Department of Space and Climate Physics Newsletter
Volume 2, Issue 4

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Covers events between 1st December 2004 and 28th February 2005

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General News

- John Raymont's very interesting memoirs of the laboratory is now available at http://www.mssl.ucl.ac.uk/heritage.

Prizes and Awards

- Aurelie Marchaudon was awarded the Prix de Géophysique 2004 du Comité National Français de Géodésie et Géophysique for her PhD thesis.

Appointments (eg Editorial Boards or Committees)

Andrew Coates - RAS G Awards Committee, 2004-5.

Chris Owen - ESA's Solar System Working Group (until Dec 2007) and PPARC's Solar System Advisory Committee.

Grants and Contracts Awarded

- Ian Hepburn - awarded a 3-year PPARC PIPSS grant of £101,334 in collaboration with Cambridge University and Space Cryomagnetic. This is to lead the development of Magnesium Diboride (MgB2) superconducting magnets for ground and space use.
- Climate Physics - £73k from 1st April 2005 for one year. To continue to develop the EuroTempest North Atlantic extra-tropical storm tracker and loss forecaster. Sponsored by Benfield and Royal&SunAlliance. Mark Saunders PI.
- Climate Physics - won the GlobICE contract from ESA. We lead a consortium of 8 partners for a €1m project to develop a sea ice tracking system using SAR data. UCL's part comes to €415k over 3 years. Contract negotiation concluded 11 March. Kick-off will be May 2005. Steve Baker PI.
- Climate Physics - awarded from ESA in January €92k – an extension to ENVISAT RA2-QA service for Jan to Dec 05. Steve Baker PI.
- Climate Physics - awarded in January £35k - an extension to WAP-QA contract for Jan-Dec 05. Steve Baker PI.

Telescope/Satellite Time Awards/Proposals

Space-based telescope time awards:

Hilary Kay (PI) – ASTRO-E2 - High-energy emission and plasma flows in stellar flares.

Roberto Soria (PI) - XMM-Newton – to study the nuclei of 4 late-type spiral galaxies which may harbour intermediate-mass black holes or no black hole at all, instead of a supermassive black hole.

Roberto Soria (Co-I) - XMM-Newton – to study the time variability of an ultra-luminous X-ray source, to determine the mass of the accreting black hole.

*Proposa*ls:

Roberto Soria - HST/HRC proposal to look at an ultra-luminous X-ray source in NGC5408 (with C. Copperwheat, M. Cropper, K. Wu); HST/ACS SNAP proposal for quick-look observations on NGC7424, NGC7714, NGC5643 containing bright, unidentified ULXs.

Roberto Soria - Spitzer proposal for a sample of elliptical galaxies where the nucleus is a few orders of magnitude underluminous in the X-rays. IR observations can tell us whether the X-ray nuclei are simply obscured by dust or are really inefficient radiators.

Mission Status and Developments

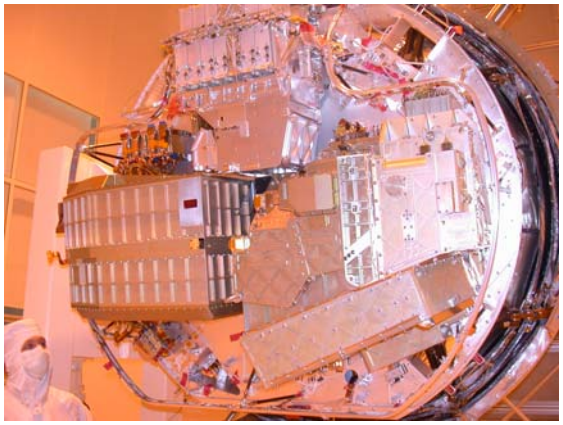
Aurora ExoMars - Input for industrial studies. We lead the team proposing the Panoramic Imaging Camera System (PICS).

Cassini-Huygens – We are co-investigator on the Cassini Plasma Spectrometer, responsible for the Electron Spectrometer (ELS). 3 Titan and 2 Enceladus encounters were successful recently and we are currently on the 5th orbit of Saturn collecting magnetosphere data. ELS is working well. We are hosting the next CAPS team meeting in London, April 05.

