Department of Space and Climate Physics Newsletter
Volume 1, Issue 3

30th December 2003

Covers events between 1st September 2003 and 30th November 2003

List of Contents

New Staff Members

We welcomed the following new staff and PhD students:

Dr Ilya Alexeev	- Research Fellow (Space Plasma/Planetary Physics).
Dr Matt Balme	- Research fellow (Space Plasma/Planetary Physics).
Alexander Blustin	- Research fellow (Astrophysics).
Melody Carter	- Work experience student (Space Plasma/Planetary Physics).
Christopher Copperwheat	- PPARC PhD student (Solar and Stellar Physics).
Longsong He	- Research fellow (Space Plasma/Planetary Physics).
Dr Aurelie Marchaudon	- Research fellow (Space Plasma/Planetary Physics).
Hazel McAndrews	- PPARC PhD student (Space Plasma/Planetary Physics).
Patricia Schady	- PPARC PhD student (Astrophysics).
Yasir Soobiah	- PPARC PhD student (Space Plasma/Planetary Physics).
Duncan Trenholme	- Work experience student (Astrophysics).
Sharon Williams	- Work experience student (Space Plasma/Planetary Physics).
Sushan Yow	- PhD student (Astrophysics).

Visitors

We welcomed the following visitors:

Pascal Demulin (Observatoire de Paris)	- visited the Solar/Stellar Physics Group for one week to discuss solar eruptive events and magnetic fields.
Jelle Kaastra (SRON, Netherlands)	- visited the Astrophysics Group to update the X-ray spectral software package SPEX and to discuss current and proposed observing programmes in X-ray spectroscopy.
Cristina Mandrini (IAFE, Buenos Aires)	- visited the Solar/Stellar Physics Group for two weeks to discuss solar eruptive events and magnetic fields.

Prizes and Awards

Alex Blustin - Awarded the Alan Johnstone Prize in 2003 for outstanding research by a PhD student at MSSL. Alex's research has focussed on high resolution X-ray spectroscopy of ionised outflows in Active Galactic Nuclei.

Louise Harra - Awarded a Philip Leverhulme Prize. These prizes are awarded to recognise the outstanding research achievements of young scholars of distinction and promise based in UK institutions.

Appointments

Andrew Coates - External examiner for Cranfield University MSc in Astronautics and Space Engineering (Oct 2003 for 3 years).
Honorary Vice President, London International Youth Science Forum (from Nov 2003).
External examiner for PhD theses at Birmingham (Oct 2003) and UMIST (Nov 2003).

Louise Harra - Director of Postgraduate Studies at MSSL (from Oct 2003).

Grants and Contracts Awarded

Software Engineering - EUR 420k from September 2003 for two years. Two contracts to provide in-flight maintenance support to ESA for the Optical Monitor and Reflection Grating Spectrometer instruments on the XMM-NEWTON mission. Rob Gowen coordinator.

Climate Physics - £74k from January 2004 for one year. To develop a North Atlantic extra-tropical storm tracker as an innovative product to increase risk awareness, forecast loss and to generate revenue. Sponsored by Benfield and Royal&SunAlliance. Mark Saunders PI.

Climate Physics - £200k from July 2004 for two years. To continue and further develop the Tropical Storm Risk venture. Sponsored by Benfield, Royal&SunAlliance and Crawford & Company. Mark Saunders PI.

Telescope/Satellite Time Awards

Ground based telescope time:

Sarah Matthews and Lidia van Driel-Gesztelyi - 10 days observing time awarded on the Dunn Solar Telescope at Sac Peak to use the IBIS instrument to investigate the photospheric response to white-light flares.

Mat Page - 2 shifts awarded for semester 2004a on the JCMT.

Mission Status and Developments

Beagle 2. Continued to perform well during the several check-outs since launch, with no ill effects from the recent solar activity. The latest version of the lander software was uploaded successfully on 21-22 November. Beagle was ejected successfully from the Mars Express orbiter on 19 December and landed on Mars at 0300UT on 25 December 2003.

Cassini-Huygens. CAPS-ELS operations with new flight software due to re-start on 22/23 December. Saturn arrival is scheduled for 1 July 2004.

Cluster. Ending 3rd magnetotail phase at 200 km separation. Solar flare reduced solar panel efficiency by a few percent. MSSL will host next Cluster workshop and SWT/SOWG in March 2004.

Double Star. Equatorial satellite launches on 28-30 December 2003; John Coker and Herve Lamoreux recently visited launch site to fit PEACE thermal blanket. Polar satellite launches in June 2004.

