COOLNEWS

A RESEARCH NEWSLETTER DEDICATED TO COOL STARS AND THE SUN

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Stellar Abstracts

Infrared Spectroscopy of Symbiotic Stars. X. Orbits for Three S-Type Systems: V1044 Centauri, Hen 3-1213, and SS 73-96

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Employing new infrared radial velocities, we have computed orbits of the cool giants in three southern S-type symbiotic systems. The orbit for V1044 Cen, an M5.5 giant, has a period of 985 days and a modest eccentricity of 0.16. Hen 3-1213 is a K4 giant, yellow symbiotic with an orbital period of 533 days and a similar eccentricity of 0.18. For the M2 giant SS 73-96 the orbital period is 828 days, and this system has a somewhat larger eccentricity of 0.26. Measurement of the H I Paschen δ emission lines, which may at least partially reflect the motion of the secondary in SS 73-96, results in a mass ratio of 2.4 for the M giant relative to the presumed white dwarf. The estimated orbital inclinations of V1044 Cen and Hen 3-1213 are low, about 40 deg. However, for SS 73-96 the predicted inclination is 90 deg, and so an ephemeris for eclipses of the secondary or the hot nebula surrounding it is provided. A search of the orbital velocity residuals of V1044 Cen and SS 73-96 for pulsation periods produced no realistic or convincing period for either star.

Accepted by AJ

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A Survey of Stellar X-ray Flares from the XMM-Newton Serendipitous Source Catalogue: Hipparcos-Tycho Cool Stars

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Context: The X-ray emission from flares on cool (i.e. spectral-type F–M) stars is indicative of very energetic, transient phenomena, associated with energy release via magnetic reconnection. *Aims:* We present a uniform, large-scale survey of X-ray flare emission. The XMM-Newton Serendipitous Source Catalogue and its associated data products provide an excellent basis for a comprehensive and sensitive survey of stellar flares – both from targeted active stars and from those observed serendipitously in the half-degree diameter field-of-view of each observation. *Methods:* The 2XMM Catalogue and the associated time-series ('light-curve') data products have been used as the basis for a survey of X-ray flares from cool stars in the Hipparcos Tycho-2 catalogue. In addition, we have generated and analysed spectrally-resolved (i.e. hardness-ratio), X-ray light-curves. Where available, we have compared XMM OM UV/optical data with the X-ray light-curves. *Results:* Our sample contains ~ 130 flares with well-observed profiles; they originate from ~ 70 stars. The flares range in duration from $\sim 10^3$ to $\sim 10^4$ s, have peak X-ray fluxes from $\sim 10^{-13}$ to $\sim 10^{-11}$ erg cm^{-2} s^{-1}, peak X-ray luminosities from $\sim 10^{29}$ to $\sim 10^{32}$ erg s^{-1}, and X-ray energy output from $\sim 10^{32}$ to $\sim 10^{35}$ erg. Most of the ~ 30 serendipitously-observed stars have little previously reported information. The hardness-ratio plots clearly illustrate the spectral (and hence inferred temperature) variations characteristic of many flares, and provide an easily accessible overview of the data. We present flare frequency distributions from both target and serendipitous observations. The latter provide an unbiased (with respect to stellar activity) study of flare energetics; in addition, they allow us to predict numbers of stellar flares that may be detected in future X-ray wide-field surveys.

The serendipitous sample demonstrates the need for care when calculating flaring rates, especially when normalising the number of flares to a total exposure time, where it is important to consider both the stars seen to flare and those from which variability was not detected (i.e. measured as non-variable), since in our survey, the latter outnumber the former by more than a factor ten.

Accepted by A&A

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For preprints via WWW: http://arxiv.org/abs/1506.05289

On Infrared Excesses Associated With Li-Rich K Giants

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Infrared (IR) excesses around K-type red giants (RGs) have previously been discovered using Infrared Astronomy Satellite (IRAS) data, and past studies have suggested a link between RGs with overabundant Li and IR excesses, implying the ejection of circumstellar shells or disks. We revisit the question of IR excesses around RGs using higher spatial resolution IR data, primarily from the Wide-field Infrared Survey Explorer (WISE). Our goal was to elucidate the link between three unusual RG properties: fast rotation, enriched Li, and IR excess. Our sample of RGs includes those with previous IR detections, a sample with well-defined rotation and Li abundance measurements with no previous IR measurements, and a large sample of RGs asserted to be Li-rich in the literature; we have 316 targets thought to be K giants, about 40% of which we take to be Li-rich. In 24 cases with previous detections of IR excess at low spatial resolution, we believe that source confusion is playing a role, in that either (a) the source that is bright

in the optical is not responsible for the IR flux, or (b) there is more than one source responsible for the IR flux as measured in IRAS. We looked for IR excesses in the remaining sources, identifying 28 that have significant IR excesses by $\sim$20 μm (with possible excesses for 2 additional sources). There appears to be an intriguing correlation in that the largest IR excesses are all in Li-rich K giants, though very few Li-rich K giants have IR excesses (large or small). These largest IR excesses also tend to be found in the fastest rotators. There is no correlation of IR excess with the carbon isotopic ratio, $^{12}C/^{13}C$. IR excesses by 20 μm, though relatively rare, are at least twice as common among our sample of Li-rich K giants. If dust shell production is a common by-product of Li enrichment mechanisms, these observations suggest that the IR excess stage is very short-lived, which is supported by theoretical calculations. Conversely, the Li-enrichment mechanism may only occasionally produce dust, and an additional parameter (e.g., rotation) may control whether or not a shell is ejected.

