COOLNEWS

A RESEARCH NEWSLETTER DEDICATED TO COOL STARS AND THE SUN

No. 145 — April 2008 Editor: Steve Skinner (coolnews@jila.colorado.edu)

TABLE OF CONTENTS

Stellar Abstracts 1
Solar Abstracts 2
Upcoming Meeting 4
Job Opening 6
Abstract Guidelines 7

Stellar Abstracts

A Spitzer Space Telescope Atlas of Omega Centauri: The Stellar Population, Mass Loss, and the Intracluster Medium

Martha L. Boyer[1], Iain McDonald[2], Jacco Th. van Loon[2], Charles E. Woodward[1], Robert D. Gehrz[1], A. Evans[2] and A. K. Dupree[3]

[1] Dept. of Astronomy, School of Physics and Astronomy, 116 Church Street, S.E., University of Minnesota, Minneapolis, MN 55455 USA
[2] Astrophysics Group, School of Physics and Geographical Sciences, Keele University, Staffordshire ST5 5BG, UK
[3] Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138 USA

We present a Spitzer Space Telescope imaging survey of the most massive Galactic globular cluster, ω Centauri, and investigate stellar mass loss at low metallicity and the intracluster medium (ICM). The survey covers approximately 3.2$\times$ the cluster half-mass radius at 3.6, 4.5, 5.8, 8, and 24 microns, resulting in a catalog of over 40,000 point-sources in the cluster. Approximately 140 cluster members ranging 1.5 dex in metallicity show a red excess at 24 microns, indicative of circumstellar dust. If all of the dusty sources are experiencing mass loss, the cumulative rate of loss is estimated at 2.9 - 4.2 $\times$ 10^{-7} solar masses per year, 63% – 66% of which is supplied by three asymptotic giant branch stars at the tip of the Red Giant Branch (RGB). There is little evidence for strong mass loss lower on the RGB. If this material had remained in the cluster center, its dust component ($> 1 \times 10^{-4}$ solar masses) would be detectable in our 24 and 70 micron images. While no dust cloud located at the center of omega Cen is apparent, we do see four regions of very faint, diffuse emission beyond two half-mass radii at 24 microns. It is unclear whether these dust clouds are foreground emission or are associated with omega Cen. In the latter case, these clouds may be the ICM in the process of escaping from the cluster.

Recently Appeared: Boyer et al. 2008, AJ, 135, 1395

For preprints contact: mboyer@astro.umn.edu

RACE-OC Project: Rotation and Variability in the Open Cluster NGC 2099 (M37)

S. Messina[1], E. Distefano[1], Padmakar Parihar[2], Y.B. Kang[3,4,5], S.-L. Kim[4], S.-C. Rey[3], and C.-U. Lee[4]

[1] INAF-Catania Astrophysical Observatory, via S.Sofia 78 Catania, Italy
[2] Indian Institute of Astrophysics, Block II, Koramangala, Bangalore India
[3] Department of Astronomy and Space Science, Chungnam National University, Daejeon, Korea
[4] Korea Astronomy and Space Science Institute, Daejeon, Korea
[5] Department of Physics and Astronomy, Johns Hopkins University, Baltimore, USA

Rotation and solar-type magnetic activity are closely related to each other in main-sequence stars of G or later spectral types. The presence and level of magnetic activity depend on star's rotation, and rotation itself is strongly influenced by strength and topology of the magnetic fields. Open clusters represent especially useful targets to investigate the connection between rotation and activity. The open cluster NGC 2099 has been studied as a part of the RACE-OC project (**R**otation and **AC**tivity **E**volution in **O**pen **C**lusters), which is aimed at exploring the evolution of rotation and magnetic activity in the late-type members of open clusters of different ages. We collected time series CCD photometric observations of this cluster in January 2004, and we determined the presence of periodicities in the flux variation related to the stellar rotation by Fourier analysis. We investigate the relations between activity manifestations, such as the light curve amplitude, and global stellar parameters. We have discovered 135 periodic variables, 122 of which are candidate cluster members. Determination of rotation periods of G- and K-type stars has allowed us to better explore the evolution of angular momentum at an age of about 500 Myr. In our analysis, we have also identified 3 new detached eclipsing binary candidates among cluster members. A comparison with the older Hyades cluster (∼625 Myr) shows that the newly-determined distribution of rotation periods is consistent with the scenario of rotational braking of main-sequence spotted stars as they age. However, a comparison with the younger M34 cluster (∼200 Myr) shows that the G8-K5 members of these clusters have the same rotation period distribution. That is, G8-K5 members in NGC 2099 seem to have experienced no significant braking in the age range from ∼200 to ∼500 Myr. Finally, NGC 2099 members have a smaller level of photospheric magnetic activity, as measured by light curve amplitude, than in younger stars of the same mass and rotation, suggesting that the activity level also depends on some other age-dependent parameters.