Mars Express. Survived the solar flare activity with a minor and temporary star-tracker problem. ASPERA operations delayed until after Mars Orbit Insertion (25 December, 0300 GMT).

MOSES. The flight electronic units are now nearing completion and should be ready for integration at Montana State University early in 2004. Characterisation of the flight CCDs was completed in October and these have now been delivered. Launch is scheduled for Spring 2004.

Rosetta. Target confirmed as Churyumov-Gerasimenko in 2014. Launch 26 February 2004.

Solar-B EIS. Environmental testing of the camera system and control electronics for the EIS telescope was completed successfully at MSSL. These units will be delivered to RAL early in 2004 for integration to the rest of the system. This

represents a major milestone in the project for MSSL and keeps us on track for a delivery to Japan in July 2004.

Venus Express. Radiation shield delivered to IRF. Instrument delivery to IRF now planned for January 2004.

XMM-NEWTON. There is a new release of the Optical Monitor Grism Tool (ISFs for flux allocation, IDL procedures, User guide and calibration report) for the data reduction of both the UV and V grisms of the OM monitor. This can be obtained from http://www.mssl.ucl.ac.uk/www_astro/xmm/om/om/om_calibration/calibration.html

Publications - Refereed

Department authors are shown in bold.

A. Published

Green, L.M., P. Demoulin, C.H. Mandrini and **L. van Driel-Gesztelyi**, How are emerging flux, flares and CMEs related to magnetic polarity imbalance in MDI data?, *Solar Phys*., **215**, 307-325, 2003.
The paper destroys the myth that coronal mass ejections are related to the appearance of large magnetic polarity imbalance in the CME source region due to important external magnetic connectivities. We show that the observed polarity imbalance in the line-of-sight magnetic component is due to emerging flux. http://solar.physics.montana.edu/cgi-bin/eprint/index.pl?entry=638

Harra, L. S, Matthews and **L. van Driel-Gesztelyi**, Evidence of flaring in a transequatorial loop on the Sun, *Astrophysical Letters*, **598**, 59, 2003.

Laxon, S. W., N.R. Peacock, and D.M. Smith, High interannual variability of sea ice thickness in the Arctic region, *Nature,* **425**, 947-950, 2003.

Loaring, N.S., M.J. Page and **G. Ramsay**, The obscured QSO 1SAX J1218.9+2958, *MNRAS*, **345**, 865, 2003.
We report on the X-ray, optical, and infrared properties of this powerful but heavily absorbed quasar. Surprisingly, at least 50% of the infrared emission is powered by the active galaxy despite the large obscuration.

Page, M.J., S.W. Davis and **N.J. Salvi**, The origin of the Fe K features in Markarian 205 and Markarian 509, *MNRAS*, **343**, 1241, 2003.
We develop a method to combine the spectra from the different imaging spectrometers onboard XMM-Newton and use this to examine claims that Mrk 509 and Mrk 205 have broad accretion disc lines from highly ionised Fe. We find that the spectra can be reproduced as well by simpler models involving reflection from more distant, cool material.

Page, M.J., **R. Soria**, **K. Wu, K.O. Mason**, F.A. Cordova, W.C. Priedhorsky, XMM-Newton RGS spectroscopy of LMC X-3, *MNRAS,* **345**, 639, 2003.
We use the unprecedented collecting area and resolution of the XMM RGS to examine the soft X-ray spectrum of the black hole binary LMC X-3. We determine that LMC X-3 is dragging accretion material from its secondary star rather than accreting from a stellar wind.

Shepherd, A., **D.J. Wingham**, T. Payne and P. Skvarca, Larsen ice shelf has progressively thinned, *Science*, **302**, 852-856, 2003.

Vontrat-Reberac, A., J.M. Bosqued, M.G.G. Taylor, B. Lavraud, D. Fontaine, M.W. Dunlop, H. Laakso, N. Cornilleau-Werhlin, P. Canu and **A.N. Fazakerley**, Cluster observations of the high-altitude cusp for northward interplanetary magnetic field: A case study, *J. Geophys. Res.*, **108**, Issue A9, pp. SMP 8-1, CiteID 1346, DOI 10.1029/2002JA009717.
Comparison of PEACE and CIS data in cusp. Phase velocity of injections and relation to convection pattern.

