

**1989**

**6 Mar 1989**

**Solar Gamma-Ray Evidence for a Distinct Population of > 1 MeV Flare-Accelerated Electrons**

Gerald H. **Share**, [Ronald J. Murphy](#), [Brian R. Dennis](#), [Justin D. Finke](#)

ApJ 2024

<https://arxiv.org/pdf/2412.19586> File

**10 March 1989**

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ApJ 2024

<https://arxiv.org/pdf/2412.19586> File

**Structure and Evolution of Magnetic Fields Associated with Solar Eruptions (Invited **Review**)**

Haimin **Wang**, Chang Liu

Research in Astronomy and Astrophysics, 2015

<http://arxiv.org/pdf/1412.8676v1.pdf> File

Quebec electrical disruption in March 1989

**On extreme geomagnetic storms**

Consuelo **Cid**, Judith Palacios, Elena Saiz, Antonio Guerrero and Yolanda Cerrato

J. Space Weather Space Clim. 4 (2014) A28; File

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**11 March 1989**

**From Polarimetry to Helicity: Studies of Solar Magnetic Fields at the Huairou Solar Observing Station**

**Review**

Hongqi **Zhang**

SCIENCE CHINA Physics, Mechanics & Astronomy 2019

<https://arxiv.org/pdf/1912.06557.pdf>

**12 Mar 1989**

**Recent Results on the Fine Structure in Cosmic Radio Emission**

**Book**

***Zebra Pattern in Solar and Pulsar Radio Emission***

G.P. **Chernov**, V. Fomichev, S. Fainshtein

LAP LAMBERT Academic Publishing 2021 File

**13-14 March 1989**

**Nighttime Geomagnetic Response to Jumps of Solar Wind Dynamic Pressure: A Possible Cause of Québec Blackout in March 1989**

T. **Zhang**, [Y. Ebihara](#), [T. Tanaka](#)

Space Weather [Volume21, Issue11](#) November 2023 e2023SW003493

<https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2023SW003493>

[Mapping a magnetic superstorm: March 1989 geoelectric hazards and impacts on United States power systems](#)

[Jeffrey J. Love](#), [Greg M. Lucas](#), [E. Joshua Rigler](#), [Benjamin S. Murphy](#), [Anna Kelbert](#), [Paul A. Bedrosian](#)

Space Weather e2021SW003030 2022

<https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2021SW003030>

### Characterizing extreme geomagnetic storms using Extreme Value Analysis: a discussion on the representativeness of short datasets

G. [Bernoux](#), [V. Maget](#)

Space Weather **Volume 18, Issue 6** e2020SW002450 2020

<https://sci-hub.tw/10.1029/2020SW002450>

<https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2020SW002450>

### A Twenty-First Century View of the March 1989 Magnetic Storm

D.H. [Boteler](#)

Space Weather **Volume 17, Issue 10** Pages 1427-1441 2019

<https://doi.org/10.1029/2019SW002278>

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### Temporal and Spatial Evolutions of a Large Sunspot Group and Great Auroral Storms around the Carrington Event in 1859

Hisashi [Hayakawa](#), [Yusuke Ebihara](#), [David M. Willis](#), [Shin Toriumi](#), [Tomoya Iju](#), [Kentaro Hattori](#), [Matthew N. Wild](#), [Denny M. Oliveira](#), [Ilaria Ermolli](#), [José R. Ribeiro](#), [Ana P. Correia](#), [Ana I. Ribeiro](#), [Delores J. Knipp](#)

Space Weather 2019

<https://arxiv.org/ftp/arxiv/papers/1908/1908.10326.pdf>

### The extreme space weather event in September 1909

Hisashi [Hayakawa](#), [Yusuke Ebihara](#), [Edward W Cliver](#), [Kentaro Hattori](#), [Shin Toriumi](#), [Jeffrey J Love](#), [Norio Umemura](#), [Kosuke Namekata](#), [Takahito Sakaue](#), [Takuya Takahashi...](#) [Show more](#)

MNRAS, Volume 484, Issue 3, 11 April 2019, Pages 4083–4099,

<https://doi.org/10.1093/mnras/sty3196>

[sci-hub.se/10.1093/mnras/sty3196](https://sci-hub.se/10.1093/mnras/sty3196)

