COOLNEWS

A RESEARCH NEWSLETTER DEDICATED TO COOL STARS AND THE SUN

No. 33 — September 1998 Editor: Steve Skinner (coolnews@jila.colorado.edu)

TABLE OF CONTENTS

Stellar Abstracts

The Closest Extrasolar Planet: A Giant Planet Around the M4 Dwarf Gl 876

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High precision radial velocity observations of the nearby M4 dwarf Gl 876 with the Observatoire de Haute Provence 1.93 m telescope and the new 1.20 m swiss telescope at la Silla indicate the presence of a jovian mass companion to this star. The orbital fit to the data gives a period of 60.8 days, a velocity amplitude of 246m.s^{-1} and an eccentricity of 0.34. Assuming that Gl 876 has a mass of 0.3 M$_\odot$, the mass function implies a mass for the companion of $2/\sin i$ Jupiter masses.

Accepted by A&A Letters

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Searching for Very Low-mass Stars and Brown Dwarfs with DENIS

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We present the results of infrared spectroscopic observations of a sample of very low-mass stars and brown dwarf candidates detected in a 230 square degree area by the DENIS (DEep Near Infrared Southern sky; Epchtein, 1997) survey. We find that objects as faint as the faintest known stars are easily detected by DENIS. This sample also includes three members of the new "L" dwarf class, one of which was the first confirmed isolated field brown dwarf. As this data represents $\sim 1\%$ of the total DENIS survey area, the completed survey can be expected to have a dramatic impact on the study of the faintest stars and brown dwarfs. In particular, it should detect ~300 of the new and poorly understood "L" class of dwarfs.

Accepted by A&A

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Magnetic Cycles of HR 1099 and LQ Hydrae

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We present in this paper a 6 yr time series of magnetic (and brightness) surface images of the K1 subgiant of the RS CVn system HR 1099 (=V711 Tauri) and of the young K0 dwarf LQ Hydrae, reconstructed (with the help of a dedicated maximum entropy image reconstruction software) from Zeeman-Doppler imaging observations collected at the Anglo-Australian Telescope.

All stellar magnetic images we reconstruct host at least one high contrast feature in which the field is predominantly azimuthal, thus confirming that such surface structures (already detected in previous similar studies) are indeed real. We take this as strong evidence that dynamo processes of late-type rapid rotators operate throughout the *whole stellar convective envelope*, rather than being confined to an interface layer between the convective and radiative zones as in the Sun. The latitudinal polarity pattern of azimuthal and radial fields that we observe at the surface of both stars suggest that these magnetic regions respectively reveal the *toroidal and poloidal components of the large scale dynamo field*. The spatial structure of these two magnetic field components gets increasingly more complex (with higher axisymmetric spherical harmonic degrees) for larger rotation rates and deeper convective zones. The strength of the toroidal and poloidal components is typically a few hundred G, more than *two orders of magnitude stronger* than in the Sun. Long-term evolution of the toroidal and poloidal components of the large scale field is clearly detected in our time series.

We also report the detection of small fluctuations in the orbital period of HR 1099, with a peak-to-peak amplitude of about 36 ± 1 s (i.e. 0.015%) and a period of about 18 ± 2 yr (assuming sinusoidal variations around the nominal value). The most plausible way of explaining such fluctuations is that the quadrupole moment of the K1 subgiant is varying with time, and that this modulation is driven by the magnetic activity cycle of the primary star itself (through periodic exchange between kinetic and magnetic energy). It provides in particular an independent confirmation that dynamo operates within the whole convective zone, and suggests that the average azimuthal field in the convective envelope is of the order of 6 kG.

Accepted by MNRAS

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Magnetic Topology and Prominence Patterns on AB Doradus

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We report new Zeeman-Doppler imaging observations of the rapidly rotating young K0 dwarf AB Doradus, obtained with the Anglo-Australian Telescope in 1996 December. From such observations, simultaneous brightness and magnetic images of the stellar photosphere of AB Dor were reconstructed at three different epochs.

