COOLNEWS

A RESEARCH NEWSLETTER DEDICATED TO COOL STARS AND THE SUN

No. 44 — August 1999 Editor: Steve Skinner (coolnews@jila.colorado.edu)

TABLE OF CONTENTS

Stellar Abstracts 1
Solar Abstracts 8
Announcements 9
Abstract Guidelines 10

Stellar Abstracts

A Super Lithium Rich Giant in the Metal-Poor Open Cluster Be 21

V. Hill[1] and L. Pasquini[1]

[1] European Southern Observatory, Karl Schwarschild Str. 2, D-85748 Garching b. München, Germany

We present the analysis of FEROS commissioning spectra of 3 giants in the metal poor cluster Be 21. One of the giants has an exceptionally high Li content, comparable to the original Li in the solar system. These objects are very rare (only a handful are known), and this is the first Super Lithium Rich giant (SLIR) discovered in an open cluster. The reasons for such a high Li abundance are unknown: it could be the result of a short lived internal process, or of accretion from external sources, the former being slightly more likely. From the spectra, the metal abundance is also derived for 3 giants, giving a mean of $\overline{[\mathrm{Fe/H}]} = -0.54 \pm 0.2$dex, in good agreement with recent photometric estimates, but substantially higher than estimates previously obtained.

Accepted by A&A

For preprints contact: vhill@eso.org

For preprints via ftp or WWW: http://xxx.lanl.gov/abs/astro-ph/9907106

On the Formation of Warm Molecular Layers

P. Woitke[1], Ch. Helling[1], J. M. Winters[1], and K. S. Jeong[1]

[1] Institut für Astronomie und Astrophysik, TU Berlin, Sekr. PN 8-1, Hardenbergstraße 36, D-10623 Berlin, Germany

The levitation of the outer atmospheres of AGB stars by pulsations is proposed as a possible mechanism to form "warm molecular layers". We compare the amounts of CO, H_2O, CO_2 and SO_2 molecules found in an oxygen-rich dynamical model atmosphere with the values derived from recent ISO observations. In the model, the molecules are present in a layered structure behind shock waves which leads to a substantial increase of the column densities in comparison with static models. By additional non-LTE investigations, we calculate the vibrational and rotational excitation temperatures of these molecules and discuss the respective deviations from the kinetic gas temperature in view of the interpretation of the observations.

Accepted by A&A Letters (to appear 5 July 1999)

For preprints contact: woitke@physik.tu-berlin.de

For preprints via WWW: http://export.physik.tu-berlin.de/∼woitke/arbeiten.html

Dust Shell of the Carbon Star RW Leonis Minoris

M.B.Bogdanov[1], and Olga G.Taranova[2]

[1] Saratov State University, Bolschaya Kazachiya st. 112a, Saratov, 410026 Russia
[2] Sternberg Astronomical Institute, Universitetskii pr. 13, Moscow, 119899 Russia

The results of our near-infrared photometry acquired over many years, the spectral energy distribution, and mid-infrared spectrum of carbon Mira variable RW LMi are fitted using the dust radiative transfer model for a spherically symmetric shell. The luminosity of the star is derived from a period-luminosity relation and found to be 9400 solar units. The model assumes a single grain size. The radius for spherical grains is found to be equal to 0.10 micron. For the dust composition, a combination of amorphous carbon and silicon carbide grains is assumed.

The derived model parameters are: effective temperature of the star, 2700 K; distance, 360 pc; inner shell radius in units of stellar radii, 5.0; temperature of the dust at the inner radius, 1300 K; ratio of silicon carbide to amorphous carbon dust, 0.03; optical dept of the dust shell at wavelength 11.3 micron, 0.58.

For the estimation of stellar wind parameters a self-consistent procedure of determination of mass-loss rate and expansion velocity is used. The derived parameters are: ratio of radiation pressure on a grain to gravitational pull, 3.9; drift velocity of the dust with respect to the gas, 4.1 $\mathrm{km\,s^{-1}}$; dust-to-gas mass ratio, 0.00203; dust mass-loss rate, $2.1 \times 10^{-8} \mathrm{M_\odot\,yr^{-1}}$; total mass-loss rate, $1.0 \times 10^{-5} \mathrm{M_\odot\,yr^{-1}}$.

