COOLNEWS

A RESEARCH NEWSLETTER DEDICATED TO COOL STARS AND THE SUN

No. 28 — March 1998 Editor: Steve Skinner (coolnews@jila.colorado.edu)

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From the Editor

Some people encountered errors when attempting to run Latex on the February issue, but others were able to process the Latex file normally. The problem appears to be due to the way in which some e-mail handlers or gateways are handling long lines (70 or more characters). In an effort to avoid this problem in the future I will edit the original Latex file before sending it out, reducing all line lengths to less than 70 characters. If you encounter problems processing the Latex file in the future you can retrieve the newsletter directly off of the COOLNEWS web page in PostScript format.

Stellar Abstracts

CS 22957-027: A Carbon-rich Extremely-metal-poor Star

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We present a high-resolution spectroscopic analysis of the extremely-metal-poor star CS 22957-027, which Beers et al (1992) noted to exhibit a rather strong G-band. For T_{eff} = 4839 K, derived from broadband photometry, our analysis obtains log g = 2.25, and a very low metallicity of [Fe/H]=-3.43 ± 0.12. The carbon-to-iron ratio is found to be enhanced by $\approx$ 2 dex relative to the solar value, similar to the handful of other carbon–rich metal–deficient stars discussed by Norris et al (1997a) and Barbuy et al (1997). From the $^{12}C^{13}C$ (1,0) Swan bandhead and ^{13}CH lines the isotope ratio $^{12}C/^{13}C$ is $\approx$ 10, indicating a ^{13}C enrichment. Nitrogen is also found to be enhanced by $\approx$ 1 dex. The $s-$ process elements Sr and Ba are, surprisingly, found to be under-abundant relative to solar, with [Sr/Fe]=-0.91 and [Ba/Fe]=-0.93. The star's low luminosity requires that the chemical enrichment arises from mass transfer from an evolved companion, rather than self-polluting dredge-up processes. However, the $s-$ process elements Sr and Ba are unusually low, with a solar ratio to one another, at variance with what found in the "classical" CH stars.

Finally we note that a feature due to ^{13}CH is present in coincidence with the Th II 401.9129 nm resonance line. The blend is of relevance for the nucleo-chronology use of the Th II line in these extremely metal poor stars, when significant ^{13}C is present.

Accepted by A&A

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Infrared Velocities of Long Period Variables: CO Δ v=3 in Four Miras and Five SR variables

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Time series of high resolution spectra have been obtained for a set of 9 long period variables (LPVs), 4 Miras and 5 semiregular variables (SRVs), in the 1.6-1.8 μm infrared. The vibration-rotational lines of CO Δv = 3 in this spectral interval have previously been shown to be good probes of the pulsational properties of cool variables stars. We use these spectral lines to show the differences and similarities in the radial velocity amplitude and excitation temperature among the Mira, SRa-, and SRb-type variables. All Miras of our sample show similar radial velocity variations and similar amplitudes independent of their period. The SRVs differ from the Miras by significantly lower amplitudes. All the LPVs show random velocity changes at the few km/s level. We find a correlation between radial velocity amplitude and visual amplitude.

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A Brown Dwarf Candidate in the Praesepe Open Cluster

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We present optical and infrared observations of RPr 1, a faint ($I = 21.01$) and very red object ($I-K = 4.57$) discovered in a deep CCD survey, covering an area of 800 square arcmin of the Praesepe open cluster. A low resolution spectrum shows that RPr 1 is a very late object, the latest object in Praesepe for which a spectrum has been taken to date. Our estimates give a mass between 0.063 and 0.084 $M_\odot$, and indicate that RPr 1 may turn out to be the first brown dwarf in this cluster.

