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RESEARCH INTERESTS

My research interests are particle acceleration and transport in solar flares, using observations in X-ray and radio wavelengths and putting them into context with theoretical models. Current projects aim at understanding particle transport in the chromosphere using numerical simulations and X-ray imaging observations made by the RHESSI satellite. I am further involved in collaborative efforts to better understand and improve current imaging techniques for the RHESSI satellite in particular visibility based approaches.

EMPLOYMENT

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| 01/2012 – present | Post-doctoral researcher
Fachhochschule Nordwestschweiz, Switzerland, Institute of 4D Technologies |
| 05/2009 – 11/2011 | Leverhulme Research Fellow
University of Glasgow, UK, School of Physics and Astronomy |
| 01/2009 – 03/2009 | Post-doctoral Research Assistant
ETH Zurich, Switzerland, Department of Physics, Institute for Astronomy |
| 02/2008 – 04/2008 | Visiting Graduate Research Assistant
University of Glasgow, UK, Department of Physics and Astronomy |

EDUCATION

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| 12/2004 – 12/2008 | Ph.D.
ETH Zurich, Switzerland
Thesis title: <i>Particle kinematics in solar flares: observations and theory</i> |
| 10/1999 – 08/2004 | dipl. phys. ETH
ETH Zurich, Switzerland
Studies of physics with focus on astrophysics and particle physics |

AWARDS & FELLOWSHIPS

- Honorary Research Fellow, School of Physics & Astronomy, University of Glasgow, UK (1/12/2011-31/12/2012)
- RAS grant for a summer student project (2011)
- Participant at the “Building a successful international research career” workshop by the British Council, Amsterdam (2011)
- Leverhulme Research Fellowship (2009)
- SNSF Fellowship for Prospective Researchers, Swiss National Science Foundation (2009, declined due to clash with Leverhulme)
- Outstanding student paper award, Space Physics and Aeronomy Section of the American Geophysical Union (2008)
- Award for scientific excellency, Institute for Astronomy, ETH Zurich (2008)
- Student Travel Grant for participation at conferences, Swiss Society for Astrophysics & Astronomy (2005 & 2006)
- Undergraduate study grant, Kuffner Foundation (2002-2004)

RESEARCH RELATED EXPERIENCE

- Participant at “Standing up for Science Media Workshop”, University of Glasgow, 18. November 2011
- Member of the LOC for the 11th RHESSI workshop, Glasgow 2011
- Helper at the National Astronomy Meeting (NAM), Glasgow (2009)
- Group leader at the 8th RHESSI workshop, Potsdam (2008)
- Webmaster and Assistant System Administrator, Institute for Astronomy, ETH Zurich (2006 – 2009)
- Referee for the Astrophysical Journal, Astronomy & Astrophysics, and Solar Physics

TEACHING EXPERIENCE

- Lecturer for “Exploring the cosmos 2y” (University of Glasgow, 2011)
- Astronomy 2 supervisor (University of Glasgow, 2010)
- Student BSc. project supervision. First supervisor of a student working on RHESSI data analysis, second supervisor of a student working on the physics of climbing falls (final report graded A4) (University of Glasgow, 2009 – 2010)
- Final Year Undergraduate Astronomy lab demonstration. Supervised an observational project on solar limb darkening and a computational project on stellar structure (University of Glasgow, 2010)
- Teaching Assistant for the lecture course “Physics II”. Tutorials and exam preparation assistance for groups of up to 20 students (ETH Zurich, 2005 – 2009)
- Demonstrator for Beginner’s Astronomy lab (ETH Zurich, 2005 – 2009)

