



# Department of Space and Climate Physics Newsletter

## Volume 3, Issue 1

1<sup>st</sup> July 2005

Covers events between 1<sup>st</sup> March 2005 and 31<sup>st</sup> May 2005

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### Promotions

- Mark Saunders to Professor of Climate Prediction
- Seymour Laxon to Reader in Climate Physics

### New Staff Members

- Lucy Green has returned to work in the Solar Group. She will be involved with monitoring the GIS instrument on SOHO and helping with the Laboratory's publicity and education activities.

## **Visitors**

- Prof Alphonse Sterling from NASA – Marshall Space Flight Center visited for 1 week in March.
- Li-Jen Chen, University of Iowa visited to work on Cassini Saturn bow shocks.

## **Prizes and Awards**

- Louise Harra has been appointed Guest Professor at Beijing Astronomical Observatory, Chinese Academy of Sciences.
- Khee Gan Lee, one of our summer students, won the RAS Science Prize for his article, “An eye for greatness: the Hubble Space Telescope”. It can be found at [http://www.ras.org.uk/index.php?option=com\\_content&task=view&id=788&Itemid=0](http://www.ras.org.uk/index.php?option=com_content&task=view&id=788&Itemid=0)
- Hazel McAndrews won the Rishbeth prize for the best talk at Cambridge MIST meeting (McAndrews, H.J., A. J. Coates, C. J. Owen, M. F. Thomsen, F. J. Crary and the CAPS Team, Saturn’s icy satellites Dione and Enceladus: Initial results from the Cassini Plasma Spectrometer, Cambridge, 5-7 April 2005).
- MSSL was given a “Superior Performance Award” by Lockheed Martin, for its contribution to the GOES-N programme. There is a plaque on the wall outside the library.

## **Grants and Contracts Awarded**

Climate Physics awards from ESA in April – Steve Baker PI:

- a €48k extension to CryoSat IPF1 contract Apr05 to Feb 06.
- two extensions of €69k and €72k, to CryoSat IPF2 contract Apr05 to Feb 06.

## **Telescope/Satellite Time Awards/Proposals**

Gavin Ramsay was recently in Chile where he had 5 nights on the ESO 2.2m telescope. The weather was excellent for the time of year. This was part of the RATS (Rapid Temporal Survey) project. Together with 4 nights on the INT, which was obtained the week before, we have nearly 1/2 Tb of data to churn through!

*Space-based telescope time awards:* Roberto Soria was awarded Spitzer time to look for dust or possible star formation in the nuclear regions of four nearby X-ray faint elliptical galaxies - in collaboration with Martin Elvis, Pepi Fabbiano, et al.

*Chandra Proposals:*

Roberto Soria is PI or Co-I on the following proposals:

Deep X-ray observation of the Sombrero galaxy - with Rosanne diStefano et al.

Diffuse hot gas in M83 - with Andrea Prestwich et al.

X-ray survey of nuclear star clusters in late-type spiral galaxies - with D Galloway & D Swartz.

Candidate intermediate-mass black holes in the colliding galaxies NGC7714/15 - with M Nowak et al.

A possible nuclear jet in the elliptical galaxy NGC821 - with G Fabbiano et al.  
A complete sample of ULX host galaxies - with D Swartz et al.  
Super-soft X-ray sources around the nucleus of M31 - with R diStefano, F Primini, et al.  
Chandra's catalogue of nearby galaxies - archival proposal with R diStefano & A Kong.

### **Mission Status and Developments**

Aurora ExoMars - meeting on Aurora science priorities attended in Birmingham (A.Coates, R.Cole, A.Griffiths).

Cassini-Huygens - hosted successful CAPS team meeting in London, 20-22 April. ELS working well at Saturn but recent SwRI ground system redevelopment caused delays with data, and a flight software uplink to CAPS also caused problems. PPARC operations grant proposal written; panel attended (18 May, Leicester, A. Coates and D. Linder), awaiting outcome. A. Coates and L. Gilbert participated in a Planetary Data System international peer review team for CAPS data

CryoSat - provisional launch date 23 September 2005 CryoSat is a three-year radar altimetry mission, which aims to determine variations in the thickness of the Earth's continental ice sheets and marine ice cover. Its primary objective is to test the prediction of thinning arctic ice due to global warming.

