COOLNEWS

A RESEARCH NEWSLETTER DEDICATED TO COOL STARS AND THE SUN

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Model Atmospheres Broad-Band Colors, Bolometric Corrections and Temperature Calibrations for O - M Stars

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Broad band colors and bolometric corrections in the Johnson-Cousins-Glass system (Bessell, 1990; Bessell & Brett, 1988) have been computed from synthetic spectra from new model atmospheres of Kurucz (1995a), Castelli (1997), Plez, Brett & Nordlund (1992), Plez (1995-97), and Brett (1995a,b). These atmospheres are representative of larger grids that are currently being completed. We discuss differences between the different grids and compare theoretical color-temperature relations and the fundamental color temperature relations derived from: (a) the infrared-flux method (IRFM) for A-K stars (Blackwell & Lynas-Gray 1994; Alonso et al. 1996) and M dwarfs (Tsuji et al. 1996a); (b) lunar occultations (Ridgway et al. 1980) and (c) Michelson interferometry (Di Benedetto & Rabbia 1987; Dyck et al. 1996; Perrin et al. 1997) for K-M giants, and (d) eclipsing binaries for M dwarfs. We also compare color - color relations and color - bolometric correction relations and find good agreement except for a few colors. The more realistic fluxes and spectra of the new model grids should enable accurate population synthesis models to be derived and permit the ready calibration of non-standard photometric passbands. As well, the theoretical bolometric corrections and temperature - color relations will permit reliable transformation from observed color magnitude diagrams to theoretical HR diagrams.

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A Ca II H&K Survey of γ Doradus Candidates

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In an investigation of the starspot hypothesis as it applies to the "slowly variable" F-type dwarfs, we spectroscopically observed eight promising γ Doradus candidates to search for Ca II H&K emission. We found that there are no significant emission reversals in the cores of these resonance lines. Based on the ceiling flux calculations of the Ca II K line and on calculations of the Rossby number, we conclude that there is no support for the presence of strong magnetic activity and the starspot hypothesis in these objects. As "by–products" of this investigation, we independently measured both radial velocities and projected rotational velocities of each target object.

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Orbital Period Modulation and Magnetic Cycles in Close Binaries

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We discuss the observed orbital period modulations in close binaries, and focus on the mechanism proposed by Applegate (1992) relating the changes of the stellar internal rotation associated with a magnetic activity cycle with the variation of the gravitational quadrupole moment of the active component; the variation of this quadrupole moment in turn forces the orbital motion of the binary stars to follow the active star's activity level. We generalize this approach by considering the details of this interaction and develop some illustrative examples in which the problem can be easily solved in analytical form. Starting from such results, we consider the interplay between rotation and magnetic field generation in the framework of different types of dynamo models which have been proposed to explain solar and stellar activity. We show how the observed orbital period modulation in active binaries may provide new constraints for discriminating between such models. In particular, we study the case of the prototype active binary RS Canum Venaticorum, and suggest that torsional oscillations — driven by a stellar magnetic dynamo — may account for the observed behaviour of this star. Further possible applications of the relationship between magnetic activity and orbital period modulation, related to the recently discovery of binary systems containing a radio pulsar and a convecting upper main-sequence or a late-type low mass companion, are discussed.

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Boron in Very Metal-Poor Stars

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We have observed the B I λ 2497 Å line to derive the boron abundances of two very metal-poor stars selected to help in tracing the origin and evolution of this element in the early Galaxy: BD +23° 3130 and HD 84937. The observations were conducted using the Goddard High Resolution Spectrograph on board the *Hubble Space Telescope*. A very detailed abundance analysis via spectral synthesis has been carried out for these two stars, as well as for two other metal-poor objects with published spectra, using both Kurucz and OSMARCS model photospheres, and taking into account consistently the NLTE effects on the line formation. We have also re-assessed all published boron abundances of old disk and halo unevolved stars. Our analysis shows that the combination of high effective temperature ($T_{\rm eff} > 6000$ K, for which boron is mainly ionized) and low metallicity ([Fe/H] < -1) makes it difficult to obtain accurate estimates of boron abundances from the B I λ 2497 Å line. This is the case of HD 84937 and three other published objects (including two stars with [Fe/H] ~ -3), for which only upper limits can be established. BD +23° 3130, with [Fe/H] ~ -2.9 and log N(B)$_{\rm NLTE} = 0.05 \pm 0.30$, appears then as the most metal-poor star for which a firm measurement of the boron abundance presently exists. The evolution of the boron abundance with metallicity that emerges from the seven remaining stars with $T_{\rm eff} < 6000$ K and [Fe/H] < -1, for which beryllium abundances were derived using the same stellar parameters, shows a linear increase with a slope ~ 1. Furthermore, the B/Be ratio found is constant at a value ~ 20 for stars in the range $-3 <$ [Fe/H] < -1. These results point to spallation reactions of ambient protons and α particles with energetic particles enriched in CNO as the origin of boron and beryllium in halo stars.

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Stellar Radii of M Giants

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We determine the stellar radii of the M giant stars in the Hipparcos catalogue that have a parallax measured to better than 20 % accuracy. This is done with the help of a relation between a visual surface brightness parameter and the Cousins $(V-I)$ colour index, which we calibrate with M giants with published angular diameters.
The radii of (non-Mira) M giants increase from a median value of $50\,{\rm R}_\odot$ at spectral type M0 III to $170\,{\rm R}_\odot$ at M7/8 III. Typical intermediate giant radii are $65\,{\rm R}_\odot$ for M1/M2, $90\,{\rm R}_\odot$ for M3, $100\,{\rm R}_\odot$ for M4, $120\,{\rm R}_\odot$ for M5 and $150\,{\rm R}_\odot$ for M6. There is a large intrinsic spread for a given spectral type. This variance in stellar radius increases with later types but in relative terms, it remains constant.
We determine luminosities and, from evolutionary tracks, stellar masses for our sample stars. The M giants in the solar neighbourhood have masses in the range 0.8 - $4\,{\rm M}_\odot$. For a given spectral type, there is a close relation between stellar radius and stellar mass. We also find a linear relation between the mass and radius of non-variable M giants. With increasing amplitude of variability we have larger stellar radii for a given mass.

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Spectroscopic Analyses of the Parent Stars of Extrasolar Planetary System Candidates

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We report on spectroscopic abundance and line-profile analyses of the parent stars of the recently announced extrasolar planet candidates: ρ^1 Cnc, ρ CrB, 16 Cyg B, 51 Peg, 47 UMa, 70 Vir, and HD 114762. We also include 16 Cyg A, which does not appear to have a planet. Combined with our previous study on two other stars, it appears that the four 51 Peg-like systems have metal-rich parent stars, with [Fe/H] averaging to +0.25. The intermediate system, ρ CrB, has [Fe/H] = -0.29. We confirm previous claims that the lithium abundances of 16 Cyg A and B are significantly different.

