COOLNEWS

A RESEARCH NEWSLETTER DEDICATED TO COOL STARS AND THE SUN

No. 18 — April 1997 Editor: Steve Skinner (coolnews@jila.colorado.edu)

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Stellar Abstracts

BD−21°3873: Another Yellow-symbiotic Barium Star

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An abundance analysis of the yellow symbiotic system BD−21°3873 reveals it to be a metal-poor K-giant ([Fe/H] = −1.3) which is enriched in the heavy s-process elements. In that respect, this star appears to be a twin of AG Dra, another yellow symbiotic system analyzed in a previous paper (Smith et al., 1996, A&A 315, 179). The heavy-element abundance distributions of AG Dra and BD−21°3873 are almost identical, and are best reproduced by a s-process with a neutron exposure parameter of 1.2 – 1.3 mb^{-1} and a neutron density $\log N_\mathrm{n} = 8.3$ (as derived from the Rb/Zr ratio). These two systems thus link the symbiotic stars to the binary barium and CH stars which are also s-process enriched. These binary systems, which exhibit overabundances of the heavy elements, owe their abundance peculiarities to mass transfer from thermally-pulsing asymptotic giant branch stars, which have since evolved to become white-dwarf companions of the cool stars we now view as the chemically-peculiar primaries.

The spectroscopic orbits of BD−21°3873 (derived from CORAVEL measurements) and AG Dra are similar to those of barium and CH stars. With an orbital period of 281.6 d, BD−21°3873 is one of the closest systems in these families, and its light curve indeed suggests that variations due to reflection and ellipticity effects are present. The amplitude of the ellipsoidal variations indicates that the giant must be close to filling its Roche lobe. However, no acceptable solution simultaneously satisfies the constraints from the light curve, the orbital elements and the evolutionary tracks in the framework of the standard Roche lobe geometry. We suggest that this discrepancy may be resolved by taking into account the deformation of the Roche lobe caused by the force driving the large mass loss of the giant.

Accepted by A&A

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A Stellar Endgame – the Born-again Sakurai's Object

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The surface chemical composition of this remarkable star shows that it is hydrogen-deficient, carbon-rich and enriched in the light s-process elements. Spectra taken in May and October 1996 indicate a decrease in the surface hydrogen abundance by 0.7 dex in five months along with an increase in the abundances of Li, Sr, Y and Zr. The abundance changes are in agreement with the hypothesis of the star being a rapidly evolving "born-again" AGB star experiencing a final He-shell flash, similar to FG Sge. The $^{12}C/^{13}C$ ratio in October is very low, also suggesting hydrogen ingestion. By chemical composition, Sakurai's object resembles the R Coronae Borealis (R CrB) stars.

Accepted by A&A (Letters)

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Loop Modeling of Coronal X-Ray Spectra. IV. One- and Two-loop Model Fitting of ROSAT PSPC Spectra: Three Test Cases

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We present a detailed application of coronal hydrostatic loop models to fit ROSAT/PSPC X-ray spectra, using three late-type stars, Procyon (F5 IV - V), ι Vir (F6 III), and HR 3625 (F9 V), selected as test cases showing different activity levels. We present results of the spectral analysis with models of coronae made of one class of loops or two classes of loops, and compare them with the results obtained with two-component isothermal models. The loop model analysis is performed with a χ^2 fitting method as accurate as in the case of the two-temperature modeling, including evaluation of statistical confidence regions in the model parameter space. We show that the observed spectra of Procyon and ι Vir can be successfully fitted with one-loop models, while two-loop models are required to fit the spectrum of HR 3625. In the case of Procyon, for which EUVE spectra are also available, we find that a coronal density estimate – based on emission line ratios – is consistent with the results of our one-loop model fitting. The case of HR 3625 is adopted to illustrate how the confidence regions in the two-loop model parameter space can be explored and interpreted. Our final results indicate different coronal conditions for the three selected stars: Procyon emission is dominated by relatively short ($L \sim 10^9$ cm), low-pressure ($p_0 \sim 2$ dyn cm^{-2}) and low-temperature ($T_{\max} = 1.7 \times 10^6$ K) loops, covering few tens percent of the stellar surface; the corona of ι Vir appears composed of relatively higher pressure ($p_0 = 2-10$ dyn cm^{-2}), higher temperature ($T_{\max} = 1 - 2 \times 10^7$ K) loops with height ($L = 1 - 6 \times 10^{10}$ cm) comparable with the pressure scale height; finally, the coronal emission of HR 3625 can be modelled with low-temperature ($T_{\max} = 1 - 2 \times 10^6$ K), short ($L < 5 \times 10^8$ cm) loops, with base pressure $p_0 > 6$ dyn cm^{-2}, possibly covering a large fraction of the stellar surface, plus higher temperature ($T_{\max} > 7 \times 10^6$ K) loops which may range from compact, very active region loops ($L < 10^9$ cm, $p_0 > 10^2$ dyn cm^{-2}) covering less than 0.5% of the surface, to larger, relatively less active region loops ($L \sim 10^{10}$ cm, $p_0 = 5 - 10$ dyn cm^{-2}) covering at most 10% of the surface.

