

Table of Contents

Preface	xiii
Organizing committee	xvi
I. SOLAR DYNAMO AND ACTIVITY CYCLES: OBSERVATIONS, THEORIES AND SIMULATIONS	
Helioseismic measurements of differential rotation and meridional flow	3
<i>J. Zhao</i>	
Observations of magnetic and kinetic helicity proxies.....	13
<i>H. Zhang</i>	
How much more can sunspots tell us about the solar dynamo?.....	25
<i>A. A. Norton, E. H. Jones, Y. Liu, K. Hayashi, J. T. Hoeksema & J. Schou</i>	
Flux-transport and mean-field dynamo theories of solar cycles	37
<i>A. R. Choudhuri</i>	
Solar-cycle precursors and predictions	49
<i>J. Jiang</i>	
Phase relationship between polar faculae and sunspot numbers	61
<i>L. H. Deng</i>	
Digitization of Spörer's sunspot drawings	63
<i>A. Diercke, R. Arlt & C. Denker</i>	
Comparison of solar activity during last two minima on turn of Activity Cycles 22/23 and 23/24.....	65
<i>M. Gryciuk, S. Gburek, M. Siarkowski, P. Podgorski, J. Sylwester & F. Farnik</i>	
Modeling the solar cycles 12-20 with a Babcock-Leighton flux transport dynamo	67
<i>J. Jiang</i>	
On the extended 23rd solar cycle	69
<i>V. N. Krivodubskij</i>	
Dependence of solar cycles duration on the magnitude of the annual module of the sunspots magnetic field	71
<i>V. N. Krivodubskij & N. I. Lozitska</i>	
Solar cycle and quasi-biennial variations in helioseismic frequencies	73
<i>S. C. Tripathy, K. Jain, R. Simoniello, F. Hill & S. Turck-Chièze</i>	
On the role of asymmetries in the reversal of the solar magnetic field	75
<i>A. S. Brun, M. L. Derosa & J. T. Hoeksema</i>	
Peculiar behavior of solar polar fields during solar cycles 21-23: Correlation with meridional flow speed.....	81
<i>S. K. Bisoi & P. Janardhan</i>	

Interplanetary scintillation signatures in the inner heliosphere of the deepest solar minimum in the past 100 years	83
<i>S. K. Bisoi & P. Janardhan</i>	
Asymmetry in the periodicities of solar photospheric fields: A probe to the unusual solar minimum prior to cycle 24	85
<i>S. K. Bisoi & P. Janardhan</i>	
Model of poleward magnetic field streams from sunspot butterflies	87
<i>N. V. Zolotova & D. I. Ponyavin</i>	
II. LOCAL DYNAMO: UBIQUITOUS SMALL-SCALE MAGNETIC FIELDS AND “HIDDEN MAGNETISM”	
Solar magneto-convection	95
<i>M. Schüssler</i>	
Spectropolarimetric diagnostics of unresolved magnetic fields in the quiet solar photosphere	107
<i>N. G. Shchukina & J. T. Bueno</i>	
Nature of the solar dynamo at small scales	119
<i>J. O. Stenflo</i>	
Magnetic network elements in solar cycle 23	131
<i>C. Jin & J. Wang</i>	
Convective mechanism of amplification and structuring of magnetic fields	137
<i>A. V. Getling, V. V. Kolmychkov & O. S. Mazhorova</i>	
Origin of quiet-Sun magnetic fields revealed with Hinode	143
<i>R. Ishikawa</i>	
Solar cycle variation of helicity characteristics indicated by SP/Hinode	149
<i>J. Hao & M. Zhang</i>	
The variations of solar magnetic networks over the solar cycle 23	151
<i>C. Huang, Y. Yan & Y. Deng</i>	
The escape of trapped electrons in the decay phase of solar flare	153
<i>J. Huang</i>	
Evolution of magnetic field corresponding to X-ray brightening events in coronal holes and quiet Sun	155
<i>Z. Huang, M. Madjarska, G. Doyle & D. Lamb</i>	
Large scale magnetic helicity fluxes estimated from MDI magnetic synoptic charts	157
<i>S. Yang & H. Zhang</i>	
Self-cancellation of solar ephemeral regions observed by SDO	159
<i>S. Yang, J. Zhang, T. Li & Y. Liu</i>	
III. STELLAR AND PLANETARY DYNAMOS	
Mechanisms of planetary and stellar dynamos	163
<i>E. Dormy, L. Petitdemange & M. Schrinner</i>	

