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

The Habitable Zone of Kepler-16: Impact of Binarity and Climate Models

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We continue to investigate the binary system Kepler-16, consisting of a K-type main-sequence star, a red dwarf, and a circumbinary Saturnian planet. As part of our study, we describe the system's habitable zone based on different climate models. We also report on stability investigations for possible Earth-mass Trojans while expanding a previous study by B. L. Quarles and collaborators given in 2012. For the climate models we carefully consider the relevance of the system's parameters. Furthermore, we pursue new stability simulations for the Earth-mass objects starting along the orbit of Kepler-16b. The eccentricity distribution as obtained prefers values close to circular, whereas the inclination distribution remains flat. The stable solutions are distributed near the co-orbital Lagrangian points, thus enhancing the plausibility that Earth-mass Trojans might be able to exist in the Kepler-16(AB) system.

Published by Int. J. Astrobiology

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Metal-Poor Type II Cepheids with Periods Less Than Three Days

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We have analysed 10 high resolution spectra of Type II Cepheids with periods less than 3 days. We find that they clearly separate into two groups: those with near or slightly below solar metallicities, and those with [Fe/H] between –1.5 and –2.0. While the former are usually called BL Her stars, we suggest that the latter be called UY Eri stars. The UY Eri subclass appears to be similar to the short period variables in globular clusters of the Galactic Halo. Globular clusters with [Fe/H] > –1.0 almost never have Type II Cepheids.

Accepted by PASP

For preprints contact: walleg@uw.edu

For preprints via WWW: www.iopscience.iop.org/article/10.1088/1538-3873/aaacf7

Solar Abstracts

Solar Activity Over Nine Millennia: A Consistent Multi-proxy Reconstruction

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The solar activity in the past millennia can only be reconstructed from cosmogenic radionuclide proxy records in terrestrial archives. However, because of the diversity of the proxy archives, it is difficult to build a homogeneous reconstruction. All previous studies were based on individual, sometimes statistically averaged, proxy datasets. Here we aim to provide a new consistent multi-proxy reconstruction of the solar activity over the last 9000 years, using all available long-span datasets of ^{10}Be and ^{14}C in terrestrial archives. A new method, based on a Bayesian approach, was applied for the first time to solar activity reconstruction. A Monte Carlo search (using the χ^2 statistic) for the most probable value of the modulation potential was performed to match data from different datasets for a given time. This provides a straightforward estimate of the related uncertainties. We used six ^{10}Be series of different lengths (from 500–10000 years) from Greenland and Antarctica, and the global ^{14}C production series. The ^{10}Be series were resampled to match wiggles related to the grand minima in the ^{14}C reference dataset. The stability of the long data series was tested. The Greenland Ice-core Project (GRIP) and the Antarctic EDML (EPICA Dronning Maud Land) ^{10}Be series diverge from each other during the second half of the Holocene, while the ^{14}C series lies in between them. A likely reason for the discrepancy is the insufficiently precise beryllium transport and deposition model for Greenland, which leads to an undercorrection of the GRIP series for the geomagnetic shielding effect. A slow 6–7-millennia variability with lows at ca. 5500 BC and 1500 AD in the long-term evolution of solar activity is found. Two components of solar activity can be statistically distinguished: the main component, corresponding to the 'normal' moderate level, and a component corresponding to grand minima. A possible existence of a component representing grand maxima is indicated, but it cannot be separated from the main component in a statistically significant manner. A new consistent reconstruction of solar activity over the last nine millennia is presented with the most probable values of decadal sunspot numbers and their realistic uncertainties. Independent components of solar activity corresponding to the main moderate activity and the grand-minimum state are identified; they may be related to different operation modes of the dynamo.