Accepted by A&A

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Low-mass Binaries and the Stellar Luminosity Function

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We present a new investigation of the influence of unresolved binaries on the form deduced for the stellar luminosity function from photometric parallax surveys. We have compiled a catalogue of photometry and binary statistics for stars

known to be north of -30^o declination and within 8 parsecs of the Sun, and have used these stars as a reference sample for our multiplicity analysis. M-dwarfs comprise almost eighty percent of the sample. The overall multiplicity fraction amongst the 106 systems (and 151 stars) in this sample is only 35 %. Transforming the local luminosity function to a mass function, we find relatively good agreement amongst most of the currently-available mass-luminosity relations. The mass function is best-represented as a power-law, $\Psi(M) \propto M^{-1.05}$ for masses between 1 and 0.10 $M_\odot$, with a steeper slope at higher masses and a sharp decline in numbers below 0.1 $M_\odot$. While incompleteness in the 8-parsec sample may contribute to some extent to the decrease in number density at the lowest masses, the 5.2-parsec sample shows the same behaviour, suggesting that the mass function turns over before reaching the hydrogen-burning limit.

We have combined images taken with the Planetary Camera on the *Hubble Space Telescope* with previously-obtained wide-field Schmidt plate data to search for wide (> 10 a.u. separation) binaries amongst a sample of mid-type M-dwarfs which have been employed in photometric parallax analyses of the stellar luminosity function. Six of the 41 stars observed are binary, while a further two are triple systems - consistent with the number of resolved companions expected from moving the local sample to a comparable distance. We have determined the mass-ratio distribution for the nearby-star sample, and find that it is incompatible with the hypothesis of both components being drawn independently from the same power-law mass function. Rather, there is clear evidence for preferred formation (or survival) of systems with components of nearly equal mass. We also find no strong evidence for a correlation between mass-ratio and the orbital semi-major axis. Based on these results, we have constructed starcount models to investigate how unresolved binary systems influence the form of the luminosity function derived using photometric parallax methods. Our conclusion is that the results are only weakly dependent on the binary fraction, and that low-mass binaries cannot bring these photometric studies into agreement with the luminosity function derived by counting the nearest stars. However, previous photometric analyses have failed to take into account the change in the slope in the (M_V, V-I) relation at (V-I)$\sim$2.9 magnitudes - close to the peak in the luminosity function. Once the data are analysed using a more appropriate colour-magnitude relation, we find (statistically) good agreement between the local luminosity function and the results of the photometric parallax analyses of more distant stars.

Accepted by AJ

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Chromospheric Models of Dwarf M Stars

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We present chromospheric models for two dM stars considered as “basal” stars due to the low level of chromospheric activity, and compare them with the model for a very active flare star obtained in a previous paper. These models are not based on a single spectral feature, but on the continuum in a broad wavelength range (3500 - 9000 Å), on many line profiles corresponding to three different atoms (H, Ca, Na), and on the Mg II h and k flux. We show that a marked chromosphere is present even for stars with the lowest levels of activity, and that the active stars have both a chromospheric temperature rise at larger column mass and a higher chromospheric temperature. These characteristics are responsible for the presence of the Balmer lines in emission in the dMe stars. We also show that the additional energy required to transform a dM star into an active star must be deposited in the high chromosphere, just below the transition region.

