Véronique Delouille

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Contact Information

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Research Interests

Solar image processing (segmentation, multiscale and multifractal analysis, super-resolution algorithms), compression, denoising, functional data analysis.

Education

2002	Ph.D. in Sciences (orientation: Statistics), Université catholique de Louvain (UCL)
1999	D.E.A. in Statistics, UCL, Belgium
1998	M.Sc. in Statistics, University of Kent at Canterbury, United Kingdom
1997	Ir. in Applied Mathematics, UCL, Belgium

Professional Experience

2004-present	Assistant in the Solar Physics Department, Royal Observatory of Belgium
May-June 2005	Invited teacher, Institut supérieur d'Informatique, de Modélisation et de leurs Applications, Université de Clermont-Ferrand II, France
2003-2004	Post-doctoral research associate in the Electrical and Computer Engineering Department, Rice University, USA
1999-2003	Assistant for the National Fund of Scientific Research (FNRS), Belgium

Professional Society Memberships

– IEEE member
– Fellow of the Royal Statistical Society (UK)
– Member of the Belgian Statistical Society

Other Noteworthy Activities

– Leader of an International Team on "Mining and Exploiting SDO data in Europe"from the International Space Science Institute (call 2009)
– Co-Investigators on the NASA grant "Design and Operation of a Solar Dynamics Observatory Science Center."PI institute: SAO, Harvard (2009-2012)
– Local Organizer chair, ICIP 2011, Belgium
– Member of the Scientific Organizing Committee, Solar Image Processing Workshop IV (2008, Baltimore), and V (2010, LesDiablerets)
– Working Group Leader: Solar Disc Features, Solar Image Processing V, 2010

– Reviewer for *Astronomy & Astrophysics, Solar Physics Journal, Annales Geophysicae, Journal of Royal Statistical Society, Biometrika, Journal of Multivariate Analysis, Journal of Computational and Graphical Statistics, IEEE Transactions on Signal Processing, ACM Transactions on Sensors Networks, Signal Processing, Pattern Recognition Letters, Quantitative Finance*

Educational Activities

Teaching

March 2005	"Multiscale statistical approach with applications in astronomy and solar physics,"Short Course, doctoral school, Institut de Statistique, UCL, Belgium
2003-2004	Co-instructor for "Advanced Digital Signal Processing: Graphical Models and Learning Algorithms,"post-graduate level, Rice University, USA
1999-2003	Teaching assistant for "Théorie de la mesure et probabilité," 3rd year study level, UCL, Belgium

Supervision tasks

April-Sept 2008	Supervisor 6 months internship on "Independent Component Analysis of EUV solar images" (Université Blaise Pascal Clermont II, France)
From Oct 2007 on	Co-Supervisor Phd thesis on "Statistical Modeling and Prediction of Solar Eruptions,"(UCL, Belgium)
April-Sept 2006	Supervisor 6-month internship on "Implementation of a super-resolution algorithm for EUV solar images" (Université Blaise Pascal Clermont II, France)
March-Sept 2004	Co-supervisor MSc thesis on "Wavelet Analysis in solar physics," (UCL, Belgium)

Refereed Journal Articles

Solar Physics

J16 P. Chainais, E. Koenig, **V. Delouille**, J.-F. Hochedez, "Virtual super resolution of scale invariant textured images using multifractal stochastic processes," *Journal of Mathematical Imaging and Vision*, **39**(1) 2011.

J15 P.C.H. Martens, G. Attrill, A.R. Davey, S. Farid, P.C. Grigis, J. Kasper, K. Korreck, S.H. Saar, Y. Su, A. Savcheva, P. Testa, M. Wills-Davey, P.N. Bernasconi, M.K. Georgoulis, **V. Delouille**, J.-F. Hochedez, J.W.. Cirtain, C.E,. DeForest, R.A. Angryk, I. De Moortel, T. Wiegelmann, "Computer Vision for the Solar Dynamics Observatory,"Accepted to be published in the SDO dedicated issue of *Solar Physics*

J14 V. Barra, **V. Delouille**, M. Kretzschmar, J.-F. Hochedez (2009) "Fast and robust segmentation of solar EUV images: algorithm and results for solar cycle," *Astron & Astrophys*, Volume 505, pages 361-371.

J13 **V. Delouille**, P. Chainais, J.-F. Hochedez (2008) "Quantifying and containing the curse of high resolution coronal imaging," *Annales Geophysicae*, **26**(2), pages 3169–3184.