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Brown Dwarfs in the Pleiades II, A Deep optical and Near-infrared Survey

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The brown dwarf population in the Pleiades cluster has been probed in a deep 850 arcmin^2 $RIJK$ survey. The survey is complete to $I = 21.4$ in 76 % of the area and to $I = 20.2$ in the remaining 24 %. Photometry of 32 previously known members is presented together with 8 new candidates, four of which are below the brown dwarf limit. The faintest one is the lowest mass brown dwarf candidate found hitherto in the Pleiades (I = 20.55, 0.04 $M_\odot$). The derived Pleiades luminosity function is compared to the most recent theoretical mass-luminosity relations and is consistent with a power-law index in the mass function between 0 and 1 to the limit of this survey.

A&A, in press

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Excess Helium as an Explanation for Metal Deficiency in Coronal Plasma?

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We suggest an alternative explanation for the apparently low metal abundances observed in some very active late-type stellar coronae: that the He abundance in these coronae is enhanced, causing lower line-to-continuum ratios. The dependence of the total free-free Gaunt factor on the square of the nuclear charge means that He can begin to dominate the EUV and X-ray thermal continua of a hot plasma with only a doubling of the abundance of He^{2+} nuclei relative to H^{+} nuclei. Using model continua, we calculate the relation between He abundance and apparent metal deficiency. We suggest that He might be selectively enhanced by preferential mechanisms for retention of He nuclei in the corona or by diffusion processes, as recent sophisticated calculations indicated might be the case under certain coronal conditions. While it might seem unlikely that He nuclei could be enhanced in the hot gas phase of elliptical galaxies, until the possible presence of small-scale structure and spatial inhomogeneities in their interstellar media are better understood, diffusion and other element fractionation processes should perhaps not be ruled out entirely in the context of trying to understand the puzzlingly low metal abundances found from X-ray studies of elliptical galaxies.

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Loop Modeling of Coronal X-Ray Spectra
V. One- and Two-Loop Model Fitting of G-Type Star ROSAT/PSPC Spectra

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As part of a systematic study devoted to the diagnostic of solar-like coronal structures in late-type stars, we have analyzed ROSAT/PSPC X-ray spectra of eight main sequence G-type stars in the solar neighborhood. We have fitted the X-ray spectra adopting two different classes of models: the usual two-component isothermal models and the more physically meaningful hydrostatic loop models. The two-component isothermal models yield fairly acceptable χ^2 values, however they allow limited physical insight on the stellar coronal structures; on the other hand, the one-loop model fitting provides unreliable long loops, namely orders of magnitude larger than the stellar radius, in the majority of the cases studied. A more realistic physical description of the observed coronae comes from the two-loop modeling approach: two distinct classes of loops with different characteristics seem to dominate the X-ray emission of our sample of G-type stars: relatively cool loops ($T_{\rm max} \simeq 1.5-5\times10^6$ K) with pressures ranging from relatively low ($p_0 \simeq 2-10$ dyn cm^{-2}) to high values ($p_0 \simeq 100$ dyn cm^{-2}) and hot loops ($T_{\rm max} \simeq 1-3\times10^7$) with very high base pressures ($p_0 \simeq 10^2-2.4\times10^4$ dyn cm^{-2}). We compare the results and the diagnostic power coming from the different approaches and discuss their physical implications.

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Measurements of Starspot Parameters on Active Stars using Molecular Bands in Echelle Spectra

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We present results from a study of starspot areas and temperatures on active, single-lined spectroscopic binaries, using absorption bands of TiO. Expanding upon our previous studies, we have analyzed multi-order echelle spectra of eight systems to simultaneously measure several different molecular bands and chromospheric emission lines. We measure starspot parameters by fitting the echelle orders containing molecular bands of interest, using spectra of inactive G

and K stars as proxies for the non-spotted photosphere of the active stars and spectra of M stars as proxies for the spots. At least two bands with different $T_{\rm eff}$ sensitivities are required. We find that fitting bands other than the TiO 7055 Å and 8860 Å features does not greatly extend the temperature range or sensitivity of our technique. The 8860 Å band is particularly important due to its sharply different temperature sensitivity. We do not find any substantial departures from previously measured spot parameters for the stars for which we have previous analyses based on single-order spectra. We refine our derived spot parameters using contemporaneous photometry when available. We find that using M giants as spot proxies for subgiant active stars often underestimates the spot filling factor needed to fit photometry; this is presumably due to the increase in strength of the TiO bands with decreasing gravity. We also investigate correlations between spot filling factor and chromospheric emission, and we d evelop a simple method to measure non-spot temperature from our echelle spectra.