COMMUNITY OUTREACH

- Ambassador for the Science, Technology, Engineering and Mathematics Network (STEMNET) (since 2009). Activities: Show with the University of Glasgow mobile planetarium at Lochwinnoch Primary, Tours of the University of Glasgow observatory for Glasgow Scouts and a group of RAF pensioners, “Speed-networking” careers event at Springburn Academy
- Talks at meetings of amateur astronomers. Highlights include the 7th International Week of Astronomy (Arosa, 2006) and the 6th Teleskoptreffen Falera (2007)
- Organized a study week for high-school students, ETH Zurich 2008
- Support at science events: “Night of Physics” (ETH Zurich 2005), “World of science” (Zurich 2005), “Physics for kids and teens” (ETH Zurich 2005)
- Article on the Sun in the professional magazine “SCHULEkonkret” for primary school teachers, *Die Sonne - unser Stern*, F. Joos, P.C. Grigis, M. Battaglia (6/2005)

SKILLS

- Expert knowledge of RHESSI data analysis and visibility imaging techniques
- IDL/Solar Soft, L^AT_EX document preparation language
- Basic knowledge in Unix system administration
- Languages: German (native), English (fluent), Italian (intermediate), French (intermediate)

PROFESSIONAL AFFILIATIONS

- Fellow: Royal Astronomical Society (F.R.A.S.)
- Member: Swiss Society for Astronomy and Astrophysics

INVITED TALKS

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- 2011** • *High accuracy height and size measurements of X-ray solar flare sources as diagnostic of particle transport mechanisms and chromospheric density*, University of St. Andrews, UK (9. November)
 - 2010** • *A new method to image X-ray albedo and study X-ray directivity*, Goddard Space Flight Center, MD, US (13. August)
 - 2009** • *Chromospheric diagnostics using RHESSI flare observations*, University of St. Andrews, UK (16. December)
 - 2008** • *RHESSI observations beyond the standard flare model*, UC Berkeley, US (4. December)
 - *New evidence for return currents in solar flare loops*, AGU, Florida, US (30. May)
 - 2006** • *RHESSI observations of solar flares with three hard X-ray sources*, UC Berkeley, US (15. February)

PRESENTATIONS AT CONFERENCES

- 2011** • *X-ray observations and theory of electron transport in the chromosphere*, 4th Glasgow-Meudon alliance workshop, Glasgow (6. October)
- *Diagnostics of electron transport in the solar chromosphere using hard X-ray solar flare observations*, 13th European Solar Physics Meeting, Rhodes, Greece (15. September)
- *Heights of X-ray, EUV and white light sources in a limb flare observed by RHESSI and SDO* (Poster), 13th European Solar Physics Meeting, Rhodes, Greece (15. September)
- *Hard X-ray solar flare observations as diagnostics of electron transport in the chromosphere*, National Astronomy Meeting, Llandudno, UK (19. April)
- *Implications of hard X-ray footpoint sizes and positions on the thick target model*, 11th RHESSI meeting, Glasgow, UK (7. April)
- 2010** • *Exploring the chromosphere using RHESSI data*, Glasgow-Meudon alliance workshop, Glasgow (6. October)
- *Science applications of visibility forward fitting*, 10th RHESSI meeting, Annapolis, US (4. August)
- *Footpoint sizes in theory and practice*, 10th RHESSI meeting, Annapolis, US (4. August)
- *Imaging observations of X-ray albedo in a compact disc flare* (Poster), COSPAR, Bremen, Germany (21. July)
- *Footpoint sizes and positions of limb flares observed with RHESSI* (Poster), COSPAR, Bremen, Germany (21. July)
- *Diagnostics of X-ray directivity and electron beaming in solar flares using RHESSI visibilities*, CESRA meeting, La Roche-en-Ardenne, Belgium (15. July)
- *Imaging observations of X-ray albedo in a compact disc flare* (Poster), RAS National Astronomy Meeting, Glasgow, UK (14. April)
- 2009** • *Chromospheric diagnostics using RHESSI visibilities*, 9th RHESSI workshop, Genoa, Italy (2. September)
- 2008** • *Pre-flares observed by RHESSI*, Solar activity during the onset of solar cycle 24, Napa Valley, US (9. December)
- *Adding a new piece to the puzzle of particle acceleration and propagation in solar flares*, General Assembly of the Swiss Society for Astronomy and Astrophysics, Zurich, Switzerland (26. September)
- *The pre-flare phase: key to understanding energy and mass transport in flare loops*, ESPM-12, Freiburg i.B., Germany (9. September)
- 2007** • *Particle acceleration and propagation in solar flares*, HINODE Data Analysis Workshop, Orsay, France (14. November)
- *Can a simple thin-thick target model explain the observed connections between coronal footpoint sources?*, 7th RHESSI workshop, Santa Cruz CA, US (27. June)