J12 **V. Delouille**, P. Chainais, J.-F. Hochedez (2008) "Spatial and Temporal Noise in Solar EUV Observations," *Solar Physics*, **248**(2), pages 441–455.

J11 V. Barra, **V. Delouille**, J.-F. Hochedez (2008) "Segmentation of Extreme Ultraviolet Solar Images via Multichannel Fuzzy Clustering," *Advances in Space Research*, **42**, 917–925.

J10 P. Fryzlewicz, **V. Delouille**, G.P. Nason (2007) "GOES-8 X-ray sensor variance stabilization using the multiscale data-driven Haar-Fisz transform," *Journal of the Royal Statistical Society, Series C*, **56**, pages 99–116.

J9 J.-F. Hochedez, W. Schmutz, Y. Stockman, U. Schühle, A. BenMoussa, S. Koller, K. Haenen, D. Berghmans, J.-M. Defise, J.-P. Halain, A. Theissen, **V. Delouille**, V. Slemzin, D. Gillotay, D. Fussen, M. Dominique, F. Vanhellemont, D. McMullin, M. Kretzschmar, A. Mitrofanov, B. Nicula, L. Wauters, H. Roth, E. Rozanov, I. Rüedi, C. Wehrli, A. Soltani, H. Amano, R. Van der Linden, A. Zhukov, F. Clette, S. Koizumi, V. Mortet, Z. Remes, R. Petersen, M. Nesládek, M. D'Olieslaeger, J. Roggen and P. Rochus (2006) "LYRA, a solar UV radiometer on Proba2", *Advances in Space Research*, **37**(2), pages 303-312.

J8 A. BenMoussa, A. Theissen, F. Scholze, J.-F. Hochedez, U. Schühle, W. Schmutz, K. Haenen, Y. Stockman, A. Soltani, D. McMullin, R.E. Vest, U. Kroth, C. Laubis, M. Richter, V. Mortet, S. Gissot, **V. Delouille**, M. Dominique, S. Koller, Z. Remes, R. Petersen, M. DOlieslaeger, J.-M. Defise (2006) "Performance of diamond detectors for VUV applications," *Nuclear Instruments and Methods A* **568**, pages 398-405.

J7 **V. Delouille**, J. de Patoul, J.-F. Hochedez, L. Jacques, J.-P. Antoine (2005) "Wavelet spectrum analysis of EIT/SoHO images," *Solar Physics*, **228**(1), pages 303-323.

Sensor Networks

J6 **V. Delouille**, R. Neelamani, R. G. Baraniuk (2006) "Robust distributed estimation using the embedded subgraphs algorithm," *IEEE Transactions on Signal Processing*, **54**(8), pages 2998- 3010

J5 **V. Delouille**, R. Neelamani, R. Baraniuk "Robust distributed estimation in sensor networks using the embedded polygons algorithm," in *Third International Symposium on Information Processing in Sensor Networks, 2004. IPSN 2004*, pages 405–413

Wavelet Methods

J4 **V. Delouille**, M. Jansen, R. von Sachs (2006) "Second generation wavelet denoising methods for irregularly spaced data in two dimensions," *Signal Processing*, **86**(7), pages 1435 - 1450.

J3 **V. Delouille**, R. von Sachs (2005) "Estimation of nonlinear autoregressive models using design-adapted wavelets," *Annals of the Institute of Mathematical Statistics*, **57**(2), pages 235–253

J2 **V. Delouille**, J. Simoens, R. von Sachs (2004) "Smooth design-adapted wavelets for nonparametric stochastic regression," *Journal of the American Statistical Association*, **99**, pages 643–658

J1 **V. Delouille**, J. Franke, R. von Sachs (2001) "Nonparametric stochastic regression with design-adapted wavelets," *Special issue of Sankhya on Wavelet Methods in Statistics*, Series A (Theory), **63**(3), pages 328–366

Proceedings

Solar Physics

P13 V. Barra, V. Delouille, J.-F. Hochedez (2009) "Segmentation, Tracking and Characterization of Solar Features from EIT Solar Corona Images "*Lecture Notes in Computer Science, Volume 5575/2009, pages 199-208.*

P12 E. Koenig, P. Chainais, V. Delouille, J.F. Hochefez (2009) Amélioration virtuelle de la résolution d'images du Soleil par augmentation d'information invariante d'échelle, *Proc. of GRETSI* (Dijon)

P11 P. Chainais, **V. Delouille**, J.-F. Hochedez (2007) "Modeling images of the Quiet Sun in the extreme ultra-violet,"*SPIE meeting, Wavelets XII* (San Diego)

P10 V. Barra, **V. Delouille**, J.-F. Hochedez (2007) "Segmentation of Extreme Ultraviolet Solar Images using a Multispectral Data Fusion Process,"*Proceedings of the IEEE Conference on Fuzzy Systems*, (London), pages 211–216.