Cluster - 4 spacecraft have been in orbit since summer 2000, and formal science operations completed their fourth year at the start of February 2005, despite the original plan being for a 2 year mission. All four PEACE plasma electron spectrometer instruments, built by an MSSL-led team and operated by MSSL are in good condition and returning excellent data. On 10 Feb ESA decided to extend the mission by a further 2 years, and, subject to review, 2 further years after that. During the extension Cluster will visit new magnetospheric regions and simultaneously measure phenomena on large and small scales.

Double Star 2 spacecraft were launched in Dec 2003 and July 2004, each carrying a Double Star PEACE plasma electron spectrometer instrument. These instruments which are modified Cluster PEACE instruments, using innovative on-board software, are working well and returning good data. This mission was designed to co-operate with Cluster - together the 6 spacecraft make valuable simultaneous measurements in key magnetospheric regions, achieving more than either mission would alone.

Herschel - SPIRE is a infra-red spectrometer and photometer instrument that will be looking at galaxy formation. It will be flown on the HERSCHEL Satellite in August 2007, along with two other instruments HiFi and PACS. MSSL was tasked with building the structure of this cryogenic instrument, which operates in the temperature range of 10 K to 300mK. The CQM model was delivered to EADS Astrium Germany just before Christmas and is currently undergoing spacecraft testing. The photograph shows all three instruments on the Herschel Optical Bench before it went into the cryostat chamber. SPIRE is the large golden oblong box nearest the engineer in the picture. The flight model is currently at RAL undergoing performance testing in the SPIRE Cryostat. MSSL is still involved with the development and improvements for the thermal straps.

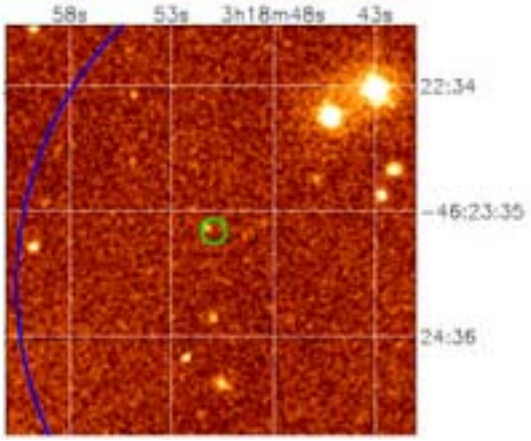


Mars Express - We are co-investigator on ASPERA looking at escape of the Mars atmosphere, working particularly on electron data near Martian magnetic anomalies and in the Martian ionosphere. Operations continue. The first MEX science conference was attended by Andrew Coates and Yasir Soobiah.

Moses - The MOSES instrument is now complete and was delivered to RAL at the end of February to be calibrated using the facility recently upgraded by Solar-B. Launch is scheduled for July this year.

Solar-B EIS - The flight instrument successfully passed the electrical and mechanical integration in Japan and is now in storage whilst other parts of the payload are completed. At the end of February our US colleagues from NRL visited the laboratory to perform flight acceptance tests on the final version of their mechanism and heater control software. This was carried out successfully under close scrutiny from NASA Quality Assurance and supported by the EIS team at MSSL and Alan Spencer. The team will travel to Japan in April to update the new code to the instrument.

Swift – NASA's Swift mission, designed to detect and rapidly follow up Gamma Ray Bursts (GRBs), was launched successfully on 20th November 2004. Swift's three instruments are now activated, and observations of GRBs are being made as they occur. MSSL designed and built the UltraViolet/Optical Telescope (UVOT) which is a near-identical copy of the Optical Monitor on XMM-Newton. This image shows the first GRB afterglow imaged by the UVOT (inside green circle, a V-band image of GRB 050318, Still et al., 2005).



We have now come to the end of the main calibration phase of the mission, with MSSL staff playing a major role in UVOT calibration and operational support and some engineers being on-call 24 hours a day. The aim is for full observatory operation by mid-April.

