



NEW PERSPECTIVES ON SOLAR PROMINENCES
IAU Colloquium 167



Edited by
David Webb, David Rust, and Brigitte Schmieder

NEW PERSPECTIVES ON SOLAR PROMINENCES
IAU Colloquium 167

A SERIES OF BOOKS ON RECENT DEVELOPMENTS IN ASTRONOMY AND ASTROPHYSICS

**Managing Editor, D. Harold McNamara
Production Manager, Elizabeth S. Holloman**

A.S.P. CONFERENCE SERIES PUBLICATIONS COMMITTEE

**Sallie Baliunas, Chair
Carol Ambruster
Catharine Garmany
Mark S. Giampapa
Kenneth Janes**

**© Copyright 1998 Astronomical Society of the Pacific
390 Ashton Avenue, San Francisco, California 94112**

All rights reserved

Printed by BookCrafters, Inc.

First published 1998

**Library of Congress Catalog Card Number: 98-72562
ISBN 1-886733-70-8**

Please contact proper address for information on:

PUBLISHING: Managing Editor PO Box 24463 211 KMB Brigham Young University Provo, UT 84602-4463 USA 801-378-2298	ORDERING BOOKS: Astronomical Society of the Pacific CONFERENCE SERIES 390 Ashton Avenue San Francisco, CA 94112 - 1722 USA 415-337-2624
pasp@astro.byu.edu Fax: 801-378-2265	catalog@aspsky.org Fax: 415-337-5205

A SERIES OF BOOKS ON RECENT DEVELOPMENTS IN ASTRONOMY AND ASTROPHYSICS

Vol. 1-Progress and Opportunities in Southern Hemisphere Optical Astronomy: CTIO 25th Anniversary Symposium ed. V. M. Blanco and M. M. Phillips	ISBN 0-937707-18-X
Vol. 2-Proceedings of a Workshop on Optical Surveys for Quasars ed. P. S. Osmer, A. C. Porter, R. F. Green, and C. B. Foltz	ISBN 0-937707-19-8
Vol. 3-Fiber Optics in Astronomy ed. S. C. Barden	ISBN 0-937707-20-1
Vol. 4-The Extragalactic Distance Scale: Proceedings of the ASP 100th Anniversary Symposium ed. S. van den Bergh and C. J. Pritchett	ISBN 0-937707-21-X
Vol. 5-The Minnesota Lectures on Clusters of Galaxies and Large-Scale Structure ed. J. M. Dickey	ISBN 0-937707-22-8
Vol. 6-Synthesis Imaging in Radio Astronomy: A Collection of Lectures from the Third NRAO Synthesis Imaging Summer School ed. R. A. Perley, F. R. Schwab, and A. H. Bridle	ISBN 0-937707-23-6
Vol. 7-Properties of Hot Luminous Stars: Boulder-Munich Workshop ed. C. D. Garmany	ISBN 0-937707-24-4
Vol. 8-CCDs in Astronomy ed. G. H. Jacoby	ISBN 0-937707-25-2
Vol. 9-Cool Stars, Stellar Systems, and the Sun. Sixth Cambridge Workshop ed. G. Wallerstein	ISBN 0-937707-27-9
Vol. 10-Evolution of the Universe of Galaxies: Edwin Hubble Centennial Symposium ed. R. G. Kron	ISBN 0-937707-28-7
Vol. 11-Confrontation Between Stellar Pulsation and Evolution ed. C. Cacciari and G. Clementini	ISBN 0-937707-30-9
Vol. 12-The Evolution of the Interstellar Medium ed. L. Blitz	ISBN 0-937707-31-7
Vol. 13-The Formation and Evolution of Star Clusters ed. K. Janes	ISBN 0-937707-32-5
Vol. 14-Astrophysics with Infrared Arrays ed. R. Elston	ISBN 0-937707-33-3
Vol. 15-Large-Scale Structures and Peculiar Motions in the Universe ed. D. W. Latham and L. A. N. da Costa	ISBN 0-937707-34-1
Vol. 16-Proceedings of the 3rd Haystack Observatory Conference on Atoms, Ions and Molecules: New Results in Spectral Line Astrophysics ed. A. D. Haschick and P. T. P. Ho	ISBN 0-937707-35-X
Vol. 17-Light Pollution, Radio Interference, and Space Debris ed. D. L. Crawford	ISBN 0-937707-36-8
Vol. 18-The Interpretation of Modern Synthesis Observations of Spiral Galaxies ed. N. Duric and P. C. Crane	ISBN 0-937707-37-6
Vol. 19-Radio Interferometry: Theory, Techniques, and Applications, IAU Colloquium 131 ed. T. J. Cornwell and R. A. Perley	ISBN 0-937707-38-4
Vol. 20-Frontiers of Stellar Evolution: 50th Anniversary McDonald Observatory (1939-1989) ed. D. L. Lambert	ISBN 0-937707-39-2