GOES-N – spacecraft due for launch on 23 June 2005. MSSL was responsible for managing the procurement and performing the characterisation of the CCDs used for the solar X-ray Imager instruments.

Magnetospheric MultiScale – we are part of the SwRI-led team selected for the NASA mission. This will be a 4 spacecraft mission to look at magnetic reconnection on electron gyroscopes, with high time resolution particle measurements.

Mars Express - paper presented at EGU, Vienna (A.Coates, 29 April). Y.Soobiah, A.Coates presentations at ASPERA-3 team meeting, Vienna, 1-3 May.

Moses - now fully calibrated and ready for launch. It will be launched on a Black Brant/Terrier rocket from White Sands missile range, New Mexico on August 18.

Solar-B EIS - New versions of flight code were tested and verified in the UK during May. Matt Whillock and Jason Tandy then installed and tested this code on the flight instrument in Japan. Next month EIS will be re-integrated to the spacecraft for the final time.

Venus Express - PPARC operations grant proposal written, panel attended (19 May, Leicester, A. Coates and D. Linder), awaiting outcome. D. Kataria, A. Coates presentations at ASPERA-4 team meeting, Vienna, 1-3 May.

Cosmic Vision – Andrew Coates, Richard Cole, Phil Guttridge, Andrew Fazakerley, Steve Welch attended the PPARC technology workshop in Birmingham.

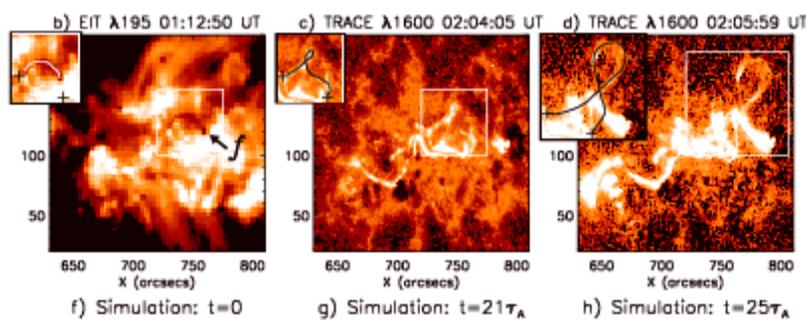
### **News from the Groups**

David Williams from the **Solar Group** reports that he has been working with Tibor Toeroek and Lidia van Driel-Gesztelyi on uniting the different theories which currently exist on the origins of coronal mass ejections (CMEs). A CME is a huge magnetic

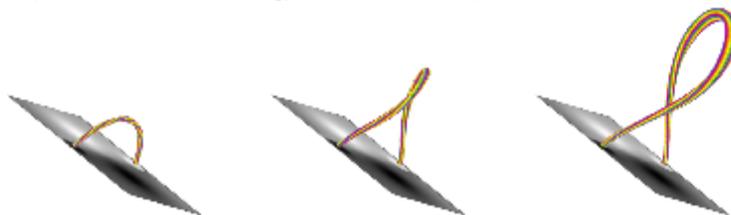
bubble of plasma that erupts from the Sun's corona and travels through space at high speeds, the most vigorous reaching Earth within a day.

This work, which has created a lot of interest from workers on both sides of the Atlantic, covers an event which occurred on 10 November 04. Using ultraviolet images of the Sun from the TRACE spacecraft, and magnetic field images of the Sun's surface from the Michelson Doppler Imager (MDI) on board SoHO they believe they can show that the three competing theories of CME birth are, in fact, working together to produce a particularly violent flare, as well as the subsequent particle storm which arrived at Earth a day later. As it happens, PhD student Gemma Attrill was visiting Svalbard in the Arctic Circle at the time of this CME, and saw the aurora that the Earth-bound storm produced!