Accepted by A&A

For preprints contact: sergio.messina@oact.inaf.it

For preprints via ftp or WWW: http://cdsads.u-strasbg.fr/abs/2008arXiv0803.1134M

Solar Abstracts

Line Intensity Enhancements in Stellar Coronal X-ray Spectra Due to Opacity Effects

S.J. Rose[1], M. Matranga[2,3], M. Mathioudakis[2], F.P. Keenan[2] and J.S. Wark[4]

[1] Department of Physics, Imperial College, London SW7 2BZ, UK
[2] Astrophysics Research Centre, School of Mathematics and Physics, Queen's University, Belfast, BT7 1NN, Northern Ireland, U.K
[3] Harvard-Smithsonian Center for Astrophysics, MS-3, 60 Garden Street, Cambridge, MA 02138, USA
[4] Department of Physics, Clarendon Laboratory, University of Oxford, Parks Road, Oxford, OX1 3PU, UK

Context. The I(15.01 Å)/I(16.78 Å) emission line intensity ratio in Fe XVII has been reported to deviate from its theoretical value in solar and stellar X-ray spectra. This is attributed to opacity in the 15.01 Å line, leading to a reduction in its intensity, and was interpreted in terms of a geometry in which the emitters and absorbers are spatially distinct.
Aims. We study the I(15.01 Å)/I(16.78 Å) intensity ratio for the active cool dwarf EV Lac, in both flare and quiescent spectra.
Methods. The observations were obtained with the Reflection Grating Spectrometer on the XMM-Newton satellite. The emission measure distribution versus temperature reconstruction technique is used for our analysis.
Results. We find that the 15.01 Å line exhibits a significant enhancement in intensity over the optically thin value.

To our knowledge, this is the first time that such an enhancement has been detected on such a sound statistical basis. We interpret this enhancement in terms of a geometry in which the emitters and absorbers are not spatially distinct, and where the geometry is such that resonant pumping of the upper level has a greater effect on the observed line intensity than resonant abs orption in the line-of-sight.

Accepted by A&A

For preprints via ftp or WWW: http://star.pst.qub.ac.uk/coolsun/

Helium Line Formation and Abundance During a C-class Flare

Vincenzo Andretta[1], Pablo J. D. Mauas[2], Ambretta Falchi[3] and Luca Teriaca[4]

[1] INAF - Osservatorio Astronomico di Capodimonte, Salita Moiariello 16, I-80131 Napoli, Italy
[2] Instituto de Astronomía y Física del Espacio, Argentina
[3] INAF - Osservatorio Astrofisico di Arcetri, Italy
[4] Max-Planck-Institut für Sonnensystemforschung, Germany

During a coordinated campaign which took place in May 2001, a C-class flare was observed both with SOHO instruments and with the Dunn Solar Telescope of the National Solar Observatory at Sacramento Peak. In two previous papers we have described the observations and discussed some dynamical aspects of the earlier phases of the flare, as well as the helium line formation in the active region prior to the event. Here we extend the analysis of the helium line formation to the later phases of the flare in two different locations of the flaring area. We have devised a new technique, exploiting all available information from various SOHO instruments, to determine the spectral distribution of the photoionizing EUV radiation produced by the corona overlying the two target regions. In order to find semiempirical models matching all of our observables, we analyzed the effect on the calculated helium spectrum both of $A_{\rm He}$ (the He abundance) and of the uncertainties in the incident EUV radiation (level and spectral distribution). We found that the abundance has in most cases (but not in all) a larger effect than the coronal back-radiation. The result of our analysis is that, considering the error of the measured lines, and adopting our best estimate for the coronal EUV illumination, the value $A_{\rm He} = 0.075 \pm 0.010$ in the chromosphere (for $T > 6300$ K) and transition region yields reasonably good matches for all the observed lines. This value is marginally consistent with the most commonly accepted photospheric value: $A_{\rm He} = 0.085$.