Role of longitudinal activity complexes for solar and stellar dynamos	175
<i>M. J. Mantere, P. J. Käpylä & J. Pelt</i>	
Magnetic field in accretion disk of close binary star	187
<i>D. V. Bisikalo & A. G. Zhilkin</i>	
The gap of differential rotation in early F-type stars	193
<i>M. Ammler-von Eiff & A. Reiners</i>	
On the behavior of stellar rotation in the solar neighbourhood	195
<i>D. B. de Freitas & J. R. De Medeiros</i>	
A nonextensive approach for the angular momentum loss rate in low-mass stars	197
<i>D. B. de Freitas & J. R. De Medeiros</i>	
CoRot observation of a young Sun-like star	199
<i>P. Gondoin, D. Gandolfi, M. Fridlund, E. W. Guenther & A. Hatzes</i>	
Effect of magnetic fields on Lithium depletion of solar-type stars	201
<i>T. Li & S. Bi</i>	
Fundamental properties and seismological analysis of three <i>Kepler</i> stars	203
<i>K. Liu & S. L. Bi</i>	
Magnetic activity and solar-like pulsations of X-ray sources in the <i>Kepler</i> field of view	205
<i>J. Molenda-Żakowicz, A. Frasca & H.-E. Fröhlich</i>	
Chemical composition of photospheres in RS CVn stars	207
<i>G. Tautvaišienė, G. Barisevičius, S. Berdyugina, I. Ilyin & Y. Chorniy</i>	
Chromospheric activity of late-type stars based on Guoshoujing Telescope	209
<i>L. Zhang, J. Shi, J. Zhao, A. Luo, G. Zhang, Q. Pi, the Guoshoujing Telescope Collaboration</i>	
IV. INTERSTELLAR AND GALACTIC DYNAMOS	
Magnetic fields in our Milky Way Galaxy and nearby galaxies	213
<i>J. L. Han</i>	
Interstellar and intergalactic dynamos	225
<i>M. Hanasz, D. Woltanski & K. Kowalik</i>	
Small-scale dynamo action in primordial halos	237
<i>J. Schober, D. R. G. Schleicher, R. S. Klessen, C. Federrath, S. Bovino, S. Glover & R. Banerjee</i>	
Galactic spiral patterns and dynamo action	249
<i>L. Chamandy, K. Subramanian & A. Shukurov</i>	
Growth rate of magnetic field during starburst phase in a galaxy	251
<i>C.-M. Ko</i>	
NIR polarimetry as a probe of the large-scale structure of the galactic magnetic field	253
<i>M. D. Pavel</i>	

V. MAGNETIC SELF-ORGANIZATION OF SOLAR/STELLAR PLASMA

Starspot detection and properties	257
<i>I. S. Savanov</i>	
Mechanisms of formation of solar pores and sunspots	269
<i>I. N. Kitiashvili</i>	
Flux concentrations in turbulent convection	283
<i>P. J. Käpylä, A. Brandenburg, N. Kleeorin, M. J. Mantere & I. Rogachevskii</i>	
Fractal multi-scale nature of solar/stellar magnetic fields	289
<i>V. I. Abramenko</i>	
Magnetic helicity as a probe of magnetic flux-tube dynamics in the solar interior	301
<i>T. Sakurai, Y. Gao & K. Kuzanyan</i>	
Solar-like differential rotation and equatorward migration in a convective dynamo with a coronal envelope	307
<i>J. Warnecke, P. J. Käpylä, M. J. Mantere & A. Brandenburg</i>	
Current helicity constraints in solar dynamo models	313
<i>D. Sokoloff, H. Zhang, D. Moss, N. Kleeorin, K. Kuzanyan, I. Rogachevskii, Y. Gao & H. Xu</i>	
Magnetic helicity transported by flux emergence and shuffling motions	319
<i>Y. Zhang, R. Kitai & K. Takizawa</i>	
Statistical characteristics of horizontal proper motions in the vicinity of pores . .	321
<i>M. Verma & C. Denker</i>	

VI. CRITICAL PHYSICAL INGREDIENTS FOR DYNAMOS: TURBULENCE AND INSTABILITIES

Astrophysical MHD turbulence: confluence of observations, simulations, and theory	325
<i>B. Burkhardt & A. Lazarian</i>	
Turbulence and dynamo interlinks	337
<i>E. M. de Gouveia Dal Pino, R. Santos-Lima, G. Kowal & D. Falceta-Gonçalves</i>	
On magnetohydrodynamic turbulence and angular momentum transport in accretion disk boundary layers	349
<i>C.-K. Chan & M. E. Pessah</i>	
Topological constraints on magnetic field relaxation	353
<i>S. Candelaresi & A. Brandenburg</i>	
The flow helicity in quasi-ordered cellular convection	359
<i>A. V. Getling</i>	
Toward understanding the multiscale spatial spectrum of solar convection	361
<i>A. V. Getling, O. S. Mazhorova & O. V. Shcheritsa</i>	
Saturation of the magnetorotational instability by stable magnetoacoustic modes	365
<i>E. Liverts, Y. Shtemler, M. Mond, O. M. Umurhan & D. V. Bisikalo</i>	

