ExoPlanet News
An Electronic Newsletter

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Editors: D. Angerhausen, J. Venturini, L. Mishra & H. Capelo
NCCR PlanetS, Gesellschaftsstrasse 6, CH-3012 Bern, Switzerland

exoplanetnews@nccr-planets.ch http://nccr-planets.ch/exoplanetnews

Contents

1 Editorial

Welcome to Edition 143 of the ExoPlanet News!
As usual we bring you abstracts of scientific papers, job ads, conference announcements, an overview of exoplanet-related articles on astro-ph, and the latest exoplanet talks on exoplanet-talks.org. Thanks a lot to all of you who contributed to this issue of the newsletter!

Also for the coming month our team is looking forward to your paper abstract, job ad or meeting announcement for the next issue. Also special announcements are welcome. As always, we would also be happy to receive feedback concerning the newsletter. The Latex template for submitting contributions, as well as all previous editions of ExoPlanet News, can be found on the ExoPlanet News webpage (http://nccr-planets.ch/exoplanetnews/).

The next issue will appear 15. June 2021.
Thanks again for your support, and best regards from the editorial team,

Daniel Angerhausen
Julia Venturini
Lokesh Mishra
Holly Capelo

2 Abstracts of refereed papers

The Demographics of Exoplanets

B.S. Gaudi[1]*, J.L. Christiansen*[2]*, M.R. Meyer*[3]

[1] Department of Astronomy, The Ohio State University
[2] Caltech/IPAC-NASA Exoplanet Science Institute, Pasadena, CA
[3] Department of Astronomy, University of Michigan

To appear in "ExoFrontiers: Big questions in exoplanetary science", Ed. N Madhusudhan, in press

In the broadest sense, the primary goal of exoplanet demographic surveys is to determine the frequency and distribution of planets as a function of as many of the physical parameters that may influence planet formation and evolution as possible, over as broad of a range of these parameters as possible. Empirically-determined exoplanet demographics provide the ground truth that all planet formation and evolution theories must reproduce. By comparing these planet distributions to the predictions of planet formation theories, we can begin to both test and refine these theories. In this chapter, we review the major results on exoplanet demographics to date. In this context, we identify a set of important open questions that remain to be answered. We outline the challenges of measuring the demographics of exoplanets using the variety of detection methods at our disposal. Finally, we summarize some of the future opportunities for refining and expanding our understanding of exoplanet demographics.

Download/Website: `https://arxiv.org/abs/2011.04703`

Contact: `mrmeyer@umich.edu`

Stellar versus Galactic: The intensity of cosmic rays at the evolving Earth and young exoplanets around Sun-like stars

D. Rodgers-Lee[1]*, A. M. Taylor*[2]*, A. A, Vidotto*[1]*, T. P. Downes* [3]

[1] School of Physics, Trinity College Dublin, University of Dublin, College Green, Dublin 2, D02 PN40, Ireland
[2] DESY, D-15738 Zeuthen, Germany
[3] Centre for Astrophysics & Relativity, School of Mathematical Sciences, Dublin City University, Glasnevin, D09 W6Y4, Ireland

Monthly Notices of the Royal Astronomical Society, in press (arXiv:2103.15460)

Energetic particles, such as stellar cosmic rays, produced at a heightened rate by active stars (like the young Sun) may have been important for the origin of life on Earth and other exoplanets. Here we compare, as a function of stellar rotation rate (Ω), contributions from two distinct populations of energetic particles: stellar cosmic rays accelerated by impulsive flare events and Galactic cosmic rays. We use a 1.5D stellar wind model combined with a spatially 1D cosmic ray transport model. We formulate the evolution of the stellar cosmic ray spectrum as a function of stellar rotation. The maximum stellar cosmic ray energy increases with increasing rotation i.e., towards more active/younger stars. We find that stellar cosmic rays dominate over Galactic cosmic rays in the habitable zone at the pion threshold energy for all stellar ages considered ($t_* = 0.6 - 2.9$ Gyr). However, even at the youngest age, $t_* = 0.6$ Gyr, we estimate that $\gtrsim$ 80MeV stellar cosmic ray fluxes may still be transient in time. At $\sim$1 Gyr when life is thought to have emerged on Earth, we demonstrate that stellar cosmic rays dominate over Galactic cosmic rays up to $\sim$4 GeV energies during flare events. Our results for t_* =0.6 Gyr ($\Omega = 4\Omega_\odot$) indicate that $\lesssim$GeV stellar cosmic rays are advected from the star to 1 au and are impacted by adiabatic losses in this region. The properties of the inner solar wind, currently being investigated by the Parker Solar Probe and Solar Orbiter, are thus important for accurate calculations of stellar cosmic rays around young Sun-like stars.