Accepted by ApJ

For preprints contact: andretta@oacn.inaf.it

For preprints via ftp or WWW: http://arxiv.org/abs/0803.0418

Upcoming Meeting

The Ages of Stars (IAU Symp. 258)

13 - 17 October 2008

Baltimore, Maryland

On behalf of our Scientific Organizing Committee and Local Organizing Committee, I am pleased to announce the availability of information and registration for Symposium 258 of the International Astronomical Union. The topic is "The Ages of Stars," and it will be held in downtown Baltimore, Maryland, USA from October 13 to 17, 2008.

Stellar ages lie at the heart of astrophysics, and stellar evolution is all about time and how stars change with time. We want to know time-scales for physical processes such as angular momentum loss, nucleosynthetic processing, changes in magnetic fields, and the like, or we wish to compare objects or groups of objects at different stages in their lives. Stellar and galactic evolution cannot be understood without some knowledge of ages.

If we could pin ages on individual stars we could determine the star formation history of the Galaxy and its principal components, and we could understand the physics of low-mass stars much better. The well-studied spin-down of stars like the Sun and the concomitant decline of observed activity indices makes it possible to estimate rough ages for individual stars, but the scarcity and remoteness of older clusters makes calibrating and testing the activity-age relation problematic.

The discovery and study of multiple populations of stars in clusters and other resolved objects in recent years has been a major accomplishment of HST and has led to changing views on how clusters form and evolve. In some cases there is evidence for multiple ages, in others for differences in composition. A full and complete understanding of the nature and ages of groups of stars is vital to stellar astrophysics.

Now is an appropriate time to examine the problem of stellar ages in detail. It is time to bring together astronomers from the around the world to discuss the current state of the problem of estimating ages of individual stars and of populations, where the advances are now being made, and what the near future offers.

Join us in Baltimore this October for an unusual symposium that will examine the problem of stellar ages from all angles! We are planning a program that will bring together diverse interests and talents, and we have scheduled it for the best time of year to be in Maryland.

For additional information and to register, please see our web page:

http://www.stsci.edu/institute/conference/iau258

David R. Soderblom, Chair, Scientific Organizing Committee (iau258@stsci.edu)

Upcoming Meeting

Second Announcement

15th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun

21 - 25 July 2008

St. Andrews, Scotland

SECOND ANNOUNCEMENT

Dear Colleagues,

This email is the second announcement of: the *15th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun*, July 21-25, 2008, in St Andrews, Scotland.

For a preliminary programme and registration see:

http://star-www.st-and.ac.uk/coolstars15/

Note extended deadline for contributed talks: 2 May 2008.

The Cool Stars meetings have a long tradition of presenting cutting edge science in the fields of cool stars, exoplanets and solar physics. Topics of interest at Cool Stars 15 will include seismology, surface and atmospheric dynamics, angular momentum evolution, dust formation, coronae, magnetospheres and winds. The conference aims to gather scientists working in all these fields in order to stimulate cross-disciplinary exchange.

Looking forward to seeing you in Scotland!

Moira Jardine, Christiane Helling and Andrew Cameron, for *Cool Stars 15*.

Job Opening

Postdoctoral Researcher

Armagh Observatory (N. Ireland)

Modeling of Solar Transient Events

Applications are invited for a 3 year postdoctoral fellowship in Solar Physics to be held at Armagh Observatory beginning October 2008 or as soon as possible thereafter. The PDRA's work activities will be directed towards reduction/interpretation and modelling relating to various solar transient features.

Further information about Armagh Observatory, and in particular the current Solar Physics research programme, may be obtained by consulting the Observatory's web-site or via email to Gerry Doyle (jgd@arm.ac.uk). This post is funded by a grant from the UK STFC. The closing date for applications is 1 June 2008. Late applications will be considered until the position is filled.

Armagh Observatory have an excellent in-house computing facility plus access to super-computing facilities via the Irish Grid. Prospective applicants should obtain an application pack from the Administrator or it may be downloaded from http://star.arm.ac.uk/jobs/.

The completed application form, together with a full curriculum vitae and bibliography should be sent to:
The Administrator, Armagh Observatory, College Hill, Armagh BT61 9DG, N. Ireland

Tel: +44-(0)28-3752-2928; FAX: +44-(0)28-3752-7174; e-mail: lfy@arm.ac.uk).

References from at least two referees should be sent to the Administrator to arrive by the initial closing date or as soon as possible thereafter.

The Armagh Observatory is an equal opportunities employer.

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.***