B. In Press

De Groof, A., D. Berghmans, **L. Van Driel-Gesztelyi** and S. Poedts, Intensity variations in EIT shutterless mode: waves or flows? *Astron. Astrophys.*, in press, 2003.
The first analysis of an EIT high-cadence series reveals intensity variations which appear to propagate from the top of the loop towards its footpoint. The analysis rejects the magneto-acoustic wave hypothesis and shows that these intensity variations are due to flowing/falling plasma blobs.
(http://solar.physics.montana.edu/cgi-bin/eprint/index.pl?entry=762)

Kaastra, J.S., T. Tamura, J.R. Peterson, J.A.M. Bleeker, C. Ferrigno, S.M. Kahn, F.B.S. Paerels, R. Piffaretti, **G. Branduardi-Raymont** and H. Boehringer, Spatially resolved X-ray spectroscopy of cooling clusters of galaxies, Astronomy and Astrophysics, in press, 2003. (http://uk.arxiv.org/abs/astro-ph/0309763).
Spatially resolved X-ray spectra taken with the XMM-Newton EPIC cameras for a sample of 17 cooling clusters of galaxies are used to investigate the reasons why much smaller amounts of cool gas at lower temperatures are observed than predicted by the 'standard' isobaric cooling flow model. The differential emission measure distribution is found to have remarkable similarities with the predictions from coronal magnetic loop models: if coronal loop models apply to clusters, a few hundred loops per scale height should be present, and the typical loop sizes are consistent with the characteristic magnetic field sizes deduced from Faraday rotation measurements.

McComas, D.J., N.A. Schwadron, F.J. Crary, H.A. Elliott, D.T.Young, J.T.Gosling, M.F.Thomsen, E.Sittler, J.-J. Berthelier, K. Szego and **A.J.Coates**, The interstellar hydrogen shadow: observations of interstellar pickup ions beyond Jupiter, *J. Geophys. Res.*, in press, 2003.
Cassini CAPS measurements of interstellar pickup ions beyond Jupiter. Pickup He shows gravitational focussing; pickup H shows depletion in antisolar direction with respect to interstellar ion flow, due to ionization near the Sun.

Ramsay, G. and **M. Cropper**, The energy balance of polars revisited, *MNRAS*, in press, 2003. (www.mssl.ucl.ac.uk/~gtbr/papers.html).
We have made an snapshot survey of polars using XMM-Newton and determined their soft/hard ratios. We find that less than one in five of systems show a significant soft X-ray excess, while the rest show ratios consistent with that predicted by the standard model: this is in contrast to observations made

using ROSAT and can be attributed to the relatively poor calibration of the ROSAT data then available.

Ramsay, G., **M. Cropper**, **K. Mason**, F. Cordova and W. Priedhorsky, XMM-Newton observations of three short period polars V347 Pav, GG Leo and EU Uma, *MNRAS*, in press, 2003. (www.mssl.ucl.ac.uk/~gtbr/papers.html).
These short period binary systems showed one dominant accretion region: in the case of EU UMa its soft/hard X-ray emission is amongst the highest seen in these objects. We infer the mass of the white dwarf and explore the affect of restricting the energy range on the derived parameters.

Smith, A.J., R.B. Horne, and **N.P. Meredith**, Ground observations of chorus following geomagnetic storms, *J. Geophys. Res*., in press, 2003.
We present data from a complete solar cycle of nearly continuous VLF/ELF observations from the VELOX instrument at Halley station, Antarctica and show evidence for enhanced chorus amplitudes during the recovery phase of geomagnetic storms. The data support the wave theory of electron acceleration, but do not rule out other mechanisms.

Summers, D., C. Ma, **N.P. Meredith**, R.B. Horne, R.M. Thorne, and R.R. Anderson, Modeling outer-zone relativistic electron response to whistler-mode chorus activity during substorms, *J. Atmos. Solar Terr. Phys*., in press, 2003.
We formulate a model kinetic equation for the electron energy distribution incorporating electron acceleration by stochastic gyroresonance with whistler mode chorus and electron loss by precipitation due to pitch angle scattering by plasma waves. We conclude that enhanced chorus waves generate during prolonged substorm activity can generate relativistic electron flux increases in the outer radiation zone whether in the presence or absence of a geomagnetic storm.

Publications – Non-Refereed

A. Published

Coates A.J., **N.B. Crosby**, **D.R. Linder** and **D.O. Kataria**, Space weather studies for the satellite insurance industry**,** in proceedings of ESA space weather workshop: looking towards a European space weather programme (17-19 December 2001), p289-291, 2003.
Description of our Tsunami activities on (1) web-based prediction of 'killer' electrons in magnetosphere and (2) prototype 'killer' electron detector (black box).