Download/Website: `https://arxiv.org/abs/2103.15460`

Contact: `drodgers@tcd.ie`

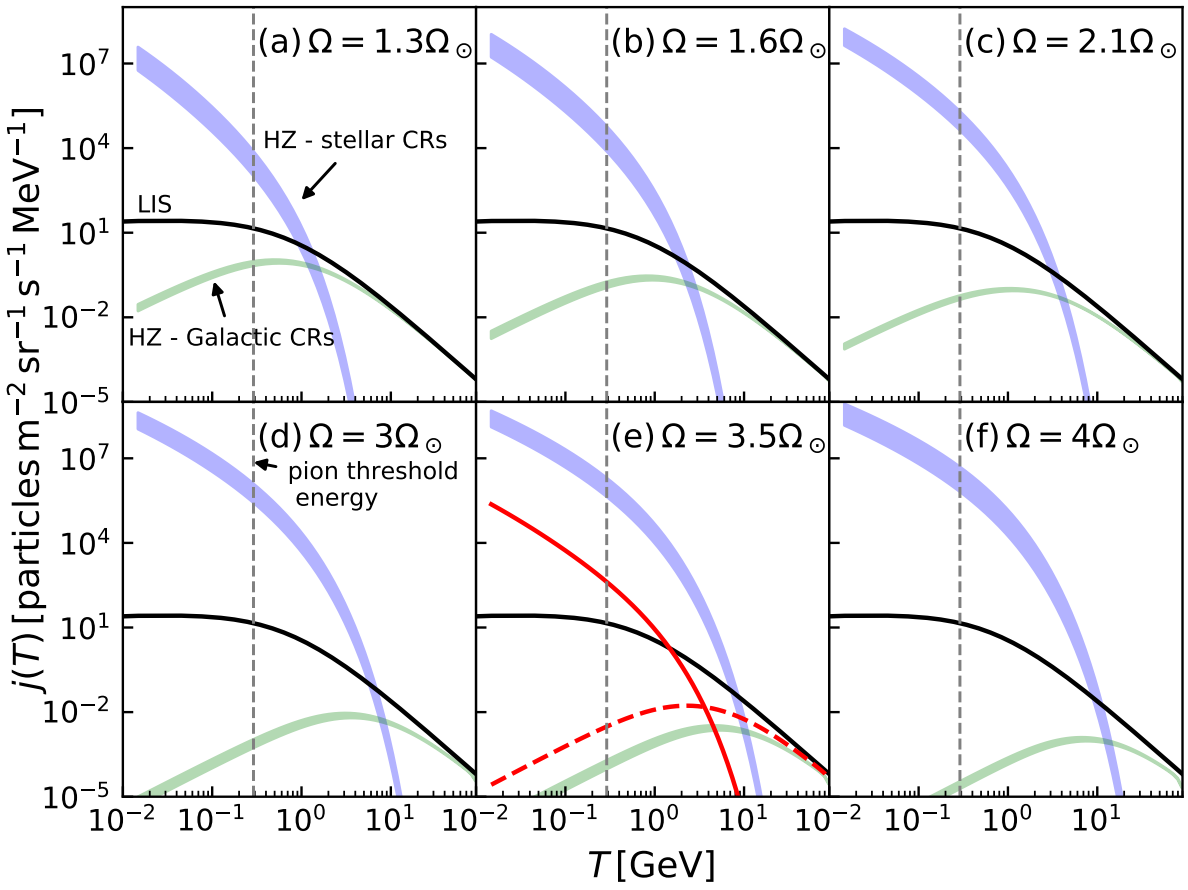


Figure 1: The differential intensity of stellar cosmic rays (blue shaded regions) and Galactic cosmic rays (green shaded regions) in the habitable zone of a Sun-like star as a function of particle kinetic energy. Each panel represents a different value for the stellar rotation rate. The maximum stellar cosmic ray energy increases with increasing stellar rotation rate, i.e. younger stars accelerate particles to higher energies. $\Omega = 2.1\Omega_\odot$ corresponds to $t_* = 1$ Gyr, shown in (c), when life is thought to have begun on Earth. Also shown are the differential intensities of stellar (solid red line) and Galactic cosmic rays (red dashed line) at 20 au, the orbital distance of HR 2562b, in panel (e). The black solid line is a fit to the *Voyager 1* data for the Galactic cosmic ray local interstellar spectrum. The grey dashed line represents the pion threshold energy, 290 MeV. Cosmic rays with energies greater than the pion threshold energy may reach the surface of Earth-like planets.

The New Generation Planetary Population Synthesis (NGPPS): V. Predetermination of planet types in global core accretion models

M. Schlecker[1], D. Pham[2,3], R. Burn[4], Y. Alibert[4], C. Mordasini[4], A. Emsenhuber[5,4], H. Klahr[1], Th. Henning[1], L. Mishra[4,6]

[1] Max-Planck-Institut für Astronomie, Königstuhl 17, 69117 Heidelberg, Germany
[2] David A. Dunlap Department of Astronomy & Astrophysics, University of Toronto, 50 St. George St., Toronto, ON M5S 3H4, Canada
[3] Carl Sagan Institute, Cornell University, Ithaca, NY 14853, USA
[4] Physikalisches Institut, University of Bern, Gesellschaftsstrasse 6, 3012 Bern, Switzerland
[5] Lunar and Planetary Laboratory, University of Arizona, 1629 E. University Blvd., Tucson, AZ 85721, USA
[6] Geneva Observatory, University of Geneva, Chemin Pegasi 51b, 1290 Versoix, Switzerland

Astronomy & Astrophysics, in press (arXiv:2104.11750)

