



Scientific Program

**NASA LWS Workshop on Solar Dynamo Frontiers:
Helioseismology, 3D Modeling, & Data Assimilation**

**National Center for Atmospheric Research
Boulder, Colorado, USA**

June 9-12, 2015

Sponsored by

**NASA Living with a Star
Stanford University**

National Center for Atmospheric Research

Scientific Organizing Committee

Mark Miesch (Co-Chair, USA), Junwei Zhao (Co-Chair, USA), Allan Sacha Brun (France), Paul Charbonneau (Canada), Arnab Choudhuri (India), Mausumi Dikpati (USA), Rudi Komm (USA), Alexander Kosovichev (USA), Nagi Mansour (USA), Markus Roth (Germany)

Local Organizing Committee

Mark Miesch, Wendy Hawkins, Junwei Zhao, Mausumi Dikpati, Phil Scherrer, Haruko Makitani

Tuesday, June 9

8:20	Bus departs from Holiday Inn Express (arrival time 8:30)
9:00-9:10	<i>Welcome:</i> Mark Miesch
9:10-9:55	<i>Keynote:</i> David Hathaway, “Observational Constraints and New Frontiers for Solar Dynamos”

Session 1: Solar Meridional Circulation and Differential Rotation: Observations

9:55-10:20	<i>Invited:</i> Ruizhu Chen, “Comprehensive Measurement of Deep Solar Meridional Flow”
9:20-10:45	<i>Invited:</i> Jason Jackiewicz, “Meridional Flows from GONG”
10:45-11:15	<i>Coffee Break and poster setup</i>
11:15-11:40	<i>Invited:</i> Martin Woodard, “Helioseismic detectability of Solar Meridional Flow”
11:40-12:00	<i>Contributed:</i> Jesper Schou, “Results from Improved Analysis of MHD and HMI Global Mode Data”
12:00-1:15	<i>Lunch (NCAR Cafeteria)</i>

Session 1 (continued)

1:15-1:40	<i>Invited:</i> Ariane Schad, “Helioseismic Measurement of Meridional Circulation and Differential Rotation from Mode Eigenfunction Perturbations”
1:40-2:00	<i>Contributed:</i> Dean-Yi Chou, “Probing Magnetic Fields at the Base of the Solar Convection Zone with Meridional Flows”
2:00-2:45	<i>Open Discussion:</i> Led by Rudi Komm, Markus Roth & Junwei Zhao
2:45-3:15	<i>Coffee Break and poster viewing</i>

Session 2: Convection and Magnetism: Observations

3:15-3:40	<i>Invited:</i> Shравan Hanasoge, “Seismic Constraints on Large-Scale Convection in the Sun”
3:40-4:05	<i>Invited:</i> Ben Greer, “Fast Convective Flows Throughout the Near-Surface Shear Layer”
4:05-4:25	<i>Contributed:</i> Tom Duvall Jr., “Flows in the Convection Zone with Potential Relevance to the Dynamo”
4:25-4:50	<i>Invited:</i> Aimee Norton, “Joy’s Law: A Space-Age Update”
4:50-5:10	<i>Contributed:</i> Xudong Sun, “Polar Field Reversal and Surface Flux Transport of Cycle 24 Observed by SDO/HMI”
5:10-6:00	<i>Poster session</i>
6:00-7:30	Reception: NCAR Foothills Laboratory
7:30	Bus departs to Holiday Inn Express

Wednesday, June 10

8:35 Bus departs from Holiday Inn Express (arrival time: 8:45)

Session 3: Modeling of Convection and Mean Flows

9:00-9:25 *Invited:* Gustavo Guerrero, “Large-Scale Flows and Dynamo in Global Large-Eddy Simulations of the Sun and Solar-Like Stars”

9:25-9:50 *Invited:* Nicholas Featherstone, “Stratified Convection Driven by Internal Radiative Heating: Scaling Laws”

9:50-10:10 *Contributed:* Bradley Hindman, “Transport Properties of Stratified Convection in the High-Rayleigh Number Regime”

10:10-10:30 *Contributed:* Nishant Singh, “Fanning out of the f-mode in Presence of Nonuniform Magnetic Fields and its Seismic Implications”