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BD+05°706: A New Member of the Class of "Cool Algols"

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We report the serendipitous discovery of an Algol-type binary with an orbital period of 18.9 days, in which both components are cool giants (G8 III and K1-2 III). Few systems with these characteristics are known, and are referred to as "cool Algols", as opposed to the "classical Algols" in which the mass-gaining component resembles an early-type main-sequence star. The nature of this object, which is a strong X-ray source, was discovered in the course of a spectroscopic search for T Tauri stars among ROSAT All-Sky Survey sources. We derive a double-lined spectroscopic orbit leading to minimum masses of $M_A = 2.481 \pm 0.023$ M$_\odot$ and $M_B = 0.515 \pm 0.011$ M$_\odot$, and a corresponding mass ratio of $q \sim 0.21$. We measure also projected rotational velocities of 22 and 31 km s^{-1}, respectively, and a luminosity ratio of $l_B/l_A = 1.06 \pm 0.04$ at ~ 5200 Å. The system is probably semi-detached, with the axial spin of the components synchronized with the orbital motion, and the probability of eclipses is high. The general properties of BD+05°706, most likely a result of Case B mass exchange, are very similar to those of the other known members of this class. We discuss the correlation between the mass of the hotter, detached components and their effective temperature for all cool Algols, noted previously by Popper (1992, IAU Symp. No. 151, p. 395), as well as a trend with the orbital period. Chromospheric activity indicators in BD+05°706 are compared to those of other members of its class, as well as with those of the classical Algols and the RS CVn binaries.

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The Spottedness of V775 Her, V833 Tau and YZ CMi by Results of Long Term Photometric Observations

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On the basis of photographic measurements and UBVRI photometry of three active red dwarf stars V 775 Her, V 833 Tau and YZ CMi, accounts of their photospheric spottedness for different assumptions of starspot configuration are carried out.

Spotted regions on V 775 Her can occupy up to 42 % of the stellar surface, on V 833 Tau – up to 68 % and on YZ CMi – up to 21 %. Thus, differences of the temperatures of the quiet photosphere and spots are 900, 800 and 420 K respectively.

Submitted to Astron. Rep.

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The Brightness Rotation Modulation and the Spottedness of Red Dwarf Stars DK Leo, AD Leo and GT Peg

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Rotational modulation and the mean brightness of three insufficiently explored spotted red dwarfs are considered. Their photometric behaviour is described by a zonal spottedness model. Spot areas make up 11 - 13 % of the complete stellar surface and spots are colder than the surrounding photosphere by 600 - 1500 K.

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The Evolutionary Status of Activity-selected Solar-type Stars and of T-Tauri stars as Derived from Hipparcos Parallaxes: Evidence for Long-lived T-Tauri Disks?

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We have used the Hipparcos parallaxes to study the evolutionary status of sample of stars with spectral types from late F to M0 (hereafter "solar-type stars"), selected on the basis of their activity, mainly from *Einstein*-based surveys. The parallaxes have been used to place the objects in the H-R diagram, determining their age by comparison with theoretical evolutionary tracks and observational main sequences. This age is compared with age estimates derived from the lithium abundance, the activity level and the presence of circumstellar disks. To complement our sample at the young end we have also studied the Hipparcos-determined distances of a sample of optically-selected pre-main sequence stars, mostly classical T-Tauri stars (CTTS). Some CTTS appear to be much nearer to us than previously determined, and far away from their putative parent cloud. This implies a significantly larger age providing observational evidence for the existence of long-lived T-Tauri disks which could produce the slow rotators on the Zero-Age Main Sequence (ZAMS).