Our $v \sin i$ estimates for 51 Peg, 47 UMa, and ρ CrB argue against these systems being nearly pole-on, while our

estimates for the other stars do not rule out that possibility.

We confirm previous findings that ρ^1 Cnc is likely a subgiant. However, its inferred age from theoretical evolutionary tracks is much greater than the age of the universe. We tentatively propose that it is a stellar spectroscopic binary viewed very nearly pole-on.

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Insights Into the Formation of Barium and Tc-poor S Stars from an Extended Sample of Orbital Elements

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The set of orbital elements available for chemically-peculiar red giant (PRG) stars has been considerably enlarged thanks to a decade-long CORAVEL radial-velocity monitoring of about 70 barium stars and 50 S stars.

When account is made for the detection biases, the observed binary frequency among strong barium stars, mild barium stars and Tc-poor S stars (respectively 35/37, 34/40 and 24/28) is compatible with the hypothesis that they are all members of binary systems.

This paper presents a detailed analysis of the complete set of orbital parameters available for PRG stars; the individual data are given in three companion papers. The main results are as follows: (i) The similarity between the orbital-period, eccentricity and mass-function distributions of Tc-poor S stars and barium stars confirms that Tc-poor S stars are the cooler analogs of barium stars; (ii) The eccentricity – period diagram of PRG stars clearly bears the signature of dissipative processes associated with mass transfer, since the maximum eccentricity observed at a given orbital period is much smaller than in a comparison sample of normal giants; (iii) The mass function distribution is compatible with the unseen companion being a white dwarf (WD); (iv) Assuming that the WD companion has a mass in the range 0.60 ± 0.04 $M_{\odot}$, the masses of mild and strong barium stars amount to 1.9 ± 0.2 and 1.5 ± 0.2 $M_{\odot}$, respectively; (v) Mild barium stars are not restricted to long-period systems; the difference between mild and strong barium stars is mainly one of galactic population rather than of orbital separation, in agreement with their respective kinematical properties; (vi) Binarity is probably not a sufficient condition to produce a PRG star, and a lower-than-solar metallicity seems to be required as well.

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For orbital elements: http://obswww.unige.ch/~udry/cine/barium/barium.html

A CORAVEL Radial-velocity Monitoring of Giant Ba and S stars: Spectroscopic Orbits and Intrinsic Variations

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This paper provides orbital parameters for 38 barium stars and 10 extrinsic S stars derived from a decade-long CORAVEL monitoring. Lower bounds on the orbital period (generally exceeding 10 y) have been obtained for 10 more systems.

Mira S, SC and (Tc-poor) C stars have also been monitored and show intrinsic radial-velocity variations due to atmospheric phenomena. Tentative orbital solutions have been proposed for 3 stars (S UMa, X Cnc, BD-08:1900) where the velocity and photometric periods are different. Three stars (RZ Peg, SS Vir and R CMi) exhibit radial-

velocity variations synchronous with the light variations. *Pseudo*-orbital solutions have been derived for those stars. In the case of RZ Peg, a line-doubling phenomenon is observed near maximum light, and probably reflects the shock wave propagating through the photosphere.

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A CORAVEL Radial-velocity Monitoring of S Stars: Symbiotic Activity vs. Orbital Separation

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Orbital elements are presented for the Tc-poor S stars HR 363 (= HD 7351) and HD 191226. With an orbital period of 4592 d (=12.6 y), HR 363 has the longest period known among S stars, and yet it is a strong X-ray source. Its X-ray flux is similar to that of HD 35155, an S star with one of the shortest orbital periods (640 d). This surprising result is put in perspective with other diagnostics of binary interaction observed in binary S stars. They reveal that there is no correlation between the level of binary interaction and the orbital period. This situation may be accounted for if the wind mass-loss rate from the giant is the principal factor controlling the activity level in these (detached) systems, via a stream of matter funneled through the inner Lagragian point.

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Radio Emission from Algol. I. Coronal Geometry and Emission Mechanisms Determined from VLBA and Green Bank Interferometer Observations

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We report dual circular polarization VLBA observations of Algol made at orbital phases 0.22–0.30 using a differential phase referencing technique. The flux density of Algol varied from 10–20 mJy during the observations. The radio maps show a double-lobe source separated by 1.6 mas (1.4 times the K star diameter). Although the total emission is only weakly circularly polarized, the individual lobes are strongly circularly polarized and of opposite helicity. Snapshot VLBI maps made at three hour intervals show variations in the flux density of both components, but no significant motions of the centroids.

We also analyze Green Bank Interferometer (GBI) synoptic observations of RCP and LCP flux densities of Algol at 2.3 and 8.3 GHz several times per day from early 1995 to mid-1997. The resulting dataset, which consists of more than 2,500 observations over two years, is by far the most comprehensive available for any stellar system. In addition, we analyzed GBI observations of the very similar (but non-eclipsing) binary system HR1099 over the same time period in order to compare the two systems. We summarize the GBI observations using several statistical descriptions. We find no phase dependence of either the radio luminosity or circular polarization for either system. The luminosity histograms for both systems are remarkably similar. The distribution functions are not well represented by exponentials as previously suggested, but can be represented by power-laws truncated at low luminosity. The cut-off occurs at 20–30 mJy and may represent emission from a slowly-varying basal level which is always detected. We confirm several previous results, including the strong dependence of spectral index on luminosity, the decrease of fractional circular polarization with luminosity, and the dependence of fractional circular polarization on orbital inclination angle.

We suggest the the radio emission at 8.3 GHz is x-mode gyro-synchrotron emission from optically thin emission regions containing mildly relativistic electrons in a dipolar magnetic field. There is no evidence for highly circularly polarized

coherent flares at 8.3 GHz although it is possible that such flares occasionally occur at 2.25 GHz. The lack of orbital phase dependence in the GBI light curves, combined with the significant inclination of the VLBA structure with respect to the orbital plane, is inconsistent with previous models in which the radio lobes are located in the equatorial plane. The individual lobes seen in the VLBI maps may be associated with the polar regions, with the strong circular polarization resulting from the opposed mean magnetic field vector component along the observer's line of sight in opposite hemispheres.

Astrometric results from the VLBA observations are discussed in a companion paper.