State-of-the-art planet formation models are now capable of accounting for the full spectrum of known planet types. This comes at the cost of increasing complexity of the models, which calls into question whether established links between their initial conditions and the calculated planetary observables are preserved.
In this paper, we take a data-driven approach to investigate the relations between clusters of synthetic planets with similar properties and their formation history.
We trained a Gaussian Mixture Model on typical exoplanet observables computed by a global model of planet formation to identify clusters of similar planets. We then traced back the formation histories of the planets associated with them and pinpointed their differences. Using cluster affiliation as labels, we trained a Random Forest classifier to predict planet species from properties of the originating protoplanetary disk.
Without presupposing any planet types, we identified four distinct classes in our synthetic population. They roughly correspond to the observed populations of (sub-)Neptunes, giant planets, and (super-)Earths, plus an additional unobserved class we denote as "icy cores". These groups emerge already within the first 0.1 Myr of the formation phase and are predicted from disk properties with an overall accuracy of $> 90\,\%$. The most reliable predictors are the initial orbital distance of planetary nuclei and the total planetesimal mass available. Giant planets form only in a particular region of this parameter space that is in agreement with purely analytical predictions. Including N-body interactions between the planets decreases the predictability, especially for sub-Neptunes that frequently undergo giant collisions and turn into super-Earths.
The processes covered by current core accretion models of planet formation are largely predictable and reproduce the known demographic features in the exoplanet population. The impact of gravitational interactions highlights the need for N-body integrators for realistic predictions of systems of low-mass planets.

Download/Website: `https://arxiv.org/abs/2104.11750`

Contact: `schlecker@mpia.de`

Figure 2

The evolution of the solar wind

Aline A. Vidotto
School of Physics, Trinity College Dublin, The University of Dublin, Dublin-2, Ireland

Living Reviews in Solar Physics, published, 2021LRSP...18....3V

How has the solar wind evolved to reach what it is today? In this review, I discuss the long-term evolution of the solar wind, including the evolution of observed properties that are intimately linked to the solar wind: rotation, magnetism and activity. Given that we cannot access data from the solar wind 4 billion years ago, this review relies on stellar data, in an effort to better place the Sun and the solar wind in a stellar context. I overview some clever detection methods of winds of solar-like stars, and derive from these an observed evolutionary sequence of solar wind mass-loss rates. I then link these observational properties (including, rotation, magnetism and activity) with stellar wind models. I conclude this review then by discussing implications of the evolution of the solar wind on the evolving Earth and other solar system planets. I argue that studying exoplanetary systems could open up new avenues for progress to be made in our understanding of the evolution of the solar wind.