None of the above-mentioned age proxies appears to reliably and unambiguously select very young stars in the range of spectral types considered here, with some apparently very young objects effectively lying onto or very close to the main sequence. The attribution of ages to young solar-type stars on the basis of any of the standard proxies may thus significantly under- or over-estimate the evolutionary age of the object. Caution must therefore be exercised when attributing ages to individual stars, and claims about the large number of PMS stars found in X-ray based surveys may need to be at least in part reconsidered in this light.

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Spectral Synthesis of TiO Lines

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We explore the extent to which current titanium oxide (TiO) line data (Jørgensen 1994) and M dwarf model atmospheres (Allard & Hauschildt 1995a, 1997) can be used to reproduce an $R = 120,000$ optical spectrum of the relatively inactive star Gliese 725B (M3.5 V). We find that tabulated TiO wavelengths have errors large enough to complicate line identification, especially for transitions involving higher vibrational states. We determine empirical wavelength corrections for 12 strong γ bands near 6680 and 7090 Å. For the sequence of orbital quantum numbers, J,

within any one of these bands, our observations confirm the predicted line spacing, thereby validating the rotational constants for low vibrational levels. However, the predicted wavelengths have zero–point errors that differ for each overlapping band. Next, we compare observed and synthetic spectra near 8463 Å, where an ϵ Q_3 0−0 band head is expected, demonstrating that the electronic oscillator strength of 0.014 advocated by Jørgensen (1994) is too large by at least a factor of 5. This has a minor effect on the structure of theoretical model atmospheres. Using our empirically corrected TiO wavelengths, we compute a grid of synthetic spectra for Allard & Hauschildt (1995a, 1997) models spanning a range in effective temperature ($T_{\rm eff}$), surface gravity ($\log g$), and metallicity ([M/H]). Interpolating in this grid of synthetic spectra, we simultaneously fit observations of the TiO band head region near 7088 Å and five Ti I and Fe I lines near 8683 Å. For Gl 725B, we find $T_{\rm eff} = 3170 \pm 71$ K, $\log g = 4.77 \pm 0.14$, [M/H]$= -0.92 \pm 0.07$, and $v_{\rm mac} = 1.1 \pm 0.7$ km s^{-1}. We show that by using both atomic and molecular lines as constraints, systematic uncertainties in derived stellar parameters can be reduced. These parameters are consistent with published values obtained by other means, but more stringent tests would be useful. In the Appendix, we tabulate wavelengths, identifications, relative line strengths, and other properties of the strongest band heads in the α, β, γ, γ', δ, ϵ, and ϕ electronic systems of TiO.

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Model Photospheres for Late-Type Stars from the Inversion of High-Resolution Spectroscopic Observations. The Sun

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An inversion technique has been developed to recover LTE one-dimensional model photospheres for late-type stars from very high resolution, high signal-to-noise stellar line profiles. It is successfully applied to the Sun by using a set of clean Ti I, Ca I, Cr I, and Fe I normalized line profiles with accurate transition probabilities and taking advantage of the well understood collisional enhancement of the wings of the Ca I line at 6162 Å. Line and continuum center-to-limb variations, continuum flux, and wings of strong metal lines are synthesized by means of the model obtained and are compared with solar observations, as well as with predictions from other well known theoretical and empirical solar models, showing the reliability of the inversion procedure. The prospects for and limitations of the application of this method to other late-type stars are discussed.

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The Large-scale Distribution of X-ray Active Stars

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We analyse the large-scale sky distribution of 8 593 X-ray emitting stars from the cross-correlation of the ROSAT All-Sky Survey sources with the Tycho catalog. We detect a density gradient from the galactic plane to the galactic pole which is attributed to the scale height of the young late type star population of the galactic disc. The data also show up a low galactic latitude enhanced feature with respect to mean plane density. We fit the observed X-ray stellar surface density with a model consisting of a constant background component plus an exponential disc and derive for the best fit an inclination $i = 27.5° \pm 1°$ and an ascending node $l_\Omega = 282° \pm 3°$ with respect to the galactic plane. These values are very close to those quoted in the literature for the *Gould Belt* and in fact consistent with them. If an expanding ring is responsible for the formation of the *Gould Belt*, it should have triggered star formation in a large scale propagating process. The low mass stars accounting for the observed surface density excess could be the remaining debris of this process, still shining brightly in X-rays.

