COOLNEWS

A RESEARCH NEWSLETTER DEDICATED TO COOL STARS AND THE SUN

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Coolnews on the Web

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Stellar Abstracts

High Resolution Study of the Abundance Pattern of the Heavy Elements in Very Metal-poor Field Stars

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The abundances of heavy elements in EMP stars are not well explained by the simple view of an initial basic 'rapid' process. In a careful and homogeneous analysis of the "First stars" sample (eighty per cent of the stars have a metallicity [Fe/H] $\simeq -3.1 \pm 0.4$), it has been shown that at this metallicity [Eu/Ba] is constant, and therefore the europium-rich stars (generally called "r-rich") are also Ba-rich.

The very large variation of [Ba/Fe] (existence of "r-poor" and "r-rich" stars) induces that the early matter was not perfectly mixed.

On the other hand, the distribution of the values of [Sr/Ba] vs. [Ba/Fe] appears with well defined upper and lower envelopes. No star was found with [Sr/Ba] < -0.5 and the scatter of [Sr/Ba] increases regularly when [Ba/Fe] decreases.

To explain this behavior, we suggest that an early "additional" process forming mainly first peak elements would affect the initial composition of the matter. For a same quantity of accreted matter, this additional Sr production would barely affect the r-rich matter (which already contains an important quantity of Sr) but would change significantly the composition of the r-poor matter.

The abundances found in the CEMP-r+s stars reflect the transfer of heavy elements from a defunct AGB companion. But the abundances of the heavy elements in CEMP-no stars present the same characteristics as the abundances in the EMP stars.

Direct stellar ages may be found from radioactive elements, the precision is limited by the precision in the measurements of abundances from faint lines in faint stars, and the uncertainty in the initial abundances of the radioactive elements.

Submitted to Astr. Nachrichten

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Nitrogen Abundances and the Distance Moduli of the Pleiades and Hyades

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Recent reanalyses of *HIPPARCOS* parallax data confirm a previously noted discrepancy with the Pleiades distance modulus estimated from main-sequence fitting in the color-magnitude diagram. One proposed explanation of this distance modulus discrepancy is a Pleiades He abundance that is significantly larger than the Hyades value. We suggest that, based on our theoretical and observational understanding of Galactic chemical evolution, nitrogen abundances may serve as a proxy for helium abundances of disk stars. Utilizing high-resolution near-UV Keck/HIRES spectroscopy, we determine N abundances in the Pleiades and Hyades dwarfs from NH features in the λ3330 region. While our Hyades N abundances show a modest $\sim$0.2 dex trend over a 800 K $T_{\rm eff}$ range, we find the Pleiades N abundance (by number) is 0.13$\pm$0.05 dex lower than in the Hyades for stars in a smaller overlapping $T_{\rm eff}$ range around 6000 K; possible systematic errors in the lower Pleiades N abundance result are estimated to be at the $\leq$0.10 dex level. Our results indicate [N/Fe]$\sim$0 for both the Pleiades and Hyades, consistent with the ratios exhibited by local Galactic disk field stars in other studies. If N production is a reliable tracer of He production in the disk, then our results suggest the Pleiades He abundance is no larger than that in the Hyades. This finding is supported by the relative Pleiades-Hyades C, O, and Fe abundances interpreted in the current context of Galactic chemical evolution, and is resistant to the effects on our derived N abundances of a He abundance difference like that needed to explain the Pleiades distance modulus discrepancy. A physical explanation of the Pleiades distance modulus discrepancy does not appear to be related to He abundance.