Helicity–vorticity turbulent pumping of magnetic fields in the solar dynamo	367
<i>V. V. Pipin</i>	
Knotty invariants: structure and evolution of magnetized fluids	369
<i>I. Roth</i>	
On the magnetic flux conservation in the partially ionized plasma	371
<i>Y. Tsap</i>	

VII. ADVANCES IN DYNAMO THEORIES, SIMULATIONS AND EXPERIMENTS

Advances in mean-field dynamo theories	375
<i>V. V. Pipin</i>	
Non-linear and chaotic dynamo regimes	387
<i>A. Brandenburg</i>	
Theory of differential rotation and meridional circulation	399
<i>L. L. Kitchatinov</i>	
Experimental realization of dynamo action: present status and prospects	411
<i>A. Giesecke, F. Stefani, T. Gundrum, G. Gerbeth, C. Nore & J. Léorat</i>	
Solar differential rotation: hints to reproduce a near-surface shear layer in global simulations	417
<i>G. Guerrero, P. Smolarkiewicz, A. G. Kosovichev & N. Mansour</i>	
Flux transport dynamo coupled with a fast tachocline scenario	427
<i>B. B. Karak & K. Petrovay</i>	
Solar dynamo model with nonlocal alpha-effect and diamagnetic pumping	429
<i>L. L. Kitchatinov & S. V. Olemskoy</i>	
Modelling stellar activity cycles using deep-seated dynamos and surface flux transport	431
<i>E. Işık, D. Schmitt & M. Schüssler</i>	
Modelling grand minima of solar activity using a flux transport dynamo model .	433
<i>B. B. Karak & A. R. Choudhuri</i>	
Forecasting the solar activity cycle: new insights	439
<i>D. Nandy & B. B. Karak</i>	

VIII. CURRENT AND NEW OBSERVING PROGRAMS FROM THE GROUND AND SPACE

Observational methods for stellar magnetism: from detection to cartography	447
<i>K. G. Strassmeier, T. A. Carroll, I. Ilyin & S. Järvinen</i>	
Prospect on intergalactic magnetic field measurements with gamma-ray instruments	459
<i>H. Sol, A. Zech, C. Boisson, H. Krawczynski, L. Fallon, E. de Gouveia Dal Pino, J. Hinton, S. Inoue, A. Neronov & R. White</i>	

How the planetary research helps to the stellar dynamo understanding	471
<i>I. Boisse, M. Oshagh, C. Lovis, N. C. Santos, X. Dumusque, X. Bonfils, M. Montalto & G. Boué</i>	
CrH molecule: New diagnostic tool for measuring magnetic fields of cool dwarfs.	477
<i>O. Kuzmychov & S. V. Berdyugina</i>	
Solar initiative at Oukaimeden Observatory	479
<i>Z. Benkaldoun, J. J. Makela & J. W. Meriwether</i>	
Development and first year of results from the Heliometer of Observatório Nacional	481
<i>A. H. Andrei, V. A. D'Ávila, E. Reis Neto, J. L. Penna, S. C. Boscardin, A. Coletti, L. C. Oliveira & C. Sigismonti</i>	
Geometrical information on the solar shape: high precision results with SDO/HMI	483
<i>X. Wang & C. Sigismonti</i>	
Venus transit, aureole and solar diameter	485
<i>W. Xie, C. Sigismonti, X. Wang & P. Tanga</i>	
Observations of interplanetary scintillation in China	487
<i>L.-J. Liu & B. Peng</i>	
Radio imaging-spectroscopy observations of the Sun in decimetric and centimetric wavelengths	489
<i>Y. Yan, W. Wang, F. Liu, L. Geng, Z. Chen & J. Zhang</i>	
Calibration and data analysis for Chinese Spectral Radioheliograph	495
<i>W. Wang, Y. H. Yan, D. H. Liu, Z. J. Chen, F. Liu, L. H. Geng, L. J. Chen & C. Su</i>	
Five-element Digital Corrector Receiver for the Chinese Spectral Radioheliograph	497
<i>A. Zhao, Y. Yan, W. Wang, L. Chen, J. Zhang & F. Liu</i>	
Microwave observations of the Chinese Solar Broadband Radio Spectrometer at Huairou	499
<i>C. Tan, B. Tan, Y. Yan & Y. Liu</i>	
A simulation of imaging capabilities for the Chinese Spectral Radioheliograph	501
<i>J. Du, Y. Yan & W. Wang</i>	
An intelligent method for solar flare observation	503
<i>J. B. Lin, J. Guo & Y. Y. Deng</i>	
IX. MAGNETIC FIELDS AND CORONAL ACTIVITY	
Helicity transport from solar convection zone to interplanetary space	507
<i>M. Zhang</i>	
Magnetic helicity ejections and coronal activity	519
<i>A. Nindos</i>	
Connections between photospheric current helicity, flares and solar subsurface ki- netic helicity	531
<i>Y. Gao, J. Zhao & H. Zhang</i>	