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Radio Observations of Algol. II. Computation of Close Stellar Encounters with the Oort Cloud

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We present here new astrometric measurements of Algol's position made with Very Long Baseline Interferometry. Using these measurements, along with a new estimate of the node of the inner binary and other orbital elements from the literature, we compute a new proper motion, with uncertainties six times less than those of *Hipparcos*. We compute the trajectories of Algol (using the new proper motion) and of Gliese 710, and discuss the various sources of uncertainty. We find that it is essential to include Galactic rotation and oscillation about the midplane in order to accurately compute not only the distance of closest encounter, but also on which side of the Sun a star will pass.

Finally, we compute a minimum distance criterion for individual stellar encounters to have an effect on the observed distribution of comets. We find the cross section for interaction for the relatively high mass to velocity ratio of Algol is an order of magnitude greater than the cross section of the inner Oort cloud. Nonetheless we find that both the Algol and Gliese 710 encounters are too distant to produce any extra observable comets. We also compute the encounter parameters of the nearest stellar system, α Cen-Proxima Cen, which we find to be gravitionally bound. The parameters of its closest approach are similar to those of Gliese 710, and we expect no extra observable comets to result from the encounter. We note that a reanalysis of the *Hipparcos* data is needed to search for other potential close encounters.

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The Problem of Hipparcos Distances to Open Clusters. II. Constraints from Nearby Field Stars

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This paper examines the discrepancy between distances to nearby open clusters as determined by parallaxes from Hipparcos compared to traditional main sequence fitting. The biggest difference is seen for the Pleiades, and our hypothesis is that if the Hipparcos distance to the Pleiades is correct, then similar subluminous ZAMS stars should exist elsewhere, including the immediate solar neighborhood. We examine a color-magnitude diagram of very young and nearby solar-type stars and show that none of them lie below the traditional ZAMS, despite the fact that the Hipparcos Pleiades parallax would place its members 0.3 magnitude below that ZAMS. We also present analyses and observations of solar-type stars that do lie below the ZAMS and show that they are subluminous because of low

metallicity and that they have the kinematics of old stars.

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Coronal and Transition Region Structure in the RS CVn Binaries V711 Tau, AR Lac and II Peg. I. Data Analysis and Emission Measure Distributions

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We present a study of the transition regions and coronae of the RS CVn binaries V711 Tau, AR Lac and II Peg. Archival data from the *Extreme Ultraviolet Explorer (EUVE)*, *International Ultraviolet Explorer (IUE)*, Goddard High Resolution Spectrograph (GHRS) and a variety of X-ray telescopes have been analysed and modeled. Emission measure distributions have been determined for the transition region of each system. The upper transition region ($6.1 < \log T_e < 7.4$) has been studied using line fluxes from the *(EUVE)*. Emission measure distributions for the lower transition region ($3.8 < \log T_e < 5.3$) have been found using emission line fluxes obtained with *IUE* and the GHRS. Electron densities of $\sim 1.6 \times 10^{11}$ cm^{-3} and $\sim 5 \times 10^{11}$ cm^{-3} have been determined at $\log T_e = 7.0$ and $\log T_e = 4.7$ respectively, using the density sensitive Fe XXI λ128.7 and Si III] λ1892 lines. The *total* pressure (gas + turbulent) is smaller at the lower temperature, indicating that the high and low temperature material originates in physically unconnected regions. The emission measure distributions derived from the *EUVE* line spectra are compared with emission measures found from spectral fits to a variety of low resolution X-ray spectra, including our re-analysis of archival *EXOSAT* spectra. Although the emission measure distribution is continuous, both types of analysis lead to two distinct peaks in the high temperature emission measure distribution, suggesting that there may be two classes of structure in the upper transition region and corona, e.g. two families of loops.

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Discovery of Apsidal Motion in α Coronae Borealis by Means of ROSAT X-ray Eclipse Timing

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Four ROSAT X-ray observations of the secondary optical minimum of the eclipsing binary system α CrB taken in 1992, 1993 and 1997 are presented. Because of the totality of the X-ray eclipse, the times of mid eclipse can be accurately determined from the ROSAT data. The period between secondary minima P_s is found to be significantly different from the optically well determined period between primary minima P_p, thus indicating apsidal motion. The observed value $P_s - P_p = 4.8 \pm 2.1$ seconds is, first, shown to be almost exclusively due to the primary component, and second, consistent with our current knowledge of α CrB A. The relativistic contribution to the observed value is 0.95 seconds or 17 % of the total effect.

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Lithium in ROSAT-discovered Candidate Members in the Alpha Persei Cluster

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We present lithium observations of 23 X-ray selected candidate members of Alpha Persei, which are part of a larger sample of stars identified through two ROSAT surveys of the cluster. Our observations on one hand allowed us to confirm membership for 18 of the candidates, thus suggesting that a high percentage of the whole X-ray selected candidates are probably cluster members. On the other hand, we had the possibility to significantly enlarge the Li database for this cluster.

The distribution of Li abundances for stars in our sample (or 'new' members) is in good agreement with that for previously known (or 'old') members, although 'new' members in the 5000 – 4700 effective temperature interval stay on the upper envelope of the Li vs. $T_{\rm eff}$ diagram. The comparison of the merged 'new' + 'old' sample with the younger IC 2602 and IC 4665 clusters and with the older Pleiades confirms that stars more massive than the Sun do not undergo any PMS Li destruction, whereas some depletion occurs during the early phases on the ZAMS. We re-addressed the issue of the star-to-star scatter and Li–rotation connection for both Alpha Per and the Pleiades; as several previous studies have pointed out, fast rotators, as a group, show higher lithium than slow rotators. At the same time, however, fast rotators exhibit a much narrower dispersion than slow rotators. We demonstrate that this dicothomy is unlikely due to projection effects and suggest that the reason for it could reside in the PMS rotational history and, in particular, in the presence (absence) of a circumstellar disk.

As to very cool stars ($T_{\rm eff} < 4500$ K), we find that Alpha Per members do not seem to have higher lithium than the Pleiades. This result, however, must be confirmed with a larger sample of Alpha Per stars before any conclusion can be drawn.

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EUVE Observations of the W UMa Contact Binary 44i Boo: Coronal Structure and Variability

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EUVE observations of 44i Boo (HD 133640), the first W UMa-type active binary observed with EUVE, give evidence for localized coronal structure. An EUV light curve has been obtained with the EUVE Deep Survey (DS) detector and Lexan/boron filter during the 6 day observation (19.5 continuous epochs) in 1994. A period search on the DS data stream reveals a period corresponding to 0.272652 ± 0.00141 d, longer than the optical period (0.267817 d) by 428 s. Since the DS flux originates predominantly from high temperature plasma ($T_e \sim 10^7$ K), this observation demonstrates for the first time an orbital phase-dependent component of the hot coronal emission of a contact binary, indicates the presence of an active region on the primary star, and signals a different rotation rate of the corona with respect to the photosphere. The high temperature plasma shows no correspondence with the two partial eclipses per orbit found in the optical and in the chromospheric and transition region emission. A flaring enhancement appears associated with maximum brightness.