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Beryllium Abundances in Parent Stars of Extrasolar Planets: 16 Cyg A & B and ρ^1 Cnc

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The ^{9}Be II λ 3131 Å doublet has been observed in the solar-type stars 16 Cyg A & B and in the late G-type star ρ^1 Cnc, to derive their beryllium abundances. 16 Cyg A & B show similar (solar) beryllium abundances while 16 Cyg B, which has been proposed to have a planetary companion of $\sim 2\ M_{\rm Jup}$, is known to be depleted in lithium by a factor larger than 6 with respect to 16 Cyg A. Differences in their rotational histories which could induce different rates of internal mixing of material, and the ingestion of a similar planet by 16 Cyg A are discussed as potential explanations. The existence of two other solar-type stars which are candidates to harbour planetary-mass companions and which show lithium and beryllium abundances close to those of 16 Cyg A, requires a more detailed inspection of the peculiarities of the 16 Cyg system.

For ρ^1 Cnc, which is the coolest known object candidate to harbour a planetary-mass companion ($M > 0.85\ M_{\rm Jup}$), we establish a precise upper limit for its beryllium abundance, showing a strong Be depletion which constrains the available mixing mechanisms. Observations of similar stars without companions are required to asses the potential effects of the planetary companion on the observed depletion. It has been recently claimed that ρ^1 Cnc appears to be a subgiant. If this were the case, the observed strong Li and Be depletions could be explained by a dilution process taking place during its post-main sequence evolution.

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Solar Abstracts

The Li I 671 nm Line in Solar Granulation

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The astrophysically very interesting Li I 671 nm line has been observed with high spatial resolution in solar granulation with the intention to diagnose departures from local thermodynamic equilibrium (LTE) in the line formation. The spectral feature is very weak, so this is also a test on the limits of such observations. The observations of the Li I line and other weak lines nearby are compared with the results of synthetic line calculations in three-dimensional granulation simulations. The dependence of line-centre velocities on photospheric continuum brightness is well described by the simulations. The observed equivalent width of the Li I line show an approximately flat dependence on continuum brightness, contrary to the theoretical LTE results. Detailed modelling of the line radiative transfer, with an approximate inclusion of three-dimensional effects, gives a better agreement with observations. The match is not perfect and various interesting reasons for this are considered. However, the possibility of systematic errors caused by the sensitivity of the Li I equivalent width to continuum placement calls for cautiousness in the conclusions.

Accepted by A&A

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SOHO Observations of the Connection between Line Profile Parameters in Active and Quiet Regions and the Net Redshift in EUV Emission Lines

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We present high spatial and spectral resolution observations of one active and one quiet Sun region, obtained with CDS and SUMER on SOHO. The connections between the line profile parameters are studied and a systematic wavelength shift towards the red with increasing peak line intensity (line broadening) is detected. The large scatter in the data calls for another approach. We apply conditional probability analysis to a series of EUV emission lines and find significant correlations between line profile parameters. For a given interval in wavelength shift we find that: 1) line profiles with large intensities (line widths) and redshifts above the average constitute an increasing fraction of the profiles as the relative wavelength shift increases, 2) line profiles with large intensities (line widths) and blueshifts compared to the average, on the other hand, constitute a decreasing fraction of the profiles as the relative wavelength shift increases. These results extend the findings of an earlier quiet Sun study from one to several emission lines and expand the validity to include the active region. Interestingly, the active region observations show correlations between peak line intensity and wavelength shift in the coronal lines.

