

Mausumi Dikpati

Professional Preparation

Lady Brabourne College	Calcutta, India	Honors in Physics	B.Sc. 1985
Calcutta University	Calcutta, India	Physics	M.Sc. 1987
Saha Inst. of Nuclear Physics	Calcutta, India	Associateship in Physics	Post M.Sc.1988
Indian Institute of Science	Bangalore, India	Physics	Ph.D. 1996
Advanced Study Program and High Altitude Observatory, NCAR	Boulder, USA	Post Doc	1996--2000

Appointments

High Altitude Observatory, NCAR	Senior Scientist	2016–Present
High Altitude Observatory, NCAR	Scientist III	2008–2016
High Altitude Observatory, NCAR	Scientist II	2006–2008
High Altitude Observatory, NCAR	Scientist I	2003–2006
High Altitude Observatory, NCAR	Project Scientist	2000–2003

SCIENTIFIC AND TECHNICAL ACCOMPLISHMENTS

Major Scientific Accomplishments

Solar magnetohydrodynamics, Rossby waves and space weather

- **2022-present:** Solar Rossby waves modeling, observational analysis and implications for space weather
- **2021-2022:** Deciphered deep origin of surface active regions, due to interaction of Rossby waves and spot-producing magnetic fields (ApJ, 922, 46, 13pp, 2021)
- **2019 – 2020:** AGU Grand challenge paper on the future outlook on space weather on intermediate-scale (few to several weeks), one of the 100 papers for celebrating 100th anniversary of AGU. This effort led to a major publication of 30 pages, and to a **science highlight in Physics World** and an **AGU research spotlight**.
- **2015 - 2018:** Discovered Tachocline Nonlinear Oscillations, which drive “seasons” in Space Weather (Nature, 2017) through quasi-periodic exchange of energies among solar differential rotation, magnetic fields and Rossby waves, with 6-18 months’ periodicity.
- **2009 - 2012:** Developed the first fully nonlinear quasi-3D shallow water model (ApJ, 745, 128, 2012) to calculate interaction of tachocline latitudinal differential rotation with Rossby waves.

- **2008 - 2009:** Showed that strong toroidal fields in solar and stellar tachoclines are unstable to axisymmetric ($m=0$) unstable modes that will break a broader toroidal field into individual flux tubes on time scales of days to weeks, creating radially stacked concentrated tubes that are then vulnerable to magnetic buoyancy instability that could cause a sequence of toroidal loops to rise to the photosphere at the same latitude and longitude, providing a possible cause for active longitudes with repeated flux eruptions. Among several papers, the major paper was published in ApJ (692, 1421, 2009).
- **2004 - 2006:** Developed a plausible theory of the Sun's "active longitudes", which is the first physical mechanism to explain that the corotation of bulging in tachocline fluid can lead to the longitude locations from which the sunspots would make their buoyant rise and would recur at the same longitudes for several years.
- **1999 - 2004:** Built and solved a sequence of global HD and MHD models for instability of latitudinal gradients in rotation and toroidal fields in the tachocline, showing that toroidal bands are unstable to longitudinal wave numbers m up to 7, in both 2D and shallow water models, of great interest for explaining surface magnetic patterns. Global helical flows in the tachocline, generated by HD shallow-water instabilities, are important for solar dynamo models.

Data assimilation in solar models

- **2022 – present:** Developing Ensemble simulations for estimating inherent predictability limit for forecasting upcoming bursty solar activity "season"
- **2019 – 2020:** Developed TNO-DART Model-system for simulating and predicting longitude-distribution of active regions (first results are published in Space Weather, 2020, e2018SW002109)
- **2012 - 2016:** Built the foundation of EnKF data assimilation in a solar dynamo model. This work demonstrates how the combination of model, observations and data assimilation can reconstruct the Sun's meridional flow-speed variation and shows the potential to derive the spatio-temporal pattern of meridional circulation. This effort led to two major publications, one of which (GRL, 41, L5361, 2014) led to a **news release** and an **AGU research spotlight**.

Solar dynamo modeling

- **2009 - 2011:** Investigated the impact of changes in the Sun's conveyor-belt on solar dynamos, and simulated an unusually long minimum at the end of cycle 23 based on observed spatio-temporal pattern of the Sun's meridional circulation during cycles 22 and 23. This work (GRL, 37, L14107, 2010) was chosen to be **one of the top 100 discoveries** of 2011 in "Discover Magazine". A joint NCAR/NSF press-release led to about 100 other news stories, including a **BBC news**, an **AGU research spotlight** and a **SCIENCE** highlight.
- **2005 - 2009:** Built the first dynamo-based solar cycle prediction scheme. Out of three major predictions made using this scheme, two have been verified, namely the delayed onset of cycle 24 and south being stronger than north. This work opened a new field which led to a joint NCAR/NSF/NASA press release and about 250 following news stories. A paper (ApJ, 649, 498, 2006) won the John Firror publication award at HAO in 2007, and was nominated for UCAR outstanding publication award in 2007.

