidad Nacional, Bogotá, Colombia, October 2015.
  - International School of Space Science, L'Aquila, Italy, September 2015.
  - Invited lecture for NASA's Living With a Star Summer School, Boulder, CO, USA, July 2015.
4. *The Solar Cycle.*
  - REU Seminar at Montana State University, Bozeman, MT, USA, June 2015.
  - REU Seminar at Montana State University, Bozeman, MT, USA, June 2014.
  - Seminar of the Salt Lake Astronomical Society in Salt Lake City, UT, USA, March 2013.
5. *The Solar Cycle: Observations, Characteristics, Understanding, and Theory.*
  - Invited lecture for the ISWI & MAGDAS School on Space Science, Bandung, WJ, Indonesia, September 2012.
6. *The Sun's Interior and the Solar Magnetic Cycle.*
  - Invited lecture for SAO's Research Experience for Undergraduates Program, Cambridge, MA, USA, June 2011.

## RESEARCH SEMINARS

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1. *Solar Surface Magnetism: A Window Into Our Star's Interior, Past, Present, and Future.*
  - Seminar of the ReSOLVE center for excellence, Oulu, Finland, November 2017.
  - APS Colloquium, University of Colorado, Boulder, CO, USA, March 2017.
2. *The Rails Inside the Sun and the Butterflies that Ride Them.*
  - Georgia State University, GA, USA, February 2017.
  - High Altitude Observatory in Boulder, CO, USA, March 2016.
  - Seminar of the Solar & Astrophysics Laboratory, Lockheed Martin, Palo Alto, CA, USA, January 2016.
  - Stanford Solar Group Meeting, Palo Alto, CA, USA, January 2016.
3. *Using Sunspot Demographics to Probe the Small-Scale vs. Global Components of the Dynamo.*
  - Seminar of the Solar & Astrophysics Laboratory, Lockheed Martin, Palo Alto, CA, USA, February 2015.
  - Stanford Solar Group Meeting, Palo Alto, CA, USA, February 2015.
  - Heliophysics Science Seminar at NASA/AMES, Mountain View, CA, USA, February 2015.

4. *The Statistics of Magnetic Structures: The Future of Cycle Prediction and the Key to the Livingston-Penn Effect.*

- Brown bag seminar at the National Solar Observatory, Tucson, AZ, USA, September 2014.

5. *Building the next-generation of model-based solar cycle predictions.*

- Space Physics Seminar at the University of Oulu, Oulu, Finland. April 2014.
- Astronomy Seminar at the Universidad Nacional de Colombia, Bogotá, Colombia. March 2014.
- High Energy Seminar at the Universidad de los Andes, Bogotá, Colombia. March 2014.
- Astronomy Seminar at the Universidad de Antioquia, Medellín, Colombia. March 2014.
- Seminar at the Southwest Research Institute, Boulder, CO, USA, February 2014.
- Seminar at the High Altitude Observatory, Boulder, CO, USA, February 2014.
- Seminar of the Solar & Astrophysics Laboratory, Lockheed Martin, Palo Alto, CA, USA, January 2014.
- Space Science Seminar, University of California - Berkeley, Berkeley, CA, USA, January 2014.
- Heliophysics Science Seminar at NASA/GSFC, Washington, DC, USA, January 2014.
- Solar Theory Seminar at the Naval Research Laboratory, Washington DC, USA, January 2014.
- SPA&CS Seminar at George Mason University, Fairfax, VA, USA, January 2014.
- Stanford Solar Group Meeting, Palo Alto, CA, USA, October 2013.
- Physics Seminar at Montana State University, Bozeman, MT, USA, August 2013.

