COOLNEWS

A RESEARCH NEWSLETTER DEDICATED TO COOL STARS AND THE SUN

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Coolnews on the Web

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Stellar Abstracts

Chromospheric Thermal Continuum Millimetre Emission from Non-dusty K and M Red Giants

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We examine the thermal free-free millimetre fluxes expected from non-dusty and non-pulsating K through mid-M giant stars based on our limited understanding of their inhomogeneous chromospheres. We present a semi-analytic model that provides estimates of the radio fluxes for the mm wavelength (e.g., CARMA, ALMA, JVLA Q-band) based on knowledge of the effective temperatures, angular diameters and chromospheric Mg II h & k emission fluxes. At 250 GHz, the chromospheric optical depths are expected to be signicantly less than unity, which means that fluxes across the mm and sub-mm range will have a contribution from the chromospheric material that gives rise to the ultraviolet emission spectrum, as well as the cool molecular material known to exist above the photosphere. We predict a lower bound to the inferred brightness temperature of red giants based on heating at the basal-flux limit if the upper chromospheres have filling factor ≈ 1. Multi-frequency mm observations should provide important new information on the structuring of the inhomogeneous chromospheres, including the boundary layer, and allow tests of competing theoretical models for atmospheric heating. We comment on the suitability of these stars as mm flux calibrators.

Accepted by MNRAS

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Elemental Abundances of Low-mass Stars in Nearby Young Associations: AB Doradus, Carina Near, and Ursa Major

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We present stellar parameters and abundances of 11 elements (Li, Na, Mg, Al, Si, Ca, Ti, Cr, Fe, Ni, and Zn) of 13 F6-K2 main-sequence stars in the young groups AB Doradus, Carina Near, and Ursa Major. The exoplanet-host star ι Horologii is also analysed. The three young associations have lithium abundance consistent with their age. All other elements show solar abundances. The three groups are characterised by a small scatter in all abundances, with mean [Fe/H] values of 0.10 (σ=0.03), 0.08 (σ=0.05), and 0.01 (σ=0.03) dex for AB Doradus, Carina Near, and Ursa Major, respectively. The distribution of elemental abundances appears congruent with the chemical pattern of the Galactic thin disc in the solar vicinity, as found for other young groups. This means that the metallicity distribution of nearby young stars, targets of direct-imaging planet-search surveys, is different from that of old, field solar-type stars, i.e. the typical targets of radial velocity surveys. The young planet-host star ι Horologii shows a lithium abundance lower than that found for the young association members. It is found to have a slightly super-solar iron abundance ([Fe/H]=0.16$\pm$0.09), while all [X/Fe] ratios are similar to the solar values. Its elemental abundances are close to those of the Hyades cluster derived from the literature, which seems to reinforce the idea of a possible common origin with the primordial cluster.

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For preprints via ftp or WWW: http://arxiv.org/abs/1209.2591

Detection of Transient High Frequency Optical Oscillations of the Flare Star YZ CMin

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In this paper we present the results of the analysis of the B-light curve for the flares of the red dwarf YZ CMin (dM4.5e), which were observed on February of 2002, with the help of the 30-inch Cassegrain telescope of the Stephanion Observatory, Greece. Discrete Fourier Transform analysis and the use of the Brownian Walk noise enable us to estimate the proper random noise and detect possible weak transient optical oscillations. Our results indicate that: (1) Transient high frequency oscillations occur during the flare event and during the quiet-star phase as well. (2) The observed frequencies range between 0.0083 Hz (period 2 min) and 0.3 Hz (period 3 s) is not rigorously bounded. The phenomenon is most pronounced during the flare state. (3) During the flare state: (a) Oscillations with period 2 to 1.5 min, 60 s, 11 s, 7.5 s, and 4 s appear around the maximum light state and persist during the whole flare state, (b) from the flare maximum phase on, a progressive increase of oscillations with periods 30 s, 20 s down to 4.0 s is markedly indicated, and (c) at the end of the flare only the oscillation of the pre-flare state do remain. Our observations are consistent with the phenomenology of impulsively exited oscillations on a coronal magnetic loop and subsequent chromospheric heating by electronic flux at the foot of the loop or/and by soft X-ray coronal emission. Our observation give evidence that more than one impulsive events may occur in the course of an observed flare.