Accepted by A&A

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Analytical Studies of Collimated Winds IV. Rotating and Collimated MHD Outflows

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This paper continues the study of the initial acceleration and final collimation of magnetized and rotating astrophysical winds, via analytical and exact steady MHD solutions, self-similar in the meridional direction. By prescribing the shape of the streamlines on the poloidal plane for a nonspherically symmetric gas pressure related *a posteriori* to the density via a nonconstant polytropic index γ relationship ($P \propto \rho^\gamma$), the main physical features of the outflowing plasma are deduced. Simple analytical relations show that cylindrical collimation and superAlfvénic terminal velocities can be attained asymptotically which depend on the rotation rate, the collimation distance from the base and the pressure gradient. If the plasma is overpressured at the flow axis, the pinching magnetic field can confine the jet, while if the gas is underpressured at its axis, the centrifugal force cannot always counterbalance the pinching magnetic stress and inwards pressure gradient. Physically acceptable solutions are obtained by a numerical integration of the radial dependence of the MHD system from the subAlfvénic to the asymptotically collimated regions and by a smooth crossing of the Alfvén critical surface. Two classes of solutions are found where either the flow speed increases monotonically to an asymptotic value, or, it reaches a maximum value at an intermediate region. In the last case it is the toroidal magnetic field that collimates asymptotically the wind while in the former the outflow of a slow (fast) rotator is collimated by the gas pressure (magnetic field). The possible implications of these results on the modelling of astrophysical winds from slow and fast magnetic rotators are shortly discussed.

Accepted by A&A

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The Emergence of Magnetic Flux Loops in Solar-Like Stars

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We explore the latitude of emergence of flux tubes at the surface of G stars as a function of the rotation rate, magnetic flux, and injection latitude at the bottom of the convective zone. Our analysis is based on a thin flux tube evolution code that has been developed to study the emergence of magnetic flux in the sun and is well calibrated by detailed comparisons with solar observations. We study solar models with rotation rates between 1/3 and 10 times solar, injection latitudes $\phi_{\rm I}$, between 1 and 40 degrees, and tubes with a range of field strengths, B_0, and fluxes. For our range of input parameters, we find: the mean latitude of emergence, $\langle\phi_{\rm E}\rangle$ increases and its range decreases with higher rotation rates; $\phi_{\rm E} \leq 45°$ for stars with rotational periods ≥ 27 days; $\phi_{\rm E}$ increases with B_0 in rapid rotators, while the reverse is true for slow rotators; the dependence of $\phi_{\rm E}$ on B_0 decreases with increasing $\phi_{\rm I}$; tubes with higher flux emerge at larger $\phi_{\rm E}$; and the footpoint separation depends linearly on B_0. We compare our results to other calculations and with observations of magnetic features on stars, and suggest future observations and extensions of this research. Our results suggest that for near-polar starspots to occur, active stars must either have a larger range of $\phi_{\rm I}$ than inferred for the sun, or differential rotation and meridional flows are more important for magnetic flux redistribution in these stars. Our models also imply that flux appearing near the equator of active stars may be generated by a distributed, rather than a boundary layer, dynamo.

Accepted by ApJ

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The Hyades Binaries θ^1 Tauri and θ^2 Tauri: the Distance to the Cluster and the Mass-Luminosity Relation

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We report new spectroscopic observations of the close binaries θ^1 and θ^2 Tauri in the Hyades. Our radial velocities for the primary component of θ^1 Tau, supplemented with other velocities from the literature and existing astrometric information (speckle observations and lunar occultation measurements), have enabled us to solve for an astrometric-spectroscopic orbit giving a period of 16.3 years and a nearly edge-on configuration on the sky.

We have analyzed our echelle spectra of θ^2 Tauri with TODCOR, a two-dimensional cross-correlation technique, and have derived a new spectroscopic orbit for this difficult system, including the orbital velocity amplitude of the rapidly-

rotating secondary component. We then combine this spectroscopic orbit with a published astrometric orbit from the Mark III interferometer, and solve for the individual masses and the orbital parallax. Our analysis technique should eliminate the distortion in the velocity amplitude of the primary that has plagued previous studies, by fully accounting for the presence of the secondary in the spectrum.