The figure below, shows a dark filament as an arched shape, which begins to twist and expand as it is released by the magnetic field around it, rather like a piece of cable which is twisted in opposite directions at each end. This runaway process, known as a "kink instability", is what Tibor has been working on since he joined MSSL last summer. David noticed the remarkable resemblance



(shown as multi-coloured ropes in the lower panels of the image) and the TRACE flare images (upper middle and right panels, where the kinking shape is traced) on the morning of the flare. and began working with Tibor on the data by the afternoon!



What is appealing about these data is that it is relatively easy to see this simple process -- which you can try out with a piece of string -- at work in a "rope" which would wrap around

the Earth N times! Lidia made a nice point, too, about bringing together the various competing theories on the birth of these solar eruptions, "Nature takes the best from each".

More details can be found in David Williams et al's paper, which has just been accepted for publication in Astrophysical Journal.

[http://www.mssl.ucl.ac.uk/~drw/papers/kink/ms2a\\_colour.pdf](http://www.mssl.ucl.ac.uk/~drw/papers/kink/ms2a_colour.pdf)

From the **Climate Physics** group, Mark Saunders reports on their recent breakthrough in hurricane prediction.

Hurricanes rank as the United States' most expensive natural disaster. These tempestuous storms afflict Florida, the eastern seaboard and the Gulf Coast and are responsible for eight of the nation's 10 most costly catastrophes. In 2004 – one of the worst hurricane seasons on record - four hurricanes struck Florida between mid-August and late September leaving an estimated damage bill of \$45 bn (\$23 bn insured). The large year-on-year variability in the number of hurricanes making US landfall (numbers range from zero to six) means that skilful seasonal forecasts of

damaging and quiet hurricane years would reduce the financial risk and uncertainty associated with each hurricane season.

For over two decades scientists have been attempting – with limited success – to deliver skilful seasonal predictions of hurricane activity reaching the coast of the United States. However, a recent breakthrough in hurricane forecasting in our Department is the first to offer forecast precision which is high enough to be practically useful. This advance was reported in the 21st April 2005 issue of the journal *Nature* ([Saunders, M.A. and A.S. Lea, Seasonal prediction of hurricane activity reaching the coast of the United States, \*Nature\*, 434, 1005-1008, 2005](#)). The new forecast model will enable



government, public emergency planning bodies and insurers with US interested to receive warning in early August of the likelihood of either high or low hurricane damage during the subsequent main hurricane season from August to October.

The image is the front cover of *Nature* on 21<sup>st</sup> April 2005. It shows a composite satellite image of hurricanes Charley, Frances, Ivan and Jeanne approaching Florida and US landfall in August and September 2004.

## **Publications - Refereed**

S & CP authors are shown in upper case

### **A. Published**

Burch, J.L., Goldstein, J., Hill, T.W., Young, D.T., Crary, F.J., COATES, A.J., André, N., Kurth, W.S., & Sittler Jr, E.C., Properties of local plasma injections in Saturn's magnetosphere, *Geophys. Res. Let.*, 32, No.14, L14S02, 2005. [10.1029/2005GL022611](https://doi.org/10.1029/2005GL022611)

Cravens, T.E., Robertson, I.P., Clark, J., Wahlund, J.-E., Waite, J.H.Jr., Ledvina, S.A., Niemann, H.B., Yelle, R.V., Kasprzak, W.T., Luhmann, J.G., McNutt, R.L., Ip, W.-H., De La Haye, V., Muller-Wodarg, I., Young, D.T. & COATES, A.J., Titan's ionosphere: model comparisons with Cassini Ta data, *Geophys. Res. Let.*, 32, No. 12, L12108, 2005. [10.1029/2005GL023249](https://doi.org/10.1029/2005GL023249)