The magnetic topology of AB Dor is found to be very complex, with at least twelve different radial field regions of opposite polarities located all around the star. Significant azimuthal field fluxes are also detected in the form of one negative polarity region close to the equator, a series of positive polarity patches at intermediate latitudes and an almost complete ring of negative polarity encircling the rotational pole at high latitudes. In particular, the azimuthal polarities we reconstruct are in very good agreement with those obtained by Donati & Cameron (1997), confirming that this field component is directly related to the dynamo-generated large-scale toroidal magnetic structure. The triple polarity latitudinal pattern observed for this structure in the upper hemisphere of AB Dor indicates that the degree of the underlying large-scale poloidal structure in an axisymmetric spherical harmonics expansion is equal to or greater than five. It also strengthens the idea that the dynamo processes operating in AB Dor do feature a non-solar component distributed throughout the convective zone.

From the subtle distortion of successive brightness images, we can also confirm the surface differential rotation first measured on this star by Donati & Cameron (1997) both in sense and magnitude, with a pole rotating slower than the equator by about one part in 220.

Finally, the rotation periods we measure for four prominences (from the recurrence rate of their spectral signatures in Balmer lines) confirm the presumption that such clouds are anchored at intermediate to high latitudes. The intrinsic variability of these prominences is not associated with any abrupt changes in the photospheric brightness or magnetic distributions, implying that they essentially result from the reorganisation of coronal field lines.

Accepted by MNRAS

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The Active RS Canum Venaticorum Binary II Pegasi. II. Surface Images for 1992-1996

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Using new high-resolution and high signal-to-noise ratio spectroscopic observations carried out in 1992-1996, nine surface images of II Peg are obtained. The inversion technique applied is the recently developed Occamian approach, which does not put any artificial constraints on the solution and provides an error analysis of the solution. The surface imaging is applied to Ca I, Fe I, and Ni I lines simultaneously, a number of blending atomic and molecular lines being included into the line list.

Two high-latitude active regions are found to dominate in all seasons, which determine the spectroscopic and photometric variability. No cool polar cap is seen. The positions of the spots are constantly migrating to earlier orbital phases with approximately the same rate. This motion of the spot configuration means a shorter rotational period, which is just about the mean photometric period. The mean longitude separation between the active regions is about 180°. This is considered as two active longitudes. The largest of the two spots seems to be close to the central meridian, i.e. tends to be faced toward the secondary. It changes its position from one active longitude to another, showing the effect of switching the activity of the longitudes. The results are compatible with the two-spot photometric modelling by Henry et al. (1995) for 1990-1992.

Submitted to A&A

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Surface Imaging by the Occamian Approach. Basic Principles, Simulations, and Tests.

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The recently developed Occamian approach for solving inverse problems was applied to surface imaging of cool stars. With a set of tests the effects of data noise and uncertainties of the stellar parameters on the solution have been investigated. The spot locations and spot configuration are found to be well determined in most cases. The spot contrast can be successfully restored in case of adequate atmospheric models and line profile calculations. A formal error analysis of the solution is applied for the first time to the surface imaging problem. It is suggested that the pole-to-equator gradient of the temperature is a consequence of the information distribution on the stellar surface, which is determined by the available observational data. From the analysis of the error distribution on the stellar surface under different conditions two practical advices have been formulated for successful surface imaging. First, a total number points of data ought to be a few times the number of unknown parameters, since only in such a case most of the stellar surface can be restored realiably. Second, the S/N ratio should be as large as possible, since its value affects proportionally the size of the area of the stellar surface with an acceptable level of the errors.

Accepted by A&A

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Permanent Active Longitudes and Activity Cycles on RS CVn stars