The EUV spectrum shows strong emission from highly ionized Fe. Like the emission measure distributions of Capella and other RS CVn binaries observed with EUVE, the spectrum of 44i Boo requires a continuous distribution of plasma temperatures to account for the relative Fe emission line fluxes. A local enhancement of emission measure at about $T_e \sim 8 \times 10^6$ K is reminiscent of the narrow feature found in Capella at $T_e \sim 6 \times 10^6$ K (Dupree et al. 1993), although substantially broader. Line ratio diagnostics indicate extremely high densities, $N_e \sim 2 \times 10^{13}$ cm^{-3} — higher than has been observed for other EUVE coronal sources.

We place a hard lower limit on the Fe/H abundance ratio of Fe/H > 0.46 with respect to the solar photospheric value. We compare our results with those derived from the ROSAT PSPC and conclude that the soft X-ray band in ROSAT observations does not give reliable abundances or low temperature emission measures.

The high electron density and peak emission measure together imply a small emitting volume, L^3 ($L \sim 0.004 R_\star$). If all the EUV emission arises from such a volume, the EUV light curve places tight constraints on the possible location of a "hot spot," namely that it must be located at high latitudes ($> 72°$) on the primary star.

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Further Evidence for the Planet Around 51 Pegasi

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An analysis is made of the spectral line shapes of 51 Peg using high resolution and high signal-to-noise data in an effort to confirm the spectral variability first reported by Gray (1997). The Fe I 6253 Å along with four other spectral features were used for line bisector measurements. The bisector velocity span and curvature of the Fe I 6253 line show a hint of sinusoidal variations with the 4.231 day radial velocity period, but these are 180° out-of-phase with the predicted variations of Gray (1997) and Gray & Hatzes (1997). Average bisector span and curvature measurements for all 5 spectral lines show no variations above a level of about 10 m s^{-1}, well below the amplitude of the variations reported earlier. We do not confirm the variability first reported by Gray and conclude that the planet hypothesis is the most likely explanation for the radial velocity variability of this star.

Accepted by Nature

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Spectral Line Profile Variations in the γ Doradus Variable HD164615: Nonradial Pulsations versus Starspots‘

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High resolution spectral data of the Fe II 5318 Å line in the γ Dor star HD 164615 are presented. These show systematic changes in the spectral line shapes with the photometric period of 0.8133 days which are modelled using either nonradial pulsations or cool starspots. The nonradial modes that can fit the line shape changes have m-degree of 2 – 4. However, only the $m = 2$ mode seems to be consistent with the amplitude of the radial velocity variations measured for this star. The starspot model, although it can qualitatively fit the line shape changes, is excluded as a possible hypothesis on the basis of 1) poorer fits to the observed spectral line profiles, 2) an inability to account for the large changes in the spectral line width as a function of phase, 3) a predicted RV curve that looks qualitatively different than the observed one, and 4) a predicted photometric curve that is a factor of 5 larger (and with the wrong qualitative shape) than the observed light curve. Finally, a "Doppler image" (assuming cool spots) derived from a sequence of synthetic line profiles having nonradial pulsations results in an image that is almost identical to the Doppler image derived for HD 164615. These results provide strong evidence that nonradial pulsations are indeed the explanation for the variability of HD 164615 as well as the other γ Dor variables.
Submitted to MNRAS

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Forever Young: High Chromospheric Activity in M Subdwarfs

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We present spectroscopic observations of two halo M subdwarfs which have $H\alpha$ emission lines. We show that in both cases close companions are the likely cause of the chromospheric activity in these old, metal-poor stars. We argue that Gl 781 A's unseen companion is most likely a cool helium white dwarf. Gl 455 is a near-equal-mass M subdwarf (sdM) system. Gl 781 A is rapidly rotating with $v \sin i \approx 30$ km s^{-1}. The properties of the chromospheres and X-ray coronae of these systems are compared to M dwarfs with emission (dMe). The X-ray hardness ratios and optical chromospheric line emission ratios are consistent with those seen in dMe stars. Comparison to active near-solar

metallicity stars indicates that despite their low metallicity ($[m/H] \approx -1.2$), the sdMe stars are roughly as active in both X-rays and chromospheric emission. Measured by L_X/L_{bol}, the activity level of Gl 781 A is no more than a factor of 2.5 subluminous with respect to near-solar metallicity stars.

Accepted by AJ

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For preprints via ftp or WWW: http://xxx.lanl.gov/ps/astro-ph/9801305

Solar Abstracts

Small-scale Topology of Solar Atmosphere Dynamics III. Granular Persistence and Photospheric Wave Amplitudes

N.M. Hoekzema[1], P.N. Brandt[2] and R.J. Rutten[1]

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We use a superb five-hour sequence of 900 solar images taken at La Palma to study long-duration persistence in the solar granulation, in the context of the long-lived “intergranular holes” discovered by Roudier et al. (1997) and the contention that these mark sites of convective downflow plumes. We develop a procedure to locate “persistency regions” that contain granular brightness maxima or minima over extended periods (up to 45 min), while allowing for lateral drifts due to horizontal flows. Statistical evaluation of the co-location probability for different pixel classes is first used to quantify the likelihood of long-term stationarity for different granular brightness classes and for the persistency regions, and then to evaluate the amount of preferential alignment, at different frequencies and time delays, between excessive Fourier modulation and granular brightness and persistence.

The results support the existence of long-lived intergranular holes. There is large persistency difference between the brightest and the darkest features; some of the latter have location memories as long as two hours. In addition, the darkest intergranular features are found to be sites of enhanced Fourier modulation in the 3-min acoustic regime, improving earlier results through much higher statistical significance. However, the persistency regions containing intergranular holes do not seem to produce the excess acoustic emission that would be expected above downflow plumes.

Accepted by A&A

For preprints via WWW: http://www.fys.ruu.nl/~rutten/
For preprints via ftp: ftp.fys.ruu.nl, cd pub/astronomy/rutten

EUV Sunspot Plumes Observed with SOHO

P. Maltby[1], N. Brynildsen[1], P. Brekke[1], S. V. H. Haugan[1], O. Kjeldseth-Moe[1], Ø. Wikstøl[1] and T. Rimmele[2]

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Bright EUV sunspot plumes have been observed in five out of nine sunspot regions with the Coronal Diagnostic Spectrometer – CDS on SOHO. In the other four regions the brightest line emissions may appear inside the sunspot but are mainly concentrated in small regions outside the sunspot areas. These results are in contrast to those obtained during the *Solar Maximum Mission*, but are compatible with the *Skylab* mission results. The present observations show that sunspot plumes are formed in the upper part of the transition region, occur both in magnetic unipolar– and bipolar regions, and may extend from the umbra into the penumbra.