Crosby, N.B., INTAS: space weather parameter definition, in proceedings of ESA space weather workshop: looking towards a European space weather programme (17-19 December 2001), p277-278, 2003.
Describes INTAS (NIS-European) project on space weather prediction.

Iles, R.H.A., **J.B.L. Jones**, **R.D. Bentley**, R. Hunter, G.C. Taylor, D.J. Thomas, **L.K. Harra and A.J. Coates**, The effect of solar particle events at aircraft altitudes, in proceedings of ESA space weather workshop: looking towards a European space weather programme (17-19 December 2001), p121-124, 2003.
Summary of effect of Bastille day event on radiation doses in aircraft

(conclusion – little effect, but was in declining phase of storm and at position unlikely to be affected).

Lea, A. and **M.A. Saunders,** September forecast update for Australian region tropical storm activity in 2003/4, 3pp, 8 September 2003. (www.tropicalstormrisk.com).

Lea, A. and **M.A. Saunders,** North Atlantic Oscillation forecast for winter 2003/4, 3pp, 1 October 2003. (http://forecast.mssl.ucl.ac.uk).

Lea, A. and **M.A. Saunders,** North Atlantic storminess forecast for winter 2003/4, 2pp, 2 October 2003. (http://forecast.mssl.ucl.ac.uk).

Lea, A. and **M.A. Saunders,** October forecast update for Australian region tropical storm activity in 2003/4, 3pp, 9 October 2003. (www.tropicalstormrisk.com).

Lea, A. and **M.A. Saunders,** November forecast update for Australian region tropical storm activity in 2003/4, 3pp, 4 November 2003. (www.tropicalstormrisk.com).

Lea, A. and **M.A. Saunders,** Summary of 2003 Atlantic tropical cyclone season and verification of authors' seasonal forecasts, 8pp, 28 November 2003. (www.tropicalstormrisk.com).

Saunders, M.A., Hurricane Isabel – a track forecasting success, *Reinsurance*, 52, November 2003. (www.tropicalstormrisk.com).

Yershov, V.N., Neutrino masses and the structure of the weak gauge boson, *J. Theoretics*, V.5-5, 2003, Section "Comprehensive theory articles" (http://www.journaloftheoretics.com/Links/links-papers.htm).
The electron-, muon- and tau- neutrino masses are predicted to be 4.5, 6.0, and 9.0 meV, respectively. The prediction is based on the author's model of composite fermions.

B. In Press

Coates, A.J., Searching for water and life on Mars – with Mars Express and Beagle 2, Federation of Astronomical Societies Handbook, in press, 2003.
Summary of science of missions and MSSL's instrument involvements.

Saunders, M.A. The value of supporting forecasts, *Business Insurance*, in press, 2003.

Trautner, R., N. Manaud, G. Michael, D. Koschny, **A. Griffiths**, **A. Coates**, J-L. Josset, S. Beauvivre, Determination of the Beagle2 Landing Site, Proceedings of International Workshop on Planetary Probe Atmospheric Entry and Descent Trajectory Analysis and Science, 6 – 9 October 2003, Lisbon, Portugal, ESA SP-544, in press, 2003.
Celestial navigation using Beagle 2's stereo camera system (observations of stars and Phobos passes in first few nights on Mars) to reduce Beagle's landing position uncertainty.

Invited Talks and Lectures (National and International)

Andrew Coates:

- Looking for life and water on Mars with Mars Express and Beagle 2, Federation of Astronomical Societies, 20 September 2003.
- Looking for life on Mars - with Mars Express and Beagle 2, UCL Alumni Open Day, 11 October 2003.

- Plasma observations at comets - constraints for modelling, presented at ISSI workshop on cometary modelling, Bern, 23-25 October 2003.
- Opening talk at Royal Institution Discussion Evening, 'A future for humans in space?', 18 November 2003.
- Mars Express and Beagle 2, talk for Physics and Law group, Institute of Physics, 20 November 2003.

Andrew Fazakerley:
- Y.V. Bogdanova, C.J. Owen, R.C. Fear and A. Lahiff co-authors. Identification of the open/closed field line boundary using particle observations made by mid- and high-altitude spacecraft, RAS G-MIST Discussion Meeting on identifying the open-closed field line boundary in magnetospheric and ionospheric data sets, 10 October 2003.

Louise Harra:
- Recent results in solar physics, National University of Ireland, Maynooth.
- Violent atmospheres: explosions from the Sun, Royal Meteorological Society.