Accepted by AJ

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On the Rotation Periods of the Components of the Triple System TYC 9300-0891-1AB/ TYC 9300-0529-1 in the Octans Association

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Stellar rotation depends on different parameters such as age, mass, initial chemical composition, initial angular momentum, and environment characteristics. The range of values of these parameters causes the dispersion in the rotation period distributions observed in young stellar clusters/associations. We focus our investigation on the effects of different circumstellar environments on stellar rotation. More specifically, we consider the effects of a perturber stellar companion on the accretion-disc lifetime at early evolution stages.
We are searching in stellar Associations for visual triple systems where all stellar parameters are similar, with the only exceptions of the unknown initial rotation period, and of the circum-stellar environment, in the sense that one of the two about equal-mass components has a close-by third 'perturber' component.
In the present study we analyse the 35-Myr old visual triple system TYC 9300-0891-1AB + TYC 9300-0529-1 in the young Octans stellar association consisting of three equal-mass K0V components. We collected from the literature all information that allowed us to infer that the three components are actually physically bound forming a triple system and are members of the Octans Association. We collected broad-band photometric timeseries in two observation seasons. We discovered that all the components are variable, magnetically active, and from periodogram analysis we found the unresolved components TYC 9300-0891-1AB to have a rotation period P = 1.383 d and TYC9300-0529-1 a rotation period P = 1.634 d.
TYC 9300-0891-1A, TYC 9300-0891-1B, and TYC 9300-0529-1 have same masses, ages, and initial chemical compositions. The relatively small 16% rotation period difference measured by us indicates that all components had similar initial rotation periods and disc lifetimes, and the separation of 157 AU between the component A and the 'perturber' component B (or vice-versa) has been sufficiently large to prevent any significant perturbation/shortening of the accretion-disc lifetime.

Accepted by New Astronomy

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HIP10680/HIP10679: A Visual Binary in the β Pictoris Association with the Fastest Rotating Member

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We present the results of a multi-filter photometric monitoring of the wide binary HIP10680/HIP10679. We found

both components to be variable with amplitude up to $\Delta V = 0.03$ mag in the case of HIP10680 and $\Delta V = 0.07$ mag in the case of HIP10679, and measured the rotation periods P = 0.2396 d of the hotter F5V component HIP10680 and P = 0.777 d of the cooler G5V component HIP10679. We found that the rotation axes of both components are aligned with an inclination $i \sim 10°$. Although the two components have a mass difference not larger than 15%, they exhibit a significant difference between their rotation periods. Such difference may arise either from different initial rotation periods or to different disc life times. For instance, the slower component HIP 10679 hosts a well know debris disc.

Accepted by IBVS

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Solar Abstracts

Deciphering Solar Magnetic Activity: On Grand Minima in Solar Activity

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The Sun provides the energy necessary to sustain our existence. While the Sun provides for us, it is also capable of taking away. The weather and climatic scales of solar evolution and the Sun-Earth connection are not well understood. There has been tremendous progress in the century since the discovery of solar magnetism – magnetism that ultimately drives the electromagnetic, particulate and eruptive forcing of our planetary system. There is contemporary evidence of a decrease in solar magnetism, perhaps even indicators of a significant downward trend, over recent decades. Are we entering a minimum in solar activity that is deeper and longer than a typical solar minimum, a "grand minimum"? How could we tell if we are? What is a grand minimum and how does the Sun recover? These are very pertinent questions for modern civilization. In this paper we present a hypothetical demonstration of entry and exit from grand minimum conditions based on a recent analysis of solar features over the past 20 years and their possible connection to the origins of the 11(-ish) year solar activity cycle.

Accepted by Frontiers in Astronomy and Space Sciences

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For preprints via ftp or WWW: http://arxiv.org/abs/1505.02326

The Cause of the Weak Solar Cycle 24

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The ongoing 11-year cycle of solar activity is considerably less vigorous than the three cycles before. It was preceded by a very deep activity minimum with a low polar magnetic flux, the source of the toroidal field responsible for solar magnetic activity in the subsequent cycle. Simulation of the evolution of the solar surface field shows that the weak polar fields and thus the weakness of the present cycle 24 are mainly caused by a number of bigger bipolar regions emerging at low latitudes with a 'wrong' (i.e., opposite to the majority for this cycle) orientation of their magnetic polarities in the North-South direction, which impaired the growth of the polar field. These regions had a particularly strong effect since they emerged within $\pm 10°$ latitude from the solar equator.