Accepted by ApJ Letters

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For preprints via ftp or WWW: http://xxx.lanl.gov/abs/astro-ph/?9801144

Coronal Line Width Variations

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Line widths measurements of the coronal ion Si VIII confirm earlier observations which show an increase in the non-thermal velocity above the solar limb. The present data, taken at the equatorial limb, show an increase from 24 km s^{-1} at the limb to 28 km s^{-1} some 25,000 km above the limb. The electron density as measured from the Si VIII line pair show a decrease from 3.5 10^8 cm^{-3} to 1.8 10^8 cm^{-3} over the same distance. This data implies that the non-thermal velocity is inversely proportional to the quadratic root of the electron density, in excellent agreement with that predicted for undamped radially propagating Alfvén waves.

Accepted by Solar Physics

For preprints via WWW: http://star.arm.ac.uk/~ambn/preprints .html

Waves in the Solar Transition Region

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The power spectra for line intensities of several lines formed in the upper transition region around 100,000 to 250,000K are presented. A period of $\sim$ 5min. is clearly present in lines due to O III, O IV & O V. In one dataset a period approaching 10 min. is present for $\sim$40 min. The size of the emitting features is limited to $\sim$7 arcsec squared. In all datasets examined, there is excess power below 4mHz everywhere along the slit, although the observed periods do not always come from the most intense regions. In $\sim$40% of instances clear periods are observable in the 2–5mHz range with the largest power peak at 3.0mHz. In all regions, the 5.0mHz power peak is smaller. For the frequencies investigated there are no significant time delays in any of the datasets examined. This finding may not be entirely unexpected as the formation temperatures of O III ($\sim$100,000K) and O V ($\sim$250,000K) may be too close in order to result in an observable phase shift.

The observations are discussed in terms of trapped magnetic modes below the transition region and resonant absorption of MHD waves. For resonant absorption we derive from the observed period of 5 minutes and the observed extent of the structure a typical magnetic field strength of about 2 Gauss. This value is in good agreement with results from MDI for quiet Sun regions. Our results seem to imply that resonant waves can play a role in the heating of the quiet Sun. We discuss the effect of observing without tracking on the power spectrum and show that the effect is small.

Accepted by Solar Physics

For preprints via WWW: http://star.arm.ac.uk/~ambn/preprints.html

On the Taylor-Proudman Balance and the Solar Rotational Data

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It is shown that the helioseismic isocontour data for the solar angular velocity is consistent with the perturbations in the entropy (or superadiabatic gradient) as derived from a Taylor-Proudman balance (TPB) of the radial and latitudinal momentum equations, provided that the latitudinal variations of the eddy-lifetime are such as to ensure the approximate uniformity of the convective flux in latitude.

The TPB (a balance between the pressure, Coriolis- and buoyancy-forces in the $r-$ and $\theta-$momentum equations) should be well satisfied in the lower solar convection zone (SCZ). If the angular velocity, Ω, is expanded in Legendre polynomials: $\Omega = \Omega_o[\omega_o(r) + \omega_2(r)P_2(\cos\theta)]$, ($\theta$ is colatitude), and higher order terms are neglected, this balance leads to $(1/rc_p)\partial\delta S/\partial\theta = -[2\Omega_o^2/7g(r)]\left[(B_1/3)\partial P_2/\partial\theta + (3B_2/5)\partial P_4/\partial\theta\right]$, where $\delta S, c_p, g(r)$ are the perturbations in the entropy introduced by rotation, the specific heat, and gravity respectively, and $B_1 = 12\omega_2 + r\omega_2' + 7r\omega_o'$; $B_2 = r\omega_2' - 2\omega_2$. Therefore, $\partial S/\partial r = S_o'(r)[1 + [1/S_o'(r)]\partial\delta S/\partial r] \approx S_o'(r)[1 + W(r)P_2(\cos\theta)]$ with $W(r) \approx -(6\Omega_o^2 c_p/21 g_o R_o^2)r^2 B_1(r)/S_o'(r)$, where S_o', g_o, R_o are the unperturbed entropy, the gravity at the surface,

and the solar radius respectively. The term in P_4 and the purely radial component of $\partial\delta S/\partial r$ have been neglected; furthermore B_1 has been assumed to be a slowly varying function of r. The radial component of the convective flux is given by $F_r \approx -(1/\tau)\rho T\ell^2\partial S/\partial r$, where τ is the eddy lifetime,and ρ, T, ℓ are the density, temperature, and the usual mixing length respectively; the term in $\partial S/\partial\theta$ of F_r has been neglected. The expression used for τ was $\tau = \tau_o[1+Z(r)P_2(\cos\theta)]$ with $Z(r) = Z(R_c)\beta(r)/\beta(R_c)$. Here τ_o is the unperturbed value $(-(1/\tau_o)\rho T\ell^2 S'_o(r)$ is therefore the unperturbed flux), R_c is the lower boundary of the SCZ, and $\beta(r) = (2\Omega_o\tau)^2$; Z(r) is small in the surface layers because there, the effect of rotation on the motions is small, and in consequence $\beta(r)$ is small. The flux is approximately uniform in the lower SCZ if $Z(R_c) = W(R_c)$. We approximate the energy equation by $(1/r^2)\partial r^2 F_r/\partial r = -\rho T U_r S'_o$. The expression for the radial component of the meridional flow was based on previous calculations: $U_r = (\psi/\rho r^2)P_2(\cos(\theta)$ with $\psi = (15r\rho/4\Omega_o)\int_0^\pi \langle u_r u_\phi\rangle \sin^2\theta d\theta$; the value of the integral ($\mathrm{I_{nt}}$) was $\approx -10^7\mathrm{cm}^2/\mathrm{s}^2$. The approximate energy equation reduces then to $W'(r) = Z'(r) - (15\mathrm{I_{nt}}\rho T/4r\Omega_o)S'_o(r)/F_{or}$ where F_{or} is the unperturbed flux, and $W'(r) \approx -W(r)S''_o(r)/S'_o(r)$.