The comparison of our results with the independent data for similar objects shows that RW LMi is a member of the carbon Mira variables group with extremal mass-loss rate. Other parameters of the dust shell and the stellar wind are close to the mean values for these stars.

Accepted by Astronomy Reports

For preprints contact: taranova@sai.msu.ru

Star-to-Star Abundance Variations among Bright Giants in the Mildly Metal-Poor Globular Cluster M4

Inese I. Ivans[1], Christopher Sneden[1], Robert P. Kraft[2], Nicholas B. Suntzeff[3], Verne V. Smith[4], G. Edward Langer[5], Jon P. Fulbright[2]

[1] Department of Astronomy and McDonald Observatory, University of Texas, Austin, TX 78712
[2] UCO/Lick Observatory, Board of Studies in Astronomy & Astrophysics, University of California, Santa Cruz, CA 95064
[3] Cerro Tololo Inter-American Observatory, National Optical Astronomy Observatories, La Serena, Chile
[4] Department of Physics, University of Texas at El Paso, 500 West University, El Paso, TX 79968-0515
[5] Physics Department, Colorado College, Colorado Springs, CO 80903 (Deceased 1999 February 16.)

We present a chemical composition analysis of 36 giants in the nearby mildy metal-poor (<[Fe/H]> = -1.18) "CN-bimodal" globular cluster M4. Confronted with a cluster that has large and variable interstellar extinction across the cluster face, we combined traditional spectroscopic abundance methods with modifications to line-depth ratio techniques to determine the atmospheric parameters of our stars. We derive a total-to-selective extinction ratio of 3.4 and an average <E(B-V)> reddening of 0.33 which is significantly lower than that estimated by using the dust maps made by Schlegel et al. (1998).

Abundance ratios for Sc, Ti, V, Ni, & Eu are typical of halo field and cluster stars. However, Si, Al, Ba, & La are overabundant with respect to what is seen in other globular clusters of similar metallicity. Superimposed on the primordial abundance distribution is evidence for the existence of proton-capture synthesis. We recover some of the C, N, O, Na, Mg, & Al abundance swings and correlations found in other more metal-poor globular clusters but the range of variation is muted. The Al enhancements appear to be from the destruction of 25,26Mg, not 24Mg. The C+N+O abundance sum is constant to within the observational errors, and agrees with the C+N+O total that might be expected for M4 stars at birth. The M4 AGB stars have C,N,O abundances that show less evidence for proton-capture nucleosynthesis than is found in the less-evolved stars of the RGB. Deeply-mixed stars of the RGB, subsequent to the helium core flash, might take up residence on the blue end of the HB, and thus fail to evolve back to the AGB but reasons for skepticism concerning this scenario are noted.

Accepted by AJ

For preprints contact: iivans@astro.as.utexas.edu

For preprints via ftp or WWW: http://xxx.lanl.gov/ps/astro-ph/9905370

Barnes–Evans Relations for Late–type Giants and Dwarfs

K. Beuermann[1], **I. Baraffe**[2] **and P. H. Hauschildt**[3]

[1] Universitäts-Sternwarte, Geismarlandstr. 11, D-37083 Göttingen, Germany
[2] Centre de Recherche Astrophysique de Lyon (UMR 5574), Ecole Normale Supérieure, 69364 Lyon Cedex 07, France
[3] Dept. of Physics and Astronomy, University of Georgia Athens, GA 30602-2451

The visual surface brightness of K/M giants and dwarfs with near-solar metallicity differ slightly in agreement with the gravity effects predicted by recent theoretical models. We show that M-dwarfs display also a metallicity dependence of the surface brightness in the infrared K-band in agreement with theory. Based on these results, we present improved Barnes-Evans type relations and estimate the radii of 60 single or presumed M and K-dwarfs.