Download/Website: `https://link.springer.com/epdf/10.1007/s41116-021-00029-w`

Contact: `Aline.Vidotto@tcd.ie`

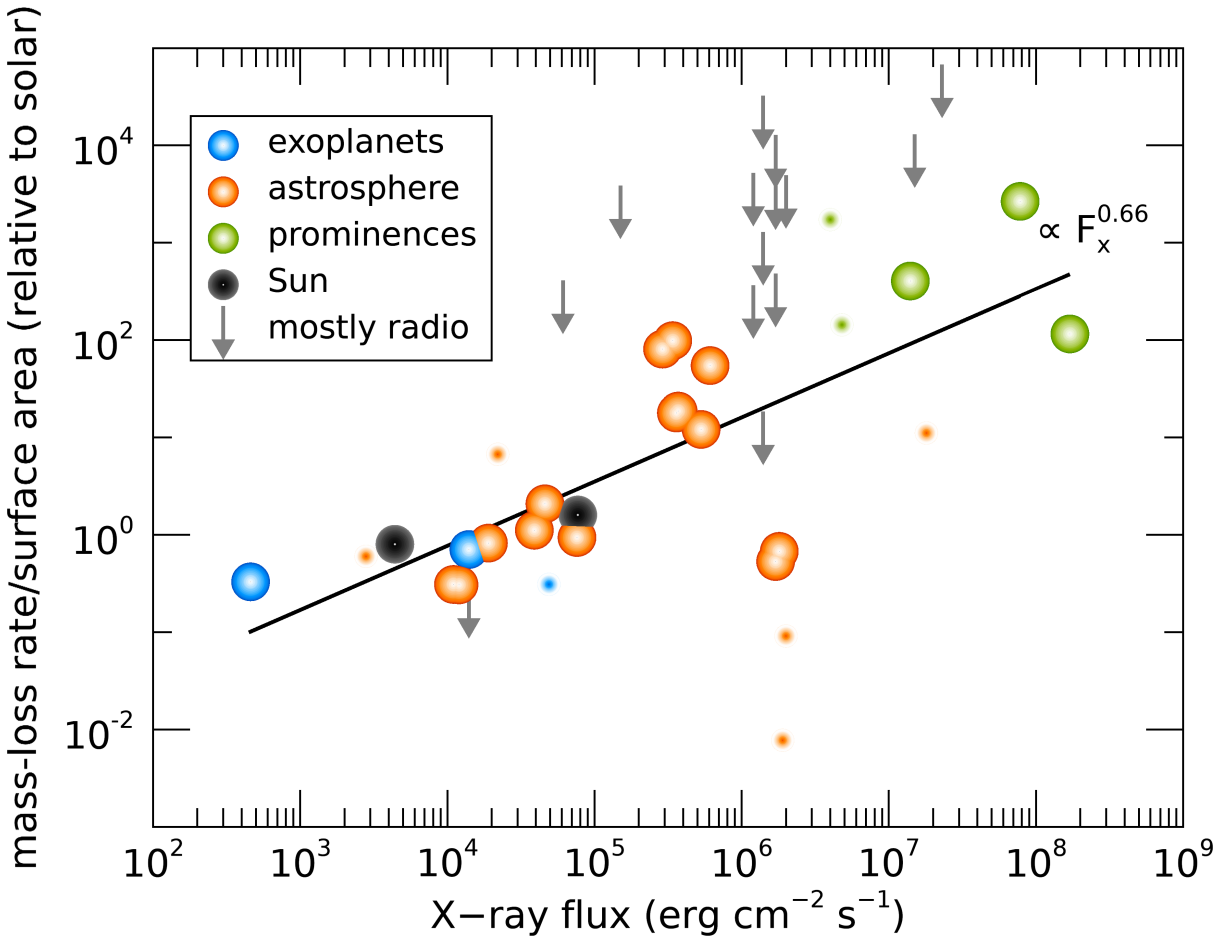


Figure 3: Summary of derived mass-loss rates for low-mass stars combining results from the different methods. The y-axis is given in solar values, i.e., $\dot{M}_\odot/R_\odot^2$, with $\dot{M}_\odot = 2 \times 10^{-14}\ M_\odot/yr$. Colour indicates the method used in the derivation: blue for exoplanets, orange for astrospheres, green for prominences, black for the Sun at minimum/maximum of its sunspot cycle. Grey arrows indicate upper limits, which are mostly derived from radio observations. The solid line is a power-law fit through the larger circles. The smaller symbols are either evolved stars or M dwarfs, which were not included in the fit and neither were the stars for which only upper limits exist (arrows).

Long-term stellar activity variations and their effect on radial-velocity measurements

J. C. Costes[1], *C. A. Watson*[1], *E. de Mooij*[1], *S. H. Saar*[2], *X. Dumusque*[3], *A. Collier Cameron*[4], *D. F. Phillips*[2], *M. N. Günther*[5], *J. S. Jenkins*[6,7], *A. Mortier*[8,9], *A. P. G. Thompson*[1]

[1] Astrophysics Research Centre, School of Mathematics and Physics, Queen's University Belfast, BT7 1NN, Belfast, UK
[2] Center for Astrophysics — Harvard & Smithsonian, 60 Garden Street, Cambridge, MA 02138 USA
[3] Observatoire Astronomique de l'Université de Genéve, 51 Chemin des Maillettes, 1290 Sauverny, Suisse
[4] Centre for Exoplanet Science, SUPA School of Physics and Astronomy, University of St Andrews, North Haugh, St Andrews KY16 9SS, UK
[5] Department of Physics, and Kavli Institute for Astrophysics and Space Research, Massachusetts Institute of Technology, Cambridge, MA 02139, USA
[6] Departamento de Astronomia, Universidad de Chile, Casilla 36-D, Santiago, Chile
[7] Centro de Astrofísica y Tecnologías Afines (CATA), Casilla 36-D, Santiago, Chile
[8] Astrophysics Group, Cavendish Laboratory, University of Cambridge, J.J. Thomson Avenue, Cambridge CB3 0HE, UK
[9] Kavli Institute for Cosmology, University of Cambridge, Madingley Road, Cambridge CB3 0HA, UK

Monthly Notices of the Royal Astronomical Society, in press (arXiv:2105.01915)

Long-term stellar activity variations can affect the detectability of long-period and Earth-analogue extrasolar planets. We have, for 54 stars, analysed the long-term trend of five activity indicators: $\log R'_{\rm HK}$, the cross-correlation function (CCF) bisector span, CCF full-width-at-half-maximum, CCF contrast, and the area of the Gaussian fit to the CCF; and studied their correlation with the RVs. The sign of the correlations appears to vary as a function of stellar spectral type, and the transition in sign signals a noteworthy change in the stellar activity properties where earlier type stars appear more plage dominated. These transitions become more clearly defined when considered as a function of the convective zone depth. Therefore, it is the convective zone depth (which can be altered by stellar metallicity) that appears to be the underlying fundamental parameter driving the observed activity correlations. In addition, for most of the stars, we find that the RVs become increasingly red-shifted as activity levels increase, which can be explained by the increase in the suppression of convective blue-shift. However, we also find a minority of stars where the RVs become increasingly blue-shifted as activity levels increase. Finally, using the correlation found between activity indicators and RVs, we removed RV signals generated by long-term changes in stellar activity. We find that performing simple cleaning of such long-term signals enables improved planet detection at longer orbital periods.

Download/Website: `https://ui.adsabs.harvard.edu/abs/2021arXiv210501915C/abstract`

Contact: `jcostes01@qub.ac.uk`

Grid of Pseudo-2D Chemistry Models for Tidally-Locked Exoplanets. I. The Role of Vertical and Horizontal Mixing

R. Baeyens[1], *L. Decin*[1], *L. Carone*[2], *O. Venot*[3], *M. Agúndez*[4], *P. Mollière*[2]

[1] Institute of Astronomy, KU Leuven, Celestijnenlaan 200D, 3001, Leuven, Belgium
[2] Max-Planck-Institut für Astronomie, Königstuhl 17, 69117 Heidelberg, Germany
[3] Laboratoire Interuniversitaire des Systèmes Atmosphériques (LISA), UMR CNRS 7583, Université Paris-Est Créteil, Université de Paris, Institut Pierre Simon Laplace, Créteil, France
[4] Instituto de Física Fundamental, CSIC, C/ Serrano 123, 28006 Madrid, Spain

Monthly Notices of the Royal Astronomical Society, in press (arXiv:2105.02245)