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A new analysis of the published long-term photometric observations has revealed permanent active-longitude structures in four RS CVn stars: EI Eri, II Peg, σ Gem, and HR 7275. Two active longitudes separated by half of the period are found to dominate on the surface during all available seasons. The positions of the longitudes on three stars (EI Eri, II Peg, HR 7275) are migrating in the orbital reference frame, and there is no preferred orientation with respect to the line of centres in the binaries. The rate of migration is approximately constant. In case of σ Gem the active longitude migration is synchronized with the orbital motion in the direction of the line of centres in the binary. The active region lifetimes can be longer than the time span of the observations ($\geq$15 yr). The periods of the active longitude rotation are determined: for EI Eri $1.^{d}9510$, for II Peg $6.^{d}7066$, for σ Gem $19.^{d}604$, for HR 7275 $28.^{d}263$. Long-term activity cycles of the stars are discovered from the analysis of the relative contribution of the two longitudes to the photometric variability. One longitude is found to be usually more active than the other at a given moment, and the change of the activity level between the longitudes is cyclic with periods of years. The switch of the activity takes a much shorter time, about a few months, similar to the "flip-flop" phenomenon found for FK Com stars. Moments of switching are regarded as new tracers of the activity, and total cycles, which return activity to the same longitude, are found to be for EI Eri 9.0 yr, for II Peg 9.3 yr, for σ Gem 14.9 yr, for HR 7275 17.5 yr.

Accepted by A&A

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Flaring and Quiescent Coronae of UX Arietis: Results from ASCA and EUVE Campaigns

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The RS CVn binary star UX Ari was observed for 14 hours with all four detectors onboard the ASCA satellite, and for 135 ks with the spectrometers onboard the EUVE satellite. During the ASCA observations, the X-ray emission was at a constant, quiescent level during the first 12 hours, after which time a powerful flare with a peak luminosity of 1.4×10^{32} ergs s^{-1} started. The flare was observed until shortly after its peak. The EUVE observations were obtained on two different days when the star was in a quiescent phase.

We present a spectral and temporal analysis of the UX Ari observations and interpret the ASCA flare data with a two-ribbon flare model including estimates for cooling losses. The quiescent emission measure (EM) distributions derived independently from ASCA and EUVE data agree remarkably. The distribution increases up to a peak around 25 MK. We find elemental abundances that are significantly sub-solar, in particular for Fe ($\approx 17\%$). A time-dependent reconstruction of the flare EM distribution shows that two separate plasma components evolve during the flare (one being identified with the quiescent EM). Most of the flare EM reaches temperatures between 50 MK and 100 MK or more. Magnetic confinement requires the loop arcade to be geometrically large, with length scales on the order of one stellar radius. The electron densities inferred from the model decrease from initial values around 10^{12} cm^{-3} early in the flare to about 10^{11} cm^{-3} at the flare peak. The best-fit models require surface magnetic field strengths of a few hundred G, compatible with the maximum photospheric fields expected from equipartition. The flare parameters imply a (conductive and radiative) cooling loss time of less than one hour at flare peak. The elemental abundances increase significantly during the flare rise, with the abundances of the low-FIP elements Fe, Mg, Si, and Ni typically increasing to higher levels than the high-FIP elements such as S or Ne. The Fe abundance increases from $(17 \pm 4)\%$ of the solar photospheric value during quiescence up to $(89 \pm 18)\%$ at flare peak. A fractionation process that occurs during the chromospheric evaporation phase may selectively enrich low-FIP elements as in the solar corona; alternatively, the chromospheric evaporation may itself bring metal-rich chromospheric plasma into the metal-poor corona.

Accepted by ApJ

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Angular Momentum Transport in Magnetized Stellar Radiative Zones. III. The Solar Light Element Abundances

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We calculate the depletion of the trace elements Lithium and Beryllium within a solar mass star, during the course of its evolution from the zero-age main sequence to the age of the present-day Sun. In the radiative layers beneath the convection zone, we assume that these elements are transported by the turbulent fluid motions that result from instability of the shear flow associated with internal differential rotation. This turbulent mixing is modeled as a diffusion process, using a diffusion coefficient that is taken to be proportional to the gradient of the angular velocity distribution inside the star. We study the evolution of the light element abundances produced by rotational mixing for models in which internal angular momentum redistribution takes place either by hydrodynamic (e.g., Chaboyer et al. 1995a, 1995b) or by hydromagnetic (Charbonneau & MacGregor, 1993) means. Since models based on these alternative mechanisms for angular momentum transport predict similar surface rotation rates late in the evolution, we explore the extent to which light element abundances make it possible to distinguish between them. In the case of an internally magnetized star, our computations indicate that both the details of the surface abundance evolution and the magnitude of the depletion at solar age can depend sensitively on the assumed strength and configuration of the poloidal magnetic field inside the star. For a configuration with no direct magnetic coupling between the radiative and

convective portions of the stellar interior, the depletion of Lithium calibrated to the solar Lithium depletion at the solar age is similar at all ages to the Lithium depletion of a model in which angular momentum transport occurs solely by hydrodynamical processes. However, the two models can be distinguished on the basis of their respective Beryllium depletions, with the depletion of the magnetic model being significantly smaller than that of the non-magnetic model.