Mandrini, C.H., Pohjolainen, S., Dasso, S., GREEN, L.M., Demoulin, P., VAN DRIELGESZTELYI, L., COPPERWHEAT, C. & FOLEY, C., Interplanetary flux rope ejected from an X-ray bright point. The smallest magnetic cloud source region ever observed, *Astron. & Astrophys.*, 434, 725-740, 2005. [10.1051/0004-6361:20041079](https://doi.org/10.1051/0004-6361:20041079)

SAUNDERS, M.A. & LEA, A.S., Seasonal prediction of hurricane activity reaching the coast of the United States, *Nature*, 434, 1005-1008, 2005. Hurricanes rank as the United States' most expensive natural disaster. For over two decades scientists have been attempting - with little success - to deliver seasonal predictions of hurricane activity reaching the coast of the United States. This study is the first to offer forecast precision which is high enough to be practically useful.

SAXTON, C. J., WU, K., CROPPER, M., RAMSAY, G., 2005, Two-temperature accretion flows in magnetic cataclysmic variables: structures of post-shock emission regions and X-ray spectroscopy, *Mon. Not. R. astr. Soc.*, **360**, 1091. We use a two-temperature hydrodynamical formulation to determine the temperature and density structures of the post-shock accretion flows in magnetic cataclysmic variables and calculate the corresponding X-ray spectra. Our calculations show that two-temperature flows predict harder keV spectra than one-temperature flows for the same white-dwarf mass and magnetic field.

## **B. In Press**

Bunce, E.J., Cowley, S.W.H., Wright, D.M., COATES, A.J., Dougherty, M.K., Krupp, N., Kurth, W.S. & RYMER, A.M., In-situ observations of compression-induced tail collapse at Saturn, *Geophys. Res. Let.*, 2005.

COATES, A.J., MCANDREWS, H.J., RYMER, A.M., Young, D.T., Crary, F.J., Maurice, S., Johnson, R.E., Baragiola, R., Tokar, R.L., Sittler, E.C. & LEWIS, G.R., Plasma electrons above Saturn's main rings: CAPS observations, *Geophys. Res. Let.*, 2005.

Canalle, J. B. G., SAXTON, C. J., WU, K., CROPPER, M., RAMSAY, G., Accretion in dipole magnetic fields: flow structure and X-ray emission of accreting white dwarfs, *A&A*. We consider a curvilinear coordinate system and derive a general hydrodynamic formulation for accretion onto stellar objects confined by a stellar dipole magnetic field.

Hill, T.W., RYMER, A.M., Burch, J.L., Crary, F.J., Young, D.T., Thomsen, M.F., Delapp, D., André, N., COATES, A.J. & LEWIS, G.R., Evidence for rotationally-driven plasma transport in Saturn's magnetosphere, *Geophys. Res. Let.*, 2005.

RAMSAY, G., Hakala, P., Marsh, T., Nelemans, G., Steeghs, D., CROPPER, M., XMM-Newton observations of AM CVn binaries, *A&A*. We present XMM-Newton observations of 4 AM CVn binaries - ultra-compact binary systems. Comparing the implied mass transfer rates with that derived using model fits to optical and UV spectra, we find evidence that in the case of AM CVn, we do not detect a significant proportion of the accretion energy - this missing component could be lost in the form of a wind.

Sittler, E.C.Jr., Thomsen, M., Chornay, D., Shappirio, M.D., Simpson, D., Johnson, R.E., Smith, H.T., COATES, A.J., RYMER, A.M., Crary, F., McComas, D.J., Young, D.T., Reisenfeld, D., Dougherty, M. & André, N., Preliminary results on Saturn's inner plasmasphere as observed by Cassini: comparison with Voyager, *Geophys. Res. Let.*, 2005.

Szego, K.Z., Bebesi, Z., Erdos, G., Foldy, L., Crary, F., McComas, D.J., Young, D.T., Bolton, S., COATES, A.J., RYMER, A.M., Hartle, R.E., Sittler, E.C., Reisenfeld, D., Bethelier, J.J., Johnson, R.E., Smith, H.T., Hill, T.W., Vippola, J., Steinberg, J. & André, N., The global plasma environment of Titan as observed by Cassini Plasma Spectrometer during the first two close encounters with Titan, *Geophys. Res. Let.*, 2005.

