COOLNEWS

A RESEARCH NEWSLETTER DEDICATED TO COOL STARS AND THE SUN

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Coolnews on the Web

The current and previous issues of *Coolnews* are available on the following web page in pdf, postscript, and Latex format: **http://casa.colorado.edu/∼skinners/coolnews.html**

Stellar Abstracts

Investigating Variation of the Latitudinal Stellar Spot Rotation and Its Relation to the Real Stellar Surface Rotation

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In this work the latitude dependent stellar spot rotation is investigated based on dynamo models. The maps of the magnetic pressure at the surface from the dynamo calculations are treated similarly to the temperature maps obtained using Doppler imaging techniques. A series of snapshots from the dynamo models are cross-correlated to obtain the shift of the magnetic patterns at each latitude and time point. The surface differential rotation patterns obtained from the snapshots of the dynamo calculations show in all studied cases variability over the activity cycle. In the models using only the large scale dynamo field the measured rotation patterns are only at times similar to the input rotation law. This is due to the spot motion being mainly determined by the geometric properties of the large scale dynamo field. In the models with additional small scale magnetic field the surface differential rotation measured from the model follows well the input rotation law. The results imply that the stellar spots caused by the large scale dynamo field are not necessarily tracing the stellar differential rotation, whereas the spots formed from small scale fields trace well the surface flow patterns. It can be questioned whether the large spots observed in active stars could be caused by small scale fields. Therefore, it is not clear that the true stellar surface rotation can be recovered using measurements of large starspots, which are currently the only ones that can be observed.

Accepted by A&A *For preprints contact*: heidi.h.korhonen@utu.fi

Observation and Modelling of Main Sequence Stellar Chromospheres; XVI Rotation of dK5 Stars (Based on observations available at Observatoire de Haute Provence and the European Southern Observatory databases and on Hipparcos parallax measurements.)

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Using two different spectrographs: HARPS (ESO) and SOPHIE (OHP), we have measured vsini for a sample of dK5 stars. These are the first measurements of vsini for most of the stars studied here.

We measured vsini to an accuracy of 0.3 $km\ s^{-1}$ and a detection limit of about 0.5-1 $km\ s^{-1}$. All our targets have similar (R-I)c colour. This is an advantage and facilitates the determination of the narrowest line profiles for vsini$\sim$0. In our total sample, we detected rotation for 22 stars (3 dK5e stars and 19 dK5 stars) and we did not detect rotation in a further 22 stars. This result shows that there are many dK5 slow rotators, and many more than for dM1 stars. We also report on a newly discovered dK5e star, McC 522, which is also the fastest rotator in our sample.

We determine radii and effective temperatures for all our target stars. The effective temperatures were derived using the (R-I)c color and empirical far-red color-effective temperature correlations, and derive the radii from the standard formulae relating M_{bol}, BC and T_{eff}.

We find that the distribution of P/sini (the projected rotation period) is rather homogeneous, i.e., the distribution of the 22 detected stars as a function of P/sini is approximately flat and does not show any maximum, unlike for dM1 stars, a close spectral type. We find that the distribution in vsini is bimodal, as in dM1 stars, with fast dK5e rotators and slower dK5 rotators.

Accepted by MNRAS

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Stars with the Solar-Type Activity: GTSh10 Catalogue

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Based on publications of the last 10-15 years, the Catalogue is made up of dwarfs with different features of solar type activity - dark spots, hydrogen and calcium chromospheric emissions, fast flares in different wavelength regions, and radio and X-ray emissions of stellar coronae. The resulting compiled list consists of 5535 objects.

Accepted by Bulletin of the Crimean Astrophysical Observatory, 2011, V. 107, P. 41-49.