Accepted by PASP

For preprints via ftp or WWW: http://arxiv.org/abs/1309.1540

S-Type and P-Type Habitability in Stellar Binary Systems: A Comprehensive Approach I. Method and Applications

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A comprehensive approach is provided to the study of both S-type and P-type habitability in stellar binary systems, which in principle can also be expanded to systems of higher order. P-type orbits occur when the planet orbits both binary components, whereas in case of S-type orbits the planet orbits only one of the binary components with the second component considered a perturbator. The selected approach encapsulates a variety of different aspects, which include: (1) The consideration of a joint constraint including orbital stability and a habitable region for a putative system planet through the stellar radiative energy fluxes ("radiative habitable zone"; RHZ) needs to be met. (2) The treatment of conservative, general and extended zones of habitability for the various systems as defined for the Solar System and beyond. (3) The providing of a combined formalism for the assessment of both S-type and P-type habitability; in particular, mathematical criteria are presented for which kind of system S-type and P-type habitability is realized. (4) Applications of the attained theoretical approach to standard (theoretical) main-sequence stars. In principle, five different cases of habitability are identified, which are: S-type and P-type habitability provided by the full extent of the RHZs; habitability, where the RHZs are truncated by the additional constraint of planetary orbital stability (referred to as ST and PT-type, respectively); and cases of no habitability at all. Regarding the treatment of planetary orbital stability, we utilize the formulae of Holman & Wiegert (1999) [AJ 117, 621] as also used in previous

studies. In this work we focus on binary systems in circular orbits. Future applications will also consider binary systems in elliptical orbits and provide thorough comparisons to other methods and results given in the literature.

Accepted by ApJ

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For preprints via ftp or WWW: http://arxiv.org/abs/1303.6645

Solar Abstracts

Calculated Resonance Line Profiles of Mg II, C II, and Si IV in the Solar Atmosphere

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NASA's Interface Region Imaging Spectrograph (IRIS) space mission, launched 2013 June 27, is intended to study the structure of the solar chromosphere and transition region between the chromosphere and corona. The spectral lines to be observed include the Mg II k line at 2796.5 Å, the C II 1334.5 Å line, and the Si IV line at 1393.8 Å, which are formed in the middle chromosphere, the upper chromosphere, and the lower transition region, respectively. Here we calculate the profiles of these lines from four models of the solar atmosphere, intended to represent the faint and mean internetwork, a network lane, and bright network. We show how the profiles change from the center of the solar disk toward the limb of the Sun, and in response to outflows and inflows. These results are intended to cover the range of expected quiet-Sun observations and assist in their interpretation. We expect that the observations will lead to improvements in the models, which then can be used to estimate the required non-radiative heating in the different regions.

Accepted by ApJ

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Low-Mass and Substellar Abstracts

Exoplanet Transit Variability: Bow Shocks And Winds Around HD 189733b

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By analogy with the Solar system, it is believed that stellar winds will form bow shocks around exoplanets. For hot Jupiters the bow shock will not form directly between the planet and the star, causing an asymmetric distribution of mass around the exoplanet and hence an asymmetric transit. As the planet orbits through varying wind conditions, the strength and geometry of its bow shock will change, thus producing transits of varying shape. We model this process using magnetic maps of HD 189733 taken one year apart, coupled with a 3D stellar wind model, to determine the local stellar wind conditions throughout the orbital path of the planet. We predict the time-varying geometry and density of the bow shock that forms around the magnetosphere of the planet and simulate transit light curves. Depending on the nature of the stellar magnetic field, and hence its wind, we find that both the transit duration and ingress time can vary when compared to optical light curves. We conclude that consecutive near-UV transit light curves may vary significantly and can therefore provide an insight into the structure and evolution of the stellar wind.

Accepted by MNRAS

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Angular Momentum Evolution of Young Low-mass Stars and Brown Dwarfs: Observations and Theory

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This chapter aims at providing the most complete review of both the emerging concepts and the latest observational results regarding the angular momentum evolution of young low-mass stars and brown dwarfs. In the time since Protostars & Planets V, there have been major developments in the availability of rotation period measurements at multiple ages and in different star-forming environments that are essential for testing theory. In parallel, substantial theoretical developments have been carried out in the last few years, including the physics of the star-disk interaction, numerical simulations of stellar winds, and the investigation of angular momentum transport processes in stellar interiors. This chapter reviews both the recent observational and theoretical advances that prompted the development of renewed angular momentum evolution models for cool stars and brown dwarfs. While the main observational trends of the rotational history of low mass objects seem to be accounted for by these new models, a number of critical open issues remain that are outlined in this review.