The atmospheres of synchronously rotating exoplanets are intrinsically three-dimensional, and fast vertical and horizontal winds are expected to mix the atmosphere, driving the chemical composition out of equilibrium. Due to the longer computation times associated with multi-dimensional forward models, horizontal mixing has only been investigated for a few case studies. In this paper, we aim to generalize the impact of horizontal and vertical mixing on the chemistry of exoplanet atmospheres over a large parameter space. We do this by applying a sequence of post-processed forward models for a large grid of synchronously rotating gaseous exoplanets, where we vary the effective temperature (between 400 K and 2600 K), surface gravity, and rotation rate. We find that there is a dichotomy in the horizontal homogeneity of the chemical abundances. Planets with effective temperatures below 1400 K tend to have horizontally homogeneous, vertically quenched chemical compositions, while planets hotter than 1400 K exhibit large compositional day-night differences for molecules such as CH_4. Furthermore, we find that the planet's rotation rate impacts the planetary climate, and thus also the molecular abundances and transmission spectrum. By employing a hierarchical modelling approach, we assess the relative importance of disequilibrium chemistry on the exoplanet transmission spectrum, and conclude that the temperature has the most profound impact. Temperature differences are also the main cause of limb asymmetries, which we estimate could be observable with the *James Webb Space Telescope*. This work highlights the value of applying a consistent modelling setup to a broad parameter space in exploratory theoretical research.

Download/Website: `https://arxiv.org/abs/2105.02245`

Contact: `robin.baeyens@kuleuven.be`

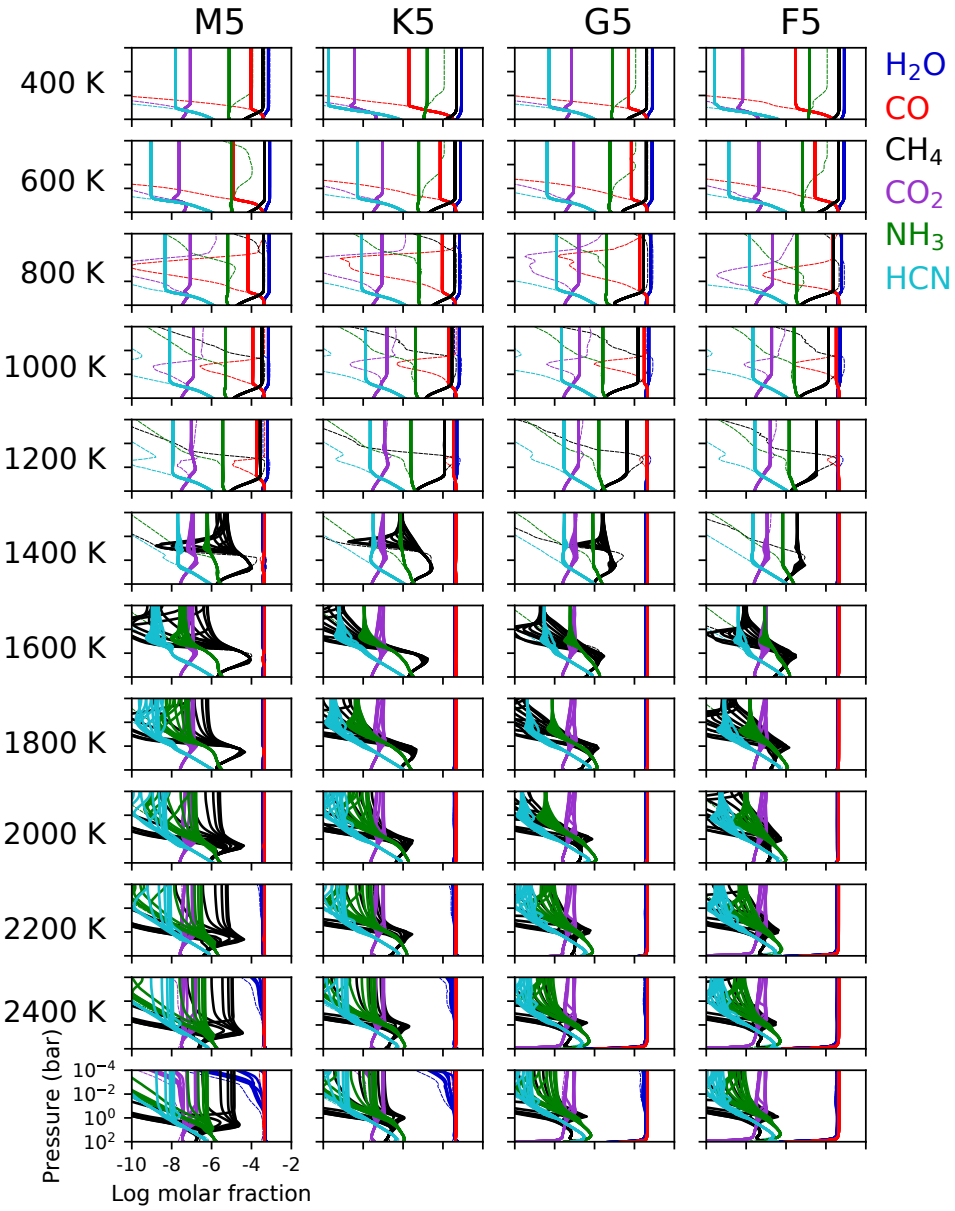


Figure 4: The abundances for the main molecular species, computed with the pseudo-2D chemistry code for $g = 10$ m/s^2, show a dichotomy of the zonal mixing regime. On the one hand, hotter planets (bottom rows) sustain large chemical gradients between the hot day- and the cold night sides, as evidenced by the 12 vertical profiles that are plotted for different longitudes ($-180°$, $-150°$,..., $150°$). Colder planets (top rows), on the other hand, exhibit zonally quenched chemistry profiles, without any day-night variation. In these cases, all longitudinally sampled vertical profiles are plotted on top of each other. The dashed lines denote the chemical equilibrium composition at the substellar point.