The catalogue is available at:

http://crao.crimea.ua/$\sim$aas/CATALOGUEs/G+2010/eCat/G+2010.html

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Magnetic Activity and Differential Rotation in the Very Young Star KIC 8429280

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Aims. We present a spectroscopic and photometric analysis of the rapid rotator KIC 8429280, discovered by ourselves as a very young star and observed by the NASA Kepler mission, designed to determine its activity level, spot distribution, and differential rotation.
Methods. We use ground-based data, such as high-resolution spectroscopy and multicolor broad-band photometry, to derive stellar parameters ($v \sin i$, spectral type, $T_{\rm eff}$, $\log g$, and [Fe/H]), and we adopt a spectral subtraction technique to highlight the strong chromospheric emission in the cores of hydrogen Hα and Ca II H&K and infrared triplet (IRT) lines. We then fit a robust spot model to the high-precision Kepler photometry spanning 138 days. Model selection and parameter estimation is performed in a Bayesian manner using a Markov chain Monte Carlo method.

Results. We find that KIC 8429280 is a cool (K2 V) star with an age of about 50 Myr, based on its lithium content, that has passed its T Tau phase and is spinning up approaching the ZAMS on its radiative track. Its high level of chromospheric activity is clearly indicated by the strong radiative losses in Ca II H&K and IRT, Hα, and Hβ lines. Furthermore, its Balmer decrement and the flux ratio of Ca II IRT lines imply that these lines are mainly formed in optically-thick sources analogue to solar plages. The analysis of the Kepler data uncovers evidence of at least seven enduring spots. Since the star's inclination is rather high – nearly 70° – the assignment of the spots to either the northern or southern hemisphere is not unambiguous. We find at least three solutions with nearly the same level of residuals. Even in the case of seven spots, the fit is far from being perfect. Owing to the exceptional precision of the Kepler photometry, it is not possible to reach the noise floor without strongly enhancing the degrees of freedom and, consequently, the non-uniqueness of the solution. The distribution of the active regions is such that the spots are located around three latitude belts, i.e. around the star's equator and around $\pm(50^{\rm o} - 60^{\rm o})$, with the high-latitude spots rotating slower than the low-latitude ones. The equator-to-pole differential rotation $d\Omega \simeq 0.27$ rad d^{-1} is at variance with some recent mean-field models of differential rotation in rapidly rotating main-sequence stars, which predict a much smaller latitudinal shear. Our results are consistent with the scenario of a higher differential rotation, which changes along the magnetic cycle, as proposed by other models.

Accepted by A&A

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Solar Abstracts

The Solar Flare Chlorine Abundance from RESIK X-ray Spectra

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The abundance of chlorine is determined from X-ray spectra obtained with the RESIK instrument on *CORONAS-F* during solar flares between 2002 and 2003. Using weak lines of He-like Cl (Cl XVI) between 4.44 and 4.50 Å, and with temperatures and emission measures from *GOES* on an isothermal assumption, we obtained $A(\mathrm{Cl}) = 5.75 \pm 0.26$ on a scale $A(\mathrm{H}) = 12$. The uncertainty reflects an approximately factor of 2 scatter in measured line fluxes. Nevertheless our value represents what is probably the best solar determination yet obtained. It is higher by factors of 1.8 and 2.7 than Cl abundance estimates from an infrared sunspot spectrum and nearby H II regions. The constancy of the RESIK abundance values over a large range of flares (*GOES* class from below C1 to X1) argues for any fractionation that may be present in the low solar atmosphere to be independent of the degree of solar activity. Accepted by ApJ
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Low-Mass and Substellar Abstracts

AKARI Observations of Brown Dwarfs II. CO_2 as Probe of Carbon and Oxygen Abundances in Brown Dwarfs

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Recent observations with the infrared astronomical satellite *AKARI* have shown that the CO_2 bands at 4.2 μm in three brown dwarfs are much stronger than expected from the unified cloudy model (UCM) based on recent solar C &

O abundances. This result has been a puzzle, but we now find that this is simply an abundance effect: We show that these strong CO_2 bands can be explained with the UCMs based on the classical C & O abundances ($\log A_C$ and $\log A_O$) which are about 0.2 dex larger compared to the recent values. Since three other brown dwarfs could be well interpreted with the recent solar C & O abundances, we require at least two model sequences based on the different chemical compositions to interpret all the *AKARI* spectra. The reason for this is that the CO_2 band is especially sensitive to C & O abundances, since the CO_2 abundance depends approximately on $A_C A_O^2$ — the cube of C & O abundances. For this reason, even low resolution spectra of very cool dwarfs, especially of CO_2, cannot be understood unless a model with proper abundances is applied. For the same reason, CO_2 is an excellent indicator of C & O abundances, and we can now estimate C & O abundances of brown dwarfs: Three out of six brown dwarfs observed with *AKARI* should have high C & O abundances similar to the classical solar values (e.g. $\log A_C = 8.60$ and $\log A_O = 8.92$), but the other three may have low C & O abundances similar to the recent solar values (e.g. $\log A_C = 8.39$ and $\log A_O = 8.69$). This result implies that three out of six brown dwarfs are highly metal rich relative to the Sun if the recent solar C & O abundances are correct.