Accepted by A&A

For preprints contact: ilya.usoskin@oulu.fi *For preprints via WWW*: https://arxiv.org/abs/1804.01302

Reconnection in the Post-Impulsive Phase of Solar Flares

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Using a recently developed analytical procedure, we determine the rate of magnetic reconnection in the "standard" model of eruptive solar flares. During the late phase, the neutral line is located near the lower tip of the reconnection current sheet, and the upper region of the current sheet is bifurcated into a pair of Petschek-type shocks. Despite the presence of these shocks, the reconnection rate remains slow if the resistivity is uniform and the flow is laminar. Fast reconnection is achieved only if there is some additional mechanism that can shorten the length of the diffusion region at the neutral line. Observations of plasma flows by the X-Ray Telescope (XRT) on *Hinode* imply that the diffusion region is in fact quite short. Two possible mechanisms for reducing the length of the diffusion region are localized resistivity and MHD turbulence.

Accepted by ApJ

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For preprints via WWW: https://arxiv.org/pdf/1804.00324.pdf

Low-Mass and Substellar Abstracts

The Pan-STARRS1 Proper-Motion Survey for Young Brown Dwarfs in Nearby Star-Forming Regions. I. Taurus Discoveries and a Reddening-Free Classification Method for Ultracool Dwarfs

Zhoujian Zhang[1],Michael C. Liu[1], William M. J. Best[1],Eugene A. Magnier[1],Kimberly M. Aller[1],K. C. Chambers[1], P. W. Draper[2],H. Flewelling[1],K. W. Hodapp[1],N. Kaiser[1], R.-P. Kudritzki[1],N. Metcalfe[2],R. J. Wainscoat[1],C. Waters[1] [1] Institute for Astronomy, University of Hawaii at Manoa, Honolulu, HI 96822, USA
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We are conducting a proper-motion survey for young brown dwarfs in the Taurus–Auriga molecular cloud based on the Pan-STARRS1 3π Survey. Our search uses multi-band photometry and astrometry to select candidates, and is wider (370 deg^2) and deeper (down to $\approx$3 M_{Jup}) than previous searches. We present here our search methods and spectroscopic follow-up of our high-priority candidates. Since extinction complicates spectral classification, we have developed a new approach using low-resolution ($R \approx 100$) near-infrared spectra to quantify reddening-free spectral types, extinctions, and gravity classifications for mid-M to late-L ultracool dwarfs ($\approx 100 - 3$ M_{Jup} in Taurus). We have discovered 25 low-gravity (VL-G) and the first 11 intermediate-gravity (INT-G) substellar (M6–L1) members of Taurus, constituting the largest single increase of Taurus brown dwarfs to date. We have also discovered 1 new Pleiades member and 13 new members of the Perseus OB2 association, including a candidate very wide separation (58 kAU) binary. We homogeneously reclassify the spectral types and extinctions of all previously known Taurus brown dwarfs. Altogether our discoveries have thus far increased the substellar census in Taurus by $\approx$ 40% and added three more L-type members ($\approx 5 - 10$ M_{Jup}). Most notably, our discoveries reveal an older (>10 Myr) low-mass population in Taurus, in accord with recent studies of the higher-mass stellar members. The mass function appears to differ between the younger and older Taurus populations, possibly due to incompleteness of the older stellar members or different star formation processes.

Accepted by ApJ

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For preprints via WWW: https://arxiv.org/abs/1804.01533

Upcoming Meeting

Observing the Sun as a Star: Would We Find the Solar System if We Saw It?

10 - 13 September 2018

Göttingen, Germany

http://sun-as-a-star.astro.physik.uni-goettingen.de

Contact: sun-as-a-star@astro.physik.uni-goettingen.de

The workshop *Observing the Sun as a Star: Would We Find the Solar System if We Saw It?* will present a comprehensive overview about the role of the Sun and the solar system in exoplanet research. The workshop will be held from September 10 - 13, 2018, in the Historic Observatory, Göttingen, Germany.

REGISTRATION and ABSTRACT SUBMISSION:

Pre-registration and abstract submission are now open with deadline June 06, 2018. Registration and type of contribution will be confirmed by the LOC shortly after the deadline. There is no registration fee.

FINANCIAL SUPPORT:

We may be able to support costs for accomodation for a few students.

