// COOLNEWS

A RESEARCH NEWSLETTER DEDICATED TO COOL STARS AND THE SUN

No. 141 — December 2007 Editor: Steve Skinner (coolnews@jila.colorado.edu)

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Have Newsletter: Need Abstracts!!

Dear Subscribers:

The number of abstracts I am receiving for *Coolnews* is dwindling. If you are a researcher working in the area of cool stars, brown dwarfs, or the Sun, please consider taking a few minutes to send in abstracts of your recently submitted or accepted papers to refereed journals, and any major review articles. *Coolnews* is e-mailed to approximately 700 recipients each month, many of whom are cool star and solar researchers, so your abstract will get broad distribution. Abstracts on pre-main sequence stars should be submitted to the *Star Formation Newsletter*, but I often cross-list these in *Coolnews* if they are of potential interest to the cool star community at large. I will also post announcements of upcoming meetings, job openings, or other announcements related to research on cool stars or the Sun. I am willing to continue putting this newsletter together on a monthly basis as long as there is sufficient interest from the community. But in order for *Coolnews* to serve a useful function, there needs to be broader input in the form of abstracts of new papers. Many thanks to those of you who have diligently sent in abstracts and other material over the years.
Steve Skinner (editor)

Spots, Plages, and Flares on λ Andromedae and II Pegasi

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We present the results of a contemporaneous photometric and spectroscopic monitoring of two RS CVn binaries, namely λ And and II Peg. The aim of this work is to investigate the behavior of surface inhomogeneities in the atmospheres of the active components of these systems which have nearly the same temperature but different gravity. The light curves and the modulation of the surface temperature, as recovered from line-depth ratios (LDRs), are used to map the photospheric spots, while the Hα emission has been used as an indicator of chromospheric inhomogeneities. The spot temperatures and sizes were derived from a spot model applied to the contemporaneous light and temperature curves. We find larger and cooler spots on II Peg ($T_{\rm sp} \simeq 3600\,{\rm K}$) compared to λ And ($T_{\rm sp} \simeq 3900\,{\rm K}$); this could be the result of both the different gravity and the higher activity level of the former. Moreover, we find a clear anti-correlation between the Hα emission and the photospheric diagnostics (temperature and light curves). We have also detected a modulation of the intensity of the HeI D_3 line with the star rotation, suggesting the presence of surface features also in the upper chromosphere of these stars. A rough reconstruction of the 3D structure of their atmospheres has been also performed by applying a spot/plage model to the light and temperature curves and to the Hα flux modulation. In addition, a strong flare affecting the Hα, the HeI D_3, and the cores of NaI $D_{1,2}$ lines has been observed on II Peg. The spot/plage configuration has been reconstructed in the visible component of λ And and II Peg which have nearly the same temperature but very different gravity and rotation periods. A close spatial association of photospheric and chromospheric active regions, at the time of our observations, has been found in both stars. Larger and cooler spots have been found on II Peg, the system with the active component of higher gravity and higher activity level. The area ratio of plages to spots seems to decrease when the spots get bigger. Moreover, with the present and literature data, a correlation between the temperature difference $\Delta T = T_{\rm ph} - T_{\rm sp}$ and the surface gravity has been also suggested.

Accepted by A&A (7 November 2007)

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For preprints via ftp or WWW: http://web.ct.astro.it/preprints/preprint/frasca18.pdf

Study of FK Comae Berenice V. Spot Evolution and Detection of Surface Differential Rotation

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We investigate the spot evolution and the surface differential rotation of the single late-type giant FK Com. A total of 18 new surface temperature maps of FK Com are calculated with the Doppler imaging technique for the years 1993–2003. Photometric observations from 2002–2004 are also given. The new and previously published spectroscopic and photometric observations are used to study the spot locations and lifetimes, and to estimate the value of the surface differential rotation. The phases of the active regions determined from the Doppler images follow closely the active longitudes determined earlier from the long term photometric observations. One active longitude can remain active for several years, but the exact spot configuration within the active longitude changes on much shorter time scales, indicating that the spot lifetime is months instead of years. There are periods during which the spot configuration changes even within days. Measurements using spot latitudes from the Doppler images and spot rotation periods from the photometric observations yield a surface differential rotation law of $\Omega = (151.30°/{\rm day} \pm 0.09°/{\rm day}) - (1.78°/{\rm day} \pm 0.12°/{\rm day}) \sin^2 \psi$ and the relative differential rotation coefficient $\alpha = 0.012 \pm 0.002$ for FK Comae.

Accepted by A&A

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The corona and upper transition region of ϵ Eridani

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We present analyses of observations of ϵ Eridani (K2 V) made with the Low Energy Transmission Grating Spectrometer on *Chandra* and the *Extreme Ultraviolet Explorer*, supplemented by observations made with the Space Telescope Imaging Spectrograph, the *Far Ultraviolet Spectroscopic Explorer* and the Reflection Grating Spectrometer on *XMM-Newton*. The observed emission lines are used to find relative element abundances, to place limits on the electron densities and pressures and to determine the mean apparent emission measure distribution. As in the previous paper by Sim & Jordan (2003a), the mean emitting area as a function of the electron temperature is derived by comparisons with a theoretical emission measure distribution found from energy balance arguments. The final model has a coronal temperature of 3.4×10^6 K, an electron pressure of 1.3×10^{16} cm^{-3}K at $T_\mathrm{e} = 2 \times 10^5$ K and an area filling factor of 0.14 at 3.2×10^5 K. We discuss a number of issues concerning the atomic data currently available. Our analyses are based mainly on the latest version of CHIANTI (v5.2). We conclude that the Ne/O relative abundance is 0.30, larger than that recommended from solar studies, and that there is no convincing evidence for enhanced coronal abundances of elements with low first ionization potentials.

Accepted by MNRAS

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For preprints via ftp or WWW: http://arxiv.org/abs/0711.3805

Solar Abstracts

Meridional Flow Profile Measurements with SOHO/MDI

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We present meridional flow measurements of the Sun using a novel helioseismic approach for analyzing SOHO/MDI data in order to push the current limits in radial depth. Analyzing three consecutive months of data during solar minimum, we find that the meridional flow is as expected poleward in the upper convection zone, turns equatorward at a depth of around 40 Mm ($\sim 0.95\,R_\odot$), and possibly changes direction again in the lower convection zone. This may indicate two meridional circulation cells in each hemisphere, one beneath the other.

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For preprints on astro-ph: http://arxiv.org/abs/0711.4968

Upcoming Meeting

Cool Stars 15

21 - 25 July 2008

St. Andrews, Scotland

FIRST ANNOUNCEMENT

Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun

Dear Colleagues:

This is the First Announcement of *The 15th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun* to be held 21 - 25 July 2008 in St Andrews, Scotland.

For a preliminary programme and more information see:

http://star-www.st-and.ac.uk/coolstars15/

Registration opens Jan 2008.

The Cool Stars meetings have a long tradition of presenting cutting edge science in the fields of cool stars, exoplanets and solar physics. Topics of interest at Cool Stars 15 will include seismology, surface and atmospheric dynamics, angular momentum evolution, dust formation, coronae, magnetospheres and winds. The conference aims to gather scientists working in all these fields in order to stimulate cross-disciplinary exchange.

Looking forward to seeing you in Scotland! Please sign up to the website mailing list if you would like to receive future announcements.

Moira Jardine, Christiane Helling and Andrew Cameron Cool Stars 15

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.***