COOLNEWS

A RESEARCH NEWSLETTER DEDICATED TO COOL STARS AND THE SUN

No. 157 — June 2009 Editor: Steve Skinner (coolnews@jila.colorado.edu)

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Stellar Abstracts

Departures from LTE for Neutral Li in Late-type Stars

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We perform non-LTE calculations of lithium in late-type stars for a wide range of stellar parameters, including quantum mechanical cross-sections for collisions with neutral hydrogen and the negative hydrogen ion. Non-LTE abundance corrections for the lithium resonance line at 670.7 nm and the subordinate line at 610.3 nm, are calculated using 1D MARCS model atmospheres spanning a grid $T_{\rm eff} = [4000, 8000]$ K, $\log g = [1.0, 5.0]$, and [Fe/H] $= [0.0, -3.0]$, for lithium abundances in the range $A({\rm Li}) = [-0.3, 4.2]$. The competing effects of ultraviolet over-ionization and photon losses in the resonance line govern the behaviour of the non-LTE effects with stellar parameters and lithium abundance. The size and sign of the non-LTE abundance corrections vary significantly over the grid for the 670.7 nm line, but are typically positive and below 0.15 dex for the 610.3 nm, line. The new collisional data play a significant role in determining the abundance corrections.

Accepted by A&A

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For preprints via ftp or WWW: http://arxiv.org/abs/0906.0899

Radius Determination of Solar-type Stars Using Asteroseismology: What to Expect from the Kepler Mission

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For distant stars, as observed by the NASA Kepler satellite, parallax information is currently of fairly low quality and is not complete. This limits the precision with which the absolute sizes of the stars and their potential transiting planets can be determined by traditional methods. Asteroseismology will be used to aid the radius determination of stars observed during NASA's Kepler mission. We report on the recent asteroFLAG hare-and-hounds Exercise#2, where a group of 'hares' simulated data of F-K main-sequence stars that a group of 'hounds' sought to analyze, aimed at determining the stellar radii. We investigated stars in the range $9 < V < 15$, both with and without parallaxes. We further test different uncertainties in T_{eff}, and compare results with and without using asteroseismic constraints. Based on the asteroseismic large frequency spacing, obtained from simulations of 4-year time series data from the Kepler mission, we demonstrate that the stellar radii can be correctly and precisely determined, when combined with traditional stellar parameters from the Kepler Input Catalogue. The radii found by the various methods used by each independent hound generally agree with the true values of the artificial stars to within 3%, when the large frequency spacing is used. This is 5–10 times better than the results where seismology is not applied. These results give strong confidence that radius estimation can be performed to better than 3% for solar-like stars using automatic pipeline reduction. Even when the stellar distance and luminosity are unknown we can obtain the same level of agreement. Given the uncertainties used for this exercise we find that the input $\log g$ and parallax do not help to constrain the radius, and that $T_{\rm eff}$ and metallicity are the only parameters we need in addition to the large frequency spacing. It is the uncertainty in the metallicity that dominates the uncertainty in the radius.

Accepted by ApJ

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The Solar Chromosphere at High Resolution with IBIS III. Comparison of Ca II K and Ca II 854.2 nm imaging

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Aims. Filtergrams obtained in Ca II H, Ca II K, and Hα are often employed as diagnostics of the solar chromosphere. The vastly disparate appearance between the typical filtergrams in these different lines calls into question the nature of what is actually being observed. We investigate the lack of obvious structures of magnetic origin such as fibrils and mottles in on-disk Ca II H and K images.
Methods. We directly compare a temporal sequence of classical Ca II K filtergrams with a co-spatial and co-temporal sequence of spectrally resolved Ca II 854.2 images obtained with the Interferometric Bidimensional Spectrometer (IBIS), considering the effect of both the spectral and spatial smearing. We analyze the temporal behavior of the two series by means of Fourier analysis.
Results. The lack of fine magnetic structuring in Ca II K filtergrams, even with the narrowest available filters, is due to observational effects, primarily contributions from the bright, photospheric wings of the line that swamp the small and dark chromospheric structures. Signatures of fibrils remain, however, in the temporal evolution of the filtergrams, in particular with the evidence of magnetic shadows around the network elements. The Ca II K filtergrams do not appear, however, to properly reflect the high-frequency behavior of the chromosphere. Using the same analysis, we find no significant chromospheric signature in the Hinode/SOT Ca II H quiet-Sun filtergrams.
Conclusions. The picture provided by Hα and Ca II 854.2, which show significant portions of the chromosphere dominated by magnetic structuring, appears to reflect the true and essential nature of the solar chromosphere. Data that do not resolve this aspect, whether spatially or spectrally, may misrepresent the behavior of the chromosphere.