Andrew Orr:
- Climate change in the 21st century, University of Portsmouth, 26 November 2003.

Chris Owen:
- An introduction to the structure of the magnetosphere, presentation at PPARC summer school, 17 September 2003.
- Magnetopause processes and substorms, presentation at PPARC summer school, 17 September 2003.

Mat Page:
- Adolescent QSOs, University of Sussex, 7 November 2003.

Mark Saunders:
- TSR (Tropical Storm Risk) and business value, Benfield team leaders, 24 September 2003.
- Storm watching and forecasting, Reuters Foundation AlertNet briefing, Guardian newsroom, London, 23 October 2003.

Conference and Workshop Presentations (National and International)

Royal Meteorological Society Conference 2003, Norwich, UK, 1-5 September 2003. Papers presented by Adam Lea and Mark Saunders (2).

ISEC 2003 Radiation Belt science meeting, Toulouse, France, 2-5 September 2003. Paper presented by Nigel Meredith.

6th Cluster workshop, ESTEC, The Netherlands, September 29 - 03 October 2003 Papers presented by Yulia Bogdanova, Robert Fear and Chris Owen.

Royal Astronomical Society MIST meeting, London, 28 November 2003. Papers presented by Ilya Alexeev, Yulia Bogdanova, Robert Fear, Jason Dewhurst, Nigel Meredith and Abi Rymer.

Press Releases

TSR (Tropical Storm Risk) September Forecast Update, 9th September 2003 (Mark Saunders).
TSR (Tropical Storm Risk) October Forecast Update, 10th October 2003 (Mark Saunders).
Weathering Space (re solar activity), 3rd November 2003 (Andrew Coates).
TSR (Tropical Storm Risk) November Forecast Update, 5th November 2003 (Mark Saunders).

Media Broadcasts and Features

Andrew Coates (selection of 35 international, national and local media pieces):

- Sky News, on asteroid 2003 QQ 47 impact prospects, 2 September 2003.
- BBC News 24, on Galileo end mission, 21 September 2003.
- BBC News 24, on SMART-1 launch on Ariane 5, 27-28 September 2003.
- CNN, on Chinese manned space mission, 15 October 2003.
- BBC1 News, on Chinese manned space mission, 15 October 2003.
- ITN News, on Chinese manned space mission, 15 October 2003.
- BBC1 News, on solar activity, 30 October 2003.
- BBC R4 Leading Edge, on solar activity, 30 October 2003.
- Sky News, on lunar eclipse, 8 November 2003.
- BBC R4 The World Tonight, on space exploration, 27 November 2003.

Andrew Griffiths:

- CNN News, on Beagle 2.
- PPARC video on Beagle 2.

Seymour Laxon:

- Polar bears' habitat threatened by thinning of Arctic ice (coverage on Nature paper), 30 October 2003:
  BBC 1 News, Sky News, Radio 5, Daily Telegraph, The Times, The Independent, The Guardian, Financial Times, New Scientist, US National Public Radio, Reuters, CNN, CBC (Canada), China Daily.

Mark Saunders:

- New Scientist, on typhoon strike on Hong Kong, 2 September 2003.
- New Scientist, on hurricane Isabel, 16 September 2003.

Proposals Submitted

Solar Orbiter Electron Analyser System. Submitted to PPARC call for proposals for involvement in Solar Orbiter. The proposal is for an in-situ instrument which would make the crucial link between the solar wind and solar remote sensing instruments. Andrew Coates PI; Chris Owen and Andrew Fazakerley co-I's.

Other News Items/Activities

Career Profiles in Space Research. Alexander Blustin and Rhaana Starling have produced a website of 'career profiles in space research', which consists of the career profiles of staff and students at MSSL working in a wide range of different science, engineering and administrative fields. The website is at http://www.mssl.ucl.ac.uk/pages/jobs/careers/intro.shtml and we also have the career profiles in printed form for use at Public Outreach events.

Acknowledgements

Venus Express - Thank you to everyone involved in the Venus Express radiation shield design and manufacture. (Space Plasma and Planetary Physics Group).

Beagle 2 - Thanks to everyone who has contributed to the mission simulations. (Space Plasma and Planetary Physics Group).

Double Star - Thanks to all involved in preparations at MSSL and in China. (Space Plasma and Planetary Physics Group).

Next Issue

The next issue of the Department of Space and Climate Physics Newsletter (Volume 1, Issue 4) will be in mid March 2004. This will cover activities from 1st December 2003 to 29th February 2004.