Accepted by ApJ

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Utrecht Echelle Spectroscopy of a Flare in VB8

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Very high-resolution (R$\sim$110,000) spectroscopic observations of the very low-mass star VB8 obtained with the Utrecht Echelle spectrograph (UES) are presented. During a series of 4 consecutive spectra, a flare occurred in the third one. This event produced significant enhancement in the strength of the emission lines of He I D_3 and H_α in VB8, as well as filling up of some but not all atomic absorption lines and a weakening of the γ TiO bandheads at 705.4 nm and 712.5 nm. Core emission in the Na I D_1,D_2 and K I 769.9 nm resonance lines became also stronger during the flare. Other very low-mass stars observed with same instrumental configuration included GJ 406 and VB10. The UES spectrum of VB8 is compared with them. In particular, VB10 appears to have lower gravity than VB8, indicating a younger age and a lower mass which could be very close to the substellar mass limit for solar metallicity.

Accepted by MNRAS

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Building Reliable Models of M Dwarf Chromospheres: the Impact of the Usual Assumptions

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We study different approximations usually made to simplify the calculation of chromospheric models of M dwarf stars. The approximations we discuss in detail are: the assumption that the minority species are in LTE, the omission of the contribution of numerous atomic and molecular lines (*line blanketing*) to the opacity, and the Complete Frequency Redistribution for the Ly_α line.

We consider a "cold" chromospheric model corresponding to a low activity dM star and a "hot" one corresponding to a very active dMe star. We find that the assumptions under study affect more strongly the cold than the hot model. In particular the approximation of Complete Frequency Redistribution in the Ly_α line, through the statistical equilibrium and ionization equilibrium equation, changes the electron density in the high chromosphere and strongly affects other line profiles.

Accepted by AA

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α Centauri: Coronal Temperature Structure & Abundances from ASCA Observations

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We have analyzed the X-ray spectrum of the nearby binary α Cen AB (G2V + K1V) that has been obtained from observations with *ASCA*. The coronal temperature structure and abundances have been derived from multi-temperature fitting and confirmed by a differential emission measure analysis. The corona as seen by *ASCA* is essentially isothermal with a temperature around 0.3 keV, consistent with the evolutionary picture of coronae of aging solar–type stars. A comparison between the measurements from various instruments indicates a source variability in the coronal flux (which precludes the joint fitting of data from different instruments taken at different epochs) and temperature structure consistent with that discovered in a series of *ROSAT* observations. The elemental abundances agree with solar photospheric abundances for Ne, Si, and Fe at 1σ level, while O appears to be underabundant by a factor of about 3 relative to solar photospheric values, and Mg overabundant by a factor of a few. The abundance ratios with respect to Fe are better determined: [O/Fe] = 0.4±0.14 (× solar, etc.), [Mg/Fe] = 4±1, [Ne/Fe] = 1±0.3, and [Si/Fe] = 6±4.

Accepted by A&A

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X-ray Spectroscopy of the Weak-lined T Tauri star HD 283572

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We have analyzed the existing X-ray spectroscopic data for the Weak-Line T Tauri star (WTTS) HD 283572, from the ROSAT, ASCA and SAX satellites. All the data sets are well fit with an absorbed two-temperature model based on collisional ionization equilibrium. Together with the *Einstein* data discussed in the literature, these data sets afford a 16.5 years time span, allowing to study the short- and long-term spectroscopic and photometric variability characteristics of the X-ray emission from WTT stars. The X-ray luminosity of HD 283572 appears to vary by factors of $\simeq 2$ on time scales of tens of kiloseconds, within a single observations, while its average X-ray luminosity has varied by a factor of $\simeq 2.5$ (peak-to-peak) along the 16.5 yr studied here. The SAX observation also shows evidence for a short flare, with an enhancement of the X-ray luminosity by a factor of $\simeq 4$.