P9 P. Chainais, **V. Delouille**, J.-F. Hochedez (2007) "Modélisation des images de Soleil calme dans l'extrême ultra-violet,"*Proceedings GRETSI*, (Troyes), 2007.

P7 V. Barra, **V. Delouille**, J.-F. Hochedez, P. Chainais (2005) "Segmentation of EIT Images Using Fuzzy Clustering: a Preliminary Study,"*Proceedings of the 11th European Solar Physics Meeting "The Dynamic Sun: Challenges for Theory and Observations"* (ESA SP-600), Leuven, Belgium. Editors: D. Danesy, S. Poedts, A. De Groof and J. Andries. Published on CDROM., p.77.1

P6 A.C. Katsiyannis, D. Berghmans, J.-F. Hochedez, B. Nicula, G. Lawrence, J.-M. Defise, A. Ben-Moussa, **V. Delouille**, M. Dominique, J.-H. Lecat, W. Schmutz, A. Theissen, V. Slemzin (2005) "SWAP: An EUV imager for solar monitoring on board of PROBA2,"SPIE, **5901**, 236.

P5 P. Fryzlewicz, **V. Delouille** (2005) "A data-driven Haar-Fisz transform for multiscale variance stabilization," *IEEE/SP 13th Workshop on Statistical Signal Processing*, (Bordeaux), pages 539–544.

Sensor Networks

P4 R. Wagner, **V. Delouille**, R. Baraniuk (2006) "Distributed Wavelet De-Noising for Sensor Networks," invited paper, *IEEE Conference on Decision and Control* (San Diego)

P3 R. Wagner, **V. Delouille**, H. Choi, R. Baraniuk (2005) "Distributed wavelet transform for irregular sensor network grids," *IEEE Statistical Signal Processing Workshop* (Bordeaux)

P2 **V. Delouille**, R. Neelamani, V. Chandrasekaran, R. G. Baraniuk (2003) "The embedded triangles algorithm for distributed estimation in sensor networks," in *IEEE Statistical Signal Processing Workshop*, (St. Louis), pages 357–360

Wavelet Methods

P1 **V. Delouille**, J. Simoens, R. von Sachs (2003) "Design-adapted wavelet estimator for two-dimensional tensor product irregular designs,"in *SPIE meeting, Wavelet Applications in Signal and Image Processing*, (San Diego), volume 5207, pages 880–891

Conference Presentations (Partial List)

2010	*COSPAR '10*, Bremen, Germany "Distributing and Mining SDO data in Europe,"*sollicited talk*
2010	*Turbulence and Multifractals in Geophysics and Space workshop*, Brussels, Belgium "Virtual resolution enhancement of quiet Sun images from EIT,"*invited talk*
2010	*ADA6*, Monastir, Tunisia "Fast and Robust Segmentation of solar EUV images: Towards Real Time use in the age of SDO,"*contributed talk*
2008	*ADA5*, Crete, "Super-resolution of EUV images using small-scale offpoints,"*poster*
2007	*SOHO 20 - Transient Events on the Sun and in the Heliosphere*, Ghent, Belgium, "Quantifying and containing the curse on high resolution coronal imaging,"*poster*
2007	*5th SECCHI Consortium Meeting*, Paris, France, "B2X: Flare recognition in Solar EUV Images,"*contributed talk*
2006	*European Space Weather week 3*, Brussels, Belgium "Automatic flare detection and tracking of active regions in EUV images,"*contributed talk*
2006	*FNRS-ROB Contact Group 'Wavelets and applications'*, Brussels, Belgium "Enhanced resolution of EUV images in solar physics,"**invited talk**
2006	*Royal Statistical Society meeting*, Belfast, UK "Distributed wavelet denoising for sensor networks,"**invited talk**
2006	*Solar Image Processing workshop III*, Dublin, Ireland "Enhanced resolution of EUV images,"*contributed talk*
2006	*SOHO-17: "10 Years of SOHO and Beyond,"* Taormina, Italy "Segmentation of EIT Images using fuzzy clustering,"*poster*
2006	*Fifth IAP workshop "Flexible Statistical Analysis Adapted to Complex Data Structures"*, Louvain-la-Neuve, Belgium, "Statistical signal processing of solar corona images,"*poster*
2005	*FNRS Contact Group "Wavelets and Applications"*, Brussels, Belgium "Multifractal analysis of extreme ultraviolet solar images,"*contributed talk*
2005	*Belgian Statistical Society meeting*, Corsendonk, Belgium "A data-driven Haar-Fisz transform for multiscale variance stabilization,"*contributed talk*
2005	*11th-Solar Physics Meeting*, Leuven, Belgium "Segmentation of EIT Images using fuzzy clustering: a preliminary study,"*poster*
2005	*IEEE Statistical Signal Processing Workshop*, Bordeaux, France, "A data-driven Haar-Fisz transform for multiscale variance stabilization,"*poster*
2005	*EGU Meeting*, Vienna, Austria "LYRA: The Large Yield Radiometer onboard the ESA PROBA2,"*poster*
2004	*Solar Image Processing Workshop II*, Annapolis, US, "Wavelet spectrum analysis of EIT-SoHO observations,"*contributed talk*

