Graham Barnes

Research Scientist
Colorado Research Associates Div.
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Education

Yale University	Mathematics and Physics	B.S., 1992
Cornell University	Physics Major, Astronomy Minor	M.S., 1995
Cornell University	Physics Major, Astronomy Minor	Ph.D., 1999

Appointments

01/03-present	Research Scientist, Colorado Research Associates Div., NorthWest Research Associates, Inc.
12/02-04/05	Visiting Scientist, High Altitude Observatory, National Center for Atmospheric Research
08/01-12/02	Postdoctoral Research Fellow, Colorado Research Associates Div., NorthWest Research Associates, Inc.
12/00-07/01	Visiting Scientist, High Altitude Observatory, National Center for Atmospheric Research
10/98-10/00	Postdoctoral Research Fellow, Dept. of Mathematics, Monash University

Research Interests

Numerical and analytic solutions to the MHD equations.
Magnetic topology, particularly with regard to solar energetic events.
Discriminant analysis and statistical prediction.
Local helioseismology.

Grants and Contracts Awarded

[1] Graham Barnes (PI) and K.D. Leka (Co-I) "A Comparison of Flare Forecasting Methods" NASA - TR&T, 16 April 2009 - 15 April 2012, $276,576.

[2] Graham Barnes (PI) and K.D. Leka (Co-I) "Hinode Data for Nonlinear Force-Free Field Extrapolations" Lockheed Martin, 2 February 2009 - 31 October 2009, $24,999.

[3] Graham Barnes (PI) and K.D. Leka (Co-I) "Hinode Data for Nonlinear Force-Free Field Extrapolations" Lockheed Martin, 5 February 2008 - 1 November 2008, $24,499.

[4] Graham Barnes (PI) and K.D. Leka (Co-I) "Predicting Flare Properties Using the Minimum Current Corona Model", AFOSR, 1 March 2006 - 30 November 2008, $199,897.

[5] Graham Barnes (PI) "Application of the Minimum Current Corona model to MDI Magnetograms" MSU (NASA) 1 June 2005 - 15 October 2005, $30,000.

[6] Graham Barnes (PI), K.D. Leka (Co-I), and Thomas R. Metcalf (Collaborator) "Distinguishing Reconnection Scenarios for Solar Energetic Events", NSF - SHINE 1 May 2005 - 30 April 2010, $516,602.

Students/Postdocs Supervised

Schumer, E. A., Air Force Institute of Technology, 2003 – 2005.
Crouch, A. D., NWRA/CoRA, 2006 – 2007.
Lee, J.-Y., NWRA/CoRA, 2008 – present.

Random Other Accomplishments

2004 Summited Cotopaxi (elev. 5900m) and Chimborazo (elev. 6300m), Ecuador
2002 4th in age category, 24 hour solo world championships of mountain biking
2001 13th overall, 24 hour solo world championships of mountain biking
2000 Summited Mera Peak (elev. 6400m), Nepal

Publications

[1] Crouch, A. D., G. Barnes and K. D. Leka: 2009 'Resolving the Azimuthal Ambiguity in Vector Magnetogram Data with the Divergence-Free Condition: Application to Discrete Data'. *Solar Phys.*, in press.

[2] Leka, K. D., G. Barnes, A. D. Crouch, T. R. Metcalf, G. A. Gary, J. Jing, and Y. Liu: 2009 'Resolving the 180° Ambiguity in Solar Vector Magnetic Field Data: Evaluating the Effects of Noise, Spatial Resolution, and Method Assumptions'. *Solar Phys.*, in press.

[3] DeRosa, M. L., C. J. Schrijver, G. Barnes, K. D. Leka, B. W. Lites, M. J. Aschwanden, T. Amari, A. Canou, J. M. McTiernan, S. Régnier, J. K. Thalmann, G. Valori, M. S. Wheatland, T. Wiegelmann, M. C. M. Cheung, P. A. Conlon, M. Fuhrmann, B. Inhester and T. Tadesse: 2009 'A Critical Assessment of NonLinear Force-Free Field Modeling of the Solar Corona for a Recent Solar Active Region'. *Astrophys. J.*, **696**, 1780-1791.

[4] Longcope, D. W., G. Barnes and C. Beveridge: 2009, 'Effects of Partitioning and Extrapolation on the Connectivity of Potential Magnetic Fields'. *Astrophys. J.*, **693**, 97-111.