Accepted by A&A
(http://www.aanda.org/articles/aa/pdf/forth/aa11223-08.pdf) *For preprints contact*: kreardon@arcetri.astro.it *For preprints via ftp or WWW*: http://www.arcetri.astro.it/∼gcauzzi/papers/ibis.k.8542.pdf

Endpoint Brightenings in Erupting Filaments

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Two well-known phenomena associated with erupting filaments are the transient coronal holes that form on each side of the filament channel and the bright post-event arcade with its expanding double row of footpoints. Here we focus on a frequently overlooked signature of filament eruptions: the spike- or fan-shaped brightenings that appear to mark the far endpoints of the filament. From a sample of non-active-region filament events observed with the Extreme-Ultraviolet Imaging Telescope (EIT) on the Solar and Heliospheric Observatory (SOHO), we find that these brightenings usually occur near the outer edges of the transient holes, in contrast to the post-event arcades, which define their inner edges. The endpoints are often multiple and are rooted in and around strong network flux well outside the filament channel, a result that is consistent with the axial field of the filament being much stronger than the photospheric field inside the channel. The EUV brightenings, which are most intense at the time of maximum outward acceleration of the filament, can be used to determine unambiguously the direction of the axial field component from longitudinal magnetograms. Their location near the outer boundary of the transient holes suggests that we are observing the footprints of the current sheet formed at the leading edge of the erupting filament, as distinct from the vertical current sheet behind the filament which is the source of the post-event arcade. Published by ApJ

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Silicate Evolution in Brown Dwarf Disks

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We present a compositional analysis of the 10 μm silicate spectra for brown dwarf disks in the Taurus and Upper Scorpius (UppSco) star- forming regions, using archival *Spitzer*/IRS observations. A variety in the silicate features is observed, ranging from a narrow profile with a peak at 9.8 μm, to nearly flat, low-contrast features. For most objects, we find nearly equal fractions for the large-grain and crystalline mass fractions, indicating both processes to be active in these disks. The median crystalline mass fraction for the Taurus brown dwarfs is found to be 20%, a factor of $\sim$2 higher than the median reported for the higher mass stars in Taurus. The large-grain mass fractions are found to increase with an increasing strength in the X-ray emission, while the opposite trend is observed for the crystalline mass fractions. A small 5% of the Taurus brown dwarfs are still found to be dominated by pristine ISM-like dust, with an amorphous sub-micron grain mass fraction of $\sim$87%. For 15% of the objects, we find a negligible large-grain mass fraction, but a >60% small amorphous silicate fraction. These may be the cases where substantial grain growth and dust sedimentation has occurred in the disks, resulting in a high fraction of amorphous sub- micron grains in the disk surface. Among the UppSco brown dwarfs, only usd161939 has a S/N high enough to properly model its silicate spectrum. We find a 74% small amorphous grain and a $\sim$26% crystalline mass fraction for this object.