Published in AN

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Rotation in NGC 2264: A Study Based on CoRoT Photometric Observations

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Rotation is one of the key stellar parameters which undergo substantial evolution during the stellar lifetime, in particular during the early stages. Stellar rotational periods can be determined on the basis of the periodic modulation of starlight produced by non-uniformities on the surface of the stars, due to manifestation of stellar activity. We present the results of an extensive search for rotational periods among NGC 2264 cluster members, based on photometric monitoring using the CoRoT satellite, with a particular attention to the distribution of classical and weak-line T-Tauri stars. NGC 2264 is one of the nearest and best studied star forming region in the solar neighbourhood, with an estimated age of 3 Myr, and is the object of a recent simultaneous multiband campaign including a new CoRoT observation with the aim to assess the physical origin of the observed variability. We find that the rotational distributions of classical and weak-line T-Tauri star are different, suggesting a difference in the rotational properties of accreting and non-accreting stars.

Accepted by MNRAS

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Solar Abstracts

Revisiting the Solar Oblateness

Rozelot, Jean Pierre[1] and Fazel, Nayer[2]

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[2] Tabriz University, Faculty of Physics, Iran)

The measurement of solar oblateness has a rich history extending well back into the past. Until recently, its estimate has been keenly disputed, as well as its temporal dependence. Recent accurate observations of the solar shape gave cause for doubt, and so far only balloon flights or satellite experiments, such as those onboard SDO, seem to achieve the required sensitivity to measure the expected small deviations from sphericity. A shrinking or an expanding shape is ultimately linked to solar activity (likely not homologously with its change), as gravitational or magnetic fields, which are existing mechanisms for storing energy during a solar cycle, lead to distinct perturbations in the equilibrium solar structure and changes in the diameter. It follows that a sensitive determination of the solar radius fluctuations might give information about the origin of the solar cycle. In periods of higher activity, the outer photospheric shape seems to become aspheric, under the influence of higher-order multipole moments of the Sun, resulting both from the centrifugal force and the core rotation. Accurate determination of the shape of the Sun is thus one of the ways we have now for peering into its interior, learning empirically about flows and motions there that would otherwise only be guessed from theoretical considerations, developing more precise inferences and ultimately building possible alternative gravitational theories.

Accepted by Solar Physics

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Silicon Abundance from RESIK Solar Flare Observations

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The RESIK instrument on the CORONAS-F spacecraft obtained solar flare and active region X-ray spectra in four channels covering the wavelength range 3.8 – 6.1 Å in its operational period between 2001 and 2003. Several highly ionized silicon lines were observed within the range of the long-wavelength channel (5.00 – 6.05 Å). The fluxes of the Si XIV Ly-β line (5.217 Å) and the Si XIII $1s^2 - 1s3p$ line (5.688 Å) during 21 flares with optimized pulse-height analyzer settings on RESIK have been analyzed to obtain the silicon abundance relative to hydrogen in flare plasmas. As in previous work, the emitting plasma for each spectrum is assumed to be characterized by a single temperature and emission measure given by the ratio of emission in the two channels of GOES. The silicon abundance is determined to be $A(\mathrm{Si}) = 7.93 \pm .21$ (Si XIV) and $7.89 \pm .13$ (Si XIII) on a logarithmic scale with H = 12. These values, which vary by only very small amounts from flare to flare and times within flares, are 2.6 ± 1.3 and 2.4 ± 0.7 times the photospheric abundance, and are about a factor of three higher than RESIK measurements during a period of very low activity. There is a suggestion that the Si/S abundance ratio increases from active regions to flares.