The UVOT instrument is taking excellent data, including this spectacular image of the spiral galaxy M101 which was taken with with optical and UV filters combined. Thanks to a clever bit of lateral thinking by Tom Kennedy, the focus of the telescope has now been improved to close to its design specification which is more than sufficient to deliver the science goals.

Journal papers, based on Swift results, have already begun to appear with many more in preparation. Many members of the MSSL astrophysics group are involved in Swift science and we anticipate that it will become a major activity of the group in the months to come.

Venus Express - We are co-investigator on ASPERA. Spacecraft testing is underway; launch October 05.

Publications - Refereed

S & CP authors are shown in upper case.

A. Published

Aikio, A., Mursula, K., Buchert, S., Forme, F., Amm, O., Marklund, G., Dunlop, M., Fontaine, D., Vaivads, A. & FAZAKERLEY, A., Temporal evolution of two auroral arcs as measured by the Cluster satellite and coordinated ground-based instruments, *Ann. Geophys.*, **22, iss. 12**, 4089-4101, 2004.

Alexeev, I.V., Owen, C.J., Fazakerley, A.N., Runov, A., Dewhurst, J.P., Balogh, A., Rème, H., Klecker, B. & Kistler, L., Cluster observations of currents in the plasma sheet during reconnection, *Geophys. Res. Let.*, **Vol. 32, No. 3**, L03101, 2005. The electron field-aligned currents were derived from the Cluster PEACE electron spectrometer. They were used to reveal the structure of electric currents in the Earth magnetotail during reconnection event. The structure consistent with the collisionless Hall reconnection model have been found. 10.1029/2004GL021420

Barros, S.C.C., Marsh, T.M., Groot, P., Nelemans, G., RAMSAY, G., Roelofs, G., Steeghs, D. & Wilms, J., Geometrical constraints on the upon the unipolar model of V407 Vul and RXJ0806.3+1527, *Mon. Not. R. astr. Soc.*, **357**, 1306-1312, 2005. We consider geometrical constraints on the system parameters of the ultracompact binary systems, RX J1914+24 and RX J0806+15, using their light curves. We find that for a dipole field only a small parameter space is permitted. doi:10.1111/j.1365-2966.2005.08740.x

Bhardwaj, A., BRANDUARDI-RAYMONT, G., Elsner, R.F., Gladstone, G.R., RAMSAY, G., Rodriguez, P., SORIA, R., & WAITE Jr, J.H., Solar control on Jupiter's equatorial X-ray emissions: 26-29 November 2003 XMM-Newton observations, *Geophys. Res. Let.*, **32**, L03S08, 2005. A 69 hour XMM-Newton observation of Jupiter in Nov. 2003 shows similar day-to-day variability in Jovian equatorial X-rays as in the solar X-rays observed by TIMED/SEE and GOES. A large solar X-ray flare occurring on the Jupiter-facing side of the Sun is found as a corresponding feature in the Jovian X-rays. This suggests that low-latitude Jovian X-rays are due to the scattering of solar X-rays in the planet's upper atmosphere, i.e. the Sun directly controls the non-auroral X-rays from Jupiter's disk. doi:10.1029/2004GL021497

BLUSTIN, A.J., PAGE, M.J., FUERST, S.V., BRANDUARDI-RAYMONT, G. & ASHTON, C.E., The nature and origin of Seyfert warm absorbers, *Astron. & Astrophys.*, **431**, 111-125, 2005. This paper is a wide-ranging survey of the properties of ionised gaseous outflows from Active Galactic Nuclei (AGN), as revealed by high resolution X-ray spectroscopy using XMM-Newton and Chandra. We find that, although the outflow accounts for less than 1% of the energy output of the AGN, the transfer of mass is probably significant enough to have a major influence on the evolution of the host galaxy and of the AGN itself. 10.1051/0004-6361:20041775

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electric field as the main factors controlling Saturn's aurorae, *Nature*, **433**, 720-722, 2005. doi:10.1038/nature03333

DEWHURST, J.P., OWEN, C.J., FAZAKERLEY, A.N. & Balogh, A., Thinning and expansion of the substorm plasma sheet: Cluster PEACE timing analysis, *Ann. Geophys.*, **22**, 4165-4184, 2004.