From Kosovichev's isocontour data, $\partial\Omega/\partial r$ vanishes for $\theta_c \approx 60$ deg leading in our case to $\omega'_o = 0.125\omega'_2$. With the help of this relation, B_1 becomes a function of ω_2 only, and the energy equation is an equation for ω_2. This equation was solved with $\omega_2(R_c) = -0.15$, (then $B_1(R_c) \approx -1.8$); the value of $Z(R_c)$ was assumed to be equal to $W(R_c)$, and all the flux was be carried by convection. The solutions reveal that ω_2 decreases from -0.15 to -0.23 at $r = 6.5\times10^{10}$cm in rough agreement with the data. The solutions are sensitive to θ_c. Since $B_1(r) < 0$, it can be readily verified that $W(r), Z(r), -(15\mathrm{I_{nt}}\rho T/4r\Omega_o)S'_o(r)/F_{or}$ are negative, whereas $W'(r)$, $Z'(r)$ are positive. The term $Z'(r)$ in the energy equation is essential to obtain values of $\omega_2(r)$ decreasing with r in the lower SCZ. The important fact is that this term can be appealingly justified physically, and that it is of the right order of magnitude to give rise to slowly decreasing values of ω_2 with radius in the lower SCZ, suggesting that these results could remain valid in more sophisticated models.

Submitted to the ApJ

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Ph.D. Thesis Abstract

Physical Properties of Starspots

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Ph.D dissertation directed by: P. Brendan Byrne
Ph.D degree awarded: December 1997

In this work, the main and most important assumption made when modelling starspots via the photometric technique, namely, the evaluation of the spectral flux distributions for the spot and the unspotted photosphere, has been revised. In order to achieve this, new calibrations of fundamental parameters were developed for very late-type stars, where $(U{-}B)$ and, to a less extent $(B{-}V)$ for the latest-type RS CVn's, were found to be affected by the level of activity. A FORTRAN code was then constructed using the aforementioned calibrations in order to produce synthetic light and colour curves of spotted stars. The main differences between this and other codes already in existence are the use of the infrared colour $(V{-}K)$ to assist in the modelling of spots, the new Barnes-Evans-like $F_{\mathrm{V}}{-}(I_{\mathrm{c}}{-}K)$ relation used to determine the fluxes for the spot and unspotted photosphere and the assumption of different surface gravities for the spot and unspotted photosphere. With this code, a study of the light emitted by the spot was undertaken and the differences between various spectral flux distributions examined. Theoretical curves were produced in order to study problematic spot configurations and the code's ability to detect them. Polar spots and equatorial bands of spots were studied, as well as two-component spots. The code was also applied to observed light and colour curves of active stars and spot parameters were derived. Combining two different modelling techniques should make it possible to better constrain those parameters and would help to overcome the limitations inherent to each particular technique. In this work, photometric and TiO spot models were derived and combined for the active star AG Dor.

Thesis-related Publications: A&A 1997, 319, 967; Irish Astron. J. 1996, 23, 177

Ph.D. Thesis Abstract

Information Extraction by Local Density Analysis: A Contribution to Content-based Management of Scientific Data

André Csillaghy

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Ph.D dissertation directed by: Prof. Arnold O. Benz

Ph.D degree awarded: December 1997

The object of this work is to efficiently and effectively retrieve pictorial documents, or images, from large archives of scientific data. Two basic methods are presented: *browsing* through a large number of images, and *searching for similar images*. Browsing relies on small-size, symbolic representations of the original images that can quickly be displayed. They are called *icons*. Searching for similar images implies the definition of attributes. These attributes describe specific image characteristics, or *indexing features*. They are used by retrieval systems to determine the degree of similarity between images. The creation of both icons and indexing features requires the extraction of the information content in the form of meaningful graphical structures. Unfortunately, existing extraction methods are meant for conventional photographic pictures (press photographs, museum catalogues etc.). They can rarely apply to scientific images because their signal-to-noise ratio is typically too low.

An new approach for the extraction of the image information would work as follows. First, image pixels are represented as points in a 3-dimensional attribute space. Second, this attribute space is partitioned into (3-dimensional) *regions* that can hold only a specific number of data points. Because of this limitation, the regions must take different shapes and volumes to adapt to the variable density of data points in the attribute space. The different shapes and volumes are the "carriers" of the image information content. Finally, the information content is clarified by considering the data density inside each region: the average and the standard deviation of the data are used as center and extension, respectively, of a structure similar to a region, called a *box*. This box is ultimately used to represent the information content.

The set of boxes represents the full information content of an image. However, for a specific application, only a fraction of this information is relevant. Therefore, a selection procedure isolates the boxes that actually represent the "interesting" information. This collection of boxes is equivalent to the image icon; it is displayed by projecting the boxes into the plane of the image.

The image icons can also help define indexing features describing single characteristics of the image content. The set of indexing features is represented as a *description vector*. Such a vector is associated with each archived image. The degree of similarity between two documents is determined by computing the distance, in a given metric system, between their description vectors. When considering a specific document as point of reference, the other documents can be sorted by their degree of similarity with the reference.

With the help of image icons and indexing features a full retrieval system can be developed. Three basic tools are provided, which users intuitively expect when searching for relevant data in an archive: (1) querying the archive, at which point preliminary information about the documents searched can be specified; (2) browsing through lists of documents, and thus allowing a quick look at a large number of documents; (3) inspecting individual documents, with the possibility of retrieving information about individual documents. The three tools are tightly connected. For instance, browsing leads to the inspection of individual documents. At that point, a search for similar documents can be started, generating a list of documents that can again be browsed. The interplay between browsing and inspecting can be seen as "surfing" back and forth among the images of the archive.

Finally, these principles are implemented with ASPECT (Archiving System for Pictures with Easy Content-based Transactions). This system helps retrieve data from an archive of solar radio spectrograms.

Thesis Publication: Shaker Verlag, Aachen, ISBN 3-8265-3131-0

Ph.D. Thesis Abstract

Brown Dwarfs and Very Low Mass Stars

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Ph.D degree awarded: October 1997

Very low mass stars and brown dwarfs are the most numerous stellar population in the Galaxy. Their observations have long been difficult (or even impossible) because of their very low luminosities. Recent instrumental progress (in particular on infrared detectors) have changed this situation. Two particulary important astrophysical issues need a good determination of the mass function (number of objects per mass interval): the influence of this population on Galactic dynamics, and the behaviour of the initial mass function at the bottom of the main sequence. These objects also severely test our understanding of the physics of degenerate objects and of dense cool stellar atmospheres dominated by molecular opacities.

In this thesis I have used DENIS (a Deep Near Infrared Southern sky survey) to determine the luminosity function (number of objects per luminosity interval) down to the bottom of the main sequence. During this work, one of the first two confirmed field brown dwarfs was discovered, and spectroscopically followed-up. To then derive the mass function, a binarity study is needed: firstly to correct the luminosity function for its binary bias, and secondly to obtain an accurate mass-luminosity relation. A systematic search for spectroscopic binaries was thus started during this thesis. It shows that the solar neighbourhood is still not well know: a significant number of companions remain unknow (11 are identified here), and distances to unrecognised binaries are underestimated.

