COOLNEWS

A RESEARCH NEWSLETTER DEDICATED TO COOL STARS AND THE SUN

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Stellar Abstracts

X-ray Spectroscopy Of The Hertzsprung-gap Giant Star 31 Com, Observed With XMM-Newton

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We have analysed the *XMM-Newton* X-ray spectra of the yellow giant 31 Com with the aim of deriving information on the coronal structures of this archetypical Hertzsprung-gap star. To determine the emission measure distribution vs. temperature, $EM(T)$, and the elemental abundances of the coronal plasma, with an accurate line-based approach, we have developed a new method for simple and accurate line measurements, based on rebinning and co-adding the two RGS spectra. We have reconstructed the $EM(T)$ independently with both APED and CHIANTI atomic databases in order to investigate possible differences in the final outcome of the analysis, and we have obtained consistent results. The derived emission measure distribution has a well defined peak at $T \sim 10^7$ K and a significant amount of plasma at higher temperatures; there is also evidence for plasma at temperatures below $\sim 10^{6.5}$ K, with a mean electron density of $\sim 3 \times 10^{10}\,\mathrm{cm}^{-3}$, as inferred from the line ratio of the O VII triplet. We have made a global fitting of the EPIC spectra, using multi-component isothermal (3-T) model, and then compared the results with the $EM(T)$, looking for a consistent multi-temperature description of both the RGS and EPIC spectra, over the whole spectral range. While the $EM(T)$ and the 3-T models individually provide a good description of the data set on which they are based, none of them describes adequately the data of all the other instruments; the disagreements may be related, at least in part, to cross-calibration problems. Finally, we have used the $EM(T)$ to derive information about the properties of the coronal structures. Our results indicate that the corona of 31 Com is dominated by a class of magnetic loops with peak temperature $\sim 10^7$ K and apparently more isothermal than the solar ones.

Accepted by A&A
For preprints contact: scelsi@astropa.unipa.it
For preprints via WWW, including all data tables: http://www.astropa.unipa.it/Library/preprint.html

Modeling an X-ray Flare on Proxima Centauri: Evidence of Two Flaring Loop Components and of Two Heating Mechanisms at Work

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We model in detail a flare observed on Proxima Centauri with the EPIC-PN on board XMM-Newton at high statistics and high time resolution and coverage. Time-dependent hydrodynamic loop modeling is used to describe the rise and peak of the light curve, and a large fraction of the decay, including its change of slope and a secondary maximum, over a duration of more than 2 hours. The light curve, the emission measure and the temperature derived from the data allow us to constrain the loop morphology and the heating function and to show that this flare can be described with two components: a major one triggered by an intense heat pulse injected in a single flaring loop with half-length $\approx 1.0 \times 10^{10}$ cm, the other one by less intense heat pulses released after about 1/2 hour since the first one in related loop systems, probably arcades, with the same half-length. The heat functions of the two loop systems appear be very similar: an intense pulse located at the loop footpoints followed by a low gradual decay distributed in corona. The latter result and the similarity to at least one solar event (the Bastille Day flare in 2000) indicate that this pattern may be common to solar and stellar flares, in wide generality.

Accepted by A&A

For preprints contact: reale@astropa.unipa.it

For preprints via ftp or WWW: http://www.astropa.unipa.it/Library/preprint.html

Coronal Stripping in Supersaturated Stars

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A recent unambiguous detection of X-ray rotational modulation of the supersaturated star VXR45 (P = 0.223 days) has shown that its corona has discrete dark and bright X-ray regions. We suggest that due to the rapid rotation, the X-ray emitting corona has been centrifugally stripped away, creating open field regions that are dark in X-rays. This leads naturally both to a significant rotational modulation in X-rays but also to the lower X-ray luminosity of supersaturated stars compared to those rotating more slowly. To demonstrate the effect, we take as an example a more slowly rotating star for which surface magnetograms are available. We extrapolate the potential coronal magnetic field based on these magnetograms and determine for a hydrostatic, isothermal atmosphere the structure of the density and of the optically-thin X-ray emission. We show that if the rotation rate of this star were increased, the magnitude of the X-ray luminosity would decrease while its rotational modulation would increase in a way that is consistent with the recent observations of VXR45.