3 Jobs and Positions

Lecturer in Astronomy (Stellar/Exoplanetary)

Andrew Norton
School of Physical Sciences, The Open University, Walton Hall, Milton Keynes MK7 6AA, UK

Milton Keynes, UK, Fixed term: 1st September 2021 – 31st August 2023

The School of Physical Sciences at the Open University is seeking a Fixed-Term Lecturer to join the Astronomy Discipline and support its teaching activities.

You will be expected to contribute to the development and delivery of our innovative distance learning programme, particularly in areas of stellar and exoplanetary astronomy. You will also conduct research in stellar or exoplanetary astronomy that aligns with the strategic research areas of the School of Physical Sciences.

The successful candidate will have a PhD in astronomy or a related field, display excellent communication and team working skills, and a strong commitment to teaching astronomy.

More details, how to apply, and other criteria are set out in the Job Description – see link below.

The School provides a friendly and flexible working environment. Our commitment to equality and diversity has been recognised by the award of Juno Champion status by the Institute of Physics and an Athena SWAN Silver Award.

If you would like to discuss this post before making an application, please email Prof. Andrew Norton.

Salary : £41,526 to £49,553
Closing date: **Friday 21 May 2021 noon**

Download/Website: `http://www.open.ac.uk/about/employment/vacancies/lecturer-astronomy-stellar-exoplanetary-18241`

Contact: `andrew.norton@open.ac.uk`

PhD position on magnetic exoplanets

Daniele Viganò

Institute of Space Sciences, Fall 2021 (flexible)

The exoplanets group in the Institute of Space Sciences (Institut de Ciències de l'Espai, ICE), Barcelona, Spain, www.ice.csic.es, invites applications for one PhD position, to start between September and December 2021 (flexible).
The PhD position will fit within the ERC Starting Grant IMAGINE, a new project aimed at considering the imprints of magnetic fields on exoplanets, from observational and theoretical perspectives. The successful candidate will be supervised by Daniele Viganò, PI of the grant. The tasks of the PhD student will include the theoretical and numerical modeling of cooling and magnetic field evolution in giants and rocky planets. A good numerical background and formation on planetary structure and evolution will be positively evaluated. As a part of the PhD program, the successful candidate will also join schools and conferences and visit international groups working in magnetism and exoplanets. Besides the PI, the growing exoplanet group at ICE currently includes, among others, the astronomers Guillem Anglada-Escudé and Ignasi Ribas, and there are active collaborations at ICE with groups working on the related subjects like magnetic fields or stellar formation.

Applicants are required to have a master degree (or an equivalent degree) in the branches of Theoretical Physics, Astrophysics or Geophysics. Students about to complete their master studies will also be considered. Interested candidates should send via email the following:
• CV (maximum 2 pages)
• Academic Certificate of Bachelor and Master Degree
• Two reference providers (name, affiliation, relation with the candidate and e-mail), who will be contacted if the candidate is shortlisted
• Research statement (maximum 1 page)

The contract will last for the entire PhD program, up to 4 years. The contract covers the costs of National Social Security and the gross salary is about 21.700 Euros (*Contrato predoctoral fuera de convenio* in the CSIC salary scheme). Budget for material and attendance to schools, conferences and visits will be granted as well. Given the current situation, substantial remote working and high flexibility will be allowed until at least end of 2021, if requested. Once selected, the ICE administration will assist the candidate, within their possibilities, with the required bureaucratic steps, like title equivalence, work permit and visa application, if applicable.

About the institution: currently, ICE counts over 20 faculty members, about 20 engineers, about 20 post-doc fellows and a dozen of PhD students. The areas of research vary, from engineering applied to several space missions to fundamental physics, from high-energy astronomy to theoretical astrophysics. ICE pertains to the *Consejo Superior de Investigaciones Científicas* (CSIC, the Spanish National Research Council). CSIC is the largest public institution dedicated to research in Spain and the third largest in Europe. ICE is also part of the Catalan Institute of Space Studies (*Institut d'Estudis Espacials de Catalunya*). Our institute is committed to building a culturally diverse community of researchers, dedicated to contributing to an inclusive environment. ICE is located in the campus of the Autonomous University of Barcelona in Bellaterra, just outside Barcelona. The campus is well served by public transportation (railways and buses), and a variety of temporary and long-term accommodation options can be found both in Barcelona city and in the smaller towns close to the campus.

Download/Website: `https://eas.unige.ch/jobs.jsp?type=job&id=1339`

Contact: `vigano@ice.csic.es`

Post-doc position (2+2 years) on magnetic exoplanets

Daniele Viganò

Institute of Space Sciences, Fall 2021 (flexible)

The exoplanets group in the Institute of Space Sciences (Institut de Ciències de l'Espai, ICE), Barcelona, Spain, www.ice.csic.es, invites applications for one post-doctoral position, to start between September and December 2021. The post-doc position will fit within the ERC Starting Grant IMAGINE, a new project aiming at considering the magnetic imprints on exoplanets from observational and theoretical perspectives. The post-doc is expected to contribute, together with the PI Daniele Viganò, to theoretical studies in long-term thermal and magnetic properties of gas and rocky exoplanets, as well as linking observational constraints to theory.