- **2000 - 2005:** Investigated why a pure Babcock-Leighton flux-transport dynamo produces the wrong parity about the equator for the Sun's large-scale magnetic fields, and became the first to find a plausible mechanism to get the correct parity. The mechanism was a global helical flow in the tachocline, generated from global hydrodynamic instability of the latitudinal differential rotation there. This work opened a new field — Parity selection in solar dynamo models — resulting in several papers written by other groups. The original paper (ApJ, 559, 428, 2001) on this topic was nominated for the UCAR outstanding publication award in 2001.
- **1999 - 2004:** Built and solved a sequence of global HD and MHD models for instability of latitudinal gradients in rotation and toroidal fields in the tachocline, showing that toroidal bands are unstable to longitudinal wave numbers m up to 7, in both 2D and shallow water models, of great interest for explaining surface magnetic patterns. Global helical flows in the tachocline, generated by HD shallow-water instabilities, are important for solar dynamo models.
- **1996 - 2000:** Developed the first Babcock-Leighton flux-transport solar dynamo model with solar-like flow fields, and showed that the dynamo cycle-period is inversely proportional to meridional flow-speed. The model produced many solar cycle features and can be calibrated for the Sun. This model created a paradigm shift in solar dynamo theory.

Major Technical Accomplishments

2022 --	Developing EnKF data-assimilation code for distributing in Jupyter Notebooks currently for LWS-team use, and eventually for community use
2022 --	Developing methodologies for solar Rossby waves speed estimates from observations of magnetic features, coronal holes: K-means clustering algorithm to derive centroids of magnetic patterns, information theoretic approach to derive speed
2021 -- 2022	Developed nonlinear Inverse-cascade code for generating Rossby waves from supergranule scale
2020 -- 2021	Developed and distributed Jupyter Notebooks for community use of simulation data
2019 -- 2020	Developed optimization code in Python, based on Trust Region Reflective algorithm for toroid derivation from magnetograms, which is now being used for pre-solar-storm toroid-pattern analysis
2015 -- 2017	Developed nonlinear 3D MHD Shallow-water code for studying Tachocline Nonlinear Oscillations and “seasons” of space weather
2014 – 2016	Developed 3D PFSS coronal structure and evolution code
2011 -- 2014	Developed EnKF data assimilation scheme based on NCAR-DART for assimilating solar flow and magnetic field data in a dynamo model
2011 -- 2013	Developed HD and MHD codes based on NCAR MUDPACK software for solving solar global flows

2009 -- 2011	Developed nonlinear HD shallow-water code based on pseudo-spectral method along with 3rd order Runge-Kutta time-integration
2003 -- 2006	Developed dynamo-based predictive tool
1996 -- 2001	Developed linear eigen-system solvers for 2D, quasi-3D shallow-water and 3D thin-shell models of tachocline
1996 -- 1999	Developed flux-transport dynamo code using a semi-implicit method, namely an Alternating-Direction-Implicit scheme; this code is benchmarked with 8 other dynamo codes
1993 -- 1995	Developed 2D transport code for poloidal flux

Professional Service

Editorial Board: 2020 – present: Atmosphere
2017 – present: Nature
2014 – present: AIMS Geoscience
2008 – 2016: Space Science Review

Guest editor: 2022: Frontiers in Astronomy and Space Sciences (topic: Connecting flows and fields)
2022: Frontiers in Astronomy and Space Sciences (topic: Long-term data)

Panels:

- NASA Early Career Proposal panel
- NASA Living With a Star panel (several times)
- NASA Heliophysics Grand Challenge
- NASA Exoplanet (several times)
- NASA HGIO (several times)
- NASA Heliophysics Theory SR&T panel (several times)
- CAWSES/SCOSTEP Symposium, decadal prediction panel: 2013

**Session
Convenor/Co-convenor:**

- TESS: 2022 (August 8-12)
- AGU Fall meeting: 2022, 2021, 2020, 2017, 2014, 2012, 2011
- IUGG/IAGA: 2011
- AAS/SPD meeting: 2009
- Joint AGU/SPD meeting: 2008