Accepted by A&A

For preprints contact: mmj@st-andrews.ac.uk

For preprints via ftp or WWW: http://star-www.st-and.ac.uk/astronomy/preprints.html

New Modelling of a Large Long-Duration X-ray Flare on UX Ari

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We have carried out a new gas-dynamic simulation of physical processes occurring in a fixed amount of plasma confined in coronal loops heated in the top. We chose the solution which explains simultaneously the time behaviour of the temperature and the energetics of the X-rays of a long-duration X-ray flare observed by BeppoSAX on UX Ari. This analysis makes it possible to obtain the length of the loop and the distribution of the temperature and density along the loop (with $T_{max} \approx 100$ MK and $n_e = (1-3) \cdot 10^{11}$ cm^{-3}), as well as to estimate the X-ray flare area $S \approx 10^{22}$ cm^2. Franciosini et al. (2001) have developed a time-dependent model of magnetic reconnection for the decay phase of long-duration X-ray flare observed by BeppoSAX on UX Ari. The X-ray light curve of this flare has been fitted well at various scales of reconnecting magnetic fields. Our gas-dynamic solution corresponds to reconnection of middle-scale magnetic fields that is the case by Franciosini et al. (2001) with the degree of the Legendre polynomial n close to 5. The magnetic field strength is estimated at about 100 G near the loop top. We assume that the shrinkage-effect plays an important role during large long-duration X-ray stellar flares in comparison with solar two-ribbon flares and discuss possible observations to clarify this problem.

Accepted by Adv. in Space Res. (2003, Vol.32, No.6, p. 1181)

For preprints contact: ilusha@sai.msu.ru

Solar Abstracts

Detailed SUMER Observations of Coronal Loop Footpoint Dynamics

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For the most part, the characteristics of heating in the open corona and in closed coronal loops are determined by observing the emitted plasma intensity as a function of position and comparing this with model calculations. There are also some efforts that include observed velocity and still others that use theoretical physical processes such as electro-dynamic or turbulent heating, for example. With a view toward future modeling endeavors we investigate the temporal behavior of the intensity and velocity of a magnetic loop footpoint as observed by SUMER on the SOHO spacecraft as part of SOHO/TRACE JOP72. We study these quantities in emission lines that were specifically chosen to span the temperature domain of the upper chromospheric and transition region plasmas (10^5-10^6 K). We discuss the implications of these observations, suggest improvements and discuss some new avenues of exploration. The most significant result is the demonstration of the importance of including the measurement of velocity as a function of time in the loop footpoint region.

Accepted by ApJ

For preprints contact: scott@grace.nascom.nasa.gov

For preprints via ftp or WWW: http://drevil.nascom.nasa.gov/ swmcintosh/publications.htm

Characteristic Scales of Chromospheric Oscillation Wave Packets

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We use wavelet transforms to study the characteristic time scales of chromospheric oscillation "wave packets" that are observed in Transition Region and Coronal Explorer (TRACE) ultraviolet continuum image timeseries. Using several datasets we investigate the statistical, spatial and temporal intermittence of the number, duration, mean frequency and delay ("wait-time") between wave packets in the timeseries data. Further, we demonstrate that these characteristic values are consistent with newly developed pictures of the wave-mode suppression and conversion by the chromospheric magnetic "canopy". We propose that wavelet analysis may be fruitfully used in diagnosing the structure of the chromosphere and in identifying chromospheric oscillation wave packets temporally and spatially with their photospheric sources.