Accepted by A&A

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Editor's Note: The above cross-disciplinary abstract appeared in the August '98 Star Formation Newsletter and is being cross-listed here since it may be of interest to those studying coronal activity in late-type stars.

Optical Spectroscopy of DENIS Mini-survey Brown Dwarf Candidates

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We present optical (6500-9200Å) spectroscopy of eight cool dwarfs detected in a 231 square degree "Mini-survey" of the Deep NEar Infrared Survey (DENIS) data. We are able to confirm that the spectral types derived from the Mini-survey infrared spectroscopy are meaningful. We provide a spectral sequence which extends beyond the M-dwarf range and into the proposed "L" class of dwarfs. The dominant spectral features in the optical for these L-type dwarfs are resonance lines of Cs I and molecular band heads of CrH and FeH. The other dominant feature in these L-type spectra is a broad 600 Å absorption dip centered on 7700 Å, which we identify with extremely strong (equivalent width ∼ several hundred Å) absorption associated with the 7664,7698 Å resonance doublet of K I. We find that model atmospheres which include the effects of molecular condensation without dust opacity (to simulate rapid gravitational settling of dust grains) produce significantly better agreement with observed optical spectra for L-type dwarfs, than models including dust opacity. This suggests gravitational settling of dust grains plays an important role in L-dwarf photospheres. The extreme strength of the K I resonance doublet, and disappearance of TiO and VO, and the consequent dominance of CrH and FeH in L-dwarf spectra offer considerable prospects as sensitive effective temperature diagnostics, even at low spectral resolution.

Accepted by A&A

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A BeppoSAX/LECS X-ray Observation of α Centauri

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We present the X-ray spectrum of the nearby binary α Cen AB (G2V + K1V) that has been obtained from observations with the low-energy concentrator (LECS) onboard the BeppoSAX X-ray astronomy satellite. SAX combines, in contrast to previous satellites, simultaneous coverage of the 0.1-10 keV energy range with sufficient spectral resolution to determine emission measure distributions and elemental abundances of soft coronal sources. The analysis of the spectrum using the SPEX plasma emission code shows a two-temperature structure of the corona which is confirmed by a differential emission measure analysis. It reveals a soft ($\sim$ 0.1 keV) component as detected previously by *EUVE* and *ROSAT* and a hard ($\sim$ 0.5 keV) component comparable to that seen by *EINSTEIN*, *EUVE*, and *ASCA*. The derived coronal Fe abundance of 0.7 $\pm$ 0.3 (relative to solar photospheric) is consistent with the solar photospheric abundance but marginally (3σ) different from the value of the metal-rich photosphere of α Cen. The abundance ratios Mg/Fe and Si/Fe are consistent (within 1σ) with solar photospheric and coronal values, whereas the O/Fe ratio (3$\pm$ 2) appears too high but the uncertainty is large. The X-ray flux in the 0.1-2.4 keV band is comparable to the average of previous observations with other instruments and to that derived from the *ASCA* observations if the different passbands of the instruments are taken into account. The two-temperature structure is reminiscent of recently determined emission measure distributions of the solar corona; the hotter component may be evidence of flare heating.

Accepted by A&A

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Doppler Imaging of Stellar Surface Structure. IX. A High-resolution Image of the Weak-lined T Tauri Star HDE283572 = V987 Tauri

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We present a Doppler image of the T Tauri star HDE 283572 from a set of high-quality spectroscopic line profiles and simultaneous multicolor photometry from October 1997. Additional photometry throughout the entire observing season was obtained with a robotic telescope and is used to determine the precise photometric period of 1.5495$\pm$0.0002 days that we interpret to be the stellar rotation period. Further relevant astrophysical parameters like mass, luminosity, radius, effective temperature, gravity, and elemental abundances are obtained and discussed. HDE 283572 shows one of the largest and coolest polar spots ever observed and confirms an earlier map by Joncour et al. from Pic-du-Midi data. We also compare our map with predicted magnetic flux-tube distributions from MHD simulations and suggest that the polar spot on HDE 283572 was possibly created by a strong poleward meridional flow.