### Quantifying the Economic Value of Space Weather Forecasting for Power Grids: An Exploratory Study **Review**

J. P. [Eastwood](#), M. A. Hapgood, E. Biffis, D. Benedetti, M. M. Bisi, L. Green, R. D. Bentley, C. Burnett

Space Weather 2018

[sci-hub.tw/10.1029/2018SW002003](https://sci-hub.tw/10.1029/2018SW002003)

### Estimating the solar wind conditions during an extreme geomagnetic storm: a case study of the event that occurred on March 13–14, 1989

[Tsutomu Nagatsuma](#), [Ryuhō Kataoka](#) & [Manabu Kunitake](#)

Earth, Planets and Space volume 67, Article number: 78 (2015)

<https://earth-planets-space.springeropen.com/track/pdf/10.1186/s40623-015-0249-4>

### **16 March**

#### High energy neutron and pion-decay gamma-ray emissions from solar flares **Review**

[Chupp](#), Edward L.; Ryan, James M.

Research in Astron. Astrophys. Volume 9, Issue 1, pp. 11-40 (2009) **File**

<http://www.raa-journal.org/raa/index.php/raa/article/view/50/36>

<https://iopscience.iop.org/article/10.1088/1674-4527/9/1/003/pdf>

### **25 July 1989 GLE#40**

#### New reconstruction of event-integrated spectra (spectral fluences) for major solar energetic particle events

Sergey A. [Koldobskiy](#), [Osku Raukunen](#), [Rami Vainio](#), [Gennady A. Kovaltsov](#), [Ilya G. Usoskin](#)

A&A 2021

<https://arxiv.org/pdf/2101.10234.pdf>

**15 Aug GLE#41**

**New reconstruction of event-integrated spectra (spectral fluences) for major solar energetic particle events**

Sergey A. [Koldobskiy](#), [Osku Raukunen](#), [Rami Vainio](#), [Gennady A. Kovaltsov](#), [Ilya G. Usoskin](#)

A&A 2021

<https://arxiv.org/pdf/2101.10234.pdf>

**16 Aug GLE41**

**High-energy (>40 MeV) Proton Intensity Enhancements Associated with the Passage of Interplanetary Shocks at 1 au**

D. [Lario](#)<sup>1</sup>, I. G. Richardson<sup>1,2</sup>, A. Aran<sup>3</sup>, and N. Wijsen<sup>1,2</sup>

2023 ApJ 950 89

<https://iopscience.iop.org/article/10.3847/1538-4357/acc9c5/pdf> File

**Modelling the transport of relativistic solar protons along a heliospheric current sheet during historic GLE events**

Charlotte O. G. [Waterfall](#), [Silvia Dalla](#), [Timo Laitinen](#), [Adam Hutchinson](#), [Mike Marsh](#)

ApJ 2022

<https://arxiv.org/pdf/2206.11650.pdf> File

**What are the Sources of Solar Energetic Particles?  
Element Abundances and Source Plasma Temperatures**

**Review**

Donald V. [Reames](#)

Space Sci. Rev 2015

<http://arxiv.org/pdf/1510.03449v1.pdf> File

**29 September GLE#42**

**High Energy Solar Particle Events and Their Relationship to Associated Flare, CME and GLE Parameters**

C. O. G. [Waterfall](#), [S. Dalla](#), [O. Raukunen](#), [D. Heynderickx](#), [P. Jiggins](#), [R. Vainio](#)

Space Weather [Volume21, Issue3](#) e2022SW003334 2023

<https://doi.org/10.1029/2022SW003334>

<https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2022SW003334> File

**Analysis of ground level enhancement events of 29 September 1989; 15 April 2001 and 20 January 2005**

Romanus Ejike [Ugwoke](#), [Augustine Ubachukwu](#), [Johnson Ozoemena Urama](#), [Ogbonnaya Okike](#), [Jibrin Adejoh Alhassan](#), [Augustine Ejikeme Chukwude](#)

Research in Astronomy and Astrophysics 2022

<https://arxiv.org/pdf/2208.12572.pdf>

**A New Model for Nowcasting the Aviation Radiation Environment With Comparisons to In Situ Measurements During GLEs**

[A. D. P. Hands](#), [F. Lei](#), [C. S. Davis](#), [B. J. Clewer](#), [C. S. Dyer](#), [K. A. Ryden](#)