Vol. 21-The Space Distribution of Quasars ed. D. Crampton	ISBN 0-937707-40-6
Vol. 22-Nonisotropic and Variable Outflows from Stars ed. L. Drissen, C. Leitherer, and A. Nota	ISBN 0-937707-41-4
Vol. 23-Astronomical CCD Observing and Reduction Techniques ed. S. B. Howell	ISBN 0-937707-42-4
Vol. 24-Cosmology and Large-Scale Structure in the Universe ed. R. R. de Carvalho	ISBN 0-937707-43-0
Vol. 25-Astronomical Data Analysis Software and Systems I ed. D. M. Worrall, C. Biemesderfer, and J. Barnes	ISBN 0-937707-44-9
Vol. 26-Cool Stars, Stellar Systems, and the Sun, Seventh Cambridge Workshop ed. M. S. Giampapa and J. A. Bookbinder	ISBN 0-937707-45-7
Vol. 27-The Solar Cycle: Proceedings of the National Solar Observatory/Sacramento Peak 12th Summer Workshop ed. K. L. Harvey	ISBN 0-937707-46-5
Vol. 28-Automated Telescopes for Photometry and Imaging ed. S. J. Adelman, R. J. Dukes, Jr., and C. J. Adelman	ISBN 0-937707-47-3
Vol. 29-Viña Del Mar Workshop on Cataclysmic Variable Stars ed. N. Vogt	ISBN 0-937707-48-1
Vol. 30-Variable Stars and Galaxies ed. B. Warner	ISBN 0-937707-49-X
Vol. 31-Relationships Between Active Galactic Nuclei and Starburst Galaxies ed. A. V. Filippenko	ISBN 0-937707-50-3
Vol. 32-Complementary Approaches to Double and Multiple Star Research, IAU Colloquium 135 ed. H. A. McAlister and W. I. Hartkopf	ISBN 0-937707-51-1
Vol. 33-Research Amateur Astronomy ed. S. J. Edberg	ISBN 0-937707-52-X
Vol. 34-Robotic Telescopes in the 1990s ed. A. V. Filippenko	ISBN 0-937707-53-8
Vol. 35-Massive Stars: Their Lives in the Interstellar Medium ed. J. P. Cassinelli and E. B. Churchwell	ISBN 0-937707-54-6
Vol. 36-Planets Around Pulsars ed. J. A. Phillips, S. E. Thorsett, and S. R. Kulkarni	ISBN 0-937707-55-4
Vol. 37-Fiber Optics in Astronomy II ed. P. M. Gray	ISBN 0-937707-56-2
Vol. 38-New Frontiers in Binary Star Research: Pacific Rim Colloquium ed. K. C. Leung and I.-S. Nha	ISBN 0-937707-57-0
Vol. 39-The Minnesota Lectures on the Structure and Dynamics of the Milky Way ed. Roberta M. Humphreys	ISBN 0-937707-58-9
Vol. 40-Inside the Stars, IAU Colloquium 137 ed. Werner W. Weiss and Annie Baglin	ISBN 0-937707-59-7
Vol. 41-Astronomical Infrared Spectroscopy: Future Observational Directions ed. Sun Kwok	ISBN 0-937707-60-0
Vol. 42-GONG 1992: Seismic Investigation of the Sun and Stars ed. Timothy M. Brown	ISBN 0-937707-61-9

Vol. 43-Sky Surveys: Protostars to Protogalaxies ed. B. T. Soifer	ISBN 0-937707-62-7
Vol. 44-Peculiar Versus Normal Phenomena in A-Type and Related Stars, IAU Colloquium 138 ed. M. M. Dworetsky, F. Castelli, and R. Faraggiana	ISBN 0-937707-63-5
Vol. 45-Luminous High-Latitude Stars ed. D. D. Sasselov	ISBN 0-937707-64-3
Vol. 46-The Magnetic and Velocity Fields of Solar Active Regions, IAU Colloquium 141 ed. H. Zirin, G. Ai, and H. Wang	ISBN 0-937707-65-1
Vol. 47-Third Decennial US-USSR Conference on SETI ed. G. Seth Shostak	ISBN 0-937707-66-X
Vol. 48-The Globular Cluster-Galaxy Connection ed. Graeme H. Smith and Jean P. Brodie	ISBN 0-937707-67-8
Vol. 49-Galaxy Evolution: The Milky Way Perspective ed. Steven R. Majewski	ISBN 0-937707-68-6
Vol. 50-Structure and Dynamics of Globular Clusters ed. S. G. Djorgovski and G. Meylan	ISBN 0-937707-69-4
Vol. 51-Observational Cosmology ed. G. Chincarini, A. Iovino, T. Maccacaro, and D. Maccagni	ISBN 0-937707-70-8
Vol. 52-Astronomical Data Analysis Software and Systems II ed. R. J. Hanisch, R. J. V. Brissenden, and Jeannette Barnes	ISBN 0-937707-71-6
Vol. 53-Blue Stragglers ed. Rex A. Saffer	ISBN 0-937707-72-4
Vol. 54-The First Stromlo Symposium: The Physics of Active Galaxies ed. Geoffrey V. Bicknell, Michael A. Dopita, and Peter J. Quinn	ISBN 0-937707-73-2
Vol. 55-Optical Astronomy from the Earth and Moon ed. Diane M. Pyper and Ronald J. Angione	ISBN 0-937707-74-0
Vol. 56-Interacting Binary Stars ed. Allen W. Shafter	ISBN 0-937707-75-9
Vol. 57-Stellar and Circumstellar Astrophysics ed. George Wallerstein and Alberto Noriega-Crespo	ISBN 0-937707-76-7
Vol. 58-The First Symposium on the Infrared Cirrus and Diffuse Interstellar Clouds ed. Roc M. Cutri and William B. Latter	ISBN 0-937707-77-5
Vol. 59-Astronomy with Millimeter and Submillimeter Wave Interferometry, IAU Colloquium 140 ed. M. Ishiguro and Wm. J. Welch	ISBN 0-937707-78-3
Vol. 60-The MK Process at 50 Years: A Powerful Tool for Astrophysical Insight: A Workshop of the Vatican Observatory ed. C. J. Corbally, R. O. Gray, and R. F. Garrison	ISBN 0-937707-79-1
Vol. 61-Astronomical Data Analysis Software and Systems III ed. Dennis R. Crabtree, R. J. Hanisch, and Jeannette Barnes	ISBN 0-937707-80-5
Vol. 62-The Nature and Evolutionary Status of Herbig Ae / Be Stars ed. P. S. Thé, M. R. Pérez, and E. P. J. van den Heuvel	ISBN 0-937707-81-3
Vol. 63-Seventy-Five Years of Hirayama Asteroid Families: The role of Collisions in the Solar System History ed. R. P. Binzel, Y. Kozai, and T. Hirayama	ISBN 0-937707-82-1
Vol. 64-Cool Stars, Stellar Systems, and the Sun, Eighth Cambridge Workshop ed. Jean-Pierre Caillault	ISBN 0-937707-83-X