Accepted by Protostars & Planets VI, 2014, University of Arizona Press, eds. H. Beuther, R. Klessen, K. Dullemond, Th. Henning

For preprints contact: Jerome.Bouvier@obs.ujf-grenoble.fr

Upcoming Meeting

Gaia and the Unseen - The Brown Dwarf Question

24 - 26 March 2014

Rettorato, Torino University, Italy

The ESA Gaia mission will revolutionise Astronomy. It will impact almost all areas of study from minor planets, stars, and galaxies out to the distant QSO's. The majority of brown dwarfs will be too faint for Gaia; however a subset of the closest, youngest, and most massive will be detectable along with a new population of companions detected via their gravitational effect on brighter primaries. When this conference takes place the Gaia mission will have started and we will have feedback on the efficiency and an update of its capabilities. The meeting will concentrate on identifying what Gaia can do for brown dwarf science, what needs to be done outside of the mission, and a discussion of original ideas with a mixing of the brown dwarf and Gaia communities.

Further details can be found at the web-page:

http://gaiabds.oato.inaf.it/

We look forward to seeing you in Torino.

Richard Smart on behalf of the SOC and LOC.

Upcoming Meeting

Binary Systems: Their Evolution And Environments

1 - 5 September 2014

Ulaan Baatar, Mongolia

*** FIRST ANNOUNCEMENT ***

http://mongolia.csp.escience.cn/ - binaries2014@gmail.com

!! PRE-REGISTRATION IS OPEN; ABSTRACT DEADLINE: 1 MARCH 2014 !!
(Formal registration will open in January 2014)

** SCIENTIFIC RATIONALE **

More than half of all stars form part of binary or higher-order multiple systems at least temporarily during their lifetimes. Yet, the highly successful field of stellar population synthesis all but ignores the presence of large fractions of stellar multiplicity. During this conference, we aim at bringing together observers, theorists and modellers to explore the synergies among the closely related fields focusing on stellar evolution and stellar dynamics, with particular emphasis on the contributions and properties of binary and higher-order multiple systems. Although we aim at addressing the key issues in these rapidly evolving areas from a population synthesis perspective, we will pay special attention to those individual stellar species that contribute most significantly to the stellar population properties that are most uniquely related to stellar multiplicity.

In particular, the conference program will be compiled around five main themes, i.e.,

1. Formation of stellar multiplicity: binaries, triples and higher-order multiples

2. Stellar and binary evolution across the Hertzsprung-Russell diagram (including the chemical evolution of globular clusters and their host galaxies)

3. Dynamics of binaries and higher-order multiple systems

4. Low-mass binary systems: population synthesis (SNe Ia, CVs, UV-upturn, transient events, etc.)

5. High-mass binary systems: population synthesis (LBVs, WR, blue supergiants, runaway stars, X-/gamma-ray binaries, binary- induced chemical signatures in massive stars, SNe II and SN Ib/c, spectral synthesis of starbursts, end products of massive binary evolution, etc.)

In addition, we plan to hold two discussion sessions on hot topics (to be determined).

We have convened a diverse Scientific Organising Committee (SOC), composed of:

- Richard de Grijs (Kavli Institute for Astronomy and Astrophysics, China), co-chair - Licai Deng (National Astronomical Observatories, Chinese Academy of Sciences), co-chair

(alphabetically:) - Christine Allen (UNAM, Mexico) - D. Batmunkh (Mongolian Academy of Sciences) - Selma de Mink (Carnegie Observatories/CalTech, USA) - Aaron Geller (Northwestern University, USA) - Rob Izzard (University of Bonn, Germany) - Thijs Kouwenhoven (Kavli Institute for Astronomy and Astrophysics, China) - Tsolmon Renchin (National University of Mongolia, LOC chair) - Alison Sills (McMaster University, Canada) - Danny Vanbeveren (Vrije Universiteit Brussel, Belgium) - Ed van den Heuvel (University of Amsterdam, Netherlands) - Lev Yungelson (Institute of Astronomy, Russian Aacademy of Sciences) - Hans Zinnecker (SOFIA, USA/Germany)

The Local Organising Committee (LOC) is led jointly by Tsolmon Renchin (National University of Mongolia) and Tuguldur Sukhbold (UCSC, USA).