Tokar, R.L., Johnson, R.E., Thomsen, M.F., Delapp, D.M., Baragiola, R.A., Francis, M., Reisenfeld, D/N/, Fish, B., Young, D.T., Crary, F., COATES, A.J., Gurnett, D.A. & Kurth, W.S., Cassini observations of the thermal plasma in the vicinity of Saturn's main rings and the F and G rings, *Geophys. Res. Let.*, 2005.

WILLIAMS, D.R., TÖRÖK, T., Démoulin, P., VAN DRIEL-GESZTELYI, L., & KLIEM, B., Eruption of a king-unstable filament in active region NOAA 10696, *Astrophys. J.*, 2005.

## **Publications - Non-refereed**

### **A. In Press**

COATES, A.J., Saturn reveals its secrets, *Physics World*, 23-24, April 2005.

COATES, A.J., National grid for Learning: "my favourites", 2005.

JAMES, A., SMITH, A. & LINDER, D., Streamline systems engineering process for small teams as applied within the space sector, in Proceedings of the INCOSE UK Spring conference, Swindon, UK, 10-11 May 2005, (Eds.), 2005.

LEA, A.S. & SAUNDERS, M.A., [Extended range forecast for Northwest Pacific typhoon activity in 2005](#), 2pp, 2005.

LEA, A.S. & SAUNDERS, M.A., [May forecast update for Northwest Pacific typhoon activity in 2005](#), 2pp, 2005.

LEA, A.S. & SAUNDERS, M.A., [Extended range forecast for Australian region tropical storm activity in 2005/6](#), 3pp, 2005.

SAUNDERS, M.A. & FLETCHER, C.G., [Seasonal forecast for Spring 2005 UK city temperatures](#), 3pp, 2005.

SAUNDERS, M.A. & LEA, A.S., [March forecast update for Atlantic hurricane activity in 2005](#), 3pp, 2005.

SAUNDERS, M.A. & LEA, A.S., [April forecast update for Atlantic hurricane activity in 2005](#), 3pp, 2005.

SAUNDERS, M.A. & LEA, A.S., [May forecast update for Atlantic hurricane activity in 2005](#), 3pp, 2005.

SAUNDERS, M.A. & LEA, A.S., [Summary of the 2004/5 Australian region tropical storm season and verification of authors' seasonal forecasts](#), 6pp, 2005.

SORIA, R., Runaway core collapse and cluster survival: where are the parent clusters of ULXs? in Proceedings of the XXII Texas Symposium on Relativistic Astrophysics, Stanford University, US, 2005.

### **B. In Press**

SAUNDERS, M.A., The weather forecaster, *JTW News*, 2005.

SAUNDERS, M.A., Stormy times ahead, *Maritime Risk International*, 2005.

SAUNDERS, M.A., LLOYD-HUGHES, B. & Hilti, N., Forecasting lower costs, *Environmental Finance*, 2005.

## **PhDs Awarded**

- Chris Fletcher: Investigations into Seasonal Predictability of North Atlantic Winter Climate. April 2005.

## **Invited Talks and Lectures (National and International)**

*Graziella Branduardi-Raymont* gave a talk at the American Geophysical Union meeting in New Orleans in May, and an invited talk at the Asia-Oceania Geophysical Society meeting in Singapore in June. Both were on the subject of XMM-Newton observations of Jupiter. This was also the topic of a poster she presented at the ESLAB2005 in Noordwijk in April, now submitted as a paper.

*Andrew Coates*: invited talks, "Plasma at Saturn and Titan: Results from CAPS", (with and the CAPS team), RAS Discussion meeting on The Cassini/Huygens Encounter with the Saturnian System, March 11, 2005

"Cassini-Huygens, Saturn, Titan and plasma physics", (with the CAPS team;), IoP Plasma physics group 32nd annual conference, Clarendon Lab and St Anne's College, Oxford, 21-24 March 2005.