Accepted by A&A

For preprints via WWW: http://babbage.sissa.it/astro-ph/9906350

Interferometric Astrometry of Proxima Centauri and Barnard's Star Using *Hubble Space Telescope* Fine Guidance Sensor 3: Detection Limits for sub-Stellar Companions

G. Fritz Benedict[1], **Barbara McArthur**[1], **D. W. Chappell**[11], **E. Nelan**[2], **W. H. Jefferys**[3], **W. van Altena**[6], **J. Lee**[6], **D. Cornell**[12], **P. J. Shelus**[1], **P. D. Hemenway**[4], **Otto G. Franz**[5], **L.H. Wasserman**[5], **R. L. Duncombe**[10], **D. Story**[8], **A. L. Whipple**[9], **and L. W. Fredrick**[7]

[1] McDonald Observatory, University of Texas, Austin, TX 78712
[2]Space Telescope Science Institute, 3700 San Martin Dr., Baltimore, MD 21218
[3]Astronomy Dept., University of Texas, Austin, TX 78712
[4]Oceanography, University of Rhode Island, Kingston, RI 02881
[5]Lowell Observatory, 1400 West Mars hill Rd., Flagstaff, AZ 86001
[6]Astronomy Dept., Yale University, PO Box 208101, New Haven, CT 06520
[7]Astronomy Dept., University of Virginia, PO Box 3818, Charlottesville, VA 22903
[8] Jackson and Tull, Aerospace Engineering Division 7375 Executive Place, Suite 200, Seabrook, Md. 20706
[9]Allied-Signal Aerospace, PO Box 91, Annapolis Junction, MD 20706
[10]Aerospace Engineering, University of Texas, Austin, TX 78712
[11]Environmental Systems Science Center, University of Reading, PO Box 238, Reading RG6 6AL, UK
[12]Tracor Aerospace, 6500 Tracor Lane, MD 28-4 Austin, TX 78725

We report on a sub-stellar companion search utilizing interferometric fringe-tracking astrometry acquired with Fine Guidance Sensor 3 (FGS 3) on the *Hubble Space Telescope*. Our targets were Proxima Centauri and Barnard's Star. We obtain absolute parallax values for Proxima Cen $\pi_{abs} = 0\farcs7687 \pm 0\farcs0003$ and for Barnard's Star $\pi_{abs} = 0\farcs5454 \pm 0\farcs0003$.

Once low-amplitude instrumental systematic errors are identified and removed, our companion detection sensitivity is less than or equal to one Jupiter mass for periods longer than 60 days for Proxima Cen. Between the astrometry and the Kurster et al (1999) radial velocity results we exclude all companions with $M > 0.8 M_{Jup}$ for the range of periods $1 < P < 1000$ days. For Barnard's Star our companion detection sensitivity is less than or equal to one Jupiter mass for periods longer than 150 days. Our null results for Barnard's Star are consistent with those of Gatewood (1995).

Accepted by AJ (to appear August 1999)

For preprints via WWW: http://xxx.lanl.gov/ps/astro-ph/9905318

Circumstellar Matter Around M-giants in Symbiotic Binaries: SY Muscae and RW Hydrae

T. Dumm[1], W. Schmutz[1], H. Schild[1] and H. Nussbaumer[1]

[1]Institute of Astronomy, ETH-Zentrum, CH-8092 Zürich, Switzerland

For the eclipsing symbiotic binary system SY Mus we present evidence for an asymmetric density distribution around the M-giant. We obtain this result from an improved orbital solution. We determine a revised orbital period of $P = 625.0 \pm 0.5$ d from UV eclipse observations and a re-analysis of the visual light curve. Based on new radial velocity observations, we measure the epoch of mid-eclipse accurately to within ± 6 days or 1/100 of the period. At ingress the eclipse curve is steeper and closer to mid-eclipse than at egress. From measured column densities of neutral hydrogen during egress we conclude that the mass loss rate of the M-giant is of the order of $\dot{M} \approx 5 \cdot 10^{-7}$ $M_\odot$/yr.

The eclipse of the UV light in SY Mus and RW Hya can be partially explained by Rayleigh scattering but there is also an additional source of opacity. HST high resolution UV observations of RW Hya during egress reveal that this additional flux attenuation is due to blanketing by numerous absorption lines, predominantly Fe II. Line blanketing is an important effect that has to be taken into account to explain the eclipse of SY Mus and of other symbiotic binaries.