Accepted by Solar Physics

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Rotation Rates of the Coronal Holes and Their Probable Anchoring Depths

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Solar coronal holes are large regions in the solar corona with low density plasma and unipolar magnetic field structures, distinguished as dark features in EUV and X-ray wavelength regimes. In addition to sunspot and magnetic activity phenomena that strongly influence the Earth's climate (Hiremath and Mandi, New Astronomy, Volume 9, 651, 2004; Hiremath, Sun and Geosphere, 4, 16, 2009), there is increasing evidence that, on short time scales, occurrences of solar coronal holes trigger responses in the Earth's upper atmosphere and magnetosphere. From the ISRO funded project, our main interests in the coronal holes are: (i) genesis of coronal holes, whether they are mere surface coronal active regions or deep rooted, (ii) their relationship with the sunspot cycle and activity phenomena and, (iii) radiative responses of these structures on the Indian summer Monsoon rainfall. For this purpose, for the years 2001-2008, full-disk SOHO/EIT 195 Åcalibrated images are used to accurately measure heliographic latitude, longitude, day to day variations of area and average radiative fluxes of the coronal holes at 1 AU and in the region of corona.

Although so called dynamo mechanism imitates some characteristics, physics of sunspot cycle and activity phenomena is not well understood (Hiremath, K. M. 2010, arXiv1012.5706; Hiremath, K. M. 2010, Sun and Geosphere, 5, 17) completely. In order to understand the sunspot cycle and activity phenomena, an understanding of rotational structure of the solar interior and the surface are necessary. On the other hand, rotation rate of the interior and the surface are coupled with the rotation rate of the solar atmosphere, especially the corona. Although there is a general consensus regarding the interior rotation as inferred from the helioseismology there is no such consensus on the magnitude and form of rotation law for features in the corona. Keeping these views in mind, for different latitude zones between 40^o north - 40^o south, we compute rotation rates, and find that, irrespective of their area, number of days observed on the solar disk and latitudes, coronal holes rotate rigidly. Combined for all the latitude zones, we also find that coronal holes rotate rigidly during their evolution history. In addition, for all latitude zones, coronal holes follow a rigid body rotation law during their first appearance. Interestingly, average first rotation rate ($\sim 438\, nHz$) of the coronal holes, computed from their first appearance on the solar disk, match with rotation rate of the solar interior only below the tachocline. Other interesting results of this study are: (i) magnetic reconnection alone can not be sufficient for explanation of dynamics (rigid body rotation) and area evolution of the coronal holes and, (ii) probable anchoring depth of coronal holes is estimated to be $\sim 0.62(\pm 0.10) R_\odot$.

Accepted by ApJ
For preprints contact: hiremath@iiap.res.in
For preprints via WWW: http://adsabs.harvard.edu/abs/2012arXiv1212.1658

Upcoming Meeting

Living With a Star / Solar Dynamics Observatory (LWS/SDO) Workshop Update

Exploring the Network of SDO Science

3 - 8 March 2013

Cambridge, Maryland (USA)

SDO 2013 Workshop Update: Registration, Abstract Submission, and Financial Aid Opportunities

The LWS/SDO Workshop *Exploring the Network of SDO Science* will be held in Cambridge, MD on March 3-8, 2013. All members of the heliophysics community are welcome to attend. The workshop website is:

http://lws-sdo-workshops.org

and inquiries can be sent to any member of the organizing committee orlws.sdo.workshops@gmail.com

We have several updates:

-Registration and abstract submission are open. Early registrations are appreciated.

-Financial aid is available for students and early career scientists. Early career scientist support has been made possible by the Thomas Metcalf Travel Fund of the Solar Physics Division of the American Astronomical Society. There is no specific deadline for applications, but award decisions will begin in mid-December 2012, so it is recommended that applicants submit materials by December 18, 2012 to maximize their chance of success. Application instructions are available on the workshop website.

-A Student Organizing Committee is planning several activities specifically for students and young scientists. The events include an "Early Career Scientist Night," with apanel discussion consisting of professionals representing different career paths, followed by networking event. - In keeping with the "Networking" theme of the workshop, several sessions dedicated to connecting SDO science to other realms. Examples include the "Asteroseismology/Helioseismology Connection"and "Geospace Response" sessions.