Using proper motions for a representative sample of cluster members, along with the orbital parallax of θ^2 Tau, we obtain a new estimate for the distance modulus of the Hyades of $m{-}M = 3.39 \pm 0.08$ (47.6 ± 1.8 pc), in excellent agreement (1%) with similar estimates from two other Hyades binaries (51 Tauri and ϕ 342), as well as with results from other methods.

We also derive individual masses for θ^1 Tau using the distance information from θ^2 Tau, transferred via relative proper motions. There are now 9 main sequence stars in the Hyades with directly determined masses and with known individual distances. We compare the empirical mass-luminosity relation from these data with recent theoretical isochrones and show that they are in good agreement. This provides a stringent test of stellar evolution models that does not invoke arbitrary shifts, as is usual in the main-sequence fitting technique for clusters.

Accepted by ApJ (to appear August 10 1997)

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The Ca I 4227 Line as a Chromospheric Diagnostic for M Dwarfs

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In M dwarfs the Ca I 4227 line is saturated, therefore, the line core forms at a relatively small column mass density. As a result, the line is a potential diagnostic of chromospheric structure in these stars. We have calculated line profiles out of LTE for a grid of early M dwarf atmospheric models that spans the range from low to high chromospheric pressure and covers a range of observed activity levels. We have found that this line is sensitive to the detailed structure of the chromosphere in the same way as well studied strong lines such as Hα and Ca II HK: as the chromospheric pressure increases, the line changes from absorption to strong emission with a central double reversal. Therefore, observations of the Ca I 4227 line in M dwarfs would provide a useful additional constraint on the structure of the outer atmosphere. We also calculate consistently the line blanketing in the upper atmosphere of models with a chromosphere and transition region and investigate the effect of its inclusion on Ca I 4227. Finally, we demonstrate that the effects of partial frequency redistribution must be taken into account if the Ca I 4227 is to be used as an accurate diagnostic of the $T_{\rm min}$ region in dMe stars.

Accepted by A&A

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Chromospheric Velocity Fields in Alpha Orionis (M2 Iab) Generated by Stochastic Shocks

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I present results from recent ab–initio models for the formation and time–dependent behavior of outer atmospheric flows in α Ori (M2 Iab) produced by stochastic shock waves. Stochastic shocks are a natural consequence of acoustic energy generation due to stellar convection. The wave models show distinct episodes of momentum and energy deposition produced by strong shocks generated by merging of shocks in the stochastic wave field. It is found that sub- and supersonic inflows and outflows are generated at different atmospheric heights as a function of the wave parameters adopted. The flow velocities given by the models encompass the velocity range revealed by the Fe II emission line components given by recent GHRS data (Carpenter & Robinson 1997) [ApJ, in press]. This result is evidence that nonmagnetic wave modes are relevant for the heating and dynamics of the outer atmosphere of α Ori and possibly other M-type supergiants as well, although it does not preclude the possibility that magnetic heating may be equally or more important.

Accepted by A&A

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The Age-Mass Relation for Chromospherically Active Binaries. II. Lithium Depletion in Dwarf Components

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We present an extensive study of lithium abundances in dwarf components of chromospherically active binary stars (CABS). Since most of these binaries have known radii, masses and ages, this kind of data is especially useful for comparisons with theoretical models which try to explain the Li depletion phenomenon. We show that a significant part of these stars have clear Li overabundances with respect to the typical values for stars of the same mass and evolutionary stage. These excesses are evident when comparing our sample of CABS with binary and single stars belonging to open clusters of different ages, namely Pleiades, Hyades, NGC752, M67 and NGC188, which have ages ranging from 7×10^7 to 10^{10} yr. The Li excesses are more conspicuous for masses in the range 0.75–0.95 $M_\odot$, indicating that the rate of Li depletion has been less pronounced in CABS than in single stars. This phenomenon is interpreted in the context of transport of angular momentum from the orbit to the stellar rotation due to tidal effects. This angular momentum transfer would avoid the radial differential rotation and the associated turbulent mixing of material in the stellar interior. Other explanations, however, can not be ruled out. This is the case of transport of material induced by internal gravity waves, which could be inhibited due to the presence of strong magnetic fields associated with the effective dynamo in CABS. The confirmed existence of a relation between Li abundances and the fluxes in Ca II H&K lines can also be accommodated within both scenarios.