As an interesting byproduct of the stellar multiplicity study, we have obtained important information on stellar rotation at the bottom of the main sequence. We demonstrate that the time scale for angular momentum dissipation continues to increase with decreasing mass, to reach a few Gyr at spectral type M3-M4 (about 0.3 solar masses).

(The text of this thesis is in french).

Thesis-related Publications: A&A 1997, 327, L25; A&A 1997, 327, L29; ApJ 1997, 490, L95; A&A 1998 (in press)

Doppler Imaging of Young, Late-Type Stars: HII 686, HII 3163, and P1724

Natalie M. Stout-Batalha

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Ph.D dissertation directed by: Steven S. Vogt

Ph.D degree awarded: December 1997

Maximum entropy image reconstruction (Doppler imaging) is applied to HII 686 (K4V, $v \sin i = 64$ km s^{-1}) and HII 3163 (K0V, $v \sin i = 70$ km s^{-1}), two zero-age main sequence stars of the Pleiades cluster, and the weak-lined T Tauri star, Parenago 1724 (K0, $v \sin i = 71$ km s^{-1}). Their surface temperature distributions are determined in order to study the nature of magnetic activity in young ultra-fast rotators.

Specific intensity line profiles, required by the DI algorithm, are synthesized. The sensitivity of the image reconstructions to the choice of input stellar and atomic parameters is investigated. The exact parameters used are found to be less important than the quality of the fit they collectively give to the average (over rotational phase) observed profile. This is true when the shape of the disk integrated line profile is dominated by rotational broadening – a condition demanded by the DI technique.

Fifteen absorption lines are used to generate fifteen individual reconstructions of each Pleiades target. Uncertainties are estimated both by simulation and by examining the statistics of the individual reconstructions. Averaging reduces noise; however, simulations show that spurious features can persist at sub-observer longitudes. Such "phase-ghosting" can largely be eliminated by including broad-band photometric observations in the analysis. However, care should be exercised when interpreting such features.

HII 686 shows one predominant feature at 77° latitude which is 700 K cooler than the surrounding photosphere. HII 3163 also shows one predominant feature centered at approximately 70° latitude. A spot temperature 1000 K cooler than the photosphere best reproduces the photometric and spectroscopic observations. P1724 shows a predominant feature (or features) centered at 30° latitude which is 800 K cooler than its photosphere. These results are discussed in light of recent theoretical models and existing image reconstructions of similar objects.

No correlations are found among reconstructions which could be attributed to line characteristics: equivalent width, excitation potential or depth of formation. This is also true for the LiI and KI resonance lines. Despite their temperature sensitivity, they are found to be suitable for DI analysis. The amplitude of the rotational modulation of the LiI λ6708 Å line in the Pleiades targets is ±6% (for HII 3163) and ±11% (for HII 686) as measured in equivalent width. Such variations are not large enough to explain the spread in lithium abundances found among the Pleiades K-dwarfs. For each object, the chromospheric residual line flux (H-α, CaII IRT λ8498 Å) is measured as a function of rotational phase. While there is evidence of rotational modulation, the maximum emission does not occur at precisely the phase of spot transit.

Upcoming Meetings

32nd COSPAR Scientific Assembly
Nagoya, Japan, 12-19 July 1998

Meeting/Symposium Title: E2.4 - Activity Observed in the Sun and in Similar Stars

Date: 17-18 July (1.5 days)

Main Scientific Organizer: R.D. Bentley (UK)
Deputy Scientific Organizer: J.G. Doyle (UK)
Organizing Comittee: J.L. Culhane (UK), R.A. Stern (USA), R. Pallavicini (Italy)

We encourage the submission of abstracts both for contributed talks and for posters. Abstracts are due by January 9th, and should be sent simultaneously to rdb@mssl.ucl.ac.uk (or fax +44-1483-278312) and to the COSPAR central office (cospar@copernicus.org, or fax number 49-5556-4709).

Information on the Programme:

Observations of the activity cycle on the Sun go back many centuries. Recent space-based observations by Yohkoh and SoHO have provided synoptic data at wavelengths that had not previously been available. Even so, there are many aspects about global solar activity that are poorly understood.

Over the last decade, the quality of stellar observations has improved dramatically and we now have a much greater knowledge of activity on other stars that are similar to the Sun. Thus, we are much better placed now than in the past to consider whether using observations of stars similar to the Sun can provide answers that observations of a single star (the Sun) cannot, and whether the detail of solar observations can help us understand phenomena that are seen on other stars.

We are not certain of the origins of the 11 cycle on the Sun and stellar observations show not all stars that exhibit activity have activity cycles. We know the solar activity is related to cyclic changes in the magnetic field; why do other stars not show this? Long-term variations in solar activity are difficult to determine from the relatively "short" interval covered by detailed observations. Can we gain a greater undertstanding by combining observations from other stars observed in different parts of their cycles?

The first part of the meeting will review what we know so far about solar and stellar activity. In later session, more recent observations that may be relevent will be discussed.

——— Tentative programme: ———

Reviews 50 mins (talk) + 10 mins (discussion) Invited 25 mins (talk) + 5 mins (discussion) Contributed 12 mins (talk) + 3 mins (discussion)

Session 1: Activity Cycles

Soon/Donahue - Stellar activity cycles (Review/Invited) ?? White O.R. - Solar activity cycles (Invited) (possible) Radick R.R. - The luminosity variability of solar-like stars (Invited) Weiss N.O. - Stellar Dynamos (Invited) (probable) Harvey K.L. - Large Scale structure of solar magnetic field (Invited)

Session 2: Coronal, Chromospheric Obs of activity

Pallivicini R. - General Stellar Coronal Activity (Review/Inv.) (confirmed) Stern R.A. - Stellar Cluster Observtations (Invited) (confirmed) Tsuneta/Hara - Coronal solar activity (Invited) ?? Gurman J.G - EIT observations of solar coronal (Invited) (possible)

Cargill P.J. - Theories of Coronal Heating (Review/Inv.) (probable) Title A. - MDI Results (+ TRACE) (Invited) (probable) Judge - Solar Chromosphere Obs. (Invited) ?? Linsky - Stellar Chromosphere Obs. (Invited) ??

+ Posters

Upcoming Meetings

Second Announcement
A CROSSROADS for EUROPEAN SOLAR and HELIOSPHERIC PHYSICS: RECENT ACHIEVEMENTS and FUTURE MISSION POSSIBILITIES
Puerto de la Cruz, Tenerife, Spain
March 23-27, 1998

Sponsored by: European Space Agency (ESA)
Instituto de Astrofsica de Canarias (IAC)

WEB PAGE: http://www.iac.es/project/eshp
E-MAIL: eshpconf@ll.iac.es

There has been an enthusiastic reply to the first announcement of the conference. We request all potential participants (INCLUDING THOSE WHO PREREGISTERED IN THE PAST MONTHS) to make a full registration at this stage using the web page indicated above.