Accepted by A&A

For preprints contact: dumm@astro.phys.ethz.ch

For preprints via WWW: http://www.astro.phys.ethz.ch/staff/dumm/dumm_nf.html

A Consistency Test of Spectroscopic Gravities for Late-Type Stars

Carlos Allende Prieto[1,2], Ramón J. García López[1], David L. Lambert[3] and Bengt Gustafsson[4]

[1] Instituto de Astrofísica de Canarias, E-38200, La Laguna, Tenerife, Spain
[2] Present address: McDonald Observatory and Department of Astronomy, The University of Texas at Austin, RLM 15.308, Austin, TX 78712-1083, USA
[3] McDonald Observatory and Department of Astronomy, The University of Texas at Austin, RLM 15.308, Austin, TX 78712-1083, USA
[4] Uppsala Astronomical Observatory, Box 515, S-751 20 Uppsala, Sweden

Chemical analyses of late-type stars are usually carried out following the classical recipe: LTE line formation and homogeneous, plane-parallel, flux-constant, and LTE model atmospheres. We review different results in the literature that have suggested significant inconsistencies in the spectroscopic analyses, pointing out the difficulties in deriving independent estimates of the stellar fundamental parameters and hence, detecting systematic errors.

The trigonometric parallaxes measured by the *Hipparcos* mission provide accurate appraisals of the stellar surface gravity for nearby stars, which are used here to check the gravities obtained from the photospheric iron ionization balance. We find an approximate agreement for stars in the metallicity range $-1.0 \leq$ [Fe/H] $\leq 0.$, but the comparison shows that the differences between the spectroscopic and trigonometric gravities decrease towards lower metallicities for more metal-deficient dwarfs ($-2.5 \leq$ [Fe/H] ≤ -1.0), which casts a shadow upon the abundance analyses for extreme metal-poor stars that make use of the ionization equilibrium to constrain the gravity. The comparison with the strong-line gravities derived by Edvardsson (1988) and Fuhrmann (1998a) confirms that this method provide systematically larger gravities than the ionization balance. The strong-line gravities get closer to the physical ones for the stars analyzed by Fuhrmann, but they are even further away than the iron ionization gravities for the stars of lower gravities in Edvardsson's sample.

The confrontation of the deviations of the iron ionization gravities in metal-poor stars reported here with departures from the excitation balance found in the literature, show that they are likely to be induced by the same physical mechanism.

Accepted by ApJ

For preprints contact: callende@astro.as.utexas.edu

Spectroscopic Observations of Convective Patterns in the Atmospheres of Metal-Poor Stars

Carlos Allende Prieto[1,2], Ramón J. García López[1], David L. Lambert[3] and Bengt Gustafsson[4]

[1] Instituto de Astrofísica de Canarias, E-38200, La Laguna, Tenerife, Spain
[2] Present address: McDonald Observatory and Department of Astronomy, The University of Texas at Austin, RLM 15.308, Austin, TX 78712-1083, USA
[3] McDonald Observatory and Department of Astronomy, The University of Texas at Austin, RLM 15.308, Austin, TX 78712-1083, USA
[4] Uppsala Astronomical Observatory, Box 515, S-751 20 Uppsala, Sweden

Convective line asymmetries in the optical spectrum of two metal-poor stars, Gmb1830 and HD140283, are compared to those observed for solar metallicity stars. The line bisectors of the most metal-poor star, the subgiant HD140283, show a significantly larger velocity span that the expectations for a solar-metallicity star of the same spectral type and luminosity class. The enhanced line asymmetries are interpreted as the signature of the lower metal content, and therefore opacity, in the convective photospheric patterns. These findings point out the importance of the three-dimensional convective velocity fields in the interpretation of the observed line asymmetries in metal-poor stars, and in particular, urge for caution when deriving isotopic ratios from observed line shapes and shifts using one-dimensional model atmospheres.

The mean line bisector of the photospheric atomic lines is compared with those measured for the strong Mg I b_1 and b_2 features. The upper part of the bisectors are similar, and assuming they overlap, the bottom end of the stronger lines, which are formed higher in the atmosphere, goes much further to the red. This is in agreement with the expected decreasing of the convective blue-shifts in upper atmospheric layers, and compatible with the high velocity redshifts observed in the chromosphere, transition region, and corona of late-type stars.

