COOLNEWS

A RESEARCH NEWSLETTER DEDICATED TO COOL STARS AND THE SUN

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Wanted: Abstracts!

If you are a reader of Coolnews and find the newsletter useful, I strongly encourage you to submit abstracts of your recently submitted or accepted papers. Also, please mention the newsletter to your colleagues and ask them to submit their abstracts as well. Several people are regular contributors to the newsletter, but there are a good number of researchers who do not contribute. The usefulness and continued existence of the newsletter depends on active participation from the community at large (cool stars, brown dwarfs, solar physics, theory). I would like to remind everyone that the newsletter can also be used to post announcements of general interest to the community, notices of upcoming meetings, job openings, and abstracts of recent Ph.D. theses. With more than 600 people on the mailing list, your posting will receive wide dissemination to other researchers in the field. This is your newsletter, and your input is urgently needed to make it work. Steve Skinner (ed.)

Stellar Abstracts

Some Like it Hot: The X-Ray Emission of The Giant Star YY Mensae

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We present an analysis of the X-ray emission of the rapidly rotating giant star YY Mensae observed by *Chandra* HETGS and *XMM-Newton*. The high-resolution spectra display numerous emission lines of highly ionized species; Fe Roman17 to Fe Roman25 lines are detected, together with H-like and He-like transitions of lower Z elements. Although no obvious flare was detected, the X-ray luminosity changed by a factor of two between the *XMM-Newton* and *Chandra* observations taken 4 months apart (from $\log L_X \approx 32.2$ to 32.5 erg s^{-1}, respectively). The coronal abundances and the emission measure distribution have been derived from three different methods using optically thin collisional ionization equilibrium models, which is justified by the absence of opacity effects in YY Men as measured from line ratios of Fe Roman17 transitions. The abundances show a distinct pattern as a function of the first ionization potential (FIP) suggestive of an inverse FIP effect as seen in several active RS CVn binaries. The low-FIP elements (< 10 eV) are depleted relative to the high-FIP elements; when compared to its photospheric abundance, the coronal Fe abundance also appears depleted. We find a high N abundance in YY Men's corona which we interpret as a signature of material processed in the CNO cycle and dredged-up in the giant phase. The corona is dominated by a very high temperature ($20-40$ MK) plasma, which places YY Men among the magnetically active stars with the hottest coronae. Lower temperature plasma also coexists, albeit with much lower emission measure. Line broadening is reported in some lines, with a particularly strong significance in Ne Roman10 Lyα. We interpret such a broadening as Doppler thermal broadening, although rotational broadening due to X-ray emitting material high above the surface could be present as well. We use two different formalisms to discuss the shape of the emission measure distribution. The first one infers the properties of coronal loops, whereas the second formalism uses flares as a statistical ensemble. We find that most of the loops in the corona of YY Men have their maximum temperature equal to or slightly larger than about 30 MK. We also find that small flares could contribute significantly to the coronal heating in YY Men. Although there is no evidence of flare variability in the X-ray light curves, we argue that YY Men's distance and X-ray brightness does not allow us to detect flares with peak luminosities $L_{\rm X} \leq 10^{31}$ erg s^{-1} with current detectors.

Accepted by ApJ

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On the Sizes of Stellar X-ray Coronae

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Spatial information from stellar X-ray coronae cannot directly be assessed, but scaling laws from the solar corona allow to estimate sizes of stellar coronae from the physical parameters temperature and density. While coronal plasma temperatures have long been available, we concentrate on the newly available density measurements from line fluxes of X-ray lines measured for a large sample of stellar coronae with the Chandra and XMM-Newton gratings. We compiled a set of 64 grating spectra of 42 stellar coronae. Line counts of strong H-like and He-like ions and Fe XXI lines were measured with the CORA single-purpose line fitting tool by Ness & Wichmann 2002. Densities are estimated from He-like f/i flux ratios of O VII and Ne IX representing the cooler (1-6 MK) plasma components. The densities scatter between $\log n_e \approx 9.5-11$ from the O VII triplet and between $\log n_e \approx 10.5-12$ from the Ne IX triplet, but we caution that the latter triplet may be biased by contamination from Fe XIX and Fe XXI lines. We find that low-activity stars (as parameterized by the characteristic temperature derived from H- and He-like line flux ratios) tend to show densities

derived from O VII of no more than a few times $10^{10}\,\mathrm{cm}^{-3}$, whereas no definitive trend is found for the more active stars. Investigating the densities of the hotter plasma with various Fe XXI line ratios, we found that none of the spectra consistently indicates the presence of very high densities. We argue that our measurements are compatible with the low-density limit for the respective ratios ($\approx 5\times10^{12}\,\mathrm{cm}^{-3}$). These upper limits are in line with constant pressure in the emitting active regions. We focus on the commonly used RTV78 scaling law to derive loop lengths from temperatures and densities assuming loop-like structures as identical building blocks. We derive the emitting volumes from direct measurements of ion-specific emission measures and densities. Available volumes are calculated from the loop-lengths and stellar radii and are compared with the emitting volumes to infer filling factors. For all stages of activity we find similar filling factors up to 0.1.