VENUE:

The workshop will take place in the buildings of the Historische Sternwarte in the southern area of Göttingen next to the city center. Hotels and restaurants can be found within walking distance.

INVITED SPEAKERS:

Drake Deming (University of Maryland), Nadège Meunier (Observatoire de Grenoble), Steve Saar (Harvard CfA), Heather Cegla (University of Geneva), Sandra Jeffers (Institute for Astrophysics Göttingen), Alexander Shapiro (Max-Planck Institute for Solar System Research Göttingen), Fabienne Bastien (Penn State University), Antonino Lanza (Osservatorio Astrofisico di Catania), Mark Giampapa (NSO), David Phillips (Harvard CfA), Tilo Steinmetz (Menlo Systems), Klaus Strassmeier (Leibniz-Institut fr Astrophysik Potsdam), Philipp Huke (Institute for Astrophysics Göttingen), Artie Hatzes (Thuringia State Observatory Tautenburg), Eric Ford (Penn State University)

SOC:

Andrew Cameron (University of St Andrews), Dainis Dravins (University of Lund), Xavier Dumusque (University of Geneva), David Latham (Harvard-Smithsonian Center for Astrophysics, co-Chair), Raphaëlle Haywood (Center for Astrophysics, Harvard University), Natasha Krivova (Max-Planck Institut for Solar System Research, Göttingen), Anne-Marie Lagrange (Université Grenoble), Ansgar Reiners (Georg-August Universität Göttingen, co-Chair), Wolfgang Schmidt (Kiepenheuer-Institut für Sonnenphysik, Freiburg).

Upcoming Meeting

Stellar Brightness Variations: Building on the Solar Knowledge

Splinter Session at Cool Stars 20

29 July - 3 August 2018

Cambridge, MA USA

Abstract Submission: Please email your contribution to abstract-coolstars.20@mps.mpg.de . We accept oral and poster contributions, please specify your preference. Deadline for abstract submission is 1 June 2018.

Website: http://www2.mps.mpg.de/projects/solve/organize_cool_stars.html

Scientific Rationale: The unprecedented precision of stellar brightness measurements achieved by the planet-hunting space telescopes initiated a new era in stellar photometric variability investigations. Understanding stellar brightness variations is of great interest to the solar, stellar, and exoplanetarycommunities, for the following reasons: Stellar brightness variations can provide constraints on the historical solar variability and solar role in climate change, as well as they allow to determine stellar magnetic cycles' properties. Moreover, stellar brightness variations are a limiting factor for detection andcharacterisation of the exoplanets via transit photometry. Recently, a plethora of observational data have pushed ahead theoretical studies aiming at developing methods for extracting information about stars and their planets from the available records of brightness variations. These studies can greatly profit fromknowledge acquired by studying the Sun. Thus the way forward is to focus on the solar-stellar comparison and examining how the solar paradigm can help us to explain variability of other stars and develop criteria for distinguishing between typical photometric signatures of intrinsic stellar variations and exoplanettransits.

Confirmed Invited Speakers: * Gibor Basri (Department of Astronomy, University of California, USA); * Joe Llama (Lowell Observatory, Flagstaff, USA); * Benjamin Montet (Department of Astronomy and Astrophysics, University of Chicago, USA).

Topics: * Observing stellar photometric variability; * Advances in modelling stellar photometric variability; * Exoplanet detection and limiting factors; * State-of-the-art in solar irradiance modelling.

Scientific Organising Committee: * Gibor Basri (Department of Astronomy, University of California, USA); * Natalie Krivova (Max Planck Institute for Solar System Research, Göttingen, Germany); * Alexander Shapiro (Max Planck Institute for Solar System Research, Göttingen, Germany); * Sami Solanki (Max Planck Institute for Solar System Research, Göttingen, Germany & School of Space Research, Kyung Hee University, Korea); * Yvonne Unruh (Blackett Laboratory, Imperial College London, United Kingdom); * Veronika Witzke (Max Planck Institute for Solar System Research, Göttingen,Germany).

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.***