Besides the PI, the growing exoplanet group at ICE currently includes, among others, the astronomers Guillem Anglada-Escudé and Ignasi Ribas, and there are active collaborations at ICE with groups working on the related subjects like magnetic fields or stellar formation.

Applicants with a good track record in the field of internal structure, cooling and evolution of planets will be positively evaluated. The position is preferentially (but not exclusively) oriented to a senior profile (3 years or more of post-doctoral experience), in which case the co-supervision of one PhD student working on the same subject will be offered. Moreover, the successful candidate, if interested to stay longer, will be able to receive support by the institute in applying to national and European calls (Ramon y Cajal, Marie-Curie Fellowships, ERC Grants...).

Interested candidates should send via email the following:
• CV (maximum 4 pages)
• Two reference providers (name, affiliation, relation with the candidate and e-mail), who will be contacted if the candidate is shortlisted
• Research statement (maximum 2 pages)

The 2+2 year contract will cover the costs of National Social Security with a gross salary in the range 37.000-42.000 Euros (*Doctor FC2* or *Doctor FC3* in the CSIC salary scheme), depending on the applicant's experience. Budget for material and attendance to conferences and visits will be granted by the project. Given the current situation, substantial remote working and high flexibility will be allowed until at least end of 2021, if requested. Once selected, the ICE administration will assist the candidate, within their possibilities, with the required bureaucratic steps, like title equivalence, work permit and visa application, if applicable. The expressions of interest will be reviewed after June, 15^{th} 2021. However, later applications may also be considered if the position remains open. Inquiries can be sent to the above e-mail.

About the institution: currently, ICE counts over 20 faculty members, about 20 engineers, about 20 post-doc fellows and a dozen of PhD students. The areas of research vary, from engineering applied to several space missions to fundamental physics, from high-energy astronomy to theoretical astrophysics. ICE pertains to the *Consejo Superior de Investigaciones Científicas* (CSIC, the Spanish National Research Council). CSIC is the largest public institution dedicated to research in Spain and the third largest in Europe. ICE is also part of the Catalan Institute of Space Studies (Institut d'Estudis Espacials de Catalunya). Our institute is committed to building a culturally diverse community of researchers, dedicated to contributing to an inclusive environment. ICE is located in the campus of the Autonomous University of Barcelona in Bellaterra, just outside Barcelona. The campus is well served by public transportation (railways and buses), and a variety of temporary and long-term accommodation options can be found both in Barcelona city and in the smaller towns close to the campus.

Download/Website: `https://eas.unige.ch/jobs.jsp?type=job&id=1339`

Contact: `vigano@ice.csic.es`

4 Announcements

Fizeau exchange visitors program in optical interferometry - call for applications

European Interferometry Initiative

www.european-interferometry.eu, application deadline: May. 15

The Fizeau exchange visitors program in optical interferometry funds (travel and accommodation) visits of researchers to an institute of his/her choice (within the European Community) to perform collaborative work and training on one of the active topics of the European Interferometry Initiative. The visits will typically last for one month, and strengthen the network of astronomers engaged in technical, scientific and training work on optical/infrared interferometry. The program is open for all levels of astronomers (Ph.D. students to tenured staff), with priority given to PhD students and young postdocs.
Non-EU based missions will only be funded if considered essential by the Fizeau Committee.
From January 2021 onwards, applications to travel to VLTI Expertise Centres are priority, given the new financial rules applying to the programme. Applicants are strongly encouraged to seek also partial support from their home or host institutions.

The deadline for applications is May 15 for visits to be carried out between mid July 2021 and December 2021!.

Further informations and application forms can be found at: www.european-interferometry.eu
The program is funded by the OPTICON/RadioNet Pilot Program.

Please distribute this message also to potentially interested colleagues outside of your community!

Looking forward to your applications,

Josef Hron & Péter Ábrahám

(for the European Interferometry Initiative)
Download/Website: `http://www.european-interferometry.eu`
Contact: `fizeau@european-interferometry.eu`

Rocky Worlds II conference at Oxford

T. Lichtenberg, A. Bonsor, V. Parmentier, J. Bryson, O. Shorttle, C. Wilson, J. Birkby, R. Pierrehumbert

10–12 January, 2022, Oxford/UK

The planets that are best understood are the four terrestrial planets of our own solar system. Applying the detailed understanding gleaned from these bodies is crucial in our interpretation of exoplanetary systems. With the ongoing programs to search for planets around nearby stars, as well as upcoming ground- and space-based surveys, we can anticipate huge growth in the number and information on detected rocky exoplanets in the coming decades. As the characterisation of these new planetary systems proceeds it will in turn improve understanding of our own solar system, and in particular of how potentially habitable Earth-like planets may form, evolve, and are distributed throughout the galaxy.