Accepted by ApJL

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For preprints via WWW: http://arxiv.org/abs/1507.01764

Upcoming Meeting

Max Planck Research School for Astronomy and Cosmic Physics

21 - 25 September 2015

Heidelberg, Germany

FINAL ANNOUNCEMENT

The International Max Planck Research School for Astronomy & Cosmic Physics at the University of Heidelberg (IMPRS-HD) announces the **10th Heidelberg Summer School**: *Dynamics of the Interstellar Medium and Star Formation* (21-25 September 2015).

IMPRS Heidelberg invites graduate students and postdocs to its 10th Heidelberg Summer School.

The focus of the school is on the dynamics of the interstellar medium (ISM) and star formation. Basic aspects of the ISM such as the composition, the different phases, turbulence and the main heating and cooling processes will be discussed, as well as the chemistry of the ISM, the formation of molecular clouds and stars and the stellar feedback to the ISM. Another important topic is the observational approach to the ISM - the question which tracers we can use and what observational techniques we may employ.

Invited lecturers are:

- Mordecai-Mark MAC LOW, American Museum of Natural History
- Peter SCHILKE, University of Cologne
- Alexander TIELENS, Leiden University
- Stefanie WALCH, University of Cologne

The school SOC is Ralf Klessen and Simon Glover (ITA, Heidelberg).

Deadline for application is July 15, 2015.

Please find more information, our poster, and the application forms under
www.mpia.de/imprs-hd/ www.mpia.de/imprs-hd/SummerSchools/2015/ or
www.imprs-hd.mpg.de/ http://www.imprs-hd.mpg.de/3880/Summer-School

IMPRS-HD is an independent part of the Heidelberg Graduate School for Fundamental Physics.

With kind regards,

Christian Fendt (Coordinating Scientist)
Email: imprs-hd@mpia.de

Job Opening

Lecturer in Astrophysics

Univ. of Exeter (U.K.)

The University of Exeter invites applications for a Lecturer position in Astrophysics. This post is available from October 1st 2015 for a period of 5 years in the first instance.

The post will contribute to extending the research profile in theoretical or observational Astrophysics at Exeter in the field of exoplanets or related areas. Preference will be given to candidates that will strengthen existing links with the Exeter-based Met Office, particularly in the area of radiative transfer and atmosphere modelling, and to candidates that will contribute to the development and scientific exploitation of the Terra Hunting Experiment. The University of Exeter is investing £1M in the Terra Hunting Experiment, which is a Doppler velocity search for Earth-twins, based on the development of the HARPS-III spectrograph.

The successful applicant will hold a PhD in Physics, Astrophysics or a related area and have an independent, internationally-recognised research programme in an active field related or complementary to existing Exeter activities in the field of exoplanets. He/she will be able to demonstrate the following qualities and characteristics: a good record in attracting research funding, or demonstrable potential to attract such funding, teamwork skills to work in collaboration with existing group members, an active and supportive approach to inter-disciplinary and multi-disciplinary research that will help to foster interactions and links both within the University and externally, the attitude and ability to engage in continuous professional development, the aptitude to develop familiarity with a variety of strategies to promote and assess learning and enthusiasm for delivering undergraduate programmes.

Appointments will be made within the Education and Research job family, salary range £33,242 - £37,394 per annum.

Informal enquiries can be made to Prof Isabelle Baraffe (tel +44 (0)1392 725123 or I.Baraffe@exeter.ac.uk).

Please apply using the Universitys online application system (https://jobs.exeter.ac.uk/) with the job reference P49203. The closing date for completed applications is 31st July 2015

Contact: Isabelle Baraffe (i.baraffe@ex.ac.uk)

Abstract Guidelines

Abstracts for *COOLNEWS* are solicited for papers that have been recently accepted by or submitted to refereed journals, and for recent Ph.D. theses. Abstracts for conference proceedings articles are *not* posted in *COOLNEWS*. The subject matter should pertain directly to cool stars (spectral types F,G,K,M or L), substellar objects, or the sun. Both theoretical and observational abstracts are appropriate.

Abstracts dealing with cool pre-main-sequence (PMS) stars will generally not be included in *COOLNEWS*, since they are already covered by the *Star Formation Newsletter*. Exceptions to this rule will be considered if the subject matter is truly cross-disciplinary. If you wish to submit a cross-disciplinary abstract on PMS stars, then first submit it to the *Star Formation Newsletter*. After doing so, submit the abstract to *COOLNEWS* accompanied by a short e-mail stating that it has already been submitted to the *Star Formation Newsletter*, and summarizing why it will be of interest to the cool star/solar community at large.

A bimonthly call for abstracts will be issued. Announcements of general interest to the cool star and solar communities may also be submitted for posting in the newsletter. These might include (but are not restricted to) the following: (i) *Job Openings* directed toward cool star or solar researchers, (ii) announcements of *Upcoming Meetings*, (iii) announcements of *Upcoming Observing Campaigns* for which participation is solicited from the community at large, (iv) reviews of *New Books*, and (v) *General Announcements* that provide or request research-related information. Please send all correspondence to the editor at coolnews@jila.colorado.edu. Abstract templates and back issues can be obtained from the COOLNEWS Web-page at

`http://casa.colorado.edu/~skinners/coolnews.html .`

*** Please send abstracts in the body of the message and *not* as attachments.***