Accepted by ApJ

For preprints contact: scott@grace.nascom.nasa.gov

For preprints via ftp or WWW: http://drevil.nascom.nasa.gov/ swmcintosh/publications.htm

Long-Term Solar Cycle Evolution: Review of Recent Developments

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The sunspot number series forms the longest directly observed index of solar activity and allows to trace its variations on the time scale of about 400 years since 1610. This time interval covers a wide range from seemingly vanishing sunspots during the Maunder minimum in 1645-1700 to the very high activity during the last 50 years. Although the sunspot number series has been studied for more than a century, new interesting features have been found even recently. This paper gives a review of the recent achievements and findings in long-term evolution of solar activity cycles such as determinism and chaos in sunspot cyclicity, cycles during the Maunder minimum, a general behaviour of sunspot activity during a great minimum, the phase catastrophe and the lost cycle in the beginning of the Dalton minimum in 1790s and persistent 22-year cyclicity in sunspot activity. These findings shed new light on the underlying physical processes responsible for sunspot activity and allow for a better understanding of such empirical rules as the Gnevyshev-Ohl rule and the Waldmeier relations.

Invited review in Solar Physics (in press)

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Do X-ray Plasma Ejections Accelerate Coronal Mass Ejections?

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The X1.2 flare occurred on 23 April 1998 approximately 13° behind the eastern solar limb. Its C2.0 precursor is identified as a rapidly expanding system of magnetic loops that was well-observed by *Yohkoh*. Basic parameters of this ejection are estimated based on images from the SXT telescope. The evolution of the X–ray ejection is compared to a sequence of CME images obtained by the LASCO coronagraph onboard *SOHO*. Evidence that the X–ray ejection is responsible for an additional acceleration of the CME is presented. A possible scenario of the event is suggested.

Accepted by A&A

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S Ori 70: Just a Foreground Field Brown Dwarf?

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We examine recent claims that the T-type brown dwarf S Ori 053810.1-203626 (S Ori 70) is a spectroscopically verified low mass (3^{+5}_{-1} Jupiter masses) member of the 1–8 Myr σ Orionis cluster. Comparative arguments by Martín & Zapatero Osorio asserting that S Ori 70 exhibits low surface gravity spectral features indicative of youth and low mass are invalidated by the fact that their comparison object was not the field T dwarf 2MASS 0559−1404 but rather a nearby background star. Instead, we find that the 1–2.5 micron spectra of S Ori 70 are well-matched to older (age $\sim$ few Gyr) field T6–T7 dwarfs. Moreover, we find that spectral model fits to late-type field T dwarf spectra tend to yield low surface gravities ($\log g$ = 3.0–3.5), and thus young ages ($\lesssim$ 5 Myr) and low masses ($\lesssim$ 3 Jupiter masses, inconsistent with expected and/or empirical values. Finally, we show that the identification of one T dwarf in the field imaged by Zapatero Osorio et al. is statistically consistent with the expected foreground contamination. Based on the re-examined evidence, we conclude that S Ori 70 is likely an old, massive (30–60 Jupiter masses) field brown dwarf lying in the foreground of the σ Orionis cluster. This interpretation should be considered before presuming the existence of so-called "cluster planets."

Accepted by ApJ (to appear April 2004)

For preprints contact: adam@astro.ucla.edu

For preprints via ftp or WWW: http://arXiv.org/abs/astro-ph/0312285

UPCOMING MEETING

Robotic Astronomy: 3rd Potsdam Thinkshop
First Announcement and Call for Papers
12 - 15 July 2004
Potsdam, Germany
www.aip.de/thinkshop3

The Astrophysical Institute Potsdam (AIP) is pleased to announce its Third Thinkshop, this time on ROBOTIC ASTRONOMY. The meeting will be held in the NH Hotel Voltaire downtown Potsdam in the week just after the 13th Cool Star Workshop in Hamburg. Note that all participants will be accommodated in the meeting hotel to ensure a continuous exchange of thoughts.

The aim of our meeting is to bring together active researchers and technicians from any field in astronomy to discuss the future science and technical goals that are to be achieved with dedicated robotic telescopes. An update of the status of the design and operation of existing robotic telescopes and their ongoing and future projects is also part of the programme. Lively discussions are part of the "Thinkshop" idea and will focus on new scientific projects tailored to the unique capabilities of robotic telescopes, small and large.