Vol. 65-Clouds, Cores, and Low Mass Stars ed. Dan P. Clemens and Richard Barvainis	ISBN 0-937707-84-8
Vol. 66- Physics of the Gaseous and Stellar Disks of the Galaxy ed. Ivan R. King	ISBN 0-937707-85-6
Vol. 67-Unveiling Large-Scale Structures Behind the Milky Way ed. C. Balkowski and R. C. Kraan-Korteweg	ISBN 0-937707-86-4
Vol. 68-Solar Active Region Evolution: Comparing Models with Observations ed. K. S. Balasubramaniam and George W. Simon	ISBN 0-937707-87-2
Vol. 69-Reverberation Mapping of the Broad-Line Region in Active Galactic Nuclei ed. P. M. Gondhalekar, K. Horne, and B. M. Peterson	ISBN 0-937707-88-0
Vol. 70-Groups of Galaxies ed. Otto G. Richter and Kirk Borne	ISBN 0-937707-89-9
Vol. 71-Tridimensional Optical Spectroscopic Methods in Astrophysics, IAU Colloquium 149 ed. G. Comte and M. Marcellin	ISBN 0-937707-90-2
Vol. 72-Millisecond Pulsars: A Decade of Surprise, ed. A. A. Fruchter, M. Tavani, and D. C. Backer	ISBN 0-937707-91-0
Vol. 73-Airborne Astronomy Symposium on the Galactic Ecosystem: From Gas to Stars to Dust ed. M. R. Haas, J. A. Davidson, and E. F. Erickson	ISBN 0-937707-92-9
Vol. 74-Progress in the Search for Extraterrestrial Life: 1993 Bioastronomy Symposium ed. G. Seth Shostak	ISBN 0-937707-93-7
Vol. 75-Multi-Feed Systems for Radio Telescopes ed. D. T. Emerson and J. M. Payne	ISBN 0-937707-94-5
Vol. 76-GONG '94: Helio- and Astero-Seismology from the Earth and Space ed. Roger K. Ulrich, Edward J. Rhodes, Jr., and Werner Däppen	ISBN 0-937707-95-3
Vol. 77-Astronomical Data Analysis Software and Systems IV ed. R. A. Shaw, H. E. Payne, and J. J. E. Hayes	ISBN 0-937707-96-1
Vol. 78-Astrophysical Applications of Powerful New Databases: Joint Discussion No. 16 of the 22nd General Assembly of the IAU ed. S. J. Adelman and W. L. Wiese	ISBN 0-937707-97-X
Vol. 79-Robotic Telescopes: Current Capabilities, Present Developments, and Future Prospects for Automated Astronomy ed. Gregory W. Henry and Joel A. Eaton	ISBN 0-937707-98-8
Vol. 80-The Physics of the Interstellar Medium and Intergalactic Medium ed. A. Ferrara, C. F. McKee, C. Heiles, and P. R. Shapiro	ISBN 0-937707-99-6
Vol. 81-Laboratory and Astronomical High Resolution Spectra ed. A. J. Sauval, R. Blomme, and N. Grevesse	ISBN 1-886733-01-5
Vol. 82-Very Long Baseline Interferometry and the VLBA ed. J. A. Zensus, P. J. Diamond, and P. J. Napier	ISBN 1-886733-02-3
Vol. 83-Astrophysical Applications of Stellar Pulsation, IAU Colloquium 155 ed. R. S. Stobie and P. A. Whitelock	ISBN 1-886733-03-1
Vol. 84-The Future Utilisation of Schmidt Telescopes, IAU Colloquium 148 ed. Jessica Chapman, Russell Cannon, Sandra Harrison, and Bambang Hidayat	ISBN 1-886733-05-8
Vol. 85-Cape Workshop on Magnetic Cataclysmic Variables ed. D. A. H. Buckley and B. Warner	ISBN 1-886733-06-6
Vol. 86-Fresh Views of Elliptical Galaxies ed. Alberto Buzzoni, Alvio Renzini, and Alfonso Serrano	ISBN 1-886733-07-4