- Friday, March 8 will be dedicated to a series ofMini-Workshops. Topics includeAdvanced Image Processing and Feature Recognition; Thermal Diagnostics and Temperature Mapping; Vector Magnetography; Local Helioseismology; EUV Data Intercomparisons; and Flare Prediction.

Upcoming Meeting

Space Climate Symposium-5

15 - 19 June 2013

Oulu, Finland

FIRST ANNOUNCEMENT

Dear Colleagues and Friends:

We have the great pleasure to invite you to *Space Climate Symposium-5* which will be held in Oulu, Finland, on 15.-19. June, 2013.

Space Climate is an interdisciplinary science that deals with the long-term change in the Sun, and its effects in the heliosphere and in the near-Earth environment, including the atmosphere and climate. A special focus will be on studies of the causes, consequences and implications of the present, unusually low solar activity since solar cycle 23 that, most likely, indicates the imminent end of the Modern Grand Maximum of solar activity. Other topics include solar dynamo, solar irradiance variations, solar wind, geomagnetic field and activity, cosmic rays and cosmogenic isotopes, and solar effects on different layers of the atmosphere and on local and global climate, as well as possible solar effects on human health and on the development of human cultures.

SCIENTIFIC ORGANIZING COMMITTEE J. Beer, P. Charbonneau, E. Cliver, T. Dudok de Wit, M. Echim, K. Georgieva, S. Gibson, N. Gopalswamy, D. Marsh, K. Mursula (chair), D. Nandy, A. Rouillard, A. Ruzmaikin, A. Tlatov, E. Turunen, I. Usoskin (vice-chair), M. Voiculescu, A. Zhukov

LOCAL ORGANIZING COMMITTEE T. Asikainen (chair), L. Holappa, V. Maliniemi, K. Mursula, I. Usoskin, I.I. Virtanen, I.O. Virtanen, L. Zhang

Further details on abstract submission, registration, a nd accommodation will be available soon at the meeting website

http://www.spaceclimate.fi/

For questions, contact: spaceclimate@oulu.fi

Welcome to SCS-5 in Oulu!

Sincerely Yours,

Timo Asikainen (LOC chair), Kalevi Mursula (SOC chair), Ilya Usoskin (SOC vice-chair)

Upcoming Meeting

From Solar Environment to Stellar Environment

24 - 28 June 2013

Brisbane, Australia

The one-day session *From Solar Environment to Stellar Environment* will be held during the AOGS General Assembly (Asia Oceania Geosciences Society) the week of 24 to 28 June 2013. The meeting will be held at the Brisbane Convention & Exhibition Centre (BCEC), Australia.

This session will review the environment of the Sun (solar wind) and those of stars which is presently permitted through interferometry. The focus will be made on the Sun, the properties of the ejected plasma, of the solar wind and on space weather. The tides in planetary systems and in binary

stellar systems will be reviewed, as well as the interactions in massive binary stars as seen by interferometry. It will be discussed the environments of young and evolved stars, stellar and solar winds properties, magnetic fields and disks. It is of utmost importance to understand the origin of the winds physical properties to delineate between the winds of cool stars like the Sun which are driven by gas pressure gradient, and the winds of hot massive stars which tend to be luminous and are driven by the star radiation pressure. Such an understanding requires synergistic effort from researchers across diverse scientific disciplines including but not limited to solar physics, atmospheric sciences, and mathematical modelling. The session is wide enough to accept papers at the scientific frontiers. It is expected to give a progress report on the very last solar developments (structure of the solar core for example) and stellar developments (space results, new stellar models) for a better understanding of solar/stellar environments in general.