Accepted by ApJ

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Two Very Nearby (d∼5 pc) Ultracool Brown Dwarfs Detected by Their Large Proper Motions from WISE, 2MASS, and SDSS data

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Aims: WISE provides an infrared all-sky survey which aims at completing our knowledge on the possibly dramatically increasing number of brown dwarfs with lower temperatures. We search for the nearest representatives of the coolest brown dwarfs, which will be very interesting for detailed follow-up observations, once they haven been discovered. **Methods:** We have used the preliminary data release from WISE, selected bright candidates with colours typical of late-T dwarfs, tried to match them with faint 2MASS and SDSS objects, to determine their proper motions, and to follow-up them spectroscopically. **Results:** We have identified two new ultracool brown dwarfs, WISE J0254+0223 and WISE J1741+2553, with large proper motions of about 2.5 and 1.5 arcsec/yr, respectively. With their $w1{-}w2{\sim}3.0$ and $J{-}w2{\sim}4.0$ colour indices we expect both to have a spectral type of ∼T8-T10 and absolute magnitude of $M_{w2}{\sim}14$. We confirm WISE J1741+2553 as a T9-T10 dwarf from near-infrared spectroscopy with LBT/LUCIFER1. From their bright WISE $w2$ magnitudes of 12.7 and 12.3, we estimate distances of $5.5^{+2.3}_{-1.6}$ pc and $4.6^{+1.2}_{-1.0}$ pc and tangential velocities of ∼65 km/s and ∼34 km/s indicating Galactic thick and thin disk membership, respectively.

Accepted for publication as a Letter in A&A

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For preprints via ftp or WWW: http://arxiv.org/abs/1105.4059

Upcoming Meeting

From Atoms to Stars: The Impact of Spectroscopy on Astrophysics

26 - 28 July 2011

Oxford, UK

SECOND ANNOUNCEMENT

Dear Colleagues,

We are now accepting registrations and talk/poster proposals for our conference:

From Atoms to Stars: The Impact of Spectroscopy on Astrophysics
July 26 - 28th, 2011, Oxford, UK
http://www.atomstars.org/

The conference has been generously sponsored by the Royal Astronomical Society.

Registration Deadlines:

Abstract/title submission for talks: by Wed 15 June 2011 Abstract/title submission for posters: by Wed 22 June 2011 Conference early registration: by Wed 22 June 2011

Applications for financial support: by Wed 15 June 2011 Room reservation for Somerville College: by Wed 15 June 2011

Science program:

The conference will celebrate the career of Carole Jordan and the many research fields to which she has contributed. The science program will include:

- multi-wavelength quantitative astrophysical spectroscopy - spectroscopic plasma diagnostics - molecular spectroscopy in cool star atmospheres - the solar atmosphere - chromospheres, coronae and winds of late-type stars

Invited speakers: Vincenzo Andretta, Tom Ayres, Alex Brown, George Doschek, Andrea Dupree, Graham Harper, Louise Harra, Viggo Hansteen, Phil Judge, Jeff Linsky, Jan-Uwe Ness, Rachel Osten, Juliet Pickering, Jurgen Schmitt

The meeting will be held in the Physics Department, University of Oxford. The science program will run from the morning of 26th July until lunchtime on the 28th of July.

Contributed talks/posters:

The science program will be a mix of invited and contributed talks. If you would like to give a contributed talk (20 mins) or a poster please submit a title and abstract at:

http://www.atomstars.org/reg/present/

The deadline for proposals is 15 June 2011 (talks) and 22 June 2011 (posters).