Approximately one-third of the time is planned for technical issues, e.g. we aim to review the current status of robotic telescope projects and their instrumentation and to discuss innovative hard- and software concepts. Another third is foreseen to highlight scientific results from existing facilities from a wide range of astronomical applications worldwide (from gamma-ray burst monitoring to stellar-activity cycle monitoring). At the end, the last third or so, we intend to discuss and "think" about new exciting observational programs and theoretical problems that could be solved with observations from current and future robotic telescopes.

Instead of a classical proceedings, we intend to publish real papers in a dedicated volume of a refereed journal, as was done previously, e.g., for the first Potsdam Thinkshop on "Sunspots & Starspots" in AN 323, p.155–440 in 2002 (see www.aip.de/thinkshop/).

More info together with a preliminary scientific program is posted on our web page

`http://www.aip.de/thinkshop3/`

Members of the Scientific Organizing Committee (SOC):

F. C. Fekel (U.S.A.), F. V. Hessman (Germany), K. Horne (U.K.), K. Oláh (Hungary), M. Rodonó (Italy),
K. G. Strassmeier (Germany, Chair).

UPCOMING MEETING

Cool Stars, Stellar Systems, and the Sun
13th Cambridge Workshop
The AG Summer Meeting 2004
5 - 9 July 2004
Hamburg, Germany

The Cool Stars Workshops provide a forum where the solar and stellar communities meet to discuss new observations and theoretical models. In particular they attempt to bring together the very detailed views we have of the Sun with the less detailed but vastly more varied observations of the more distant stars. Cool Stars 13 will continue this tradition. We expect this to be a lively meeting with more than 200 participants.

SCIENTIFIC ORGANISING COMMITTEE (SOC)

J.H.M.M. Schmitt (chair), F. Allard, M. Asplund, T.R. Ayres, J.J. Drake, A.K. Dupree, F. Favata, R. Garcia-Lopez, M. Giampapa, D.F. Gray, L.K. Harra, C. Helling, C.M. Johns-Krull, C. Jordan, J. Krautter, J.L. Linsky, O. v.d. Lühe, B. Montesinos, R. Pallavicini, M.H. Pinsonneault, S. Randich, D. Queloz, C.J. Schrijver, K.G. Strassmeier, J.A. Valenti, S.A. White

TOPICS

The topics to be discussed will depend on the contributions from the cool star community, but the SOC expects the following issues to play a major role:

- High resolution X-ray and FUV-spectroscopy
- solar and stellar winds
- atmospheres and spectroscopic signatures of low mass stars and planets
- formation of planets, stars and clusters
- role of IR surveys and spectroscopy for cool star research

We will of course also discuss the future of cool star research. Invited speakers will be identified in the second announcement.

MEETING FORMAT

The Workshop will consist of a series of oral and poster sessions. Each oral session will be built around a broad-ranging review talk that focuses on a relevant scientific topic. Contributed talks will be interleaved within each review and will offer opportunities to highlight exciting new results and cover theoretical aspects in more detail. The SOC will entertain a specific effort to also include recent PhDs and young researchers in the mix of contributed speakers.

CONTRIBUTIONS

All participants who wish to present an oral or a poster contribution at the workshop should submit an abstract before the appropriate deadline (tentatively May 15, 2004). A web-based abstract form will be available by the end of January on the web page. The final accepted abstracts will be available via our web pages.

WEB SITE

The conference web site is `http://www.hs.uni-hamburg.de/cs13/`. There you can find the full announcement and detailed contact information.