The tendency for redshifted profiles to be more intense than blueshifted profiles will shift line profiles derived by integrating along the slit towards the red. From the present observations we are not able to determine the fraction of the net redshift that emerges from this correlation. We suggest that the same mechanism is responsible both for the correlation between the line profile parameters and for the differential redshift between the transition region and chromospheric emission lines.

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On the Power in the Legendre-Modes of the Solar Radial Magnetic Field

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The power in the different ℓ-modes of an expansion of the solar radial magnetic field at the surface in terms of Legendre polynomials, P_ℓ, is calculated with the help of a solar dynamo model studied earlier. The model is of the Babcock-Leighton type, i.e, the surface eruptions of the toroidal magnetic field −through the 'tilt angle', γ, formed by the magnetic axis of a bipolar magnetic region with the east-west line− are the sources for the poloidal field. In this paper it is assumed that the tilt angle is subject to fluctuations of the form, $\gamma = \gamma'(\sigma) + <\gamma>$ where $<\gamma>$ is the average value and $\gamma'(\sigma)$ is a random normal fluctuation with standard deviation σ which is taken from Howard's observations of the distribution of tilt angles. For numerical considerations, negative values of γ were not allowed. If this ocurred, γ was recalculated. The numerical integrations were started with a toroidal magnetic field antisymmetric across the equator, large enough to generate eruptions, and a negligible poloidal field. The fluctuations in the tilt angle destroy the antisymmetry as time increases. The power of the antisymmetric modes across the equator (i.e., odd values of ℓ) is concentrated in frequencies, ν_p, corresponding to the cycle-period. The maximum power lies in the $\ell = 3$-mode with considerable power in the $\ell = 5$-mode, in broad agreement with Stenflo's results who finds a maximum power at $\ell = 5$. For the symmetric modes, there is considerable power in frequencies larger than ν_p, again in broad agreement with Stenflo's power spectrum.

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Flare Index of Solar Cycle 22

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A brief description and final results of the flare index (FI) of solar activity are given. The calculation of the daily flare index of cycle 22 was determined using the final grouped solar flare files from National Geophysical Data Center A. The final data of FI are presented in graphical form over cycle 22. Daily calculated values are available for general use in Kandilli observatory=92s and NGDC=92s anonymous ftp servers. The pattern of similar activity indices that arise

under different physical conditions during cycle 22 are compared with the flare index. The North-South asymmetry in the daily flare index data was studied.

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Simulations of Solar Granulation: I. General Properties

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Numerical simulations provide information on solar convection not available by direct observation. We present results of simulations of near surface solar convection with realistic physics – an equation of state including ionization and three-dimensional, LTE radiative transfer using a four bin opacity distribution function. Solar convection is driven by radiative cooling in the surface thermal boundary layer, producing the familiar granulation pattern. In the interior of granules, warm plasma ascends with $\approx 10\%$ ionized hydrogen. As it approaches and passes through the optical surface, the plasma cools, recombines and loses entropy. It then turns over and converges into the dark intergranular lanes and further into the vertices between granulation cells. These vertices feed turbulent downdrafts below the solar surface, which are the sites of buoyancy work that drives the convection. Only a tiny fraction of the fluid ascending at depth reaches the surface to cool, lose entropy and form the cores of these downdrafts. Granules evolve by pushing out against and being pushed in by their neighboring granules, and by being split by overlying fluid that cools and is pulled down by gravity. Convective energy transport properties that are closely related to integral constraints such as conservation of energy and mass, are exceedingly robust. Other properties, that are less tightly constrained, and / or involve higher order moments or derivatives are found to depend more sensitively on the numerical resolution. At the highest numerical resolution, excellent agreement between simulated convection properties and observations is found. In interpreting observations it is crucial to remember that surfaces of constant optical depth are corrugated. The surface of unit optical depth in the continuum is higher above granules and lower in the intergranular lanes, while the surface of optical depth unity in a spectral line is corrugated in ways that are influenced by both thermal and Doppler effects.