- 2006**
 - *Relations between concurrent hard X-ray sources in solar flares*, AAS-SPD Meeting Durham NH, US (28. June)
 - *Coronal and footpoint hard X-ray sources in solar flares*, 6th RHESSI workshop, Paris, France (5. April)
- 2005**
 - *Size dependence of solar X-ray flare properties*, 5th RHESSI workshop, Ascona, Switzerland (9. June)
 - *Solar Flare Parameters vs. Flare Size* (Poster), EGU General Assembly, Vienna, Austria (26. April)

SEMINAR TALKS

- 2011**
 - *Wait a moment - exploring the chromosphere using RHESSI data*, University of Glasgow, UK (17. November)
- 2010**
 - *Wait a moment - exploring the chromosphere using RHESSI data*, University of Glasgow, UK (22. April)
- 2008**
 - *The puzzle of particle acceleration and propagation in Solar Flares*, ETH Zurich, Switzerland (7. October)
 - *Three's company - new insight into particle acceleration and transport in solar flares*, University of Glasgow, UK (April)
- 2007**
 - *Can a simple thin-thick target model explain the observed connections between coronal and footpoint sources?*, ISSI Bern, Switzerland (8. May)
 - *Can a unified thin-thick target model explain the observed connections between coronal and footpoint sources in solar flares?*, ETH Zurich, Switzerland (23. January)
- 2005**
 - *Three is company - RHESSI observations of solar flares with three hard X-ray sources*, ETH Zurich, Switzerland (29. November)

OUTREACH TALKS

- 2011**
 - *The dark side of the Sun*, Stars over the Botanics, Glasgow (15. February)
 - *Solar research in the space age*, East-Renfrewshire Astronomical Society, Paisley, Scotland (27. January)
 - *Solar research in the space age*, Dundee Astronomical Society, Dundee, Scotland (14. January)
- 2010**
 - *Solare Flares: Ein explosives Gebiet der modernen Sonnenphysik*, 50th Anniversary of the Kuffner Foundation, Zurich, Switzerland (18. June)
- 2009**
 - *Sonnenforschung im Raumfahrtzeitalter*, Urania Amateur Astronomer's society, Zurich, Switzerland (27. March)
- 2007**
 - *Ein Stern entsteht*, 6th yearly meet ("Teleskoptreffen") of Amateur Astronomers, Falera, Switzerland (8. September)
 - *Die aktive Sonne*, Monthly get-together of the Astronomische Gesellschaft Luzern, Switzerland (3. September)
 - *Aus dem Leben eines Sterns*, General Assembly of the Swiss Amateur Astronomer's society, Falera, Switzerland (2. June)
- 2006**
 - *Die Sonne in ungewohntem Licht*, 5th yearly meet ("Teleskoptreffen") of Amateur Astronomers, Falera, Switzerland (23. September)
 - *Die aktive Sonne*, 7th International Astronomy Week, Arosa, Switzerland (23. July)