Accepted by ApJ

For preprints contact: callende@astro.as.utexas.edu

Model Photospheres for Late-Type Stars from the Inversion of High-Resolution Spectroscopic Observations. Groombridge 1830 and ϵ Eridani

Carlos Allende Prieto[1], Ramón J. García López[2], David L. Lambert[1] and Basilio Ruiz Cobo[2]

[1] McDonald Observatory and Department of Astronomy, The University of Texas at Austin, RLM 15.308, Austin, TX 78712-1083, USA
[2] Instituto de Astrofísica de Canarias, E-38200, La Laguna, Tenerife, Spain

An inversion technique to recover LTE one-dimensional model photospheres for late-type stars, which was previously applied to the Sun (Allende Prieto et al. 1998), is now employed to reconstruct, semi-empirically, the photospheres of cooler dwarfs: the metal-poor Groombridge 1830 and the active star of solar-metallicity ϵ Eridani. The model atmospheres we find reproduce satisfactorily all the considered weak-to-moderate neutral lines of metals, satisfying in detail the excitation equilibrium of iron, the wings of strong lines, and the slope of the optical continuum. The retrieved models show a slightly steeper temperature gradient than flux-constant model atmospheres in the layers where $\log \tau \leq -0.5$. We argue that these differences should reflect missing ingredients in the flux-constant models and point to granular-like inhomogeneities as the best candidate.

The iron ionization equilibrium is well satisfied by the model for Gmb1830, but not for ϵ Eri, for which a discrepancy of 0.2 dex between the logarithmic iron abundance derived from neutral and singly ionized lines may signal departures from LTE. The chemical abundances of calcium, titanium, chromium, and iron derived with the empirical models from neutral lines do not differ much from previous analyses based on flux-constant atmospheric structures.

Accepted by ApJ

For preprints contact: callende@astro.as.utexas.edu

Orbital Period Modulation and Quadrupole Moment Changes in Magnetically Active Close Binaries

A. F. Lanza[1], **M. Rodonò**[1,2]

[1] Osservatorio Astrofisico di Catania

[2] Istituto di Astronomia dell'Università degli Studi, Viale A. Doria, 6, Città Universitaria, I-95125, Catania, Italy

We discuss the main characteristics of the orbital period modulation in close binaries with late-type components. We focus on the various physical scenarios proposed to explain this phenomenon and, in particular, Hall's (1989) suggestion that it may be connected with magnetic activity. Starting from the work of Applegate (1992) and Lanza et al. (1998), we develop an integral approach to evaluate the gravitational quadrupole moment of an active star and its variations, which we consider to be an important driver of the observed orbital period changes. The method applies the tensor virial theorem after Chandrasekhar (1961) and directly relates the variation of the quadrupole moment with the changes of kinetic and magnetic energy of the stellar hydromagnetic dynamo. Particular effort has been applied in minimizing the number of free parameters entering the problem.

A sample of 46 close binaries with period changes of alternate signs has been studied by our method. The amplitude of the quadrupole moment change appears to decrease with increasing angular velocity, implying that the time-variable part of the kinetic energy of rotation varies as $\delta\mathcal{T}/\mathcal{T} \propto \Omega^{-0.93\pm0.10}$, with a correlation coefficient of 0.83. The length of the cycle of the orbital period modulation seems to be correlated with the angular velocity as $P_{mod} \propto \Omega^{-0.36\pm0.10}$, but with a smaller correlation coefficient of 0.62. These results support the suggestion that a distributed non-linear dynamo is at work in the convective envelopes of very active stars and that it strongly affects the differential rotation. We also discuss the energy budget of the process responsible for the quadrupole moment variation and find that, on the average, only $\sim$ 10% of the energy required to maintain the differential rotation may be lost by dissipation in the turbulent convective envelope during a cycle of the orbital period change. The problems of the magnetic field geometry and stability and the relationship between the length of the activity cycle, as determined by the change of the area of the starspots and the orbital period modulation, respectively, are also addressed.

Accepted by A&A

For preprints contact: nla@sunct.ct.astro.it

For preprints via ftp: ftp sunct.ct.astro.it , login: anonymous , cd /pub/nlanza/opv, get LR.ps

Radiative Transfer in Weakly Polarizing Media

J. Sánchez Almeida[1] **and J. Trujillo Bueno**[1]

[1]Instituto de Astrofísica de Canarias, E-38200 La Laguna, Tenerife, Spain

We study the radiative transfer through a weakly polarizing medium, i.e., a medium where the degree of polarization of the absorbed, retarded and emitted light is always weak. In this case, the general radiative transfer equation for the Stokes parameters yields very simple formal solutions. The intensity does not depend on the polarization, and the other Stokes parameters are uncoupled from each other. It is shown how this simplified radiative transfer equation holds in many realistic cases relevant for solar and stellar magnetometry. It can be applied whenever the weak magnetic field approximation works, i.e., for weakly split lines. In addition, it handles weak spectral lines, structures with complex magnetic topology, chromospheric lines formed under non-LTE conditions, etc. The merits of the approximation, that we call Weakly Polarizing Medium (WPM) approximation, are illustrated by means of several LTE and non-LTE line syntheses in realistic solar model atmospheres.