[5] Barnes, G. and K. D. Leka: 2008, 'Evaluating the Performance of Solar Flare Forecasting Methods'. *Astrophys. J. Letters*, **688**, L107–L110.

[6] Schrijver, C. J., M. L. DeRosa, T. R. Metcalf, G. Barnes, B. Lites, T. Tarbell, J. McTiernan, G. Valori, T. Wiegelmann, M. S. Wheatland, T. Amari, G. Aulanier, P. Démoulin, M. Fuhrmann, K. Kusano, S. Régnier and J. K. Thalmann: 2008 'Non-Linear

Force-Free Modeling of a Solar Active Region Around the Time of a Major Flare and Coronal Mass Ejection'. *Astrophys. J.*, **675**, 1637–1644.

[7] Metcalf, T. R., M. L. DeRosa, C. J. Schrijver, G. Barnes, A. A. van Ballegooijen, T. Wiegelmann, M. S. Wheatland, G. Valori and J. M. McTiernan: 2008 'Non-Linear Force-Free Modeling of Coronal Magnetic Fields. II. Modeling a Filament Arcade from Simulated Chromospheric and Photospheric Vector Fields'. *Solar Phys.*, **247**, 269–299.

[8] Crouch, A. D. and G. Barnes: 2008 'Resolving the Azimuthal Ambiguity in Vector Magnetogram Data with the Divergence-Free Condition: Theoretical Examination'. *Solar Phys.*, **247**, 25–37.

[9] Barnes, G.: 2007, 'On the Relationship Between Coronal Magnetic Null Points and Solar Eruptive Events'. *Astrophys. J. Letters*, **670**, L53–L56.

[10] Longcope, D. W., C. Beveridge, J. Qiu, B. Ravindra, G. Barnes, and S. Dasso: 2007, 'Modeling and Measuring the Flux Reconnected by the Two-ribbon Flare/CME Event on 7 November 2004'. *Solar Phys.*, **244**, 45–73.

[11] Longcope, D. W., B. Ravindra and G. Barnes: 2007, 'Determining the Source of Coronal Helicity through Measurements of Braiding and Spin Helicity Fluxes in Active Regions'. *Astrophys. J.*, **668**, 571–585.

[12] Barnes, G., K. D. Leka, E. A. Schumer, and D. J. Della-Rose: 2007, 'Probabilistic Forecasting of Solar Flares from Vector Magnetogram Data'. *Space Weather J.*, **5**, S09002.

[13] Leka, K. D. and G. Barnes: 2007, 'Photospheric Magnetic Field Properties of Flaring Versus Flare-Quiet Active Regions IV: A Statistically Significant Sample'. *Astrophys. J.*, **656**, 1173–1186.

[14] Metcalf, T. R., K. D. Leka, G. Barnes, B. W. Lites, M. K. Georgoulis, A. A. Pevtsov, G. A. Gary, J. Jing, K. S. Balasubramaniam, J. Li, Y. Liu, H. N. Wang, V. Abramenko, V. Yurchyshyn, and Y.-J. Moon: 2006, 'An Overview of Existing Algorithms for Resolving the 180° Ambiguity in Vector Magnetic Fields: Quantitative Tests with Synthetic Data'. *Solar Phys.*, **237**, 267–296.

[15] Barnes, G. and K. D. Leka: 2006, 'Photospheric Magnetic Field Properties of Flaring Versus Flare-Quiet Active Regions III: Magnetic Charge Topology Models'. *Astrophys. J.*, **646**, 1303–1318.

[16] Barnes, G., K. D. Leka, and M. S. Wheatland: 2006, 'Quantifying the Performance of Force-Free Extrapolation Methods Using Known Solutions'. *Astrophys. J.*, **641**, 1188–1196.

[17] Barnes, G., D. W. Longcope, and K. D. Leka: 2005, 'Implementing a Magnetic Charge Topology Model for Solar Active Regions'. *Astrophys. J.* **629**, 561–571.

[18] Leka, K. D., Y. Fan, and G. Barnes: 2005, 'On the Availability of Sufficient Twist in Solar Active Regions to Trigger the Kink Instability'. *Astrophys. J.* **626**, 1091–1095.

[19] Leka, K. D. and G. Barnes: 2003b, 'Photospheric Magnetic Field Properties of Flaring Versus Flare-Quiet Active Regions II: Discriminant Analysis'. *Astrophys. J.* **595**, 1296–1306.

[20] Leka, K. D. and G. Barnes: 2003a, 'Photospheric Magnetic Field Properties of Flaring Versus Flare-Quiet Active Regions I: Data, General Approach, and Sample Results'. *Astrophys. J.* **595**, 1277–1295.