** CHOICE OF LOCATION **

The meeting will be held on the premises of the new planetarium in Ulaan Baatar (Mongolia). Space availability will limit the number of attendees to fewer than 70, including local students and scientists. Although Mongolian astronomy

dates back thousands of years, the country has only been an interim member of the International Astronomical Union (IAU) since 2006. The population of Mongolia is slightly less than three million, almost half of which lives in its capital city, Ulaan Baatar. Despite the relatively isolated location of this land-locked country, Mongolia's economy has shown a substantial growth over the last decades, and its activities in astronomy have steadily expanded over the years, both in terms of teaching and research. Astronomy is currently taught at the National University of Mongolia's School of Physics and Electronics, and at the NUM-ITC-UNESCO Space Science and Remote Sensing International Laboratory in Ulaan Baatar, while research in astrophysics is carried out at the Research Center for Astronomy and Geophysics at the Mongolian Academy of Science. Several small telescopes are available for teaching and research purposes, while amateurs have organised themselves into active astronomical societies.

The (as yet small) Mongolian astronomical community has interacted with foreign organisations through several workshops and schools, most prominently the 2008 Astronomical Summer School, held in Ulaan Baatar, and also through interaction with the National Astronomical Observatories of Japan (NAOJ). More recently, Mongolia has strengthened the connections with its neighbours through their participation as an associated node of the IAU's East Asian regional Office of Astronomy for Development (EA-ROAD), based in Beijing.

The small community of Mongolian astronomers is keen to develop their research abilities and exposure to attain an internationally competitive level. The EA-ROAD (http://www.astro4dev.org/oadregions/eastasia/) strongly supports the Mongolian astronomical community in their efforts. As such, this conference is not organised as a "stand-alone" meeting. Instead, it will be linked to a summer school in two parts (3 days before and 2 days after the conference) at the National University of Mongolia, aimed at training young scientists. Leading up to the summer school, a number of senior astronomers from abroad are offering remotely supervised research projects to a selection of Mongolian students.

** CHOICE OF DATE RANGE**

From 25 to 29 August 2014, IAU Symposium 312 on *Star Clusters and Black Holes in Galaxies Across Cosmic Time* will be held in Beijing (http://silk0.bao.ac.cn/silkroad-save/IAU_symp_china2014_10.pdf).

We believe that it may be to our advantage to hold both meetings back-to-back. Although the topics do not (or barely) overlap, the research interests of many participants in the IAU Symposium will overlap with those of participants in our conference. Flights between the two capitals take around 2 hours; a train journey takes about 30 hours.

** INVITED AND REVIEW SPEAKERS **

The following invited and review speakers have already accepted our invitations (some tentatively); we are awaiting further confirmations.

C. Allen K. Belczynski A. Bogomazov J. Eldridge Z. Han J. Hurley C. Kobayashi U. Kolb S. McMillan H. Perets P. Podsiadlowski S. Portegies Zwart H. Sana A. Tokovinin D. Vanbeveren S.C. Yoon

Richard de Grijs Licai Deng (co-chairs)

Upcoming Meeting

ASTROBIO 2013 - An International Workshop on Astrobiology:
The Distribution of Life on Earth, in the Solar System, and the Galaxy

9 - 13 December 2013

Auditorium Campus La Casona UNAB, Santiago, Chile

http://www.astrobio.cl

e-mail: astrobio@astro.puc.cl

There has recently been great progress in our understanding of the origins of life, the range of conditions in which life is found on Earth, the chemistry of the Universe, extrasolar planetary systems, and the search for life in the Solar System and beyond. These themes synergized to create Astrobiology, a truly interdisciplinary science that involves a growing number of researchers from an increasing variety of areas. To help further this fascinating new field, we are organizing "ASTROBIO 2013", an International Workshop with the aims of covering the major topics in Astrobiology, to identify opportunities for new studies, and to promote the development of the Chilean community in this subject.