Conference web page:

http://www.asiaoceania.org/society/index.asp

Abstract Submission and Reduced Registration Fee Application Deadline: 29 Jan 2013

Acceptance Notification: 26 Feb 2013

SOC and invited speakers (preliminary list): J.P. Rozelot (France), K. Georgevia (Bulgaria), C. Neiner (France), A. ud-Doula (USA), A. Kosovichev (USA), I. Kitashvili (USA), J. Javaraiah (India), S. Mathis (France), P. Stee (France), N. Kilifarska (Bulgaria), A. Ogzuc (Turkey), S. Bright, O. Demarco (Australia), J.C. Vial (France), E. Babayev (Azerbaijan).

Upcoming Meeting

Brown Dwarfs Come of Age

20-24 May 2013

Fuerteventura, Canary Islands, Spain

Dear Collegues:

An international conference on Brown Dwarfs will be held next May in the sunny island of Fuerteventura, exactly 11 years after the first IAU Symposium devoted to these once elusive objects and 18 years after the definitive observational confirmation of their existence. Much work has been done in the last two decades, both from the theoretical and observational point of view. Time is ripe now to have a conference to provide a comprehensive overview of this very active field of research.

Some of the most relevant work on Brown Dwarfs has been done in the Canarian Observatories, making Canary Islands an ideal location to host this conference. Fuerteventura is the easternmost island of the Canaries, rich of unique natural spaces and impressive landscapes. It is well connected by direct flights with many European cities and offers many possibilities of affordable and comfortable accommodation. This island is working to preserve its dark night sky and become a Starlight Reserve.

Please visit our conference website:

http://bdofage.tng.iac.es

Job Opening

Postdoctoral Positions

Solar Magnetohydrodynamics

University of Dundee (UK)

Applications are invited for **two** three-year postdoctoral research positions in the area of Magnetohydrodynamics (MHD). The positions are available to work on two projects within an STFC consolidated grant to study the behaviour of complex magnetic fields in the solar corona. Topics will include studying the importance of the complex topology magnetic carpet on the dynamics and heating of coronal loops, and determining the constraints that govern the relaxation of coronal magnetic fields.

The successful candidates will join a young and growing MHD group at Dundee that currently consists of three permanent members of staff (Prof. G. Hornig, Drs. D. Pontin and A. Wilmot-Smith) and three PhD students. The group has access to a large Beowulf parallel computer. The projects are funded as part of a Consortium that also includes Dr. A. Yeates at the University of Durham. Further details about our group in Dundee can be found here:

http://www.maths.dundee.ac.uk/mhd/

The ideal candidate will have a good knowledge of MHD and will have extensive experience in either one or both of the following: (i) computational MHD/hydrodynamics and code development, (ii) mathematical modelling of plasmas or fluids. Experience in solar physics observations would also be beneficial. Applicants must hold a PhD in solar physics, plasma physics or applied mathematics by the start of the project.

The positions are available for three years, from April 1st 2013. The starting salary will be on Grade 7 of the UK Universities' pay scale, typically around 29249 pounds.

The formal advert will appear in the near future.

Interested parties are encouraged to contact us (at e.g. dpontin@maths.dundee.ac.uk) to make us aware of their interest, and for further details.

Job Opening

Ph.D. Student Fellowships

Solar System Physics

Max Planck Institute for Solar System Research

Katlenburg-Lindau, Germany

The IMPRS on Physical Processes in the Solar System and Beyond at the Max Planck Institute for Solar System Research in Katlenburg-Lindau, Germany, offers excellent research possibilities for students to obtain a PhD degree in a three-year graduate program in collaboration with the Universities of Braunschweig and Goettingen.

The research-oriented doctoral program focuses on training in solar and stellar physics, planetary sciences as well as underlying fundamental physics. Additional training in computational physics, space technology, presentation skills and scientific writing complete the science program.

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

We encourage highly-qualified and well-motivated students from all countries to apply. Prerequisites include a MSc in physics or a related field (including a master thesis) and a good command of the English language.

The next review of applications begins on 15 February 2013 for a start of a PhD in autumn 2013.

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

For detailed information on the IMPRS doctoral program and the application procedure, please visit http://www.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 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.***