The WPM approximation should be useful to plan and understand measurements based on polarization. It simplifies the relationship between the observed polarization and the physical structure that one tries to retrieve. The approximation may also be used in numerical problems requiring extensive polarized radiative transfer (inversion codes, syntheses of stellar spectra, self-consistent multilevel non-LTE Zeeman line transfer with atomic polarization, etc.).

Accepted by ApJ, Vol. 526

For preprints contact: jos@ll.iac.es

For preprints via WWW: http://www.iac.es/publicaciones/preprints.html

The Sun as an X–ray Star. II: Using the Yohkoh/SXT-derived Solar Emission Measure vs. Temperature to Interpret Stellar X-ray Observations

G. Peres[1], **S. Orlando**[2], **F. Reale**[1], **R. Rosner**[3] **and H. Hudson**[4]

[1] Dipartimento di Scienze Fisiche ed Astronomiche, Sezione di Astronomia, Piazza del Parlamento 1, 90134 Palermo, Italy

[2] ESA Space Science Dept., ESTEC, Postbus 299, NL–2200 AG Noordwijk, The Netherlands

[3] Dept. of Astronomy and Astrophysics, University of Chicago; Enrico Fermi Institute, Chicago, Illinois, USA

[4] Solar Physics Research Corp., 4720 Calle Desecada, Tucson, Arizona 85718, USA

This paper is the second of a project dedicated to use solar Yohkoh/SXT data as a guide and a template to interpret data on stellar coronae.

In the light of the large difference in scope and approach between solar and stellar studies we have developed a method to translate Yohkoh/SXT data of the whole solar corona into stellar-like data, i.e. to put them in the same format and context as the stellar ones. First from the Yohkoh/SXT images we derive the whole–Sun X-ray emission measure vs. temperature (EM(T)), in the range $10^{5.5}$ K -10^8 K, during the specific observation. Then, we synthesize the solar X-ray spectrum; finally, we fold the spectrum through the instrumental response of non-solar X-ray observatories, for instance Rosat/PSPC and ASCA/SIS. Finally, we analyze such solar coronal data in the same band and with the same methods used for stellar observations allowing a direct and homogeneous comparison with them.

In this paper we present in detail our method and, as an example of results, we show and discuss EM(T) and stellar-like spectra for three phases of the solar cycle: maximum, intermediate phase, and minimum. The total amount and the distribution of the emission measure change dramatically during the cycle, in particular at temperatures above 10^6 K. We also show the EM(T) of the whole solar corona during a large flare.

The Rosat/PSPC- and ASCA/SIS-like X-ray spectra of the Sun as a star that we obtain are discussed in the context of stellar coronal physics.

The Sun's coronal total luminosity in the Rosat/PSPC band ranges from $\approx 2.7 \times 10^{26}$ erg s^{-1} (at minimum) to $\approx 4.7 \times 10^{27}$ erg s^{-1} (at maximum).

We discuss future developments and possible applications of our method.

Accepted by ApJ

For preprints contact: peres@oapa.astropa.unipa.it

For preprints via WWW: http://www.astropa.unipa.it/Library/preprint_oapa.html

The Active RS Canum Venaticorum binary II Pegasi. III. Chromospheric Emission and Flares in 1994-1996

S.V. Berdyugina[1], **I.Ilyin**[1], **I. Tuominen**[1]

[1] Astronomy Division, University of Oulu, P.O. Box 3000, FIN-90401 Oulu, Finland

We analyse observations of the very active RS CVn-type star II Peg carried out simultaneously in chromospheric and photospheric lines in 1994-1996. We describe the correlation of the strength of the He I D_3, Ca II K and Ca II 8498Å emissions with the spot position on the stellar disk. A two-component structure is suggested in the chromosphere of II Peg, similar to that in the corona: nonvariable component (cool plages) with constant contribution to the line emission and variable, active one (hot plages) showing a growth of its activity during 1994-1996. The active component is related to the spots seen in the photosphere.