**Scientific/Local
Organizing
Committee:**

- Geophysical Turbulence Workshop: 2016, 2018, 2022 (upcoming)
- LWS/SDO-3/SOHO-26/GONG-2011: 2011
- Prof. Dimitri Mihalas 70th Birthday workshop: 2011
- Gong 2008/SOHO 21 workshop: 2008
- 22nd NSO, Sac Peak workshop: 2004
- IAU General Assembly 25: 2002

- Thesis committee:**
- Master’s Thesis of R. Wallace, CU, Denver, 2017
 - Licentiate Thesis of J. Wernecke, NORDITA, Stockholm, Sweden, 2011
 - PhD Thesis of G. Guerrero, Sao Paulo University, Brazil, 2010
- Internal committee:**
- HAO-DSAC (Director’s Scientific Advisory Committee) (2016- present)
 - HAO Scientific Appointment Committee (2016-present)
 - UCAR outstanding publication awards committee (2012-2014)
 - HAO/NCAR Postdoc/visitor committee (2003-2009) (chaired during 2007-2009)
 - NCAR Data Assimilation committee (2015-2017)
 - NCAR-ARG (2021-present)
 - NCAR SAM (Scientific Appointment Modernization) Codesign committee (2021-present)
 - UCAR Leadership Academy training (2022 March-September)
- Decadal panel:**
- Currently serving as a panelist in the solar and heliospheric decadal panel of the National Academy of Science (October 2022 – July 2024)

Education and Public Outreach Activities

- Teaching:**
- 2013: A full-credit course on “SPACE WEATHER & CLIMATE” at Northern Vermont University
- Advising/co-advising students for PhD:**
- 2014 – 2016: J. Shetty, Armagh Observatory, Ireland
 - 2012 – 2016: B. Belucz, Universitas Budapestinensis de Rolando Eotvos Nominata, Hungary
 - 2008-2010: G. Guerrero, Sao Paulo Univ., Brazil
- Advising/co-advising for master’s thesis:**
- 2017: R. Wallace, CU Denver, USA
 - 2020: S. Dallas, Edinburgh University, Scotland
 - 2021: J. Llabres, Universitat de les Illes Balears
- Mentoring:**
- 2022 – present: two postdocs
 - 2003 – present: several Summer REU students

Professional Affiliations

- American Geophysical Union (AGU)
- American Astronomical Society (AAS)
- Solar Physics Division (AAS/SPD)

HONORS and AWARDS

- 2017 Wenner-Gren Guest Professorship Award of Stockholm
- 2010 Research article on extended minimum recognized as one of the top 100 discoveries in the DISCOVER Magazine

2008 Medal for leading GONG 2008 / SOHO XXI workshop
 2007 John W. Firor HAO Outstanding Publication Award given for Paper 2.27
 2007 Paper 2.27 nominated for UCAR Outstanding Publication Award
<http://www.ucar.edu/communications/performance/perf07.jsp>
 2002 Paper 2.14 nominated for UCAR Outstanding Publication Award
 1989-1994 CSIR (Council of Scientific and Industrial Research) Fellowship for PhD, all India competition
 1985 College Gold Medal for First Class B.Sc Degree in Physics (major)

SUCCESSFUL RESEARCH GRANTS

<u>Proposal title</u>	<u>Competition</u>	<u>PI</u>	<u>Co-I/Collaborators</u>	<u>Status</u>
Consequences Of the Flows and Fields in the Interior and Exterior of the Sun (COFFIES)	NASA DRIVE Center Phase II	J. T. Hoeksema (Stanford)	M. Dikpati + 48 team members	Awarded (2022) (\$13 millions for 5 years)
Link between polar fields and sunspots: an information theoretic approach	NASA HSR	S. Wing (JHU/APL)	M. Dikpati , J. Johnson (Andrews Univ.), A. Munoz-Jaramillo (SWRI), N. Raouafi (JHU/APL)	Awarded (2021) \$726,000 for 3 years
Simulating pre-solar-storm patterns of magnetic toroids from surface sunspot observations	NASA HSR	M. Dikpati	A. A. Norton (Stanford)	Awarded (2021) \$739,000 for 3 years
Consequences Of the Flows and Fields in the Interior and Exterior of the Sun (COFFIES)	NASA DRIVE Center Phase-I	J. T. Hoeksema (Stanford)	M. Dikpati , and 25 other team-members	Awarded (2020) \$1,300,000 for 2 years
Simulating active longitudes by coupling magnetograms with a nonlinear MHD tachocline model: a data assimilation approach	NASA LWS	M. Dikpati	J. Johnson (Andrews Univ.), R. J. Leamon (UMBC/NASA-GSFC), S. W. McIntosh (NCAR), A. A. Norton (Stanford), S. Wing (JHU/APL)	Awarded (2019) \$1million for 4 years