UPCOMING MEETING

First International Symposium on Space Climate: Direct and Indirect Observations of Long-Term Solar Activity 20 - 23 June 2004 Oulu, Finland

Second Announcement

First International Symposium on Space Climate: Direct and Indirect Observations of Long-Term Solar Activity will be held around the Summer Solstice (20-23 June 2004) in Oulu, Finland, hosted by the University of Oulu. Full updated information on the Symposium is available at the Symposium web-site http://cosmicrays.oulu.fi/spaceclimate1/

CALENDAR OF EVENTS

Deadline for financial support applications - 15 February 2004 Deadline for abstract submission - 31 March 2004 Deadline for early registration - 31 March 2004 Symposium starts - 20 June 2004

SCIENTIFIC RATIONALE

The Symposium aims to cover a wide range of topics nowadays covered under the apt nickname of Space Climate, i.e., the long-term change in the Sun, heliosphere and near-Earth space. The topics of the Symposium include, e.g., Long-term cyclicities in solar activity; Extremes in solar activity: Great minima and active times; Long-term hemispheric and longitudinal asymmetries of solar activity; Stellar magnetic cycles; Long-term behaviour of solar magnetic field; Long-term helioseismic observations; Different modes of stellar dynamos; Long-term changes in the heliosphere; Cosmogenic isotopes as long-term solar proxies; Long-term cosmic ray variations; Long-term geomagnetic and auroral activity;

The Symposium aims to discuss the above and related topics in an inspiring and informal atmosphere of the Northern Finland during the time of continuous lightness. The program will consist of a number of invited talks, shorter contributed oral presentations and posters. Since this is the first symposium on a new topic, a relatively large number of invited review lectures will be included in the program in order to acquaint all participants with the various aspects of Space Climate. Also, some time will be reserved in the program for for discussions on the most interesting aspects of space climate.

SCIENTIFIC ORGANIZING COMMITTEE

J. Beer, E. Cliver, A. Ferriz-Mas, D. Hoyt, H. Moraal, K. Mursula (Co-Chair), H. Nevanlinna, J.-P. Rozelot (Co-Chair), M. Shea, S. Solanki, I. Tuominen, I. Usoskin

LOCAL ORGANIZING COMMITTEE

K. Alanko, S. Berdyugina, T. Hiltula, T. Jamsen, S. Joki-Huuki, J. Jussila, L. Kalliopuska (secretary), K. Mursula (Co-Chair), V-M- Pelkonen, I. Usoskin (Co-Chair)

INVITED SPEAKERS

J. Beer, S. Berdyugina, E. Cliver, A. Ferriz-Mas, L. Gizon, B. Kromer, H. Moraal, K. McCracken*, H. Nevanlinna, J.-P. Rozelot, E. Smith*, D. Sokoloff, S. Solanki, L. Svalgaard, J. Sykora, Y.-M. Wang (* to be confirmed)

ABSTRACT SUBMISSION

The deadline for abstract submission is 31 March 2004. Abstract (up to 400 words) can be submitted either in plain text or LaTeX format using web-based form (available after Jan. 15 2004) or by e-mail to mailto:spaceclimate1@oulu.fi. In the latter case please clearly indicate the presenting author. Abstracts will be printed in an abstract booklet and distributed during the Symposium.

REGISTRATION

The deadline for early registration is 31 March 2004. The web-based form should be used for registration (available after Jan. 15 2004). The registration fee by March 31 2004 is 180 Euro, which includes conference materials, *cont.* →

coffee break service, welcome reception, conference dinner and other social program. Late registration fee thereafter is 200 Euro. The fee for accompanying persons is 80 Euro, which includes welcome reception, conference dinner and other social program.

Registration fee can be paid preferably by credit card through the web page after January 15, 2004. Note that we accept *only* VISA, MASTER CARD or EURO CARD. Cash payment is also possible (but not recommended) at the registration desk during the Symposium. Cheques are not accepted.

FINANCIAL SUPPORT

Due to a limited budget, only a very limited number of support grants can be given, mostly in the form of conference fee waiver. If you need support please submit your request with Your abstract before 15 Ferbuary 2004 following the instructions that will be available on the Symposium web site after January 15 2004.

SPONSORS We wish to thank the following for their contribution to the success of this Symposium: European Office of Aerospace Research and Development, Air Force Office of Scientific Research, United States Air Force Research Laboratory, and the University of Oulu.