2004 *Wavelet and Multifractal Analysis, summer school*, Cargèse, France,
"Continuous wavelet analysis of the solar activity observed by SoHO/EIT," *poster*

2002 *Workshop: Statistical Modeling and Inference for Complex Data structures*,
Louvain-la-Neuve, Belgium, "Second generation wavelet transforms for
irregularly spaced data in two dimensions," *poster*

2002 *XXXIVèmes Journées de Statistique*, Brussels, Belgium,
"Estimation de modèles autorégressifs non linéaires au moyen d'ondelettes
adaptées au plan d'expérience," **invited talk**

2001 *Meeting of the FNRS Contact Group "Wavelets and Applications," Brussels, Belgium*,
"Nonparametric stochastic regression with design-adapted wavelets, " *contributed*

2001 *Ninth Belgian Statistical Society meeting*, Ostende, Belgium,
"Nonparametric stochastic regression with design-adapted wavelets," *contributed talk*

2001 *Times Series Workshop*, Luminy, France,
"Nonlinear autoregression using design-adapted wavelets," **invited talk**

Invited talks

2006 Institut de Statistique, UCL, Belgium, "Multifractal analysis of
extreme ultraviolet images and motion detection using optical flow"

2005 Lilly Development Center, Mont-St-Guibert, Belgium, "Wavelet methods
for signal analysis with applications in astronomy"

2004 Department of Electrical and Computer Engineering, Rice University, US,
"Wavelet spectrum analysis of EIT-SoHO observations"

2003 Department of Statistics, Texas A&M, US, "Second generation wavelet
estimation for irregularly spaced data in one and two dimensions"

2003 Department of Statistics, Rice University, US, "Second generation wavelet
estimation for irregularly spaced data in one and two dimensions"

2002 Fachbereich Mathematik, Universität Kaiserslautern, Germany, "Second-generation
wavelet transforms for irregularly spaced data in one and two dimensions "

2001 Department of Electrical and Computer Engineering, Rice University, US,
"Nonparametric stochastic regression with design-adapted wavelets"

2001 Statistics Department, The Wharton School, University of Pennsilvania, US
"Nonparametric stochastic regression with design-adapted wavelets"

2000 German National Research Center for Information Technology, GMD First,
Intelligence Data Analysis group, Germany, "Introduction to wavelets"

2000 Weierstrass Institute, Germany, "Regression with design-adapted wavelets
using the lifting scheme to improve unbalanced Haar wavelets"

Grants

2009 Travel grant from the International Space Science Institute in Bern,
Project on 'Mining and exploiting SDO data in Europe'

2007 Tournesol Grant (scientific cooperation between France and Belgium)
Project on 'Couronne Solaire, Segmentation et Modélisation d'Images par des Cascades'

2003-2004 Postdoctoral research grant from Rice University, US.

1999-2003 Ph.D. Scholarship from the National Fund of Scientific Research (FNRS), Belgium

1998-1999 Ph.D. Scholarship from Walloon Government, Belgium

1997-1998 M.Sc. Scholarship from the Engineering and Physical Sciences Research Council,
United Kingdom