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Ph.D. Thesis Abstract

Dynamical studies of the Sun in the Extreme Ultraviolet (EUV)

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Ph.D degree awarded: December 1997

Results are presented of a study of solar EUV (Extreme Ultraviolet) spectral lines. The wavelength range covered by these lines includes emission from the chromosphere, transition region and the corona. Using recent atomic data for O IV, Fe XII and Fe XIII ions in conjunction with observational data from the S-055 spectrometer on Skylab, the High Resolution Telescope and Spectrometer (HRTS), and the CDS and SUMER instruments on board SOHO, temperatures and densities have been derived for a number of different solar features. In the case of the results from the CDS and SUMER instruments, densities are presented as a function of time and evidence found for small-scale flaring events. A study of densities in an active region using the O IV and Fe XIII lines reveals there to be little evidence for the constant density assumption. Nonthermal velocities are presented for spectral lines, covering the temperature range 10^4K–10^6K, which were obtained from high resolution HRTS data of a coronal hole and a 'quiescent region' at the limb. These results are compared with predictions based on acoustic and Alfvén wave heating. The analysis of light curves from observations of active regions with the Ultraviolet Spectrometer and Polarimeter (UVSP) reveals evidence for periodicities in the 2–5 mHz band with a distinct maximum at 3–3.5 mHz. These oscillations are interpreted as being probably related to evanescent acoustic waves driven by the photospheric five minute oscillations. The power spectra for line intensities of several lines formed in the upper transition region and corona are presented for CDS observations of a quiet and active region. Periods of 5 and 10 minutes are present in lines of O III, O IV and O V while lines of He I and Mg X show little or no periodicity. There are found to be no significant time delays present in any of the datasets examined. Results are presented from an analysis of SUMER data which show evidence for intensity and velocity oscillations in different chromospheric and transition region lines. Evidence for time delays is found between different high and low temperature line pairs, indicating propagating waves. Small-scale brightening events are found to be common in lines of C IV, N V and O VI and are accompanied by small blueshifts and nonthermal line broadening. The results for CDS and SUMER are discussed in terms of a number of different models including trapped magnetic modes below the transition region, resonant absorption of Alfvén waves and propagating kink modes.

Thesis-related Publications: A&A, 306, 621, Solar Phys., 173, 243, A&A, 327, 365

Announcement

Proceedings of the Second Annual Lowell Observatory Fall Workshop: Solar Analogs

We announce the availability of the proceedings of the Second Annual Lowell Observatory Fall Workshop, "Solar Analogs: Characteristics and Optimum Candidates," held October 5-7, 1997 in Flagstaff, Arizona. The proceedings are available on the WWW at the URL

- http://www.lowell.edu/users/jch/workshop/sa.html

This page contains links to texts of the invited talks and contributed posters, results obtained by the small "working groups," in which attendees debated specific issues relevant to the selection of solar analogs, and transcripts of the extensive discussions that formed the heart of the workshop.

The contributions can also be downloaded as PostScript versions of the LaTeX files submitted by the authors.

You can download individual contributions, or the entire proceedings.

Included in the proceedings are

- texts of invited talks by Karen Harvey, Gary Rottman, David Soderblom, Mark Giampapa, Irina Glushneva, and Giusa Cayrel de Strobel;
- texts of ten contributed posters spanning a wide range of topics relevant to the study of solar-like stars;
- extemporaneous presentations by panelists Tom Ayres, Bob Garrison, Derek Buzasi, and Richard Wade, and the transcript of the long and spirited discussion that followed;
- the latest tabulation of fundamental properties of solar analogs using HIPPARCOS parallaxes, by Giusa Cayrel de Strobel;
- a thorough study of the current best solar twin, HD 146233 = 18 Sco, by Gustavo Porto de Mello & Licio da Silva; and
- a three-session debate, by the entire workshop, as well as 5- to 6-member "working groups," on issues spanning the entire 20-year hunt for solar analogs, and the proper directions to take in the future.

Anyone with questions regarding the proceedings, or having difficulty with any downloads, should contact Jeffrey Hall at Lowell Observatory, jch@lowell.edu, for assistance.

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 .`