The time is ripe for an in-depth assessment of the most important results from SOHO, Ulysses and Yohkoh and for discussion of the next possible steps for the European solar community in space. Exciting possibilities include stereoscopic viewing, probe-sampling of the corona and ultra-high resolution observation. The workshop will therefore consist of a series of reviews on results from current space missions together with extensive poster sessions. In addition, there will be overviews of the current situation in ESA and other agencies, together with accounts of the future mission possibilities.

SCIENTIFIC ORGANIZING COMMITTEE: E. Priest (chair), C Chiuderi, L Culhane, R Harrison, E Marsch, O Kjeldseth-Moe, F Moreno-Insertis, M Schussler, S Solanki, JC Vial.

LOCAL ORGANIZING COMMITTE: F. Moreno-Insertis (chair), A. Jimenez, M. Murphy, P. Palle, T. Roca Cortes, H. Socas-Navarro, J.C. del Toro Iniesta, M. Vazquez, C. Westendorp Plaza

INVITED SPEAKERS:

OVERVIEW OF KEY OPEN SCIENTIFIC QUESTIONS: C. Chiuderi, E. Leer, I. Roxburgh, M. Schussler

SCIENTIFIC ACHIEVEMENTS OF SOHO: E Antonucci, P. Bochsler, R Harrison, T Roca Cortes

SCIENTIFIC ACHIEVEMENTS OF PRESENT MISSIONS: A Balogh, L. Culhane

FUTURE MISSION POSSIBILITIES: M Coradini (ESA), J Davila (NASA)

SCIENTIFIC OBJECTIVES OF FUTURE MISSIONS: V Bothmer, L Dame, L Golub, T. Kosugi, D LeQueau, E Marsch, D Rust, W. Schmidt, WKH Schmidt

CONFERENCE PROCEEDINGS: The proceedings of this workshop will be published by ESA Publications Division (EPD) as document "SP-417".

Announcement

ESA-MUSICOS Spectrograph

From: Bernard H. Foing Attn: MUSICOS collaboration Object: MUSICOS98 proposals

Please find a summary of activities concerning MUSICOS that took place at the last ESO Workshop in October 1997. In order to prepare for the next world-wide multi-site MUSICOS campaigns, in particular the campaign at end 98-beginning 99, we need to collect for each programme the necessary information in order to prepare the MUSICOS proposals at the different sites. We would appreciate receiving before the 20 january 1998 from the proposal PIs the following information: - Title of proposal - Abstract - PI and co-PI, with full addresses - Other collaborators and contacts at participating observatories - Scientific justification - Proposed observations - Observing strategy - Required Wavelength coverage, Exposure time, S/N - Justification for required duration of multi-site campaign - Technical feasibility and non-standard technical requirements - Principal targets - Scheduling constraints - Status of requested observing time.

Please email copy of the info to me and to Claude Catala (catala@obs-mip.fr) and Joana Oliveira (joana@so.estec.esa.nl).

Sincerely yours,

Bernard H. Foing

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SUMMARY OF MUSICOS PRESENTATIONS AND MEETINGS AT ESO GARCHING in October 1997

Editor's Note: for a more complete summary, contact Dr. Foing.

A) MUSICOS PRESENTATIONS AT ESO WORKSHOP on Cyclical Variability in Stellar Winds

Invited papers:

The MUSICOS network: previous campaigns C.Catala, B.H.Foing and MUSICOS collaboration
MUSICOS results on the Pre-Main Sequence Herbig Ae star AB Aur C.Catala et al (presented by B.H. Foing)
NRP analysis of the Delta Scuti satr V480 Tau J. Hao, H. Cao and MUSICOS collaboration
Photospheric and wind variability in O stars H.F. Henrichs and MUSICOS collaboration
Photospheric and Chromospheric Variability on SU Aur Y.C. Unruh and MUSICOS collaboration
Posters:
The MUSICOS network and results from ESA-MUSICOS at INT B.H.Foing, J. Oliveira et al
Flares and Circumstellar Material around the Fast Rotating Giant FK Comae J.M.Oliveira, B.H. Foing et al

B) MUSICOS TEAM MEETING (Saturday 18 October 1997)

B1) STATUS OF ANALYSIS FROM MUSICOS96 CAMPAIGN

SU AUR programme (PI Y. Unruh), AB Aur programme (PI C. Catala), Discrete components and NRP on Ksi Per (PI H. Henrichs), Non radial pulsations on V480 Tau (Pi Hao JinXin, T. Kennelly)

B2) LESSONS LEARNED FROM MUSICOS96 CAMPAIGN

C) PROPOSALS FOR FUTURE MUSICOS CAMPAIGNS PRESENTED AT ESO WORKSHOP (please confirm info on these and other proposals before 20 January 98)

Surface imaging and flares on RS CVns (Foing, Linsky, Washuttl, Unruh); Neutron stars (Kaper et al); Non radial pulsations in Beta Cephs (Telting et al); OBI star monitoring (Kaufer et al; Environment of Herbig Ae/Be stars (Beskrovnaya et al.); Be star Non Radial Pulsations(Cao et al.)

D) INSTRUMENTAL DEVELOPMENTS

E) MUSICOS SUPPORT TO SPACE MISSIONS

New Books

The Solar Corona

by Leon Golub (SAO) and Jay Pasachoff (Williams College)

This is an up-to-date book which presents an excellent introduction to coronal physics. The Preface indicates that the book will be suitable as a textbook for advanced undergraduates or beginning graduates, or for practicing astronomers seeking an introduction to the subject. Even though it is described as a textbook, there are no end-of-chapter problems, no chapter summaries, and no glossary, so it reads much more like a monograph. Material in Chapters 1 and 2 is non-technical and could be incorporated into an Introductory Astronomy course for first or second year students, as could some of the material on eclipse observations (Ch. 5), space-based observations by Yohkoh and SOHO (Ch. 8), and space weather (Ch. 10). Chapters 3 and 4 are calculus based and are suitable as an introduction to spectroscopy and dynamo theory at the beginning level. For the most part, CGS units are used.

Chapter Headings: 1. Introduction 2. Brief History of Coronal Studies 3. The Coronal Spectrum 4. The Solar Cycle 5. Ground-based Observations 6. Observations from Space: I. The first 30 years 7. Activity of the Inner Corona 8. Observations from Space: II. Recent missions 9. Solar Flares and the Corona 10. Solar-terrestrial Physics

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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

`http://casa.colorado.edu/~skinners/coolnews.html` .