Space Weather [Volume20, Issue8](#) e2022SW003155 2022

<https://doi.org/10.1029/2022SW003155>

<https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2022SW003155>

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ApJ 2022

<https://arxiv.org/pdf/2206.11650.pdf> File

## New reconstruction of event-integrated spectra (spectral fluences) for major solar energetic particle events

Sergey A. [Koldobskiy](#), [Osku Raukunen](#), [Rami Vainio](#), [Gennady A. Kovaltsov](#), [Ilya G. Usoskin](#)

A&A 2021

<https://arxiv.org/pdf/2101.10234.pdf>

## Radio astronomical tools for the study of solar energetic particles II. Time-extended acceleration at subrelativistic and relativistic energies **Review**

Karl-Ludwig [Klein1](#)\*

Front. Astron. Space Sci. Volume 7, id.93 2020

<https://doi.org/10.3389/fspas.2020.580445>

<https://www.frontiersin.org/articles/10.3389/fspas.2020.580445/full>

## The 2012 July 23 Backside Eruption: An Extreme Energetic Particle Event?

Nat [Gopalswamy](#), Seiji Yashiro, Neeharika Thakur, Pertti Mäkelä, Hong Xie, Sachiko Akiyama

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<https://arxiv.org/pdf/1610.05790v1.pdf> File

## The cosmic-ray ground-level enhancements of 29 September 1989 and 20 January 2005

H. [Moraal](#), R. A. Caballero-Lopez, K. G. McCracken

Proc. 34rd International Cosmic Ray Conference, 2015 2016

<https://arxiv.org/pdf/1610.04635v1.pdf>

## What are the Sources of Solar Energetic Particles? Element Abundances and Source Plasma Temperatures

**Review**

Donald V. [Reames](#)

Space Sci. Rev 2015

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## Transient Phenomena in the Energetic Behind-the-Limb Solar Flare of September 29, 1989

[Bhatnagar](#), A.; Jain, R. M.; Burkepile, J. T.; Chertok, I. M.; Magun, A.; Urbarz, H.; Zlobec, P. ASTROPHYSICS AND SPACE SCIENCE I Vol. 243 No. 1 1996; edited by S. Ananthakrishnan; A. Pramesh Rao., p.209-213

[https://ui.adsabs.harvard.edu/link\\_gateway/1996Ap%26SS.243..209B/ADS\\_PDF](https://ui.adsabs.harvard.edu/link_gateway/1996Ap%26SS.243..209B/ADS_PDF)

## A New and Comprehensive Analysis of Proton Spectra in Ground-Level Enhanced (GLE) Solar Particle Events

Allan J. [Tylka](#)\* and William F. Dietrich†\*

PROCEEDINGS OF THE 31st ICRC, ŁÓDŹ 2009

<http://icrc2009.uni.lodz.pl/proc/pdf/icrc0273.pdf>

## Flare-associated energetic particles in the corona and at 1 AU

[Klein](#), K. -L. ; Chupp, E. L. [Trottet](#), G. ; [Magun](#), A. ; [Dunphy](#), P. P. ; [Rieger](#), E. ; [Urpo](#), S.

Astronomy and Astrophysics, v.348, p.271-285 (1999)

<https://articles.adsabs.harvard.edu/pdf/1999A%26A...348..271K>

## On the Origin of Gamma-Ray Emission from the Behind-the-Limb Flare on 29 September 1989

[Cliver, E. W.](#); [Kahler, S. W.](#); [Vestrand, W. T.](#)

23rd International Cosmic Ray Conference, Vol. 3, held 19-30 July, 1993 at University of Calgary, Alberta, Canada. Edited by D.A. Leahy, R.B. Hicks, and D. Venkatesan. Invited, Rapporteur, and Highlight Papers. Singapore: World Scientific, 1993., p.91–94

[https://ui.adsabs.harvard.edu/link\\_gateway/1993ICRC...3...91C/ADS\\_PDF](https://ui.adsabs.harvard.edu/link_gateway/1993ICRC...3...91C/ADS_PDF)

**13-15 Oct**

**A limit for the values of the Dst geomagnetic index**

F.J. [Acero](#), [J.M. Vaquero](#), [M.C. Gallego](#), [J.A. García](#)

2024

<https://arxiv.org/pdf/2402.00437.pdf>

**19 Oct** Large SEP **GLE#43**

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<https://iopscience.iop.org/article/10.3847/1538-4357/acc9c5/pdf> File