6. *Improvements and applications of the kinematic models of the solar magnetic cycle.*

- Heliophysics Science Seminar at NASA/Goddard Space Flight Center, Washington, DC, USA, September 2011.
- School of Physics, Astronomy and Computational Sciences Seminar at George Mason University, Fairfax, VA, USA, September 2011.
- Solar Theory Seminar at the Naval Research Laboratory, Washington, DC, USA, September 2011.
- Astronomy and Astrophysics Seminar at the Université de Montréal, Montréal, Canada, March 2011.
- Invited colloquium speaker at the Udaipur Solar Observatory, Udaipur, India, January 2011.
- Seminar of the Solar, Stellar and Planetary Sciences Division at the Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA, October 2010.
- High Energy Seminar at the Universidad de los Andes in Bogotá Colombia, September 2010.
- High Altitude Observatory in Boulder, CO, USA, May 2010.
- Physics Seminar at the Indian Institute of Science Education and Research, Kolkata, India, April 2010

7. *Solar Cycle Propagation, Memory, and Prediction: Insights from a Century of Magnetic Proxies.*

- Numerical Analysis Seminar at Durham University, Durham, UK, June 2013.
- HEAP seminar at the University of Utah, Salt Lake City, UT, USA, February 2013.
- Brown bag seminar at the National Solar Observatory, Tucson, AZ, USA, January 2013.

## CONTRIBUTED ORAL PRESENTATIONS

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1. *The Harm that Underestimation of Uncertainty Does to Our Community: A Case Study Using Sunspot Area Measurements*

- Meeting of the Solar Physics Division, Portland, Oregon, August 2017.

2. *A New Generation of Long-Term Variability Datasets with Better Estimates of Uncertainty*

- Boulder Solar Day, Boulder, CO, USA, April 2017.

3. *The Rails Inside the Sun and the Butterflies that Ride Them*

- Space Climate Symposium 6, Levi, Finland, April 2016.

4. *The Minimum of Solar Cycle 23: As Deep as It Could Be?*
  - 2015 Triennial Earth-Sun Summit, Indianapolis, IN, USA, April 2015.
5. *Automatic vs. Human Detection of Bipolar Magnetic Regions: Using the Best of Both Worlds.*
  - Meeting of American Geophysical union in San Francisco, CA, USA, December 2014.
6. *How the Statistical Analysis of Magnetic Structures Will Help Us Usher a New Generation of Solar Cycle Predictions.*
  - 2014 Living With a Star Science Meeting in Portland, OR, USA, November 2014.
7. *From the Tachocline Into the Heliosphere: Coupling a 3D kinematic dynamo to the CCMC.*
  - Meeting of the Solar Physics Division in Boston, MA, USA, June 2014.
8. *From the Tachocline Into the Heliosphere.*
  - Meeting of American Geophysical union in San Francisco, CA, USA, December 2013.
9. *What Makes Each Cycle Unique?.*
  - Meeting of American Geophysical union in San Francisco, CA, USA, December 2013.
10. *Solar Cycle Propagation, Memory, and Prediction: Insights from a Century of Magnetic Proxies.*
  - Meeting of the Solar Physics Division in Bozeman, MT, USA, July 2013.
11. *Calibrating 100 Years of Polar Faculae Measurements: Implications for the Evolution of the Heliospheric Magnetic Field.*
  - Meeting of the Solar Physics Division in Anchorage, AK, USA, June 2012.
12. *Polar Faculae: A Proxy for the Evolution of the Solar Polar Field during the Last 100 Years.*
  - CfA Postdoc Science Symposium in Cambridge, MA, USA, November 2011.
  - Hinode-5 Meeting in Cambridge, MA, USA, October 2011.
13. *Understanding the Origin of the Extended Minimum of Sunspot Cycle 23.*
  - IAU Symposium 286 in Mendoza, Argentina, October 2011.
14. *The Double-Ring Algorithm: Reconciling Surface Flux Transport Simulations and Kinematic Dynamo Models.*
  - Meeting of the Solar Physics Division in Las Cruces, NM, USA, June 2011.
15. *The unusual minimum of solar cycle 23 explained.*
  - Hinode-4 Meeting in Palermo, Italy, 2010
16. *Are changes in the solar meridional circulation responsible for the characteristics of minimum 23-24?.*
  - SORCE Meeting in Keystone, CO, USA, May 2010.
17. *Towards Better Constrained Kinematic Dynamo Models: The Velocity Fields and Turbulent Diffusivity Profiles.*
  - Meeting of the Solar Physics Division in Boulder, CO, USA, May 2010.