Accepted by A&A

For preprints contact: jness@hs.uni-hamburg.de

For preprints via ftp or WWW: http://www.hs.uni-hamburg.de/DE/Ins/Per/Ness/Ness/Pubs/dens.ps.gz

A Search for He I λ10830 Absorption Among Metal-Poor Red Giants

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We present the results of a search for near-IR chromospheric He I absorption in ten metal-poor red giants using high resolution spectra obtained with NIRSPEC on Keck II. Four of these red giants are in the field and six are in the globular cluster M13. Two of the field stars and one of the cluster stars show evidence for He I absorption, consistent with chromospheric outflow velocities ranging from 30-140 km s^{-1}. If identified with a wind, the velocity found in the M13 red giant IV-15 (30 km s^{-1}) is comparable to the escape velocity of the cluster core, suggesting that such winds may be effective in clearing out the interstellar medium of globular clusters. Absorption is confined to stars with $T_{eff} >\sim 4600$ K and M_V fainter than -1.5. Since previous studies have found Hα and C II K$_2$ emission line profiles indicative of winds in metal-poor giants brighter than this limit, the mechanism responsible for He I absorption in metal-poor red giants apparently operates less effectively in the cooler and brighter stars. On the other hand, the He I line extends the detection of mass outflows further down the giant branch of metal-poor stars than the Hα observations.

Accepted by PASP (to appear September 2004)

For preprints via ftp or WWW: ftp to cfa-ftp.harvard.edu, cd /pub/dupree

Low-Mass and Substellar Abstracts

Dynamical Masses of the Binary Brown Dwarf GJ 569 Bab

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We have obtained new images and high-resolution ($R\sim22400$) near-infrared (1.2400–1.2575 μm) spectra of each component of the brown dwarf binary GJ 569 Bab using the Adaptive Optics facility of the Keck II telescope and the NIRSPEC spectrometer. These data have allowed us to improve the determination of the astrometric orbit and to measure radial velocities of the components. We have used the astrometric and spectroscopic measurements to derive the dynamical mass of each brown dwarf and the systemic velocity of the pair by means of a χ^2 fitting technique. From various considerations, the mass of each component is likely in the range 0.034–0.070 $M_\odot$ (GJ 569 Bb) and 0.055–0.087 $M_\odot$ (GJ 569 Ba). This implies that the mass ratio, q, of the binary is greater than 0.4, being the most likely value $q=0.75$–0.85. Adopting 0.072 $M_\odot$ as the most conservative location of the substellar limit for solar metallicity, our analysis confirms GJ 569 Bb as the *first genuine brown dwarf known without any theoretical assumption*. We

have compared the dynamical masses of GJ 569 Ba and Bb, and their effective temperatures and luminosities, to the predictions of state-of-the-art theoretical evolutionary isochrones, finding that models exhibit good performance in the regime of high substellar masses if the binary is about a few hundred million years old. However, the surface gravities of GJ 569 Ba (M8.5V) and Bb (M9V) derived from our spectral analysis (the observed data have been compared to the latest synthetic spectra) appear to be smaller than the values provided by the evolutionary models.

Accepted by ApJ

For preprints: http://xxx.unizar.es/abs/astro-ph/0407334

JOB OPENING

Marie Curie Fellowship in Astrophysics (Postdoctoral)
INAF - Osservatorio Astronomico di Palermo Giuseppe S. Vaiana
Palermo, Italy

Closing date: 20 October 2004

INAF - Osservatorio Astronomico di Palermo (OAPA) Giuseppe S. Vaiana will appoint one fellow in the area of Astrophysics under the European Commission's Marie Curie Actions Host Fellowship - Transfer of Knowledge programme "The Influence of Stellar High Energy Radiation on Planetary Atmospheres". The selected fellow will work in one of the following areas:

1. X-ray emission from very young and/or active stars, focusing on the determination of high energy emission and flare frequency.
2. X-ray emission and stellar population, through a detailed study of galactic models and characterization in terms of activity of selected fields.
3. Interaction of X-ray emission with planetary atmospheres.

Depending on the need of the institute, one additional position could be covered from the list of selected candidates. The first fellowship has to start before the end of February 2005.

Candidates should have a PhD or at least four years of full-time research experience at postgraduate level in a relevant field. In any case the candidate cannot have more than ten years of research experience. The applicant must be national of a Member State of the European Community (other than Italy) or an Associated State, or otherwise residing in the Community or in an Associated State for at least four years out of the last five years (except Italy). Candidates should not have been resident in Italy for more than 12 months in the three years prior to selection. Candidates from third countries, could be considered, but subjected to formal approval by the European Commission. In the case of a researcher holding more than one nationality including the italian one, (s)he could apply if (s)he has not resided in Italy during the previous 5 years. As an exception to the general rule, an italian citizen can apply if (s)he can provide evidence testifying that (s)he has legally resided and had his/her main activity in a third country for at least four out of the last five years immediately prior to his/her appointment.

Gross salary, including all compulsory deductions under italian legislation, is fixed at 3889.25 Euro per month plus a mobility allowance for the duration of the contract, which is expected to last for 24 months.

Continued on next page →

Female candidates are explicitly encouraged to apply.

Applications should include

1. Documents certifying the doctoral degree or a four years of full time research experience.
2. Statement of compliance with the eligibility requirements relative to the citizenship or residence.
3. Curriculum Vitae.
4. Publication list.
5. Description of applicant's research interests/program with the indication of which area(s) of research, (s)he is interested in working on, selected among those listed above.
6. Two letters of recommendation.

Documents 1,2,3,4,5 should be signed by the candidate.

All documents should arrive by 20 October 2004 at:

INAF - Osservatorio Astronomico di Palermo
Marie Curie Fellowship Selection
Piazza del Parlamento 1
I-90134 Palermo, Italy

For further information contact:
Giusi Micela - giusi@astropa.unipa.it or
http://www.astropa.unipa.it/ISHERPA

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

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

*** Please send abstracts in the body of the message and *not* as attachments.***