Accepted by ApJ

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Structural Effects of Magnetic Fields in Brown Dwarfs

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In the brown-dwarf binary 2M0535-05, Stassun et al have reported that the more massive primary has a *lower* T_{eff} than the less massive secondary. Here, we report results obtained by an evolutionary code in which the criterion for the onset of convection in the primary is modified in the presence of a magnetic field. Structural alterations to the primary lead to a lower T_{eff} and a larger radius than would occur in a non-magnetic brown dwarf of the same age mass and age. The observed value of T_{eff} can be explained if the field in the primary increases in strength from 120 G at the surface to 6-13 MG at the center. With zero field in the secondary, our models indicate that both components can be co-eval with an age of 1.0-1.3 Myr. Because the age is so young, the components have not yet had time to synchronize their rotations: differences in angular velocity may explain why one component has developed a field while the other has not.

Accepted by ApJ

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Upcoming Meeting

Solar Analogs II

20 - 23 September 2009

Lowell Observatory

Flagstaff, AZ

SECOND ANNOUNCEMENT

We are pleased to issue the second announcement for Solar Analogs II, to be held 20 - 23 September 2009 at Lowell Observatory in Flagstaff, AZ. Scientists with interests in solar variations and the solar cycle, the physics of solar analog stars, solar twins and exoplanets, and solar influences on climate are invited to visit the workshop Web site and register for this 2.5-day event in the high country of northern Arizona. This will be a highly interactive workshop, with extended time after talks for questions and discussion. We will publish a complete online proceedings after the meeting. Further information including a list of confirmed invited and contibuted talks, posters, and registration and accommodation specifics is available at the Solar Analogs II web site:

http://www.lowell.edu/workshops/SolarAnalogsII/index.php

Inquiries may be directed to:

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Sydney Barnes (barnes@lowell.edu), or
Wes Lockwood (gwl@lowell.edu).

Job Opening

Ph.D. Fellowships

Solar System Physics

Max Planck Institute for Solar System Research

Univ. of Braunschweig and Goettingen

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, offer 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 2010, review of application begins on 1 August 2009. 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
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Announcement

Call for Papers on Space Climate

Journal of Atmospheric and Solar-Terrestrial Physics (Special Issue on Space Climate)

Title: Space Climate
Guest Editors: Kalevi Mursula, Ilya Usoskin, Dibyendu Nandi, Dan Marsh

Dear colleagues:

This is an open call for papers discussing any aspect of Space Climate, i.e., the long-term change in the Sun and its effects in the heliosphere (solar wind, HMF, cosmic rays etc.) and the near-Earth space, including magnetosphere, ionosphere, atmosphere and climate. The idea for this special issue originates from (but is not restricted to) contributions presented at the Space Climate Symposium-3 in March 2009, in Saariselk, Finnish Lapland.

We will have a fairly tight schedule with
1. Submission deadline: 31 July 2009
2. Deadline for reviews to authors: 30 Sep 2009
3. Deadline to receive revisions: 15 Nov 2009
4. Deadline for re-revisions after any re-review: 31 Dec 2009
5. Deadline for final acceptance: 31 Jan 2010
6. Deadline for on-line publication of papers: 28 Feb 2010

Delayed papers will be published separately in regular issues of the journal. The manuscripts should be submitted to the JASTP web page:
http://ees.elsevier.com/atp/

When choosing the article type, you should use the special volume title "Mursula SpaceClimate". You can find information for authors at the above journal main page and the LaTeX style files at:
http://www.elsevier.com/wps/find/authorsview.authors/latex

Please send a note of the coming submission with the (preliminary) title and author list to spaceclimate@oulu.fi as soon as You decide to submit. This information is for Guest Editor information only, and is neither condition nor obligation to submission. Also, in case of any questions on JASTP special issue, please use this email address.

Additional information from JASTP:
i) Each corresponding author will receive a PDF file of his paper. ii) There is no page charge. iii) Colour on the web is free of charge. Colour figures in the printed version incur a charge of 270 per figure. Authors must indicate which figures should be published in colour in the printed version, and that they are willing to cover the costs involved.

More information on Space Climate and links to earlier publication on the subject can be found on the Space Climate Symposium web page:
http://spaceweb.oulu.fi/spaceclimate/

With best regards,

Kalevi Mursula (for the Guest Editors)

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.***