Vol. 87-New Observing Modes for the Next Century ed. Todd Boroson, John Davies, and Ian Robson	ISBN 1-886733-08-2
Vol. 88-Clusters, Lensing, and the Future of the Universe ed. Virginia Trimble and Andreas Reisenegger	ISBN 1-886733-09-0
Vol. 89-Astronomy Education: Current Developments, Future Coordination ed. John R. Percy	ISBN 1-886733-10-4
Vol. 90-The Origins, Evolution, and Destinies of Binary Stars in Clusters ed. E. F. Milone and J. -C. Mermilliod	ISBN 1-886733-11-2
Vol. 91-Barred Galaxies, IAU Colloquium 157 ed. R. Buta, D. A. Crocker, and B. G. Elmegreen	ISBN 1-886733-12-0
Vol. 92-Formation of the Galactic Halo--Inside and Out ed. H. L. Morrison and A. Sarajedini	ISBN 1-886733-13-9
Vol. 93-Radio Emission from the Stars and the Sun ed. A. R. Taylor and J. M. Paredes	ISBN 1-886733-14-7
Vol. 94-Mapping, Measuring, and Modelling the Universe ed. Peter Coles, Vicent Martinez, and Maria-Jesus Pons-Borderia	ISBN 1-886733-15-5
Vol. 95-Solar Drivers of Interplanetary and Terrestrial Disturbances: Proceedings of 16th International Workshop, National Solar Observatory/Sacramento Peak ed. K.S. Balasubramaniam, S. L. Keil, and R. N. Smartt	ISBN 1-886733-16-3
Vol. 96-Hydrogen-Deficient Stars ed. C. S. Jeffery and U. Heber	ISBN 1-886733-17-1
Vol. 97-Polarimetry of the Interstellar Medium ed. W. G. Roberge and D. C. B. Whittet	ISBN 1-886733-18-X
Vol. 98-From Stars to Galaxies: The Impact of Stellar Physics on Galaxy Evolution ed. Claus Leitherer, Uta Fritze-von Alvensleben, and John Huchra	ISBN 1-886733-19-8
Vol. 99-Cosmic Abundances: Proceedings of the 6th Annual October Astrophysics Conference ed. Stephen S. Holt and George Sonneborn	ISBN 1-886733-20-1
Vol. 100-Energy Transport in Radio Galaxies and Quasars ed. P. E. Hardee, A. H. Bridle, and J. A. Zensus	ISBN 1-886733-21-X
Vol. 101-Astronomical Data Analysis Software and Systems V ed. George H. Jacoby and Jeannette Barnes	ISSN 1080-7926
Vol. 102-The Galactic Center, 4th ESO/CTIO Workshop ed. Roland Gredel	ISBN 1-886733-22-8
Vol. 103-The Physics of Liners in View of Recent Observations ed. M. Eracleous, A. Koratkar, C. Leitherer, and L. Ho	ISBN 1-886733-23-6
Vol. 104-Physics, Chemistry, and Dynamics of Interplanetary Dust, IAU Colloquium 150 ed. Bo A. S. Gustafson and Martha S. Hanner	ISBN 1-886733-24-4
Vol. 105-Pulsars: Problems and Progress, IAU Colloquium 160 ed. M. Bailes, S. Johnston, and M.A. Walker	ISBN 1-886733-25-2
Vol. 106-Minnesota Lectures on Extragalactic Neutral Hydrogen ed. Evan D. Skillman	ISBN 1-886733-26-0
Vol. 107-Completing the Inventory of the Solar System: A Symposium held in conjunction with the 106th Annual Meeting of the ASP ed. Terrence W. Rettig and Joseph M. Hahn	ISBN 1-886733-27-9

