COOLNEWS

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Stellar Abstracts

Solar-like Oscillations in the G2 Subgiant β Hydri from Dual-site Observations

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We have observed oscillations in the nearby G2 subgiant star β Hyi using high-precision velocity observations obtained over more than a week with the HARPS and UCLES spectrographs. The oscillation frequencies show a regular comb structure, as expected for solar-like oscillations, but with several $l = 1$ modes being strongly affected by avoided crossings. The data, combined with those we obtained five years earlier, allow us to identify 28 oscillation modes. By scaling the large frequency separation from the Sun, we measure the mean density of β Hyi to an accuracy of 0.6%.

The amplitudes of the oscillations are about 2.5 times solar and the mode lifetime is 2.3 d. A detailed comparison of the mixed $l = 1$ modes with theoretical models should allow a precise estimate of the age of the star.

Accepted by ApJ

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For preprints via ftp or WWW: http://arxiv.org/abs/astro-ph/0703747

Possible Identification of a Metal-Rich Old Moving Group: High-Resolution Spectroscopy of Candidate members

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Using new high-resolution spectroscopic observations from both the McDonald Observatory 2.7-m and Kitt Peak National Observatory 4-m telescopes, we observed four candidate members of the Ursa Major (UMa) moving group previously suggested to instead belong to a significantly older kinematic assemblage. The Fe abundances we measure strongly suggest that these stars are not UMa members, but form a more metal-rich group of stars ($+0.10 \leq$ [Fe/H] $\leq +0.18$) with an age near 3 Gyr. Our [Ca/H] determinations corroborate this result. The apparent similarities in metallicity and previously discovered UVW space motions lend credence to prior suggestions that these stars belong to a field kinematic structure of uniform age. Li abundances have also been derived from the 6707 Å feature for all four stars and show differences expected from the stars' varying evolutionary states. The low Li abundance of one object, HD 88654, does not support its previously reported status as a Post T Tauri star (PTTS) candidate.

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Results from a Spectroscopic Survey in the CoRoT Fields. I. Search for Chromospherically Active Stars

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In this paper we report the results of the spectroscopic survey we carried out to detect chromospheric activity of late-type stars in the fields of view of the CoRoT space mission. We give an accurate MK classification of all targets, which is valuable information on both the main CoRoT project and additional science programs, by means of cross-correlation with MK standard stars, by using artificial neural networks. The presence or absence of excess Hα emission, determined using spectral subtraction technique, is used to characterize the chromospheric activity level. In most cases our MK classification agrees with the spectral classification reported in the SIMBAD database; however, there are a few stars that are found to have very different MK classes. Our survey reveals that $\sim$7% of late-type stars in our sample indeed possess a very active chromosphere. The measured Hα excess and the presence of the 6708 Å Li line allow us to confirm the membership of 5 targets in the young open cluster NGC 2264.

Accepted by A&A

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Atmospheric Dynamics and the Mass-loss Process in Red Supergiant Stars

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Context: Red supergiant stars represent a key phase in the evolution of massive stars. Recent radiative hydrodynamic simulations suggest that their atmospheres may be the location of large-scale convective motions.
Aims: As supergiant convection is expected to generate supersonic motions and shocks, we seek constraints on these atmospheric motions and their possible relation with mass-loss rates.
Methods: We present high-resolution, visible spectroscopy of a sample of red supergiants (spectral type M I) and analyse them with a tomographic technique.
Results: We observe steep velocity gradients, characterising both upward and downward supersonic motions, which are time variable on time scales of a few hundred days.
Conclusions: These convective motions will generate turbulent pressure, which will strongly decrease the effective gravity. We suggest that this decrease, combined with radiative pressure on molecular lines, initiate the mass loss in red supergiant stars.

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For preprints via ftp or WWW: http://arxiv.org/abs/0705.0266

Why are Accreting T Tauri Stars Observed to be Less Luminous in X-rays Than Non-accretors?

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Accreting T Tauri stars are observed to be less luminous in X-rays than non-accretors, an effect that has been detected in various star forming regions. To explain this we have combined, for the first time, a radiative transfer code with an accretion model that considers magnetic fields extrapolated from surface magnetograms obtained from Zeeman-Doppler imaging. Such fields consist of compact magnetic regions close to the stellar surface, with extended field lines interacting with the disc. We study the propagation of coronal X-rays through the magnetosphere and demonstrate that they are strongly absorbed by the dense gas in accretion columns. The reduction in the observed X-ray emission depends on the field geometry, which may explain why accreting T Tauri stars show a larger scatter in their observed X-ray luminosity compared to non-accreting stars.

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For preprints via ftp or WWW: http://arxiv.org/abs/0704.2958

Editor's Note: The above abstract is being cross-listed with the Star Formation Newsletter.