Accepted by A&A

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Solar Abstracts

Periodic Modulation of X-Ray Intensity from Coronal Loops: Heating by Resonant Absorption?

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We have applied time-series analysis to sequences of coronal loop images obtained with the Yohkoh Soft X-Ray Telescope (SXT). Using images obtained in fast-cadence mode ($\Delta t = 4$ sec), we have generated X-ray light curves and power spectra for multiple subregions of a number of coronal loops. Our analysis indicates that out of 544 spectra of loops which range in length L from 40 Mm to 150 Mm, there are 16 cases where the X-ray brightness is modulated periodically with $\geq$99.5% confidence. The periods τ range from 9.6 sec to 61.6 sec, and the amplitudes range from 0.4% to 1.8%. Our result is statistically significant at the 8σ level.

The observed periods can hardly be due to fluctuations in gas pressure: temperatures estimated from image ratios indicate sound speeds of 200 – 280 km/sec, with loop crossing times of hundreds of seconds. On the other hand, the ratio $2L/\tau$ yields "velocities" of 2 – 14 Mm/sec: these overlap with published estimates of Alfvén speeds v_A in coronal loops, 3.5 – 37 Mm/sec (Schmelz et al., 1994, *ApJ*, **434**,786). Now, in the context of coronal loop heating by resonant absorption of MHD waves, the period $\tau_g \approx 2L/v_A$ plays a key role: loops which are oscillating in their global mode (with period τ_g) are maximally efficient at absorbing energy (Steinolfson and Davila, 1993, *ApJ*, **415**, 354). We suggest that the loops which we have found to be modulated periodically are oscillating in their global mode. With this interpetation, we find that the plasma beta in the loops lies in the range $\beta_p = 0.001 - 0.045$. According to the

oscillating loop model of Zaitsev and Stepanov (1989, *Sov. Astron. Letters*, **15**, 66), loops with such β_p values should be modulated with amplitudes of 1.1% or less: our data are consistent with at least the upper limit of this prediction.

Submitted to Solar Physics

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Solar Interface Dynamos. I. A Linear, Kinematic Model in Cartesian Geometry

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We describe a simple, kinematic model for a dynamo operating in the vicinity of the interface between the convective and radiative portions of the solar interior. The model dynamo resides within a Cartesian domain, partitioned into an upper, convective half and lower, radiative half, with the magnetic diffusivity η of the former region (η_2) assumed to exceed that of the latter (η_1). The fluid motions that constitute the α-effect are confined to a thin, horizontal layer located entirely within the convective half of the domain; the vertical shear is non-zero only within a second, non-overlapping layer contained inside the radiative half of the domain. We derive and solve a dispersion relation that describes horizontally propagating dynamo waves. For sufficiently large values of a parameter analogous to the dynamo number of conventional models, growing modes can be found for any ratio of the upper and lower magnetic diffusivities. However, unlike kinematic models in which the shear and α-effect are uniformly distributed throughout the same volume, the present model has wave-like solutions that grow in time only for a finite range of horizontal wavenumbers.

An additional consequence of the assumed dynamo spatial structure is that the strength of the azimuthal magnetic field at the location of the α-effect layer is reduced relative to the azimuthal field strength at the shear layer. When the jump in η occurs close to the α-effect layer, it is found that over one period of the dynamo's operation, the ratio of the maximum strengths of the azimuthal fields at these two positions can vary as the ratio (η_1/η_2) of the magnetic diffusivities.

Accepted by ApJ

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Solar Interface Dynamos. II. Linear, Kinematic Model in Spherical Geometry

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Numerical models of *interface dynamos* are constructed, and their properties discussed in some detail. These models are extensions in spherical geometry of the Cartesian interface models considered by Parker (1993, ApJ 408, 707) and in the first paper of this series. The models are cast in the framework of classical mean-field electrodynamics, and make use of a realistic solar-like internal differential rotation profile. The magnetic diffusivity is assumed to vary discontinuously by orders of magnitude across the core-envelope interface. This allows the buildup of very strong toroidal magnetic fields below the interface, as apparently required by recent models of erupting bipolar magnetic regions.