Registration

The standard registration fee for the conference is 65 GBP, which includes lunch/coffee for three days and attendance at the "Welcome reception". To register visit

http://www.atomstars.org/reg/register/

The deadline for registration (and payment) at the standard fee is 22 June 2011. It may still be possible to register at a later date but the fee for late registration will be higher.

Financial support

Thanks to sponsorship by The Royal Astronomical Society we have limited funds to support the attendance of early career researchers at the conference. We anticipate assigning these funds to provide financial support for accommodation/travel and to waive registration fees for students and junior postdocs who will attend the conference. To apply

for financial support please complete the form at:

http://www.atomstars.org/reg/support/

The deadline for applications for financial support is 15th June 2011. Applications will be reviewed as they are received and all decisions on financial support will be completed by 22nd June 2011.

Welcome reception: A welcome reception for conference participants will be held at Somerville College, Oxford on the evening of Monday the 25th of July.

Conference banquet:

This will be held at Somerville College, Oxford on the evening of 27th July, 2011. The cost is 42 GBP per head. Please indicate that you will attend the banquet when completing the registration form:

http://www.atomstars.org/reg/register/

It is possible to register only for the conference, only for the banquet or both.

Accommodation A limited number of basic single rooms has been reserved at Somerville College for conference participants. To reserve one of these visit:
http://www.atomstars.org/accommodation/

Alternatively there are many hotels in and around central Oxford. See

http://www.atomstars.org/accommodation/

for useful links.

Further information:

For enquires related to the science program and general organisation e-mail: soc@atomstars.org. For information on local organisation e-mail: loc@atomstars.org.

We look forward to seeing you in Oxford.

On behalf of the SOC, Stuart Sim, ssim@mso.anu.edu.au

On behalf of the LOC, Graeme Smith, g.smith2@physics.ox.ac.uk

Upcoming Meeting

Extreme Space Weather

Fall AGU Meeting Special Session

5 - 9 December 2011

San Francisco, CA

This is a notification of a special session (NG05) entitled Extreme Space Weather to be held at the AGU meeting 5-9 December in San Francisco, Ca. This session will focus on solar, interplanetary, planetary, astrophysical, magnetospheric, ionospheric and atmospheric phenomena that can be directly observed, simulated in advanced models, inferred from paleo-data (such as ice cores, rocks, and meteorites) and observed from a multitude of stars like the Sun. The extremes of interest include events like the 1859 Carrington event, as well as the recent deep extended solar minimum. What are the worst cases that we should prepare for in terms of geomagnetic storms, energetic-particle populations, or solar irradiance changes? Should we care about experiencing a modern-day Maunder Minimum? Predictions for the next solar cycle are welcome.

The NG05 session is sponsored by the Nonlinear Geophysics (NG) section and is cosponsored by the Space Physics and Aeronomy (SPA) and Planetary Sciences (PS) sections. Questions can be directed to any of the session organizers: Bruce Tsurutani (bruce.tsurutani@jpl.nasa.gov), Karel Schrijver (schryver@lmsal.com), Lika Guhathakurta (Madhulika.guhathakurta@nasa.gov), Walter Gonzalez (Gonzalez@dge.inpe.br), Tony Mannucci (Anthony.mannucci@jpl.nasa.gov), Gibor Basri (gbbasri@berkeley.edu) and Dave Brain (brain@ssl.berkeley.edu).

Please note that the deadline for all submissions is 4 August 23:59 EDT/03:59 +1 GMT.

Upcoming Meeting

Fourth SONG Workshop

15 - 20 September 2011

Charleston, S.C.

Dear Colleagues,

We are pleased to announce that abstract submission and registration for the Fourth SONG Workshop is now open. The workshop will take place in Charleston, South Carolina from September 15-20, 2011. For registration, abstract submission, and more information about the workshop please see our web site at http://go.cofc.edu/SONG4/ Please forward this announcement to interested colleagues, and we apologize if you have received this email more than once.

Scientific Rationale:
SONG is an international initiative to design, build, and utilize a global network of eight 1-meter class telescopes to be operated as a whole-Earth telescope. SONG's primary goals are to study stellar interiors by measuring surface sound and gravity-wave oscillations, and to search for and place limits on the number of extrasolar planets. Secondary goals include daytime observations of the Sun, analysis of stellar surface structure, observation of gamma-ray burst afterglows, and connection with other large data-rate temporal studies (e.g. Kepler, LSST) via astrostatistics and astroinformatics.