<u>Proposal Title:</u>	<u>Competition</u>	<u>PI</u>	<u>Co-I/Collaborators</u>	<u>Status</u>
Observations and Assimilations of Meridional Circulation in Dynamo Models	NASA HSR	R. Komm (NSO)	M. Dikpati (HAO/NCAR), K. Jain, S. Kholikov, S. Tripathy (NSO)	Awarded (2018) \$650,000 for 3 years
Development of “sequential” data assimilation in a flux-transport dynamo model for solar cycle prediction	NASA LWS	M. Dikpati	J. L. Anderson, (IMAGe/NCAR) P. A. Gilman (HAO) R. K. Ulrich (UCLA)	Awarded (2012) \$48,000 for 2 years
Development of “sequential” data assimilation in a flux-transport dynamo model for solar cycle prediction	NASA LWS	M. Dikpati	J. L. Anderson, (IMAGe/NCAR) P. A. Gilman (HAO) R. K. Ulrich (UCLA)	Awarded (2008) \$325,000 for 3 years
A large-scale spherical 3D MHD model of emerging magnetic fields in solar convective envelope	NCAR opportunity fund	Y.Fan	M. Dikpati , P. A. Gilman, K. B. MacGregor	Awarded (2005) ~\$90,000 for 2 years (HAO)
Predicting global scale solar cycle features using a flux-transport dynamo model	NASA LWS	M. Dikpati	T. Corbard (Nice), G. de Toma (HAO), P. A. Gilman (HAO), D. A. Haber (CU/JILA), E. Rhodes (USC), O. R. White (HAO)	Awarded (2005) ~\$227,000 for 3 years
Exploiting a nonaxisymmetric flux- transport dynamo to simulate long.-dependent solar cycle features	NASA SR&T	M. Dikpati	P. S. Cally, (Monash Univ.) G. de Toma (HAO) P. A. Gilman (HAO)	Awarded (2005) \$40,000 for 1 year

<u>Proposal Title:</u>	<u>Competition</u>	<u>PI</u>	<u>Co-I/Collaborators</u>	<u>Status</u>
A 3D flux-transport dynamo for the Sun	NASA SR&T	M. Dikpati	P. A. Gilman (HAO), M. S. Miesch (HAO) A. vanBallegooijen (CFA)	Awarded (2003) ~\$280,000 for 3 years
Numerical modeling of the solar tachocline and its role in solar dynamo	NASA SR&T	K. B. MacGregor/ M. Miesch	M. Dikpati (HAO), P. A. Gilman (HAO)	Awarded (2003) ~\$300,000 for 3 years
Predicting the strength of new solar cycles by fitting old cycles' magnetic field and meridional flow data	NASA LWS	M. Dikpati	D. H. Hathaway, (MSFC) P. A. Gilman (HAO), J. Schwitzer, N. Jevtic (UConn/Storrs)	Awarded (2003) ~\$250,000 for 3 years
Solar synoptic map database for Mauna Loa solar observatory	NCAR opportunity fund	G. Detoma	M. Dikpati & 14 team members	Awarded (2003) ~\$90,000 for 1 year

LEADERSHIP Activities

Acting Section-head of Solar variability section, HAO (2011-2012)

2019LWS-FST#4 Team-Lead (2019-present)

NASA-DRIVE-Center (COFFIES Phase I & II) Dynamo/Rossby-waves working group lead (2020 – present)

HAO-Colloquium co-organizer (2021-present)

UCAR Leadership Academy graduation (2022)

HAO representative of NCAR-supercomputing using NWSC (NCAR-Wyoming-Super-Computer) under NCAR Strategic Capability (2022 - present)

Conference and workshop talks

KEYNOTE Talks:

- **2012: Royal Astronomical Society Specialist Discussion Meeting on ‘Mean Field Electrodynamics and Large-Scale Cosmic Magnetic Fields: Present Problems and Future Trends’, London, UK, 1 hour talk on “Solar mean field dynamo models: progress and prospects”**

- **2007: International CAWSES Symposium**, Kyoto, Japan, a 45-minutes' talk on "Simulating and predicting solar 'climate'".