"Cassini's first Titan encounters: a comparison of plasma results", EGU General Assembly, Vienna, 24-29 April 2005. (with F.J. Crary, A.M. Rymer, K. Szego, J. Steinberg, J. Vilppola, D.T. Young, and the CAPS team), Abstract: Geophysical Research Abstracts, Vol. 7, 08841, 2005, SRef-ID: 1607-7962/gra/EGU05-A-08841

"Cassini's first Titan encounters: a comparison of plasma results", (with Crary, F.J., Rymer, A.M., Szego, K., Steinberg, J. T., Vilppola, J, Young, D. T.), 2005 AGU Joint Assembly, New Orleans, 23-27 May 2005.

*Louise Harra*: invited talks at the National Astronomical Meeting (Birmingham), "Review of Solar flares", Tsinghua University, "Solar flares and CMEs observed in the EUV", (May) and Peking University, "UCL's space program" (May).

*Gavin Ramsay*: gave a talk titled "Ultra-Compact Binaries" at the National Astronomy meeting in Birmingham (April),

*Mark Saunders*: "2004 Hurricane Season: Climate Overview and Lessons Learned", Benfield's 2005 Florida Catastrophe Summit, Key Largo, Florida, USA, 2-4 March 2005.

"Using Leading-Edge Computer Technology for Storm Watching and Forecasting", British Computer Society, Cambridge, 26 April 2005.

"Windstorm Erwin: A European Perspective", Benfield Nordic Seminar, Copenhagen, Denmark, 28 April 2005.

*Roberto Soria*: "Association between intermediate-mass black holes and young star clusters", MIT, 8 April 2005, and a talk in May at the 2005 NERQUAM meeting at Boston University, "Why are they not AGN?"

## **Conference and Workshop Presentations (National and International)**

RAS MIST meeting, Cambridge, 5-7 April 2005. Presentations were given by Andrew Coates (representing the CAPS team), Abi Rymer, Hazel McAndrews and Rob Fear.

EGU Vienna presentations (12 in total)

2005 AGU Joint Assembly, New Orleans, 23-27 May 2005. (9 in total).

36th Annual Lunar and Planetary Science Conference, March 14-18, 2005, in League City, Texas. (1)

## **Press Releases**

- Mark Saunders - Breakthrough in forecasting US hurricane activity by UCL scientists.  
(<http://forecast.mssl.ucl.ac.uk/shadow/docs/TSRRelease20042005gen.pdf>)
- The MSSL News website contains details of the many press releases issued during the period - <http://www.mssl.ucl.ac.uk/pages/general/news/news.html>

## **Media Broadcasts and Features**

- Andrew Coates - Interview on BBC1 London News, 8 April 2005, on future ESA Mars mission (Aurora programme); Interview for BBC 3 Counties radio on Mars and Aurora programme, 13 April 2005.
- The Nature paper by Saunders and Lea (2005) was carried by over 100 media organisations across the US. These included National Geographic, New York Times, USA Today and Newsday.
- Filming for the next Stardate programme is underway. The topic is NASA's Deep Impact mission to comet Tempel 1 and the programme airs on 4th July, BBC, 8pm (The time might change!)

## **Proposals Submitted**

Cassini and Venus Express operations grant proposals (PPARC).

## **Other News**

Hazel McAndrews gave a talk to Collyers School 6<sup>th</sup> formers entitled, "The Wonder of the Ringed World: The Cassini-Huygens Mission", 10th May.

Lord Levine (chairman of Lloyd's of London) highlighted the forecast work of Tropical Storm Risk (led by Mark Saunders) as one of three main lessons the insurance industry should learn from the damaging 2004 hurricane season. Lord Levine pointed this out in a visit to Florida in May.

## **Acknowledgements**

Andrew Coates would like to thank Libby, Hazel and all others involved at MSSL on organization of CAPS team meeting.

## **Next Issue**

The next issue of the Department of Space and Climate Physics Newsletter (Volume 3, Issue 2) will be published in mid-September 2005. This will cover activities from 1 June 2005 to 31 August 2005.