Distinct dynamo modes powered either by the latitudinal or radial shear can coexist and, under certain conditions, interfere destructively with one another. *Hybrid modes*, relying on the latitudinal shear both in the envelope and below it, are most easily excited in some portions of parameter space, and represent a class of dynamo solutions distinct from the true interface modes previously investigated in Cartesian geometry. Which mode is preferentially excited depends primarily on the assumed ratio of magnetic diffusivities on either side of the core-envelope interface. For an α-effect having a simple $\cos(\theta)$ latitudinal dependency, the interface mode associated with the radial shear below the polar regions of the interface is easier to excite than its equatorial counterpart. In analogy with more conventional dynamo models, interface modes propagate equatorward if the product of the radial shear ($\mathrm{d}\Omega/\mathrm{d}r$) and α-effect coefficient (C_α) is negative, and poleward if that product is positive.

Interface dynamo modes powered by the positive radial shear localized below the core-envelope interface in the equatorial regions can be produced by artificially restricting the α-effect to low latitudes. For negative dynamo number, those modes are globally dipolar, propagate towards the equator, and are characterized by a phase relationship between

poloidal and toroidal magnetic field components that is in agreement with observations.

While the models discussed in this paper are linear and kinematic, and consequently rather limited in their predictive power, results obtained so far certainly suggest that interface dynamos represent a very attractive alternative to conventional solar mean-field dynamo models.

Accepted by ApJ

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Acoustic Wave Propagation in the Solar Atmosphere. IV. Nonadiabatic Wave Excitation with Frequency Spectra

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We study the response of the solar atmosphere to excitations by large amplitude acoustic waves with radiation damping now included. Monochromatic adiabatic waves, due to unbalanced heating, generate continuously rising chromospheric temperature plateaus in which the low frequency resonances quickly die out. All non-adiabatic calculations lead to stable mean chromospheric temperature distributions determined by shock dissipation and radiative cooling. For non-adiabatic monochromatic wave excitation, a critical frequency $\nu_{cr} \sim 1/25$ Hz is confirmed, which separates domains of different resonance behaviour. For waves of $\nu < \nu_{cr}$, the resonances decay, while for waves of $\nu > \nu_{cr}$ persistent resonance oscillations occur, which are perpetuated by shock merging. Excitation with acoustic frequency spectra produces distinct dynamical mean chromosphere models where the detailed temperature distributions depend on the shape of the assumed spectra. The stochasticity of the spectra and the ongoing shock merging lead to a persistent resonance behaviour of the atmosphere. The acoustic spectra show a distinct shape evolution with height such that at great height a pure 3 min band becomes increasingly dominant. This result is of particular interest as it may explain the 3 min component observed by Lites et al. (1993) [ApJ 414, 345] in a low lying iron line.

Accepted by A&A

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New Instruments

Wolfgang–Amadeus: the University of Vienna Twin Automatic Photoelectric Telescope

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We describe the University of Vienna twin automatic photoelectric telescope (APT) located at the new Fairborn Observatory at Washington Camp in southern Arizona. Not only are the telescopes fully automatic, also the observatory itself is automatic. A site-control computer monitors weather sensors and operates the roof while the telescope control computer operates the photometer and accepts input files from and provides nightly observations to the astronomer; no direct operating personnel are needed. Both telescopes have 0.75-m primary mirrors, a CCD finder camera, and an environmentally controlled single-channel photoelectric photometer with filter combinations optimized for use in the blue (Wolfgang) and in the red (Amadeus) wavelength regions. The telescopes are currently used for monitoring spotted stars, for asteroseismology of non-radially pulsating variables, and for monitoring asymptotic-giant-branch stars. Some first results on the active stars FK Comae, 31 Comae, 30 Comae, 37 Comae and HD 111395 are presented.