INVITED Talks:

- **July 2023 (upcoming): IUGG/IAGA symposium**, Berlin, Germany
- **June 2022: ISSI workshop**, Bern, Switzerland, "Global nonlinear magnetohydrodynamics of the tachocline, and implication in spatio-temporal distribution of surface active regions"
- **March 2022: Sheffield Univ. SP2RC seminar series (virtual)**, Sheffield, UK, "Solar Rossby waves and their implications in space weather"
- **January 2021: COSPAR 2021 Hybrid (Virtual)**, Sydney, Australia, "Simulating global distribution of surface active regions from their deep origins"
(<https://www.youtube.com/watch?v=PNLfLdnDw-c>)
- **February 2021: Durham Univ./Math Dept. colloquium (virtual)**, Durham, UK, "MHD Rossby waves in the Sun and their role in causing space weather 'seasons'"
- **December 2020: NMSU/Astron Dept. colloquium (virtual)**, Astronomy Dept., New Mexico, USA, "Role of solar Rossby waves in causing space weather on intermediate time-scales"
- **May 2020: NOAA/SWPC Colloquium (virtual)**, Boulder, USA; "Space weather challenges and forecasting implications of solar Rossby waves"
- **January 2020: International workshop for the Center of Space Science (CSS – New York Univ. at Abu Dhabi)**, Abu Dhabi; "Modeling quasi-annual variability in solar activity and implications in space weather"
- **July 2019: Space Climate Symposium**, Orford, Canada; "Advances in model-based predictions of decadal and "seasonal" solar activity"
- **June 2019: SCOSTEP/VarSITI Symposium**, Sofia, Bulgaria; "Advances and limitations in physics-based predictions of short-term and deacadal solar activity"
- **September 2018: GTP workshop**, Boulder Colorado; "Role of Tachocline Nonlinear Oscillations (TNOs) in producing Solar Seasons"
- **July 2018: COSPAR meeting**, Pasadena, CA; "On forecasting seasonal-to-decadal-to-millennial time- scale solar magnetic activity"
- **February 2018: IAU Symposium**, Jaipur, India; "Forecasting phase-by-phase progression of a solar cycle using data assimilation and machine learning"
- **November 2018: Solar Cycle 25 Prediction workshop**, Nagoya, Japan; "Refining Solar Cycle Prediction by Data Assimilation"
- **October 2017: Our Mysterious Sun**, Tbilisi, Georgia; "Global MHD Tachocline Instabilities"
- **February, 2017: ISSI Meeting**, Bern, Switzerland; "HD/MHD Tachocline Instabilities and Interactions with Rossby waves"
- **August, 2016: GTP workshop**, Boulder, Colorado; "Nonlinear evolution of Shallow-water Instability in Solar Tachocline"

- **August, 2016: Workshop for celebrating 65th Birthday and Retirement of Prof. Manfred Schuessler**, Goslar, Germany; “The Solar Cycle and Dynamo Models”
- **February 2016: ISSI Meeting**, Bern, Switzerland; “On the refinement of dynamo-based solar cycle forecasts”
- **September, 2015: 75th anniversary of HAO**, ”The Solar Cycle: Observations and Dynamo Modeling”
- **May 2015: BUKS 2015 and Ruderman honorary meeting**, Budapest, Hungary, “Global MHD instabilities in the solar/stellar tachocline”
- **February 2015: 2nd SOLARNET meeting**, Palermo, Italy, “Observation, data assimilation and simulation of global solar magnetic fields”
- **January 2015: ISSI workshop**, Bern, Switzerland, “Flux-transport solar dynamos”
- **November 2013: CAWSES/SCOSTEP Symposium**, Nagoya, Japan, “Decadal scale predictions: future challenges”
- **September 2012: ISSI workshop**, Bern, Switzerland, “2D solar mean-field dynamos: status and challenges”
- **July 2012: COSPAR meeting**, Mysore, India, “Solar dynamo models and prediction of sunspot cycles”
- **April 2012: EGU**, Vienna, Austria, “Is a high-latitude, second, reversed meridional flow cell the Sun’s common choice?”
- **May 2011: NORDITA Data-assimilation and Predictability School**, Stockholm, Sweden, “Data-assimilation in a flux-transport solar dynamo model”
- **April 2011: EGU**, Vienna, Austria, “Impact of Changes in the Sun’s Conveyor-belt on Recent Solar Cycles”
- **July 2010: COSPAR meeting**, Bremen, Germany, “What processes are missing from solar cycle prediction models?”
- **April 2010: ISSI workshop**, Bern, Switzerland, “Comparison of past two solar minima from the perspective of the interior dynamics and dynamo of the Sun”
- **August 2009: IAU General Assembly**, Rio de Janeiro, Brazil, “Flux-transport dynamos and torsional oscillations”
- **July 2008: COSPAR meeting**, Montreal, Canada, “Dynamo models and predictions of solar activity cycles”
- **May 2008: SPD/AGU meeting**, Ft. Lauderdale, Florida, “Simulations of anomalies in cycle 23 and forecast of cycle 24 using a dynamo model”
- **January 2008: ISSI workshop**, Bern, Switzerland, “Flux-transport solar dynamos”
- **October 2007: ISSI workshop**, Bern, Switzerland, “Development of sequential data-assimilation technique in solar cycle models”
- **May 2007: American Physical Society North-West Section Annual meeting**, Pocatello, Idaho, “Solar dynamo modeling and prediction”
- **January 2007: Diamond Jubilee celebration of PRL**, Ahmedabad, India, “Global solar dynamo models: from inception to prediction”