Vol. 108-M. A. S. S. Model Atmospheres and Spectrum Synthesis: 5th Vienna Workshop ed. S. J. Adelman, F. Kupka, and W. W. Weiss	ISBN 1-886733-28-7
Vol. 109-Cool Stars, Stellar Systems, and the Sun, Ninth Cambridge Workshop ed. Roberto Pallavicini and Andrea K. Dupree	ISBN 1-886733-29-5
Vol. 110-Blazar Continuum Variability ed. H. R. Miller, J. R. Webb, and J. C. Noble	ISBN 1-886733-30-9
Vol. 111-Magnetic Reconnection in the Solar Atmosphere: Proceedings of a Yohkoh Conference ed. R. D. Bentley and J. T. Mariska	ISBN 1-886733-31-7
Vol. 112-The History of the Milky Way and Its Satellite System ed. A. Burkert, D. H. Hartmann, and S. R. Majewski	ISBN 1-886733-32-5
Vol. 113-Emission Lines in Active Galaxies: New Methods and Techniques, IAU Colloquium 159 ed. B. M. Peterson, F.-Z. Cheng, and A. S. Wilson	ISBN 1-886733-33-3
Vol. 114-Young Galaxies and QSO Absorption-Line Systems ed. Sueli M. Viegas, Ruth Gruenwald, and Reinaldo R. de Carvalho	ISBN 1-886733-34-1
Vol. 115-Galactic and Cluster Cooling Flows ed. Noam Soker	ISBN 1-886733-35-X
Vol. 116-The Second Stromlo Symposium: The Nature of Elliptical Galaxies ed. M. Arnaboldi, G. S. Da Costa, and P. Saha	ISBN 1-886733-36-8
Vol. 117-Dark and Visible Matter in Galaxies ed. Massimo Persic and Paolo Salucci	ISBN 1-866733-37-6
Vol. 118-First Advances in Solar Physics Euroconference: Advances in the Physics of Sunspots ed. B. Schmieder, J. C. del Toro Iiesta, and M. Vázquez	ISBN 1-886733-38-4
Vol. 119-Planets Beyond the Solar System and the Next Generation of Space Missions ed. David R. Soderblom	ISBN 1-886733-39-2
Vol. 120-Luminous Blue Variables: Massive Stars in Transition ed. Antonella Nota and Henny J. G. L. M. Lamers	ISBN 1-886733-40-6
Vol. 121-Accretion Phenomena and Related Outflows, IAU Colloquium 163 ed. D. T. Wickramasinghe, G. V. Bicknell and L. Ferrario	ISBN 1-886733-41-4
Vol. 122-From Stardust to Planetesimals: Symposium held as part of the 108th Annual Meeting of the ASP ed. Yvonne J. Pendleton and A. G. G. M. Tielens	ISBN 1-886733-42-2
Vol. 123-The 12th 'Kingston Meeting': Computational Astrophysics ed. David A. Clarke and Michael J. West	ISBN 1-886733-43-0
Vol. 124-Diffuse Infrared Radiation and the IRTS ed. Haruyuki Okuda, Toshio Matsumoto, and Thomas L. Roellig	ISBN 1-886733-44-9
Vol. 125-Astronomical Data Analysis Software and Systems VI ed. Gareth Hunt and H. E. Payne	ISBN 1-886733-45-7
Vol. 126-From Quantum Fluctuations to Cosmological Structures ed. D. Valls-Gabaud, M. A. Hendry, P. Molaro, and K. Chamcham	ISBN 1-886733-46-5

Vol. 127—Proper Motions and Galactic Astronomy ed. Roberta M. Humphreys	ISBN 1-886733-47-3
Vol. 128—Mass Ejection from AGN (Active Galactic Nuclei) ed. N. Arav, I. Shlosman, and R. J. Weymann	ISBN 1-886733-48-1
Vol. 129—The George Gamow Symposium ed. E. Harper, W. C. Parke, and G. D. Anderson	ISBN 1-886733-49-X
Vol. 130—The Third Pacific Rim Conference on Recent Development on Binary Star Research ed. Kam-Ching Leung	ISBN 1-886733-50-3
Vol. 131—Boulder-Munich II: Properties of Hot, Luminous Stars ed. Ian D. Howarth	ISBN 1-886733-51-1
Vol. 132—Star Formation with the Infrared Space Observatory (ISO) ed. João L. Yun and René Liseau	ISBN 1-886733-52-X
Vol. 133—Science with the NGST ed. Eric P. Smith and Anuradha Koratkar	ISBN 1-886733-53-8
Vol. 134—Brown Dwarfs and Extrasolar Planets ed. Rafael Rebolo, Eduardo L. Martin, and Maria Rosa Zapatero Osorio	ISBN 1-886733-54-6
Vol. 135—A Half Century of Stellar Pulsation Interpretations: A Tribute to Arthur N. Cox ed. P. A. Bradley and J. A. Guzik	ISBN 1-886733-55-4
Vol. 136—Galactic Halos: A UC Santa Cruz Workshop ed. Dennis Zaritsky	ISBN 1-886733-56-2
Vol. 137—Wild Stars in the Old West: Proceedings of the 13th North American Workshop on Cataclysmic Variables and Related Objects ed. S. Howell, E. Kuulkers, and C. Woodward	ISBN 1-886733-57-0
Vol. 138—1997 Pacific Rim Conference on Stellar Astrophysics ed. Kwing L. Chan, K. S. Cheng, and Harinder P. Singh	ISBN 1-886733-58-9
Vol. 139—Preserving the Astronomical Windows ed. Syuzo Isobe and Tomohiro Hirayama	ISBN 1-886733-59-7
Vol. 140—Synoptic Solar Physics ed. K. S. Balasubramaniam, J. W. Harvey, and D. M. Rabin	ISBN 1-886733-60-0
Vol. 141—Astrophysics from Antarctica ed. Giles Novak and Randall H. Landsberg	ISBN 1-886733-61-9
Vol. 142—The Stellar Initial Mass Function, 38th Herstmonceux Conference ed. Gerry Gilmore and Debbie Howell	ISBN 1-886733-62-7
Vol. 143—The Scientific Impact of the Goddard High Resolution Spectrograph ed. John C. Brandt, Thomas B. Ake III, and Carolyn Collins Petersen	ISBN 1-886733-63-5
Vol. 144—Radio Emission from Galactic and Extragalactic Compact Sources, IAU Colloquium 164 ed. J. Anton Zensus, G. B. Taylor, and J. M. Wrobel	ISBN 1-886733-64-3
Vol. 145—Astronomical Data Analysis Software and Systems VII ed. Rudolf Albrecht, Richard N. Hook, and Howard A. Bushouse	ISBN 1-886733-65-1

Vol. 146-The Young Universe: Galaxy Formation and Evolution at
Intermediate and High Redshift
ed. S. D'Odorico, A. Fontana, and E. Giallongo

ISBN 1-886733-66-X

Vol. 147-Abundance Profiles: Diagnostic Tools for Galaxy History
ed. Daniel Friedli, Mike Edmunds, Carmelle Robert,
and Laurent Drissen

ISBN 1-886733-67-8

Vol. 148-Origins

ed. Charles E. Woodward, J. Michael Shull,
and Harley A. Thronson, Jr.