Accepted by A&A

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Editor's Note: The above cross-disciplinary abstract has also been submitted to the Star Formation Newsletter and is cross-listed here since it may be of interest to those studying surface structure in late-type stars.

HR 1817: The EUV Properties of an Active F Dwarf

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We examine the coronal properties of the active F dwarf HR 1817. Photometric observations with EUVE show that the source is in a near-continuous state of flare-like activity. Using IUE and EUVE spectroscopic observations we construct the emission measure distribution in the $10^4 - 10^{7.2}$ K temperature range. These observations reveal a hot corona and activity levels similar to those of RS CVn binaries. Based on Fe XXI line ratios we derive an upper limit of $10^{11.7}$ cm^{-3}, for the coronal density of HR 1817 and a magnetic field strength of B$\leq$ 160 Gauss. A comparison of the EUVE spectroscopic observations with synthetic spectra derived from ASCA and ROSAT fits, shows that optimal agreement is obtained for fits with sub-solar metal abundances. The reduced metal abundances increase the radiative losses significantly at temperatures above $10^{6.5}$ K where Fe is no longer the dominant radiative cooling agent.

Accepted by A&A

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High-Resolution Spectra of Very Low-Mass Stars

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We present the results of high-resolution (1-0.4 Å) optical spectroscopy of a sample of very low-mass stars. These data are used to examine the kinematics of the stars at the bottom of the hydrogen-burning main sequence. No evidence is found for a significant difference between the kinematics of the stars in our sample with I–K > 3.5 ($M_{Bol} \gtrsim 12.8$) and those of more massive M-dwarfs ($M_{Bol} \approx 7-10$). A spectral atlas at high (0.4 Å) resolution for M8-M9+ stars is provided, and the equivalent widths of Cs I, Rb I and Hα lines present in our spectra are examined. We analyse our data to search for the presence of rapid rotation, and find that the brown dwarf LP 944-20 is a member of the class of "inactive, rapid rotators". Such objects seem to be common at and below the hydrogen burning main sequence. It seems that in low-mass/low-temperature dwarf objects either the mechanism which heats the chromosphere, or the mechanism which generates magnetic fields, is greatly suppressed.

Accepted by MNRAS

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A Search For Lithium Rich Giants Among Stars With Infrared Excesses

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The unusual nature of the single, rapidly-rotating, lithium-rich K giant HDE 233517, which is currently undergoing significant mass loss, prompted a search for giants with similar properties. High-dispersion spectroscopic observations were obtained of HD 219025, a known lithium-rich infrared-excess giant, plus 39 stars from a list of G and K giants with excess far-infrared emission. The projected rotational velocities of the vast majority of infrared-excess giants appear to be similar to those of normal G and K giants. Six giants have lithium abundances at or above theoretical upper-envelope values. The percentage of such stars in a sample of 39 infrared-excess giants is similar to that of normal

giants. The three giants with the largest lithium abundances have previously been discovered. None of the sample of 39 giants have an Hα line similar to the broadened and very asymmetric line of HDE 233517. The star with optical properties most similar to HDE 233517 is HD 219025.

Accepted by AJ for November 1998

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Solar Abstracts

Time Variability of Active Region Loops Observed with the Coronal Diagnostic Spectrometer (CDS) on SOHO

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Monochromatic images from the Coronal Diagnostic Spectrometer (CDS) of loops above active regions show clear evidence of rapid time variability. The rapidly changing conditions that we observe give a new conception of loop systems that has never before been seriously considered. Loop systems, particularly in emission lines formed at temperatures in the 1-5$\times 10^5$ K range, traditionally thought of as transition region temperatures, are seen to change significantly over a period of one hour. Loops may appear or disappear in certain emission lines, may show rapid variations in the distribution of the emission along their lengths, or may change shape or expand outward, all on time scales of 10-20 minutes. At other temperatures below 1.5 MK the variability appear less striking, but is still pronounced. At high temperatures, i.e. T$\geq$1.5 MK, conditions are normally much more stable. Examples exist, however, of loop systems showing violent changes in images at all temperatures up to Fe XVI formed at 2.7 MK. The structural variability is accompanied by high Doppler shifts, especially in the O V line. Corresponding velocities typically amount to 50-100 km s^{-1}, but values as high as 300 km s^{-1} have been recorded. Animations with illustrating examples of loop variability have been prepared and are found on the enclosed CD-ROM. In addition we briefly discuss other structural and dynamical properties of active region loops, particularly those with temperatures below 1.5 MK. Theoretical models of loops cannot explain the present observations, but models that combine extreme fine structure, episodic heating and magneto-acoustic wave disturbances propagating in the loop legs seem promising.