- **November 2006: European Space Weather Workshop**, Brussels, Belgium, “Predicting cycle 24 using various dynamo-based tools”
- **October 2006: ISSI workshop**, Bern, Switzerland, “An example of data assimilation technique in solar cycle prediction problem”
- **October 2006: SOLARIS workshop**, Boulder, Colorado, “A dynamo-based prediction of which hemisphere of the Sun will be more active during upcoming cycle 24”
- **July 2006: SHINE workshop Student’s day**, Midway, Utah, “Global MHD of the solar interior”
- **July 2006: SHINE workshop**, Midway, Utah, “Forecasting mean properties of solar cycle 24”
- **June 2006: GTP workshop**, Boulder, Colorado, “Global solar dynamo models: application to cyclic photospheric and nearly steady interior fields”
- **June 2006: SolVar workshop**, Boulder, Colorado, “Modeling ‘solar climate’: predicting solar cycle amplitude and timing”
- **April 2006: Space Weather Workshop**, Boulder, Colorado, “Simulating and predicting solar cycles using a flux-transport dynamo”
- **April 2006: Atmospheric Neutral Density Forecast Workshop**, Colorado Springs, Colorado, “Simulating and predicting solar cycles using a flux-transport dynamo”
- **March 2006: IAU Symposium**, Cairo, Egypt, “Simulating and predicting solar cycles using a flux-transport dynamo”
- **October 2005: CCMC (Community Coordinated Modeling Center) workshop**, Clearwater Beach Hilton, Florida, “Solar dynamo models”
- **October 2005: ISSI workshop**, Bern, Switzerland, “Predicting mean features of upcoming solar cycles”
- **March 2005: ISSI workshop**, Bern, Switzerland, “Global solar dynamos: Mean field theory”
- **October 2004: 22nd NSO/SP workshop**, Sac Peak, New Mexico, “Large scale organization in the solar dynamo and its observational signature”
- **July 2004: COSPAR meeting**, Paris, France, “Solar magnetic fields and the dynamo theory”
- **July 2004: COSPAR meeting**, Paris, France, “The importance of the solar tachocline”
- **July 2004: GONG/SoHO 14 meeting**, New Haven, Connecticut, “Global MHD theory of tachocline and the current status of large-scale solar dynamo”
- **December 2003: SORCE meeting**, Sonoma, California, “The solar dynamo”
- **November 2003: 5th Solar-B meeting**, Tokyo, Japan, “Solar dynamo models”
- **June 2003: AAS/SPD meeting**, Baltimore, Maryland, “The solar dynamo”
- **April 2003: EGS/AGU/EUG**, Nice, France, “Flux-transport type solar dynamos”
- **August 2002: London Mathematical Society Symposium on Astrophysical Fluid Mechanics**, Durham, UK, “Global instabilities in the solar tachocline”

- **December 2001: AGU Fall meeting**, San Francisco, California, “Flux-transport type solar dynamos: where are we now and what’s next?”

CONTRIBUTED Talks:

- October 2022: COFFIES DRIVE Center Phase II kick-off meeting presentation
- July 2022: 22019LWS-FST#4 3rd annual meeting presentation
- July 2021: 2019LWS-FST#4 2nd annual meeting presentation
- March 2021: EAC talk at HAO on SWG#5 (jointly with Nick Pedatella)
- July 2020: COFFIES DRIVE Center Phase I talk
- April 2020: 2019LWS-FST#4 Kick-off meeting presentation
- March 2018: Local visit of Air Force Space Command; “Forecasting Seasons of Space Weather”
- February 2018: Solar Focus Meeting, Boulder, Colorado; “The origin of the ”Seasons” in Space Weather”
- December 2017: AGU Fall meeting, New Orleans; “Ensemble Kalman Filter Data Assimilation in a Solar dynamo Model”
- Data Assimilation Inventory Workshop, NCAR, Boulder, Colorado (October 2014), talk on “EnKF Data Assimilation in a Solar Dynamo Model”
- SHINE workshop, Telluride, Colorado (June 2014), talk on “How to account for relative contributions of erupted and coalesced spots to a solar cycle?”
- NSO workshop 27, Tucson, (May, 2013), talk on “Modeling the Sun’s meridional circulation”
- External Advisory Committee of HAO, August, 2012, Boulder, “Data assimilation in solar dynamo models”
- EGU, Vienna, Austria, April 2012, “Implementing sequential data assimilation in a flux-transport solar dynamo model for reconstructing meridional flow”
- University of Leeds Colloquium, UK, February 2012, “A shallow-water model of the solar tachocline and explaining active longitudes
- LSV section presentation, HAO, Boulder, (May 2012), “Implementing sequential data assimilation in a flux-transport solar dynamo model for reconstructing meridional flow”
- AGU Fall meeting, San Francisco, USA, December 2011, “Sequential Data Assimilation In A Flux-transport Dynamo Model Using Ensemble Kalman Filter”
- LSV section presentation, HAO, Boulder, (October 2011), “Extrapolating dynamo-generated magnetic fields to corona”
- Colloquium, Monash University, Melbourne, Australia, (July 2011), “2D and 3D Global Solar Dynamo Models”
- XXV IUGG General Assembly, Melbourne, Australia, July 2011, “Is a high-latitude reverse meridional flow-cell the Sun’s common choice?”

- “What caused cycle 23 to be unusually long”, Science highlight presentation in NSF Review, HAO, Boulder, (March 2011).
- “SIV Sections’s Research”, (acting) section-head’s presentation in NSF Review, HAO, Boulder, (March 2011).
- “Recent progress and remaining challenges for understanding the solar dynamo”, CIPS/CU Colloquium, CU, Boulder, (February 2011).
- “The solar dynamo: Recent progress and unsolved problems”, HAO Colloquium, HAO, Boulder, (January 2011).
- “Impact of Changes in the Sun’s Conveyor-belt on Recent Solar Cycles”, Science highlight presentation, HAO Director’s Staff meeting, HAO, Boulder, (August 2010).
- NCAR Director’s HAO visit, Boulder, (August 2008), “Solar Interior and Variability”
- HAO/ARG Colloquium, Boulder, Colorado (March 2008), on ‘In search of the solar cycle’
- HAO Vision Committee presentation, Boulder, Colorado (October 2007), on ‘Solar dynamo modeling and prediction’
- 5th Potsdam Thinkshop, Potsdam, Germany (June 2007), a 30-minutes’ talk on ‘Predicting solar ‘climate’ by assimilating magnetic data into a flux-transport dynamo’
- UCLA Colloquium (INVITED), Los Angeles, California, (April 2007) on ‘Modeling the global-scale solar dynamo and predicting the Sun’s “climate” ’
- LASP Colloquium (INVITED), Boulder, Colorado, (March 2007) on ‘Predicting upcoming solar cycle features by assimilating surface magnetic data into a flux-transport dynamo model’
- Fall AGU meeting, San Francisco, (December 2006), a 15 minutes’ contributed talk on ‘Dynamo-based simulations of solar activity differences between north and south hemispheres and forecasts for cycle 24’
- AAS meeting, Calgary, Canada, (June 2006), 10 minutes’ contributed talk on ‘Simulating and predicting solar cycles using a flux-transport dynamo model’
- “Simulating and predicting solar cycles using a flux-transport dynamo model”, presentation to National Science Board, (local invitation) February 2006, Boulder, Colorado
- ESSL Advisory Panel meeting, Boulder, Colorado (February 2006), 15 minutes’ INVITED talk on ‘Simulating and predicting solar cycles using a flux-transport dynamo’
- NCAR’s Director’s Committee meeting, Boulder, Colorado (January 2006), 45 minutes’ INVITED talk on ‘Simulating and predicting solar cycles using a flux-transport dynamo’
- NOAA/SEL seminar (INVITED), Boulder, Colorado, (November 2005) on ‘A flux-transport dynamo- based predictive model’
- Rice University, Houston, USA (February, 2003), two interview presentations for Tenure-track faculty selection:
 1. a one hour’s talk on ‘Flux-transport dynamos’
 2. another one hour’s talk on ‘Magnetic parity selection in solar cycle dynamo models’