10:30-11:00 *Coffee Break and poster viewing*

11:00-11:25 *Invited:* Yuhong Fan, “Differential Rotation in Solar Convective Dynamo Simulations”

11:25-11:50 *Invited:* Hideyuki Hotta, “Small- and Large-Scale Dynamo in the Solar Convection Zone”

11:50-12:10 *Contributed:* Nicholas Nelson, “Self-Organization and Solar-Like Differential Rotation Using a Plume Boundary Condition in Global Solar Convection Simulations”

12:10-1:30 *Lunch (NCAR Cafeteria)*

Session 3 (continued)

1:30-2:15 *Open Discussion:* Led by Mark Miesch & Mark Rast

Session 4: Advances in Dynamo Modeling: Convective Dynamos

2:15-3:00 *Keynote:* Axel Brandenburg, “Simulating and Understanding Large-Scale Dynamos”

3:00-3:25 *Invited:* Youhei Masada, “Organization of Coherent Magnetic Fields in Turbulent Thermal Convection”

3:25-3:55 *Coffee Break and poster viewing*

3:55-4:20 *Invited:* Jean-Francois Cossette, “Large-Scale Field Induction in Global MHD Simulations of Solar Convection”

4:20-4:45 *Invited:* Petri Käpylä, “Competing Dynamo Modes in Spherical Wedge Simulations of Turbulent Convection”

4:45-5:10 *Invited:* Antoine Strugarek, “Benchmarking Convective Dynamos: Subgrid-Scale Modeling Effects”

5:10-5:30 *Contributed:* Jörn Warnecke, “Understanding Equatorward Migration of the Sun’s Magnetic Field”

5:30-6:15 *Open Discussion:* Led by Matthias Rempel and Juri Toomre

6:30 Bus departs to Holiday Inn Express

Thursday, June 11

8:35 Bus departs from Holiday Inn Express (arrival time: 8:45)

Session 5: Advances in Dynamo Modeling: Flux-Transport Dynamos and Flux Emergence

9:00-9:25	<i>Metcalf Award Lecture:</i> Bidya Karak, “Flux Transport Dynamo Models: Fluctuations and Grand Minima”
9:25-9:50	<i>Invited:</i> Andrés Muñoz-Jaramillo, “Modeling Active Region Emergence in 3D Flux-Transport Solar Dynamos”
9:50-10:10	<i>Contributed:</i> Robert Cameron, “The Importance of Surface Magnetic Fields to the Solar Dynamo”
10:10-10:30	<i>Contributed:</i> Gopal Hazra, “Is the Deep One-Cell Meridional Circulation Essential for the Flux-Transport Solar Dynamo?”
10:30-11:00	<i>Coffee Break and poster viewing</i>
11:00-11:20	<i>Contributed:</i> Alexander Kosovichev, “Dynamo Models with Double-Cell Meridional Circulation”
11:20-11:40	<i>Contributed:</i> Alexandre Lemerle, “A 2DX2D Babcock-Leighton Dynamo Model”
11:40-12:00	<i>Contributed:</i> Maria Weber, “Magnetic Flux Tubes in the Turbulent Solar Interior: Linking Fibril Magnetic Fields with Active Regions”
12:00-1:15	<i>Lunch (NCAR Cafeteria)</i>

Session 5 (continued)

1:15-2:00 ***Open Discussion:*** Led by Robert Cameron & Andrés Muñoz-Jaramillo

Session 6: Data Assimilation in Dynamo Models

2:00-2:45	<i>Keynote:</i> Alexandre Fournier, “Data Assimilation with 3D Models of the Earth’s Dynamo”
2:45-3:10	<i>Invited:</i> Olivier Talagrand, “A Few Basics about Data Assimilation: Principles and Methods”
3:10-3:35	<i>Invited:</i> Laurene Jouve, “Variational Data Assimilation as a Tool to Better Understand Solar Magnetism”
3:35-4:05	<i>Coffee Break and taking down of posters</i>
4:05-4:30	<i>Invited:</i> C. Nick Arge, “Estimating the Global Solar Photospheric Magnetic Field Distribution using the ADAPT Model”
4:30-4:55	<i>Invited:</i> Irina Kitiashvili, “Data Assimilation Approach for Prediction of Solar Activity Cycles”
4:55-5:15	<i>Contributed:</i> Mei Zhang, “Helicity Observations as a Constraint on Solar Dynamo Models”
5:15-6:00	<i>Open Discussion:</i> Led by Sacha Brun and Mausumi Dikpati
6:15	Bus departs to Holiday Inn Express