ISBN 1-886733-68-6

Vol. 149-Solar System Formation and Evolution
ed. D. Lazzaro, R. Vieira Martins, S. Ferraz-Mello,
J. Fernández, and C. Beaugé

ISBN 1-886733-69-4

Vol. 150-New Perspectives on Solar Prominences, IAU Colloquium 167

ed. David Webb, David Rust, and Brigitte Schmieder

ISBN 1-886733-70-8

Inquiries concerning these volumes should be directed to the:

Astronomical Society of the Pacific
CONFERENCE SERIES
390 Ashton Avenue
San Francisco, CA 94112-1722 USA
415-337-2126
catalog@aspssky.org
Fax: 415-337-5205

ASTRONOMICAL SOCIETY OF THE PACIFIC
CONFERENCE SERIES



Volume 150

NEW PERSPECTIVES ON SOLAR PROMINENCES
IAU Colloquium 167

Proceedings of a meeting held in Aussois, France
28 April - 4 May 1997

Edited by
David Webb, David Rust, and Brigitte Schmieder

Table of Contents

Preface	xxi
Workshop Participants	xxiii
Group Photograph	xxx

Introduction

Lucien d'Azambuja M. J. Martres	3
The History of Solar Prominence Research (Review) E. Tandberg-Hanssen	11

Filaments and Their Environment

Observations of Filament Structure and Dynamics (Review) O. Engvold	23
Dynamics and Fine Structures in Quiescent Prominences (MSDP/Pic du Midi, SOHO/SUMER and CDS) K. Li, J.-M. Malherbe, J. E. Wiik, B. Schmieder, Th. Roudier, T. Kucera and A. Poland	32
Observations of the Association of Prominences and the Surrounding Corona R. N. Smartt, Z. Zhang, V. S. Airapetian and I. S. Kim	37
First Year of Observations with SOHO/EIT of the “Quiet” Sun Corona F. Portier-Fozzani, A. J. Maucherat and the EIT Team	41
The Plasma Environment of Prominences – SOHO Observations (Review) D. Moses, C.M. Korendyke, N. Moulton and J. Newmark	45
EUV and Microwave Observations of a Filament F. Chiuderi-Drago, K. Bocchialini, S. Lamartinie, J.-C. Vial, T. Bastian, C. E. Alissandrakis, R. Harrison, J.-P. Delaboudinière and P. Lemaire	55
A Statistical Investigation of Prominence Fine Structure in the EUV S. Pojoga, A. G. Nikoghossian and Z. Mouradian	59
Small-Scale Structure in Loops and Prominence Threads P. Rudawy and M. S. Madjarska	63
Eclipse Polarimetric Research of Prominences A. N. Lebedev, I. A. Belenko, O. I. Bougaenko, I. S. Kim, O. T. Matsuura, E. Picazzio, R. P. Livi and S. H. Livi	66

On the Bright Rims of H α Filaments F. Paletou	70
A Large Filament and Flares in Active Region NOAA 5669 on September 2, 1989 G. A. Porfir'eva, G. V. Yakunina and Z. Mouradian	74
Magnetic Fields in Filaments (Review) P. Démoulin	78
3-D Twisted Flux-Tube in a Linear Force-Free Equilibrium G. Aulanier and P. Démoulin	86
Concerning Magnetic Field Measurements in Prominences Using Zeeman and Hanle Methods V. S. Bashkirtsev and G. P. Mashnich	90
Hidden Manifestations of Inverse Polarity in Filaments B. P. Filippov	94
Vector Magnetic Fields in the Base of Filaments and the Filament Environment J. Wang and W. Li	98
Magnetic Helicity and Filaments (Review) M. A. Berger	102
On The Relationship Between Current and Magnetic Field in Ring-Filaments D. K. Callebaut and V. I. Makarov	111
Formation of Thin Current Sheets in the Solar Atmosphere C. Z. Cheng and G. S. Choe	115
Plasma Electric Field Measurements as a Diagnostic of Neutral Sheets in Prominences P. Foukal	119
Nonstationary Electric Drifts in the Solar Atmosphere I. S. Veselovsky	123
A Model of Plasma Sheets in Equilibrium S. Koutchmy, M. Molodensky and D. Vibert	127
Latitudinal Variations of Line-of-Sight Velocity Oscillations in the Photosphere, Chromosphere and Prominences G. P. Mashnich and V. S. Bashkirtsev	131
Velocity Fields of a Filament Region Observed with Ground-Based Telescopes and from SOHO P. Mein, B. Schmieder, J.-M. Malherbe, J. E. Wiik, O. Engvold, P. Brekke, J. B. Zirker, A. I. Poland, J.-P. Delaboudinière and J. Staiger	135
Infrared Doppler Oscillations in a Solar Filament R. Molowny-Horas, R. Oliver, J. L. Ballester and F. Baudin	139
The Prominence-Corona Transition Region and the Problem of Prominence Oscillations R. Oliver and J. L. Ballester	143