Space environment during Solar Minimum of SC-23.....	533
<i>A. A. Hady</i>	
Helicity, induced electric field and Poynting flux of AR 11158 and their relationship with the X-class flare	535
<i>J. Liu, J. Su & H. Zhang</i>	
Magnetic helicity injection in NOAA 11261 associated with flares	537
<i>H. Xu, H. Z, J. Su, G. Ruan & J. Liu</i>	
Probing the solar origin of energy build-up and release in solar energetic particles	539
<i>A. K. Awasthi, R. Jain & N. J. Bhatt</i>	
Generalization of the Neupert effect over the solar flare plasma cooling.....	541
<i>A. K. Awasthi & R. Jain</i>	
Observations of a geomagnetic SI ⁺ – SI ⁻ pair and associated solar wind fluctuations	543
<i>S. K. Bisoi & P. Janardhan</i>	
Radiative hydrodynamic simulations of He I 10830 Å	545
<i>J. X. Cheng, M. D. Ding & C. Fang</i>	
Coordinate flares observed by TRACE	547
<i>D. Kong, X. Yan & Z. Xue</i>	
Polar jet kinetics and energetics analysed from STEREO/COR data.....	549
<i>L. Feng & W. Q. Gan</i>	
A statistical study on solar soft X-ray flare and the sources	551
<i>J. Guo</i>	
Tests and applications of nonlinear force-free field extrapolations in spherical geometry	553
<i>Y. Guo & M. D. Ding</i>	
A small-scale EUV jet in the quiet Sun region	555
<i>J. Hong, Y. Jiang, R. Zheng & Y. Bi</i>	
Changing photospheric vector magnetic fields associated with a B4.2-class solar flare	561
<i>J. Su, Y. Liu & Y. Shen</i>	
Observational evidence of unwinding and chirality changing in penumbral filaments by Hinode	565
<i>J. Su & Y. Liu</i>	
SDO/AIA and Hinode/EIS observations of interaction between an EUV wave and active region loops	567
<i>L. Yang, J. Zhang, T. Li & W. Liu</i>	
Accuracy analysis and application of extrapolation of force-free fields in solar active and quiet regions	569
<i>S. Liu, H. Zhang, J. Su & M. Song</i>	
Solar flares observed simultaneously with SphinX, GOES and RHESSI.....	571
<i>T. Mrozek, S. Gburek, M. Siarkowski, B. Sylwester, J. Sylwester, A. Kepa & M. Gryciuk</i>	

Flares and non-potentiality of AR 11158	573
<i>Q. Song, J. Zhang, S. Yang & Y. Liu</i>	
Numerical simulations of the CME on 2010 April 8	575
<i>Y. Su, B. Kliem, A. van Ballegooijen & E. Deluca</i>	
Peculiar microwave quasi-periodic pulsations with zigzag pattern in a CME-related flare on 2005-01-15	577
<i>B. Tan</i>	
Nonlinear force-free magnetic field extrapolation in AR 11158 by GPU-DBIE . .	579
<i>R. Wang & Y. Yan</i>	
Frequency and time properties of decimeter narrowband spikes in solar flares . .	581
<i>S. Wang</i>	
Simulation of a CME-driven shock by anisotropic scattering angular distributions	583
<i>X. Wang & Y. Yan</i>	
Study of ribbon separation and magnetic reconnection rates	585
<i>W. Xie, H. Zhang, J. Lin & H. Wang</i>	
A statistical study on photospheric active-region magnetic nonpotentiality and associated flares during solar cycles 22 – 23	587
<i>X. Yang, H. Zhang, G. Lin, Y. Gao & J. Guo</i>	
Relaxation of magnetic field relative to plasma density during solar flares . . .	589
<i>S. Yu, Y. Yan & B. Tan</i>	
Reflection and refraction of an extreme ultraviolet wave at boundary of coronal hole	591
<i>Z. Xue, Z. Qu, X. Yan & L. Zhao</i>	
Formation and disappearance of a filament	593
<i>G. P. Zhou, J. X. Wang & S. Tsuneta</i>	
Waldmeier relations and the solar cycle dynamics by the mean-field dynamos .	595
<i>V. V. Pipin, D. D. Sokoloff & I. G. Usoskin</i>	
Author index	597