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A&A 2021

<https://arxiv.org/pdf/2101.10234.pdf>

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Astronomy and Astrophysics, v.348, p.271-285 (1999)  
<https://articles.adsabs.harvard.edu/pdf/1999A%26A...348..271K>

**19-29 Oct**

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C. O. G. [Waterfall](#), [S. Dalla](#), [O. Raukunen](#), [D. Heynderickx](#), [P. Jiggins](#), [R. Vainio](#)  
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<https://doi.org/10.1029/2022SW003155>  
<https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2022SW003155>

### Very high energy proton peak flux model

Osku [Raukunen](#)<sup>1\*</sup>, Miikka Paassilta<sup>1</sup>, Rami Vainio<sup>1</sup>, Juan V. Rodriguez<sup>2</sup>, Timo Eronen<sup>1</sup>, Norma Crosby<sup>3</sup>, Mark Dierckxsens<sup>3</sup>, Piers Jiggins<sup>4</sup>, Daniel Heynderickx<sup>5</sup> and Ingmar Sandberg<sup>6</sup>  
J. Space Weather Space Clim. 2020, 10, 24  
<https://www.swsc-journal.org/articles/swsc/pdf/2020/01/swsc190089.pdf>

**22 Oct GLE#44**

### High Energy Solar Particle Events and Their Relationship to Associated Flare, CME and GLE Parameters

C. O. G. [Waterfall](#), [S. Dalla](#), [O. Raukunen](#), [D. Heynderickx](#), [P. Jiggins](#), [R. Vainio](#)  
Space Weather [Volume21, Issue3](#) e2022SW003334 2023  
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Charlotte O. G. [Waterfall](#), [Silvia Dalla](#), [Timo Laitinen](#), [Adam Hutchinson](#), [Mike Marsh](#)  
ApJ 2022  
<https://arxiv.org/pdf/2206.11650.pdf> File

### The Effect of the Fluctuating Interplanetary Magnetic Field on the Cosmic Ray Intensity Profile of the Ground-level Enhancement (GLE) Events

Ashraf [Moradi](#)<sup>1</sup> and Joe Giacalone<sup>1</sup>  
2022 ApJ 932 73

<https://iopscience.iop.org/article/10.3847/1538-4357/ac66e0/pdf>

## THE HIGH-ENERGY IMPULSIVE GROUND-LEVEL ENHANCEMENT

K. G. [McCracken](#)<sup>1</sup>, H. Moraal<sup>2</sup>, and M. A. Shea

2012 ApJ 761 101, [File](#)

[https://ui.adsabs.harvard.edu/link\\_gateway/2012ApJ...761..101M/PUB\\_PDF](https://ui.adsabs.harvard.edu/link_gateway/2012ApJ...761..101M/PUB_PDF)

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A&A 2021

<https://arxiv.org/pdf/2101.10234.pdf>

24 Oct GLE#45

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C. O. G. [Waterfall](#), [S. Dalla](#), [O. Raukunen](#), [D. Heynderickx](#), [P. Jiggins](#), [R. Vainio](#)

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Donald V. [Reames](#)

Space Sci. Rev 2015

<http://arxiv.org/pdf/1510.03449v1.pdf> [File](#)

15 Nov GLE#46

### **The time profile of relativistic solar particle events as observed by neutron monitors**

Sophie **Musset**<sup>1</sup>, Karl-Ludwig Klein<sup>2\*</sup>, Nicolas Fuller<sup>2</sup>, Gaelle Khreich<sup>2,3</sup> and Antonin Wargnier<sup>2</sup>  
J. Space Weather Space Clim. **2023**, 13, 15

<https://www.swsc-journal.org/articles/swsc/pdf/2023/01/swsc220075.pdf>

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A&A **2021**

<https://arxiv.org/pdf/2101.10234.pdf>

**27-Nov - 05-Dec-1989**

### **The virtual enhancements – solar proton event radiation (VESPER) model**

Sigiava **Aminalragia-Giamini**<sup>1,2\*</sup>, Ingmar Sandberg<sup>1,2</sup>, Constantinos Papadimitriou<sup>1,2</sup>, Ioannis A. Daglis<sup>1,3</sup> and Piers Jiggins

J. Space Weather Space Clim. **2018**, 8, A06

<https://www.swsc-journal.org/articles/swsc/pdf/2018/01/swsc170059.pdf>

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