Accepted by PASP

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Ph.D. Thesis Abstract

Radiative Transfer in Stellar Chromospheres

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Thesis work conducted at: Dept. of Physics (Theoretical Physics), University of Oxford, UK

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D.Phil dissertation directed by: Prof. Carole Jordan

D.Phil degree awarded: March 1997

This thesis is concerned with modelling the chromospheres of two stars, α Tau (K5 III) and ξ Boo A (G8 V). I have created new, improved semi-empirical models of both stars. By solving the equation of radiative transfer I have calculated the fluxes of a range of spectral lines formed in the chromosphere, and have compared these computed fluxes with those observed in spectra taken with the Goddard High Resolution Spectrograph on the Hubble Space Telescope in order to create a model that is consistent with as many spectral lines as possible.

I have also examined the extent to which fluorescent lines of H_2, Fe II and Ca II, seen in the GHRS spectra of α Tau, can be accounted for in plane parallel, homogeneous, chromospheric models. The lines have recently been identified in the GHRS spectra, and have not before been analysed in stars other than the Sun. These lines have the potential to be valuable diagnostics of chromospheric structure for use in future studies of stellar chromospheres, given improved atomic data.

In the case of ξ Boo A, I have combined my chromospheric model with existing models of the transition region and corona to form a model of the whole outer stellar atmosphere, by linking onto a model made from the emission measure distribution of the transition region and corona.

Announcement

ESA-MUSICOS at INT

From: B.H. Foing
ESA Space Science Department

Dear Colleagues:

The ESA-MUSICOS spectrograph was commissioned on the 2.5m Isaac Newton Telescope (INT) at La Palma, and took part succesfully to the large Multi-site MUSICOS96 campaign in 15-30 November 1996. Based on the obtained results, we are pleased to leave the ESA-MUSICOS spectrograph at INT, at least until end of 1998, and to propose its use by the community. The spectrograph, used with an INT 1kx1k Tek detector (pixel 25 micron) gives the following performances: - spectral resolution 32000 - multi-order coverage 380-590 nm (blue B), 470-830 nm (red R) giving well separated orders. Another mode of operation was also qualified 440-960 nm (blue-infrared), S/N is 400 in V for one hour exposure on 7th magnitude star

If you wish to use this spectrograph at INT for semester 97B and following, I encourage you to submit a proposal. You may contact me or Joana Oliveira for informations on the instrument, performances, proposal submission, observing support and eventual collaborations with members of the MUSICOS team. We have a planned observing run at INT on 14-22 May 97, where some improvements and customization will be implemented.

Sincerely yours,

Bernard H. Foing, Research Unit Coordinator, Solar System Division, ESA Space Science Department, ESTEC (SO), postbus 299, NL-2200 AG, Noordwijk, The Netherlands

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Job Announcement

POST-GRADUATE STUDENTSHIP IN STELLAR ASTROPHYSICS

from
OCTOBER 1997

Applications are invited for a three year studentship in COOL STAR ACTIVITY at ARMAGH OBSERVATORY beginning on or about 1 October 1997. The successful student should have at least an upper second class honours degree in either Physics, Astronomy or Applied Mathematics and would enroll for a PhD degree, probably at the Queen's University, Belfast. He/she will carry out their research programme at Armagh under the supervision of DR. P.B. BYRNE.

Dr. Byrne's research interests are in the area of solar-type magnetic activity in late-type stars. More specifically the following topics are under investigation:

Braking of rotation in young open clusters
Chromospheric activity in young open clusters
Energetics of stellar flares
Physics of starspots
Stellar prominences

The research involves international collaborative projects, including extensive use of some of the world's largest optical and infra-red telescopes. The successful applicant would expect to become fully involved in these activities.Extensive use is made of the local STARLINK computers (DEC Alpha workstations), which are part of the N. Ireland STARLINK node.

The Observatory's academic staff currently consists of 7 astronomers, 6 Post-Doctoral Research Assistants and 7 Post-Graduate Research Students. Current research interests of staff members at Armagh Observatory include the following:

Solar system dynamics
Solar physics
Cool stars
Solar-terrestrial physics
Hot stars

For further details on the Observatory and our research interests one should check the WWW at: http://star.arm.ac.uk/research.html.

Requests for further, general information should be addressed to:

The Secretary, Armagh Observatory, College Hill, Armagh BT61 9DG, N. Ireland

to whom applications, including a CV and the names of three referees, should be forwarded before 1 July 1997. Queries about the research programme should be directed to Dr. Byrne (eMail: pbb@star.arm.ac.uk).

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. 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 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. 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 .`