Friday, June 12

8:35 Bus departs from Holiday Inn Express (arrival time: 8:45)

Session 7: The Solar-Stellar Connection

9:00-9:45 *Keynote:* Moira Jardine, “Magnetic Activity of Intermediate and Low-Mass Stars”

9:45-10:10 *Invited:* William Chaplin, “Inferences on the Solar-Stellar Connection and Stellar Activity from Space-Based Photometry”

10:10-10:35 *Invited:* Timo Reinhold, “Rotation and Differential Rotation in the Kepler Era”

10:35-10:55 *Coffee Break*

10:55-11:20 *Invited:* Kyle Augustson, “Superequipartition Convective Dynamos in Massive Stars”

11:20-11:40 *Contributed:* Corrine Simard, “Non-Kinematic α^2 - Ω Mean-Field Dynamo Model”

11:40-12:45 *Lunch (NCAR Cafeteria)*

Session 7 (continued)

12:45-1:10 *Invited:* Matthew Browning, “Magnetic Field Generation in Fully Convective Stars”

1:10-1:30 *Contributed:* Patrice Beaudoin, “Double Dynamo Signatures in a Global MHD Simulation and Mean-Field Dynamos”

1:30-1:50 *Contributed:* Paul Bushby, “Convectively-Driven Dynamo Action in the Quiet Sun”

1:50-2:10 *Coffee Break*

2:10-2:50 *Open Discussion:* Led by Ben Brown & Moira Jardine

Session 8: Perspectives and Outlook

2:50-3:15 *Invited:* Matthias Rempel, “The Future of Dynamo Modeling”

3:15-3:40 *Invited:* Laurent Gizon, “Perspectives in Helioseismology”

3:40-4:20 *Open Discussion:* Led by Paul Charbonneau and Jesper Schou

4:20 Workshop Adjourns

4:30 Bus departs to Holiday Inn Express

Posters

**On display from 9:00am Tuesday, June 9
through 4:00pm on Thursday, June 11**

1. Zahida Ehsan: Interaction of Solar Wind with Cometary Plasma
2. Zahida Ehsan and Raoul M.G.M. Trines: Collisionless Ion Heating and Acceleration of the Solar Wind
3. Yori Fournier: Making use of 3D numerical simulations of rising flux tubes to constrain a flux transport dynamo
4. Lee Gunderson: Towards a global analytic model of mean solar behavior: the tachocline as a trans-Alfvénic feature
5. Bidya Karak: Magnetically controlled stellar differential rotation near the transition from solar to anti-solar profiles
6. Irina Kitiashvili: 3D Modeling of the Local Dynamo Action on the Sun
7. Rudolf Komm: The variation of subsurface flows during Solar Cycle 23 and 24
8. Alexander Kosovichev: Multi-scale Flows and Magnetic Field Evolution in Solar Cycle 24
9. Mark Miesch: A Three-Dimensional Babcock-Leighton Solar Dynamo Model
10. V. Senthamizh Pavai: Sunspot group, tilt angles and surface field reconstruction from historical observations
11. Ethan Peterson: Helioseismology in the Lab
12. Anthony Rasca: Pixel Dynamics Analysis of Photospheric Spectral Data
13. Andrey Stejko: Visualization and Analysis of 3D MHD Simulations of Solar Dynamics and Dynamo
14. Junfeng Wang: Convection in Oblate Late-Type Stars
15. Martin Woodard: Possible signature of solar oblateness in the Sun's oscillation frequency splittings
16. Junwei Zhao: Temporal Evolution of Solar Meridional Flow and Large-Scale Structures at High Latitudes