Prominence Oscillations and the Influence of the Distant Photosphere N. A. J. Schutgens, M. Kuperus and G.H.J. van den Oord	147
Nonlinear Waves in Force-Free Fibrils Y. D. Zhugzhda and V. M. Nakariakov	151
Linear Waves in Force-free Fibrils Y. D. Zhugzhda	155
Observation of Prominence Heating and the Heating Mechanism L. Ofman, Z. Mouradian, T. A. Kucera and A. I. Poland	159
Yohkoh Observations of Coronal Structures Surrounding Dark Filaments (Review) Y. Uchida	163
Axial Soft X-ray Brightening Associated with H α Filaments F. C. R. Solberg and A. McAllister	171
Solar Prominence Diagnostics (Review) J.-C. Vial	175
Lyman Lines in Prominences and Filaments: NLTE Modelling Strategies P. Heinzel	188
NLTE Model of a Quiescent Filament E. V. Kononovich, A. B. Gorshkov, O. B. Smirnova and P. Kotrč ..	190
Prominence Emission Lines Observed with SUMER and Two Ground-Based Telescopes C. R. de Boer, G. Stellmacher and E. Wiehr	196
Solar Prominence Diagnostics from November 3, 1994 Eclipse B. H. Foing, J. E. Wiik, L. Duvet, N. Henrich, S. Cravatte, F. David, B. Altieri, T. Beaufort, L. Ligot and E. Maurice	201
SUMER/SOHO Filament Observations in Selected Lyman Lines B. Schmieder, T. Kucera, P. Heinzel and J.-C. Vial	205
2-D Radiative Transfer Simulations with Angle-Dependent Partial Frequency Redistribution A. B. Gorshkov and P. Heinzel	209
Modelling of Non-Uniform Prominence Slabs P. Heinzel and U. Anzer	213
Spectroscopic Study of a Quiescent Prominence Y. D. Park, H. S. Yun, K. Ichimoto, K. J. Sim and Y.-J. Moon ...	217
Evolution of Complex Filaments C. Dumitrache	221
Stellar Filaments	
Evidence of Prominences on Cool Late-Type Stars (Review) P. B. Byrne, M. T. Eibe and G. H. J. van den Oord	227
Prominences on Rapidly-Rotating Solar-Type Stars M. Jardine, J. Barnes, Y. Unruh and A. Collier Cameron	235

Stability of an Idealized Equilibrium Model of Prominences in Rapidly-Rotating Stars M. Ferreira	239
Prominences and Circumstellar Emission Around FK Comae Berenices: Balmer Line Diagnostics from MUSICOS Spectra J. M. Oliveira, B. H. Foing, Ph. Gondoin, H. C. Stempels, T. Beaufort, R. S. Le Poole and J. A. de Jong	243
A Fibril Structure Model for Stellar Prominences R. Oliver and J. L. Ballester	247
Prominence-like Clouds Near HK Aqr G. H. J. van den Oord, P. B. Bryne and M. T. Elbe	251

Birth and Death of Filaments

Filament Channels: Essential Ingredients for Filament Formation (Review) V. Gaizauskas	257
Magnetic Flux Transport and Formation of Filament Channels A. A. van Ballegooijen, N. P. Cartledge and E. R. Priest	265
Filament Channels: Contrasting Their Structure in H α and He I 1083 nm K. L. Harvey and V. Gaizauskas	269
Force-Free Models of Filament Channels A. Longbottom	274
Simulation Studies of Solar Prominence Formation G. S. Choe and C. Z. Cheng	278
Are Prominences Formed by Flux Convergence? K. Galsgaard and A. W. Longbottom	282
Force-Free Models of a Filament Channel in Which a Filament Forms D. H. Mackay, V. Gaizauskas and E. R. Priest	286
Analysis of H α Observations of High Altitude Coronal Condensations U. A. Allen, F. Bagenal and A. J. Hundhausen	290
MHD and Plasma Interpretation of a Prominence Eruption Observed by SOHO (Review) P. C. H. Martens	294
Prominence Eruptions (Review) B. Vršnak	302
Magnetic Field Reconnection in the H α Eruptive Prominence on September 18, 1995 M. Karlický, P. Kotrč, S. Šimberová, M. Knížek and M. Varady ..	310
Wave Activity and Prominence Eruption F. Baudin, K. Bocchialini, C. Delannée, S. Koutchmy, G. Stellmacher, K. Shibata, I. S. Veselovsky, O. A. Panasenko and A. N. Zhukov ..	314
Helical Structure in an Eruptive Prominence Related to a CME (SUMER, CDS, LASCO)	