PUBLICATION

Selected papers will be published in the Springer publication series after a peer review. Other contributions may be published, e.g., in the PASP series.

TRAVEL

Oulu is a modern university town and the high-tech capital of Finland. Oulu is situated at 65 deg latitude, only 200 km south of the Polar Circle. This location guarantees that the nights during the Summer Solstice are almost as light as during the day although the Sun briefly drops below the horizon.

Oulu can be easily reached by an 1-hour flight from Helsinki (10+ daily flights operated by Finnair http://www.finnair.com/ and Flying Finn http://www.flyingfinn.fi/) or from Stockholm (a few daily flights operated by SAS http://www.sas.fi/ or actually its daughter company Blue1 http://www.blue1.com/). During the 6-7-hour train trip from Helsinki to Oulu you can enjoy the northern nature (forest) sightseeing or sleep in a comfortable sleeping car. Those coming from St. Petersburg to Helsinki can take a flight by Finnair or Aeroflot (http://www.aeroflot.ru/eng/), or use a train or bus. The shortest train route from St.Petersburg directly to Oulu goes via the route St.Petersburg-Riihimaki-Oulu.

VISA INFORMATION

Finland is a member of the Schengen zone, and, accordingly, all regulations applied to the Schengen zone are valid here. For most of European countries, U.S.A., Japan, a short-term entry to Finland does not require a visa. For Russia and other ex-USSR countries visa is needed. Please consult at your nearest Embassy/Consulate of Finland about your case. If you need a letter of invitation for Your visa, please let us know and the LOC will send you an official letter of invitation verifying that the purpose of your planned visit is a scientific attendance at the Symposium.

ACCOMMODATION

There are a number of hotels in Oulu with prices starting from about 80 Euro/night (which includes a hot buffet breakfast). LOC is also aiming to find a possibility for a cheaper accommodation in a hostel or a University guest-room. Detailed information on the accommodation will be available later.

FURTHER INFORMATION AND CONTACT ADDRESSES

Further updated information will be placed on the Symposium web-site: http://cosmicrays.oulu.fi/SpaceClimate1/

A formal contact address is

e-mail: SpaceClimate1@oulu.fi fax: +358-8-5531303 or +358-8-5531287 Address: Space Climate Symposium Department of Physical Sciences P.O.Box 3000 FIN-90014 University of Oulu Finland

You can also contact one of us directly

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Leena Kalliopuska, secretary email: Leena.Kalliopuska@oulu.fi Phone +358-8-5531378

JOB OPENING

Postdoctoral Position
Stellar Astrophysics
Paul Scherrer Institute (Switzerland)

We invite applications for a new postdoctoral research position in stellar astrophysics, starting between spring-fall 2004. This position will be awarded for two years; extension is contingent on further funding. Candidates with an observational or theoretical background in star formation and/or magnetic activity/coronal physics in young stars are particularly encouraged to apply. Experience in either infrared, millimeter, or X-ray astronomical observing and/or related theory is welcome. Candidates with expertise in related fields of stellar astronomy are also invited to apply.

The successful candidate will work in a joint team of astronomers from the Paul Scherrer Institute and ETH Zurich. This team has a strong background and interest in X-ray, millimeter and radio astronomy of magnetically active and young stars, star formation, plasma physics, and solar physics. PSI has been involved in the development of space missions such as XMM-Newton, the James Webb Space Telescope (JWST), RHESSI, and Integral. We offer extensive scientific collaborations within several ongoing research projects. The candidate is expected to develop further vigorous research activities. Office space and computing facilities will be provided by both PSI and ETH Zurich.

Please send CV, publication list, and a short description of research interests, and arrange for two letters of recommendation sent directly to us. Applications are requested by 20 February 2004 but will continue to be considered thereafter until the position is filled. For questions, please send e-mail to Dr. M. Güdel (guedel@astro.phys.ethz.ch).

Human Resources, Ref. Code 1513
PAUL SCHERRER INSTITUT
Würenlingen and Villigen
CH-5232 Villigen PSI
Switzerland

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.***