REFEREES

on request

- 2011** 17) **M. Battaglia**, E. P. Kontar *Height structure of X-ray, EUV and white-light emission in a solar flare* A&A, **533** L2
doi:10.1051/0004-6361/201117605
- 16) **M. Battaglia**, E. P. Kontar *Hard X-ray footpoint sizes and positions as diagnostic of flare accelerated electrons in the low solar atmosphere* ApJ, **735** 42B
doi:10.1088/0004-637X/735/1/42
- 15) **M. Battaglia**, E. P. Kontar, I. G. Hannah *The influence of albedo on the size of hard X-ray flare sources* A&A **526** 3B
doi:10.1051/0004-6361/201014798
- 14) A. O. Benz, **M. Battaglia**, N. Vilmer *Location of decimetric pulsation in solar flares* Sol. Phys
doi:10.1007/s11207-011-9760-3
- 13) S. Krucker, H. S. Hudson, N. L. S. Jeffrey, **M. Battaglia**, E. P. Kontar, A. O. Benz, A. Csillaghy, R. P. Lin *High-resolution imaging of solar flare ribbons and its implication on the thick-target beam model* ApJ **739** 96
doi:10.1088/0004-637X/739/2/96
- 12) L. Fletcher, B. R. Dennis, H. S. Hudson, S. Krucker, K. Phillips, A. Veronig, **M. Battaglia**, L. Bone, Q. Chen, P. Gallagher, P. C. Grigis, H. Ji, W. Liu, R. O. Milligan, M. Temmer *An Observational Overview of Solar Flares* Space Sciences Reviews
doi:10.1007/s11214-010-9701-8
- 11) I. G. Hannah, H. S. Hudson, **M. Battaglia**, S. Christe, J. Kasparova, M. Kundu, S. Krucker, A. Veronig *Microflares and the Statistics of X-ray Flares* Space Sciences Reviews
doi:10.1007/s11214-010-9705-4
- 10) G. Holman, M. J. Aschwanden, H. Aurass, **M. Battaglia**, P. C. Grigis, E. P. Kontar, W. Liu, P. Saint-Hilaire, V. V. Zharkova *Implications of X-ray observations for electron acceleration and propagation in solar flares* Space Science Reviews, accepted
- 2010** 9) E. P. Kontar, I. G. Hannah, N. L. S. Jeffrey, **M. Battaglia** *The sub-arcsecond hard X-ray structure of loop footpoints in a solar flare* ApJ **717** 250
doi:10.1088/0004-637X/717/1/250
- 2009** 8) **M. Battaglia**, A. O. Benz *Do decimetric spikes originate in coronal X-ray sources?* A&A **499** L33
doi:10.1051/0004-6361/200912143
- 7) **M. Battaglia**, L. Fletcher, A. O. Benz *Observations of conduction driven evaporation in the early rise phase of solar flares* A&A **498** 891
doi:10.1051/0004-6361/200811196
- 2008** 6) S. Krucker, **M. Battaglia**, P. J. Cargill, L. Fletcher, H. S. Hudson, A. L. MacKinnon, S. Masuda, L. Sui, M. Tomczak, A. L. Veronig, L. Vlahos, S. M. White *Hard X-ray emission from the solar corona* A&A Review **16** 155
doi:10.1007/s00159-008-0014-9
- 5) **M. Battaglia**, A. O. Benz *Observational evidence for return currents in solar flare loops* A&A **487** 337
doi:10.1051/0004-6361:200809418
- 2007** 4) **M. Battaglia**, A. O. Benz *Exploring the connection between coronal and footpoint sources in a thin-thick target solar flare model* A&A **466** 713
doi:10.1051/0004-6361:20077144
- 2006** 3) A. O. Benz, P. C. Grigis, **M. Battaglia** *Particle acceleration in solar flares: observations versus numerical simulations* Plasma Phys. Control. Fusion **48** B115
doi:10.1088/0741-3335/48/12B/S12
- 2) **M. Battaglia**, A. O. Benz *Relations between concurrent hard X-ray sources in solar flares* A&A **456** 751

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- 2005** 1) **M. Battaglia**, P. C. Grigis, A. O. Benz *Size dependence of solar X-ray flare properties* A&A **439** 737
[doi:10.1051/0004-6361:20053027](https://doi.org/10.1051/0004-6361:20053027)