Accepted by Solar Physics

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An Empirical Model of a Polar Coronal Hole at Solar Minimum

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We present a comprehensive and self-consistent empirical model for several plasma parameters in the extended solar corona above a polar coronal hole. The model is derived from observations with the *SOHO* Ultraviolet Coronagraph Spectrometer (UVCS/*SOHO*) during the period between 1996 November and 1997 April. We compare observations of H I Lyα and O VI $\lambda\lambda$1032, 1037 emission lines with detailed three-dimensional models of the plasma parameters, and iterate for optimal consistency between measured and synthesized observable quantities. Empirical constraints are obtained for the radial and latitudinal distribution of density for electrons, H^0, and O^{5+}, as well as the outflow velocity and unresolved anisotropic most-probable speeds for H^0 and O^{5+}.

The electron density measured by UVCS/*SOHO* is consistent with previous solar-minimum determinations of the white light coronal structure; we also perform a statistical analysis of the distribution of polar plumes using a long time series. From the emission lines we find that the unexpectedly large line-widths of H^0 atoms and O^{5+} ions at most heights are the result of anisotropic velocity distributions. These distributions are not consistent with purely thermal motions or the expected motions from a combination of thermal and transverse wave velocities. Above 2 $R_\odot$, the observed transverse most-probable speeds for O^{5+} are significantly larger than the corresponding motions for H^0, and the outflow velocities of O^{5+} are also significantly larger than the corresponding velocities of H^0. Also, the latitudinal dependence of intensity constrains the geometry of the wind velocity vectors, and superradial expansion is more consistent with observations than radial flow. We discuss the constraints and implications on various theoretical models of coronal heating and acceleration.

Accepted by ApJ

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Characteristic Scales of Photospheric Flows and their Magnetic and Temperature Markers

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We study the characteristic scales of quiet Sun photospheric velocity fields, along with their temperature and magnetic markers, in Doppler images from the SOHO/MDI instrument, in simultaneous, Doppler, magnetic and intensity images from the San Fernando Observatory and in full-disk magnetograms and an intensity image from NSO/KP.

Wavelet flatness spectra show that velocity fluctuations are normally distributed (Gaussian). This is often assumed in stochastic models of turbulence, but had not yet been verified observationally for the Sun. Temperature fluctuations also are Gaussian distributed, but magnetic fields are intermittent and are gathered into patterns related to flow structures.

Wavelet basis functions designed to detect characteristic convection cell flow topologies in acoustically filtered SOHO/MDI Doppler images reveal granulation scales 0.7 Mm to 2.2 Mm and supergranulation 28 Mm to 40 Mm. Mesogranular flows are weakly but significantly detected in the range 4 Mm to 8 Mm. The systematic flows account for only 30% of the image variances at granular and supergranular scales and much less between. The main flows for the intermediate range 2 Mm to 15 Mm are self similar, i. e. chaotic or turbulent.

Accepted by ApJ

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New Instruments

A Dedicated Polarimeter for the MuSiCoS Échelle Spectrograph

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We present in this paper the technical characteristics of a new polarimetric unit dedicated to the MuSiCoS échelle spectrograph. The first test runs indicate that our instrument is very good at measuring polarisation or depolarisation structures in line profiles. It is therefore one of the very few facilities worldwide for studying magnetic topologies of active and chemically peculiar stars through rotational modulation of linearly and circularly polarised Zeeman signatures in line profiles. It is also a very interesting tool for investigating geometries of non-axisymmetric circumstellar environments through depolarisation of spectral lines formed within the scattering envelope.

Accepted by A&AS

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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

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