Two subsequent flares on July 19–23, 1995 were observed in the He I D_3 and Ca II K and 8498Å lines showing strong *narrow red-shifted* emissions. The development of the flares took a few hours and decay lasted several days. At the maximum of the flaring, in addition to the narrow components, *broad blue-shifted* emissions appeared in He I and Ca II K and in the cores of many strong absorption lines. The broad components are attributed to the process of the explosive evaporation from the low chromosphere. The amount of energy released in different lines is determined. From the radial velocity curve of the He I emission the location of the radiating matter is deduced. It appears to be related to the largest active region which is seen in the stellar image. The flare occurred concurrently with the break of the extended group on two well separated spots. On October 26, 1996 another flare was observed in three spectra, as narrow emissions in the He I and Ca II 8498Å lines but without development in other lines. It probably was a late

stage of the flare decay.

Accepted by A&A

For preprints contact: sveta@ukko.oulu.fi

For preprints via WWW: http://cc.oulu.fi/~sberdyug

Solar Abstracts

Stability of the Solar Latitudinal Differential Rotation Inferred from Helioseismic Data

Paul Charbonneau[1], Mausumi Dikpati[1], and Peter A. Gilman[1]

[1]High Altitude Observatory, NCAR, P.O. Box 3000, Boulder CO80307-3000

We revisit the hydrodynamical stability problem posed by the observed solar latitudinal differential rotation. Specifically, we carry out stability analyses on a spherical shell for solar-like 2D inviscid shear flow profiles of the form $\nu = s_0 - s_2\mu^2 - s_4\mu^4$, where μ is the sine of latitude. We find that stability is remarkably sensitive to the magnitude of the μ^4 term. This allows us to reconcile apparently conflicting results found in the published literature. We then use latitudinal differential rotation profiles extracted from various helioseismic inversions of the solar internal rotation, and investigate their stability as a function of depth from the base of the tachocline to the top of the convective envelope. In all cases considered, we find that the latitudinal differential rotation in the tachocline is stable, while that in the bulk of the convective envelope is unstable. Under the assumption that the instability is not impeded by finite Reynolds number or three-dimensional effects not accounted for in our analysis, we speculate on possible observable consequences of the occurrence of the instability in the top half of the convective envelope.

Accepted by ApJ

For preprints contact: paulchar@ncar.ucar.edu

ANNOUNCEMENT

Upcoming Conference Discussion Session

UNDERSTANDING THE ROLE OF BINARITY ON MASS LOSS AND ATMOSPHERIC STRUCTURE IN DETACHED SYSTEMS

Discussion Session at The Eleventh Cambridge Workshop on Cool Stars, Stellar Systems, and The Sun
Tenerife, Spain

The goal of this informal session is to discuss observational, modelling, and theoretical results relating to mass loss processes and atmospheric structure/activity derived from studies of detached binary systems. Binary systems offer unique methods to understand stellar activity and mass loss. However, in using such methods the influence of the binary environment on observed phenomena must be carefully evaluated.

The discussion session will be held on the afternoon of Monday October 4 lasting 90 minutes. We are canvassing the cool star community to find out who would like to contribute to the session. Contibutors should plan to present 2-3 viewgraphs that clearly show the result/topic/problem that they wish to highlight. We hope for a lively discussion involving astronomers working on a wide variety of topics and that a useful exchange of results and experiences will result.

The science to be covered includes:

Mass Loss from binaries (e.g. ζ Aur, VV Cep, symbiotic systems); Mass transfer within binary systems; Coronal magnetic interaction within active binaries (e.g. RS CVns); Comparison of properties of stars in binary systems with single star proxies (how similar or different are the binaries compared to single stars); Hydrodynamical and magnetohydrodynamical simulations of flows/winds in binaries.

Please contact the organiser (ab@casa.colorado.edu) if you wish to present any results or raise questions on these or any other related topics. The final form of the discussion will be defined by what you, the participant, wants to hear/say. We welcome any suggestions.

Alexander Brown (Session Organiser; ab@casa.colorado.edu) Robert Baade, Philip Bennett, Manfred Cuntz, Edward Guinan, Graham Harper, Klaus-Peter Schröder

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, or M) 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` .