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Hakala, P., RAMSAY, G., Muhli, P., Charles, P., Hannikainen, D., Mukai, K. & Vilhu, O., XMM-Newton observations of UW CrB - detection of X-ray bursts and evidence for accretion disc evolution, *Mon. Not. R. astr. Soc.*, **356**, 1133-1138, 2005. XMM-Newton observations of this system show several X-ray bursts lasting a few seconds, which strengthens the case for this object having a neutron star primary. White light observations made using the OM show very different light curves several days apart suggesting the disc is warped. doi:10.1111/j.1365-2966.2004.08543.x

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RAMSAY, G., Hakala, P., WU, K., CROPPER, M., MASON, K. O., Cordova, F. & Priedhorsky, W., XMM-Newton observations of the ultra-compact binary RX

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TRENHOLME, D, RAMSAY, & FOLEY, C, Properties of serendipitous X-ray flares discovered in XMM-Newton observations, *Mon. Not. R. astr. Soc.*, **355**, 1125-1131, 2004. We find eight flaring sources in a search of archive XMM-Newton data for which we identify 7 optical counterparts. One of the stars shows two flares in close succession: we discuss the likelihood of this double event being either sympathetic or homologous in nature. doi:10.1111/j.1365-2966.2004.08388.x

YERSHOV, V.N., Dualism of spacetime as the origin of the fermion mass hierachy, *Apeiron*, **12**, 1-25, 2005.

Young, D.T., Berthelier, J.-J., Blanc, M., Burch, J.L., Bolton, S., COATES, A.J., Crary, F.J., Dunlop, M.W., Goldstein, R., Grande, M., Hill, T.W., Johnson, R.E., Baragiola, R.A., Kelha, V., McComas, D.J., Mursula, K., Sittler, E.C., Svenes, K.R., Szego, K., Tanskanen, P., Thomsen, M.F., Bakshi, S., Barraclough, B.L., Bebesi, Z., Delapp, D., Dunlop, M.W., Gosling, J.T., Furman, J.D., GILBERT, L.K., Glenn, D., Holmlund, C., Illiano, J.-M., LEWIS, G.R., LINDER, D.R., Maurice, S., McANDREWS, H.J., Narheim, B.T., Pallier, E., Reisenfeld, D., RYMER, A.M., Smith, H.T., Tokar, R.L., Vilppola, J. & Zinsmeyer, C., Composition and dynamics of plasma in Saturn's magnetosphere, *Science*, **307**, 1262-1265, 2005.

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B. In Press

Burch, J.L., Goldstein, J., Hill, T.W., Young, D.T., Crary, F.J., COATES, A.J., Andre, N., Kurth, W.S., & Sittler Jr, E.C., Properties of local plasma injections in Saturn's magnetosphere, Geophys. Res. Let., 2005.

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GOFF, C.P., VAN DRIEL-GESZTELYI, L., HARRA, L.K., MATTHEWS, S.A. & Mandrini, C.H., A slow Coronal Mass Ejection with Rising X-ray source, *Astron. & Astrophys.*, 2005. Direct observation of helical flows in a CME, in addition to a rising X-ray source.

Luoni, M.L., Mandrini, C.H., Dasso, S., VAN DRIEL-GESZTELYI, L. & Demoulin, P., Tracing magnetic helicity from the solar corona to the interplanetary space, *JASTP*, 2004.

Mandrini, C.H., Pohjolainen, S., Dasso, S., GREEN, L.M., Demoulin, P., VAN DRIEL-GESZTELYI, L., FOLEY, C. & COPPERWHEAT, C., 2004.

MITRA-KRAEV, U., HARRA, L.K., WILLIAMS, D.R. & Kraev, E., The first observed stellar X-ray flare oscillation: Constraints on the flare loop length and the magnetic field, *Astron. & Astrophys.*, 2005. With the help of oscillations, spatially unresolved parameters like loop lengths and local magnetic field strengths can be estimated in stellar coronae. We present the first X-ray observation of an oscillation during a stellar flare.