T. A. Kucera, A. I. Poland, J. E. Wiik, B. Schmieder and G. Simnett	318
Hα Observations of the Dual Eruptive Prominences of June 29, 1994	
L. Lenža	322
Behaviour of H α and H Ca II Emission Lines in a Prominence Before and During its Dynamic "Disparition Brusque"	
M. S. Madjarska, V. N. Dermendjiev, Z. Mouradian and P. Kotrč ..	326
Horizontal Expansion of Eruptive Prominences	
B. Rompolt	330
On the Eruption of Prominences and Disappearance of Quiescent Filaments	
S. S. Gupta and J. Singh	334
Eruption of Twisted Filament and Associated Phenomena	
W. Uddin and V. K. Verma	338
Causes and Effects of Filament Eruptions (Review)	
B. P. Filippov	342
The Energetics of Flux-Rope Prominence Models in Axially Symmetric Systems	
J. Lin, T. G. Forbes, P. A. Isenberg and P. Démoulin	350
On a Possible Mechanism of Quiescent Prominence Destabilization	
P. Nenovski, V. N. Dermendjiev, M. S. Madjarska and J.-C. Vial ..	354
Radio and X-ray Investigations of Erupting Prominences (Review)	
N. Gopalswamy, Y. Hanoka and J. R. Lemen	358
Filament Disparition Brusque and CME – September 25–26, 1996 Event	
L. van Driel-Gesztelyi, B. Schmieder, G. Aulanier, P. Démoulin, P. C. H. Martens, D. Zarro, C. DeForest, B. Thompson, C. St. Cyr, T. Kucera, J. T. Burkepile, O. R. White, Y. Hanaka and N. Nitta ..	366
Ultraviolet Spectroscopy of a Coronal Mass Ejection	
A. Ciaravella, J. C. Raymond, S. Fineschi, M. Romoli, C. Benna, L. Gardner, S. Giordano, J. Michels, R. O'Neal, E. Antonucci, J. Kohl and G. Noci	370
Soft X-ray Observations of Eruptive Prominences	
T. Watanabe, M. Yamamoto, H. Hudson, M. Irie, K. Ichimoto, H. Kurokawa and H. Yatagai	376
Prominence Disappearance Related to CMEs	
E. Hiei	380
MHD Simulation of Dark Filament Eruption in the Quadrupole Source Model	
Y. Uchida, S. Hirose S. Cable, S. Uemura, K. Fujisaki, M. Torii and S. Morita	384
Coronal Plasmoid Dynamics	
C. Delannée, S. Koutchmy, A. Zhukov and I. Veselovsky	388
Evolution of the Filament/CH/Magnetic Field Complex	
B. A. Iosha, E. I. Mogilevsky and V. N. Obrik	393
New Evidence of Chromospheric Evaporation	
J. Kašparová, P. Kotrč, P. Heinzel, I. F. Nikulin and P. Rudawy ..	397

Filament Activity Associated with an Umbral Flare W. Li and J. Wang	401
Global Patterns	
Filaments and the Solar Dynamo (Review) N. Seehafer	407
Solar and Stellar Dynamo Waves Under Asymptotic Investigation K. M. Kuzanyan	415
Filament Chirality: A Link Between Fine-Scale and Global Patterns (Review) S. F. Martin	419
The Skew of Polar Crown X-ray Arcades A. H. McAllister, A. J. Hundhausen, D. Mackay and E. Priest	430
Global Pattern of the Magnetic Field Vectors Above Neutral Lines from 1974 to 1982: Pic-du-Midi Observations of Prominences V. Bommier and J. L. Leroy	434
Are All Prominences Either Sinistral or Dextral? J. B. Zirker, J.-L. Leroy and V. Gaizauskas	439
Large-Scale Patterns of Prominences in the Global Solar Cycles During 1880–1995 D. K. Callebaut, V. I. Makarov and K. S. Tavastsherna	442
Chirality, Helicity, and Joy's Law P. Foukal	446
A Dynamic Dextral-Sinistral Model for the Structure and Evolution of Prominence Magnetic Fields E. R. Priest	453
CMEs and Prominences and Their Evolution over the Solar Cycle (Review) D. F. Webb	463
LASCO/EIT Observations of Coronal Mass Ejections from Large-Scale Filament Channels S. P. Plunkett, K. P. Dere, R. A. Howard, D. J. Michels, G. E. Brueckner, B. J. Thompson and J.-P. Delaboudinière	475
Disappearances of High-Latitude Filaments as Sources of High-Latitude CMEs E. W. Cliver and D. F. Webb	479
Time-Latitude Prominence and the Green Corona Distribution Over the Solar Activity Cycle M. Minarovjech, M. Rybanský and V. Rušin	484
Digital "Cartes Synoptiques de la Chromosphere Solaire et Catalogues des Filaments et des Centres d'Activité" H. E. Coffey and C. D. Hanchett	488

Reconstruction of Sun-as-Star Magnetic Field Structure and Evolution Using Filament Observations D. I. Ponyavin	493
Instrumentation	
A New Station of Prominence Patrol Observations in Slovakia I. Dorotovič, B. Lukáč, T. Pintér and M. Rybanský	499
The Present and Future of Prominence Observations at Valašské Meziričí Astronomical Observatory L. Lenža and D. Dokoupilová	502
Development of an Instrument Based on a Fibre-Bonded CCD Camera for Prominence Observations V. K. Verma, W. Uddin and V. P. Gaur	506
List of Unpublished Papers	511
Author Index	513