- High Altitude Observatory, Boulder, USA (November, 2002), one hour's interview presentation for NCAR Scientist I selection on 'Flux-transport solar dynamos'
- AAS/SPD, Albuquerque, USA (June, 2002), 20 minutes' contributed talk on 'Effect of turbulent pumping on flux-transport solar dynamos'
- ASP Conference Series on Magnetic Fields Across The Hertzsprung-Russell Diagram, Chile (January 2001), 20 minutes' contributed talk on 'Symmetry selection in solar cycle dynamo models'
- AGU, San Francisco, USA (December, 1999), 15 minutes' contributed talk on 'Intermittency in solar cycle caused by caused by stochastic fluctuation in meridional circulation'
- Pacific Rim Conference on Stellar Astrophysics, in Hong Kong University of Science and Technology, Hong Kong. (August, 1997).
- 16th NSO/SP Workshop on Solar Drivers Of Interplanetary and Terrestrial Disturbances, Sacramento Peak, USA (October, 1995)
- 154 IAU Colloquium on Solar and Interplanetary Transients, Pune, (January, 1995) Other talks (selected)

Thesis and Book publications

BOOK PUBLICATIONS:

1. "Solar/stellar Dynamos as revealed by Helio- and Asteroseismology", ASPSC, volume 416, pp648, Eds.: **Dikpati, M.**, T. Arentoft, I. Gonzalez-Hernandez, C. Lindsay and F. Hill, Date: 2010

THESIS: "The Evolution Of Weak Diffuse Magnetic Fields Of The Sun, And The Heating Of The Quiet Corona"

Date: April, 1996

Institution: Indian Institute of Science, Bangalore, India

Advisors: Prof. P. Venkatakrishnan and Prof. Arnab Rai Choudhuri

Publications (refereed journal)

1. Belucz, B., **Dikpati, M.**, McIntosh, S. W., Leamon, R. J. & Erdelyi, R., "Magnetohydrodynamic Instabilities of Double Magnetic Bands in a Shallow-water Tachocline Model: I Cross-equatorial Interactions of Bands", ApJ, **945**, 32, 17pp., 2023
2. Korsos, M. B., **Dikpati, M.**, Erdelyi, R., Liu, J. & Zuccarello, F., "On The Connection Between Rieger-type and Magneto-Rossby Waves Driving the Frequency of the Large Solar Eruptions during Solar Cycles 19-25", ApJ, **944**, 180, 10pp., 2023
3. Raphaldini, B., **Dikpati, M.** & Raupp, C. F. M., "Quasi-geostrophic MHD equations: Hamiltonian formulation and nonlinear stability", Computation and Applied Mathematics, **42**, article no. 57, 2023

4. Harris, J., **Dikpati, M.**, Hewins, I., Gibson, S. E., McIntosh, S. W., Chatterjee, S., Kuchar, T., “Tracking Movement Of Long-lived Equatorial Coronal Holes From Analysis Of Long-term McA Data”, *ApJ*, **931**, 54, 14pp, 2022
5. **Dikpati, M.**, Gilman, P. A., Guerrero, G. A., Kosovichev, A. G., McIntosh, S. W., Sreenivasan, K. R., Warnecke, J. & Zaqarashvili, T. V., “Simulating Solar Near-surface Rossby Waves by Inverse Cascade from Supergranule Energy”, *ApJ*, **931**, 117, 18pp, 2022
6. Jain, K., Jain, N., Tripathy, S. C. & **Dikpati, M.**, “What Seismic Minimum Reveals about Solar Magnetism below the Surface, *ApJ Lett.*, **924**, L20, 8pp, 2022
7. McIntosh, S. W., Leamon, R. J., Egeland R., **Dikpati, M.**, Altrock, R. C., Banerjee, D., Chatterjee, S., Srivastava, A. K. & Velli, M, “Deciphering Solar Magnetic Activity: 140 Years of the ‘Extended Solar Cycle’ – Mapping the Hale Cycle, *Sol. Phys.*, **296**, 189, 29pp, 2021
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10. Zaqarashvili, T. V., Albekioni, M., Ballester, J. L., Bekki, Y., Biancofiore, L., Birch, A. C., **Dikpati, M.**, Gizon, L., Gurgenchvili, E., Heifetz, E., Lanza, A. F., McIntosh, S. W., Ofman, L., Oliver, R., Proxauf, B., Umurhan O. M., & Yellin-Bergovoy, R., “Rossby Waves in Astrophysics”, *Space Science Reviews*, vol. **217**, issue 1, article id 15, 2021
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Other Externally Refereed Publications

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