RAMSAY, & Hakala, P, RApid Temporal Survey - RATS I: Overview and first results, *Mon. Not. R. astr. Soc.*, 2005. This survey explores a new parameter space - namely searching for objects which vary in their optical brightness on timescales of a few mins to hours, over a moderately large area of sky. We have found 46 new variable objects, which show coherent variations on timescales as short as 374 sec up to over 5hrs.

Reynolds, A. P., RAMSAY, G, de Bruijne, J. H. J, Perryman, M. A. C, CROPPER, M, BRIDGE, & Peacock, A, High-speed, energy-resolved STJ observations of the AM Her system V2301 Oph, *Astron. & Astrophys.*, 2005. We present high time-resolution optical energy-resolved photometry of the eclipsing cataclysmic variable V2301 Oph made using the ESA S-Cam detector, an array of photon counting super-conducting tunnel junction devices with intrinsic energy resolution. Spectral fits to the data reveal a 10,000\,K blackbody continuum with strong, time-varying emission lines of hydrogen and helium: this is the first time that stellar emission lines have been detected in the optical band using a non-dispersive photon-counting system.

SAUNDERS, M.A. & LEA, A.S., Seasonal prediction of hurricane activity reaching the coast of the United States, Nature, 2005.

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Sylwester, J., CULHANE, J.L., WHYNDHAM, M., BENTLEY, R.D., GUTTRIDGE, P.R. &17 other authors, RESIK: A Bent Crystal Spectrometer for Studies of Solar Plasma Composition, *Solar Phys.*, 2005.

Publications - Non-refereed

LEA, A.S. & SAUNDERS, M.A., December forecast update for Australian region tropical storm activity in 2004/5, 3pp, 2004.

PARTON, F.A. & SAUNDERS, M.A., Arctic oscillation forecast for December 2004, 2pp, 2004.

PARTON, F.A. & SAUNDERS, M.A., Arctic oscillation forecast for January 2005, 2pp, 2005.

PARTON, F.A. & SAUNDERS, M.A., Arctic oscillation forecast for February 2005, 2pp, 2005.

SAUNDERS, M.A. & LEA, A.S., February forecast update for Atlantic hurricane activity in 2005, 4pp, 2005.

SAUNDERS, M.A. & LEA, A.S., Extended range forecast for Atlantic hurricane activity in 2005, 3pp, 2004.

SAUNDERS, M.A. & LEA, A.S., January forecast update for Atlantic hurricane activity in 2005, 4pp, 2005.

SAUNDERS, M.A. & LEA, A.S., Summary of 2004 NW Pacific typhoon season and verification of authors' seasonal forecasts, 6pp, 2005.

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TOEROEK, T. & Kliem, B., The Kink Instability in Solar Eruptions, in Proceedings of the SOHO 15 Workshop - Coronal Heating, St. Andrews, Scotland, UK, 6-9 September 2004, **SP-575**, 56-61, R.W. Walsh, J. Ireland, D. Danesy, B. Fleck (Eds.), ESA, 2004. We present a new model for the initiation of solar eruptions based on numerical simulations of the helical kink instability of a twisted coronal magnetic flux tube. .

VAN DRIEL-GESZTELYI, L., Demoulin, P., Mandrini, C.H., HARRA, L.K & Klimchuk, J., An observational test for coronal heating models, *Stars as Suns: Activity, evolution and planets*, 473-477, 2004.

Invited Talks and Lectures (National and International)

Roberto Soria - Talk at Sydney University entitled, “Intermediate-mass black holes and ultraluminous X-ray sources”.

Rob Fear gave a seminar, “A Survey of FTEs observed by Cluster: Northward IMF”, at British Antarctic Survey, Cambridge, 17th February. (with A.N. Fazakerley, C.J. Owen and A. Balogh)

A.J. Coates presented a paper, “Plasma Near Saturn's Rings: CAPS observations”, at the AGU Fall meeting, San Fransisco, 13-17 December 2004. (with D.T. Young, H.J. McAndrews, F.J. Crary, S. Maurice, R.E. Johnson, R. Baragiola, D.B. Reisenfeld, R.L. Tokar, E.C. Sittler)

Andrew Coates gave public talks on Cassini-Huygens (Herstmonceux Observatory); Mars Express (PPARC staff); Solar system exploration (British Council – Thessaloniki, Greece – including C-H and MEX) and was a panel member at the Dana centre ‘Changing Planets’ event, 2 February 2005.