The HARPS Search For Southern Extra-Solar Planets. IX. Exoplanets Orbiting HD 100777, HD 190647 and HD 221287

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The HARPS high-resolution high-accuracy spectrograph is offered to the astronomical community since the second half of 2003. Since then, we have been using this instrument for monitoring radial velocities of a large sample of solar-type stars ($\simeq$1400 stars) in order to search for their possible low-mass companions. Amongst the goals of our survey, one is to significantly increase the number of detected extra-solar planets in a volume-limited sample to improve our knowledge of their orbital elements distributions and thus obtain better constraints for planet-formation models.

In this paper, we present the HARPS radial-velocity data and orbital solutions for 3 Solar-type stars: HD 100777, HD 190647 and HD 221287. The radial-velocity data of HD 100777 is best explained by the presence of a 1.16 M_{Jup} planetary companion on a 384–day eccentric orbit ($e = 0.36$). The orbital fit obtained for the slightly evolved star HD 190647 reveals the presence of a long-period ($P = 1038$ d) 1.9 M_{Jup} planetary companion on a moderately eccentric orbit ($e = 0.18$). HD 221287 is hosting a 3.1 M_{Jup} planet on a 456–day orbit. The shape of this orbit is not very well constrained because of our non-optimal temporal coverage and because of the presence of abnormally large residuals. We find clues for these large residuals to result from spectral line profile variations probably induced by stellar activity related processes.

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Ph.D. Thesis Abstracts

Flares on active M-type stars observed with XMM-Newton and Chandra

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Ph.D degree awarded: April 2007

The full thesis is available from: `http://www.mssl.ucl.ac.uk/www_astro/academic/doctorates.html`

M-type red dwarfs are among the most active stars. Their light curves display random variability of rapid increase and gradual decrease in emission. It is believed that these large energy events, or flares, are the manifestation of the permanently reforming magnetic field of the stellar atmosphere. Stellar coronal flares are observed in the radio, optical, ultraviolet and X-rays. With the new generation of X-ray telescopes, XMM-Newton and Chandra, it has become possible to study these flares in much greater detail than ever before. This thesis focuses on three core issues about flares: (i) how their X-ray emission is correlated with the ultraviolet, (ii) using an oscillation to determine the loop length and the magnetic field strength of a particular flare, and (iii) investigating the change of density sensitive lines during flares using high-resolution X-ray spectra.

(i) It is known that flare emission in different wavebands often correlate in time. However, here is the first time where data is presented which shows a correlation between emission from two different wavebands (soft X-rays and ultraviolet) over various sized flares and from five stars, which supports that the flare process is governed by common physical parameters scaling over a large range.

(ii) As it is impossible to spatially resolve any but a very few giant stars, the only information on spatial dimensions as well as the magnetic field strength of stellar coronae has to come from indirect measurements. Using wavelet analysis, I isolated the first stellar X-ray flare oscillation. Interpreting it as a standing coronal flare loop oscillation, I derived a flare loop length as well as the magnetic field strength for this X-ray flare.

(iii) The high-resolution soft X-ray spectra of Chandra and XMM-Newton allow us to determine temperatures, densities and abundances of the stellar coronae. Despite a low signal-to-noise ratio because of the relatively short duration of a flare, we find that, if adding up the photons of several flares, certain density sensitive spectral lines change significantly between quiescent and flaring states. This project led on to investigate the flaring spectrum further, and it is found that the plasma is no longer in collisional ionisation equilibrium, but that it is dominated by recombinations.

Thesis-related Publications: A&A, **431**, 679 (2005); A&A **436**, 1041 (2005); two more to be submitted

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,M or L), substellar objects, or the sun. Both theoretical and observational abstracts are appropriate.

Abstracts dealing with cool pre-main-sequence (PMS) stars will generally not be included in *COOLNEWS*, since they are already covered by the *Star Formation Newsletter*. Exceptions to this rule will be considered if the subject matter is truly cross-disciplinary. If you wish to submit a cross-disciplinary abstract on PMS stars, then first submit it to the *Star Formation Newsletter*. After doing so, submit the abstract to *COOLNEWS* accompanied by a short e-mail stating that it has already been submitted to the *Star Formation Newsletter*, and summarizing why it will be of interest to the cool star/solar community at large.

A monthly call for abstracts will be issued and abstracts received by the last day of the month will usually appear in the following month's newsletter. Announcements of general interest to the cool star and solar communities may also be submitted for posting in the newsletter. These might include (but are not restricted to) the following: (i) *Job Openings* directed toward cool star or solar researchers, (ii) announcements of *Upcoming Meetings*, (iii) announcements of *Upcoming Observing Campaigns* for which participation is solicited from the community at large, (iv) reviews of *New Books*, and (v) *General Announcements* that provide or request research-related information. Please send all correspondence to the editor at coolnews@jila.colorado.edu. Abstract templates and back issues can be obtained from the COOLNEWS Web-page at

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