Workshop topics are: * SONG Status Report * Stellar oscillations * Extrasolar planet searches * Secondary science objectives * The interaction between SONG and other instruments * Mini-SONG * Other SONG Nodes and the future of the SONG Network. (continued →)

Current list of invited speakers: * J. Christensen-Dalsgaard * Frank Grundahl * Pere Palle * Licai Deng * Sarbani Basu * Tim Brown * Panel representing U.S. SONG team: Travis Metcalfe, Jason Jackiewicz, James Neff, Frank Hill, Jon Hakkila

Registration: The workshop registration fee is $200 until August 15. After August 15, the fee will increase to $230, with onsite registration of $250. Registration includes coffee breaks, lunch each day of the workshop, and the banquet. Full registration fees need to be paid even if you do not intend to stay for the whole duration of the workshop. We will be able to provide some travel support to a limited number of U.S. students and postdocs to attend the workshop. When you register, indicate whether you wish to be considered for travel support. The SOC will contact you with further information.

Abstract submission: We invite participants to submit abstracts for proposed scientific contributions to the workshop. The number of oral presentations will be limited, so the scientific organizing committee will select some abstracts for oral presentations, with the remainder being assigned as posters. Please indicate your preference on the abstract submission form. The deadline for abstract submission for oral presentations is 15 August 2011. Poster abstracts may be submitted until 1 September 2011.

Hotel reservations: The workshop webpage has links to lists of hotels in Charleston, their distance from the workshop site and details on how to make reservations. Hotels in Charleston are typically busy in September, so we encourage participants to make reservations early to ensure a place at the hotel of their choice.

Scientific Organizing Committee: J. Hakkila (USA, co-chair), J. Christensen-Dalsgaard (Denmark, co-chair), Yan Li (China, co-chair), Frank Hill (USA), Licai Deng (China), Travis Metcalfe (USA), Uffe Graae Jorgensen (Denmark), James Neff (USA), Katrien Uytterhoeven (Spain), Jason Jackiewicz (USA)

Local Organizing Committee: J. Hakkila (co-chair), James Neff (co-chair), Alfair Meredith, Fahn Lan Hakkila, Robert Dukes, Joseph Carson

Job Opening (Ph.D. Student Fellowships)

Fellowships for Ph.D. Students

Solar System Physics

Max Planck Institute for Solar System Research

Germany

The *International Max Planck Research School on Physical Processes in the Solar System and Beyond* at the Max Planck Institute for Solar System Research in Katlenburg-Lindau, and the Universities of Braunschweig and Goettingen, Germany, offers excellent research possibilities for students to obtain a PhD degree in a 3-years graduate program.

The program covers the full range of physics inherent in the field of solar system science from geophysics and planetary physics to solar physics as well as the underlying fundamental physics. The science program is complemented by training in computational physics, space technology and project management.

High-profile space missions, outstanding projects for ground- based instruments and data analysis, as well as theoretical and extensive numerical modeling provide a wide range of research possibilities for PhD students.

Applications for the program are open to highly-qualified and well-motivated students from all countries. A prerequisite is a diploma or master of science degree in physics or a related field, including a corresponding thesis. Proficiency in English is required.

The next PhD program will start in January 2012, review of application begins on 1 August 2011. Successful applicants will receive adequate financial support.

The application documents should include a CV, the filled application form (see web page), copies of university certificates and two letters of recommendation. The application can be send either by mail or by email (preferentially one attachment in pdf format).

For details on the IMPRS program and the application procedure, please visit http://www.solar-system-school.de or email to info@solar-system-school.de

Address applications to

Dr. Dieter Schmitt Coordinator IMPRS Solar System School Max Planck Institute for Solar System Research Max-Planck-Str. 2 37191 Katlenburg-Lindau Germany

Tel: +49 5556 979 431, Fax: +49 5556 979 190
Email: info@solar-system-school.de

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 monthly call for abstracts will be issued and abstracts received by the last day of the month will usually appear in the following month's newsletter. 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.***