Conference and Workshop Presentations (National and International)

Roberto Soria gave a poster at the Texas Symposium on Relativistic Astrophysics, Stanford (USA), Dec 2004.

Chris Owen and Ilya Alexeev presented material (Alexeev: Comparison of Cluster PEACE, CIS and curlometer electric currents, measured during tail plasmasheet crossings) at the INTAS workshop on thin current sheets, Tarusa, Russia, 7-12 Feb. 2005.

Len Culhane and Louise Harra gave presentations on Solar-B at the Annual UK Solar Missions Forum, RAL, February 8-9 2005

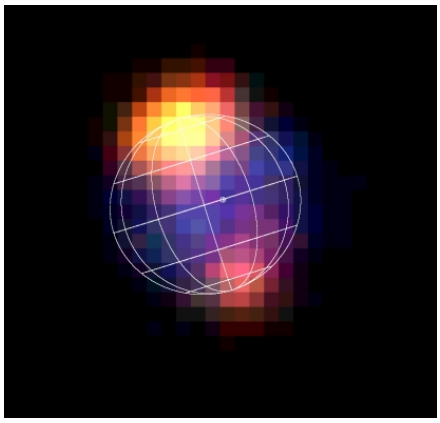
Yulia Bogdanova, Andrew Fazakerley, Matt Taylor and Chris Owen participated in ISSI team ‘Combined Cluster-Double Star observations of the dayside magnetosphere’ meeting, 1st -4th December 2004, ISSI, Bern.

Andrew Fazakerley, Abi Rymer and Hazel McAndrews presented papers at the AGU Fall meeting, San Fransisco, 13-17 December 2004. In total there were more than 20 contributions with MSSL authors.

Andrew Coates and Yasir Soobiah presented papers at the Mars Express science conference, ESTEC, 21-24 February 2005.

Press Releases

The work on XMM-Newton observations of Jupiter, reported last time and published in Geophys. Res. Lett., has been selected as a highlight of the journal. This spun off some press releases by PPARC and ESA (see http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=36688), as well as in the US: Jupiter's low latitude X-ray glow has been found to be due to X-rays from the Sun being reflected back off the planet's atmosphere, and thus to respond to solar flares. This suggests that we could use the reflected emission from Jupiter to establish when a solar flare goes off on an area of the Sun that is facing Jupiter, but which cannot be seen from around the Earth at the time.



This XMM-Newton EPIC image of Jupiter has been slightly smoothed, to show the distribution of X-ray energies: lowest energies in red, highest in blue. The graticule shows Jupiter's orientation and lines of latitude and longitude.

Following accurate 2004 outlook, TSR predicts another active Atlantic hurricane season in 2005. 16th February 2005 (Mark Saunders). (http://forecast.mssl.ucl.ac.uk/shadow/docs/TSRRelease16022005.pdf)

Media Broadcasts and Features

Andrew Coates

- Over 30 media appearances on topics including: Cassini-Huygens (BBC 1 Sky at Night, BBC News 24, BBC radio 4, BBC Southern Counties, Radio Free Europe/Radio Liberty, Sky News, ITN News, BBC R5 phone-in, BBC World, BBC 2 Weekend 24, BBC R5 breakfast, BBC R4 Material World), Deep Impact (Sky News), Mars and Mars Express (BBC R4 Material World, New Scientist, BBC Southern Counties, Radio Netherlands)

Proposals Submitted

Len Culhane - Post-launch support for UK involvement in the Japanese Solar-B Mission. Proposal from the Mullard Space Science Laboratory and the Rutherford Appleton Laboratory, submitted to PPARC, 11 January, 2005.

Next Issue

The next issue of the Department of Space and Climate Physics Newsletter (Volume 3, Issue 1) will be published in mid-June 2005. This will cover activities from 1 March 2005 to 31 May 2005.