The Workshop is intended for professional scientists, post-docs, and advanced students active in the areas of Astronomy, Biology, Physics, Engineering, Medicine, Oceanography, Geophysics, Chemistry, Planetary Physics, and related subjects interested in Astrobiology.

Job Opening

Ph.D. Scholarships

Solar System Science

Univ. of Göttingen (Germany)

The International Max Planck Research School for Solar System Science at the University of Gttingen in Germany (Solar System School) offers a research-oriented doctoral program covering the physical aspects of Solar system science. It is jointly run by the Max Planck Institute for Solar System Research (MPS) and the University of Gttingen. Research at the MPS covers three main research areas: Sun and heliosphere, Stellar and Solar Interiors and Planets and Comets. Solar System School students collaborate with leading scientists in these fields and graduates are awarded a doctoral degree from the renowned University of Gttingen.

The Solar System School is open to students from all countries and offers an international three-year PhD program in an exceptional research environment with state-of-the-art facilities on the Gttingen Research Campus. The language of the structured graduate program is English, with complimentary German language courses offered. The program includes an inspiring curriculum of scientific lectures and seminars as well as advanced training workshops and provides travel funds to attend international conferences.

Applicants to the Solar System School should have a keen interest in Solar system science and a record of academic excellence. They must have, or must be about to obtain, an M.Sc. degree or equivalent in physics or a related field, including a written Masters thesis (or a scientific publication), and must document a good command of the English language.

Successful applicants receive an attractive scholarship covering relocation support, housing and living expenses and are exempt from tuition fees. The stipend is free of income tax and free of contributions to social insurance. Health insurance is mandatory and has to be paid by the stipend holder.

*** Review of applications for a starting date of September 2014 *** will begin on 15 November 2013. Applications must be *** prepared following the instructions at *** http://www.solar-system-school.de

Dr. Sonja Schuh ¡info@solar-system-school.de¿ IMPRS Scientific Coordinator

Job Opening

Postdoctoral Research Fellowship in Astrophysics

Solar/Stellar Physics

Institute of Theoretical Astrophysics

University of Oslo (Norway)

A position as post-doctoral research fellow is available at the Institute of Theoretical Astrophysics, University of Oslo, Norway. The fellowship is for a period of up to 3 years. The preferred starting date is April 1st, 2014 or earlier. A later starting date can be negotiated but the position will end at latest on March 31st, 2017.

The position is connected to the solar physics group, which is renowned for its detailed modeling of the solar atmosphere with radiative magnetohydrodynamics, and for innovative data analysis methods for high cadence imaging and spectroscopic observations. The research activities are now extended towards the atmospheres of cool stars.

The selected candidate would contribute to the project "Vortex flows and magnetic tornadoes on the Sun and cool stars", which combines high-resolution observations of the Sun with world-leading facilities like the ground-based Swedish 1-m Solar Telescope (SST) and the space-borne observatories Solar Dynamics Observatory (SDO) and Interface Region Imaging Spectrograph (IRIS) and advanced numerical simulations with state-of-the-art 3-D radiative magnetohydrodynamics computer codes (CO5BOLD,Bifrost).

Qualifications: Applicants must hold a PhD degree or equivalent in astrophysics, astronomy or space sciences. A good command of English and programming skills are required.

Application deadline: November 30th, 2013

Reference number: 2013/12624

Contact: Dr. Sven Wedemeyer-Böhm
Telephone: +47 228 56 520
e-mail: sven.wedemeyer@astro.uio.no

More information and online application portal at http://uio.easycruit.com/vacancy/1063573/64278

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 bimonthly call for abstracts will be issued. 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.***