[21] Barnes, G. and K. B. MacGregor: 2003, 'Angular Momentum Transport Between a T Tauri Star and an Accretion Disk'. In: A. Brown, G. M. Harper, and T. R. Ayres (eds.): *The Future of Cool-Star Astrophysics*. pp. 747–753.

[22] Barnes, G. and P. S. Cally: 2001, 'Frequency Dependent Ray Paths in Local Helioseismology'. *Proc. Astron. Soc. Aust.* **18**, 243–251.

[23] Barnes, G. and P. S. Cally: 2000, 'Mode Mixing by a Shallow Sunspot'. *Solar Phys.* **193**, 373–382.

[24] Barnes, G. and K. B. MacGregor: 1999, 'On the magnetohydrodynamics of a conducting fluid between two flat plates'. *Physics of Plasmas* **6**, 3030–3046.

[25] Barnes, G., P. Charbonneau, and K. B. MacGregor: 1999, 'Angular Momentum Transport in Magnetized Stellar Radiative Zones. III. The Solar Light-Element Abundances'. *Astrophys. J.* **511**, 466–480.

[26] Barnes, G., P. Charbonneau, and K. B. MacGregor: 1998, 'Angular Momentum Transport in Magnetized Stellar Radiative Zones: The Solar Light Element Abundances'. In: R. A. Donahue and J. A. Bookbinder (eds.): *ASP Conf. Ser. 154: Cool Stars, Stellar Systems, and the Sun*. p. 886.

[27] Barnes, G., K. B. MacGregor, and P. Charbonneau: 1998, 'Gravity Waves in a Magnetized Shear Layer'. *Astrophys. J. Letters* **498**, L169–L172.

Recent Presentations

[1] Poster: "An Overview of 'Forecasting the Operational All-clear' ", SPD meeting, 2009.

[2] Poster: "An Overview of 'Forecasting the Operational All-clear' ", Space Weather Workshop, 2009.

[3] Invited Talk: "Solar Energetic Event Forecasting Using Magnetic Field Data and Discriminant Analysis", Forecasting the Operational All-clear Workshop, 2009.

[4] Poster: "Magnetic Charge Topology Analysis for Space Weather Forecasting", AGU fall meeting, 2008.

[5] Invited Talk: "Forecasting of Solar Flares From Vector Magnetogram Data", Space Weather Workshop, 2008.

[6] Colloqium: "A Comparison of Solar Flare Forecasting Methods", Space Weather Prediction Center, 2007

[7] Contributed Talk: "A Comparison of Selected Flare Forecasting Parameters", LWS meeting, 2007

[8] Invited Talk: "On The Relationship Between Coronal Magnetic Null Points and Solar Eruptive Events", SHINE workshop, 2007

[9] Poster: "A Comparison of the Topology of Potential Magnetic Fields Inferred for Solar Active Regions", SHINE workshop, 2007

[10] Poster: "The Relationship Between Coronal Magnetic Null Points and Solar Eruptive Events", SPD meeting, 2007

[11] Poster: "Estimating Active Region Free Energy from the Minimum Current Corona Model", IAU General Assembly, 2006

[12] Invited Talk: "A Free Energy Estimate from the Minimum Current Corona Model", SHINE workshop, 2006

[13] Poster: "Photospheric Magnetic Field Properties of Flaring vs. Flare-Quiet Active Regions II: Probabilistic Forecasts and Nonparametric Statistics", SHINE workshop, 2006

[14] Invited Talk: "The Minimum Current Corona Model", NLFFF workshop, 2006

[15] Invited Talk: "Field Line Divergence Metric", NLFFF workshop, 2006

[16] Poster: "Can Force-Free Extrapolations Reproduce the Coronal Magnetic Topology?", SHINE workshop, 2005

[17] Contributed Talk: "Magnetic Charge Topology (MCT) Analysis of NOAA AR 8210, May 1, 1998", Living With a Star meeting, 2004

[18] Contributed Talk: "Magnetic Charge Topology (MCT) Analysis of NOAA AR 8210", Solar MURI workshop, 2004

[19] Poster: "Quantifying the Performance of Coronal Extrapolations: Just Because It Looks Good, Is It?", SHINE workshop, 2004

[20] Poster: "Magnetic Topology, Flux Emergence/Reconnection and Velocities from a Magnetic Charge Topology Model for Solar Active Regions", SPD meeting, 2004