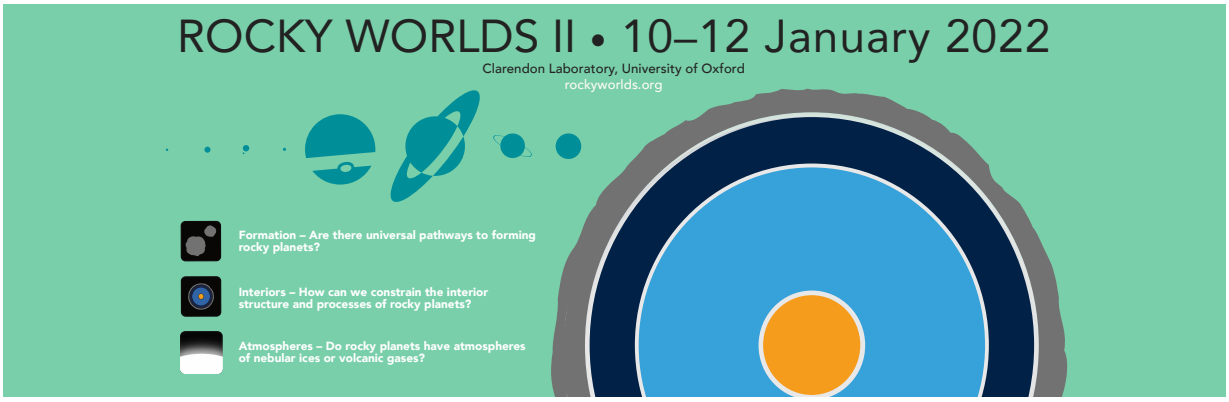
The Rocky Worlds conference series aims to bring together planetary scientists, astronomers, and earth scientists to foster discussion and build the collaborations that will pave the way for the next decade of rocky exoplanet discovery and characterisation.

Confirmed invited speakers:
Nathalie Carrasco (LATMOS), Linda Elkins-Tanton (ASU), Rebecca Fischer (Harvard), Sascha Quanz (ETH Zurich), Elishevah van Kooten (Copenhagen), Allona Vazan (OU Israel)

Registration deadline: September 30, 2021

Download/Website: `https://www.rockyworlds.org`

Contact: `info@rockyworlds.org`



ERS PRE-LAUNCH DATA HACKATHON + THEORY WEBBINAR

Zach Berta-Thompson, Mike Line, Mercedes Lopez-Morales

Virtual conference/hackathon, 21 - 25 June, 2021

The JWST Transiting Exoplanet Community Early Release Science (ERS) team is hosting two summer 2021 activities related to exoplanet science with the Webb Telescope: the ERS Pre-launch Data Hackathon (21-25 June 2021) and the ERS Theory Webbinar (weekly starting 1 July 2021).
The key goals of these events are to teach the tools and concepts needed to make the most from JWST exoplanet observations, to inspire the development of new and better analyses in advance of JWST's launch, and to provide an inclusive space where scientists can work together in preparing for the revolution in exoplanet science that JWST will provide. While broadly focused on the Early Release Science (ERS) datasets, these events are open to the broader exoplanet community, and we encourage all those interested in participating to register. All levels of expertise are welcome, from the novice student to the expert exoplaneteer!
Details and registration can be found at ers-transit.github.io. Registration is due by 21 May 2021 for the ERS Prelaunch Hackathon and suggested by 1 July 2021 for the ERS Theory Webbinar.

Download/Website: `http://ers-transit.github.io/`

Contact: `Zachory.BertaThompson@colorado.edu`

Lorentz Workshop - Planet-forming Disks: From Surveys to Answers

Giovanni Rosotti[1], *Feng Long*[2], *Alessandro Morbidelli*[3], *Paola Pinilla*[4,5], *Carsten Dominik*[6]
[1] University of Leicester, UK
[2] Harvard-Smithsonian Center for Astrophysics, USA
[3] CNRS, France
[4] MPIA, Germany
[5] MSSL/UCL, UK
[6] Univeristy of Amsterdam, NL

ONLINE, 13 - 17 September 2021

Today more than 4000 exoplanets have been discovered with a large range of properties and placed in a surprising variety of planetary system architectures. A new frontier of research in this field is to observe newborn exoplanets inside protoplanetary discs. A common denominator of recent high angular resolution images from powerful instruments like ALMA and SPHERE is that protoplanetary discs are not smooth, but show structures like gaps, rings and spirals. The most tantalizing possibility is that these structures are the signature of unseen planets, which would be the youngest ever found (from 105 yr to 3 Myr old) compared to the mature exoplanets discovered with missions like Kepler (Gyr old).

If the observed structures in discs are due to planets, it means that planet formation is already well underway in these discs and that planets form much quicker than previously thought. The crucial, still unanswered question emerging is: where are these planets coming from? In recent years the field has been blessed with a wealth of observational data. The main idea of this workshop is to discuss the results of recent observations, in particular of three large programs (two from ALMA, DSHARP and MAPS, and one from SPHERE, DESTINYS). Now that most of the results of these programs are available, it is a crucial moment to discuss what is the next step for the field, both from theory and observations. We aim to bring to this workshop experts in the field, with a large diversity of observers and theorists, including those working on planet formation mechanisms. The connection between them and disc experts is currently underdeveloped and we aim to strengthen it to understand what are the next steps to understand the new paradigms of planet formation.

Download/Website: `www.lorentzcenter.nl/planet-forming-disks-from-surveys-to-answers.html`

Contact: `krebbers@lorentzcenter.nl`

2021 Sagan Summer Virtual Workshop: Circumstellar Disks and Young Planets

D. Gelino, E. Furlan
NASA Exoplanet Science Institute, California Institute of Technology, Pasadena, CA, USA

Online Workshop, July 19-23, 2021

Free registration for the 2021 Sagan Summer Workshop is available on the workshop website.

The 2021 Sagan Summer Workshop will focus on young planets and the circumstellar disks from which they form during the first few million years of a star's lifetime. The workshop will address how transformational new datasets are allowing us to address key questions about the formation and evolution of planets and their potential habitability. The preliminary agenda is available on the workshop website.

The workshop will be held via Zoom webinar and Slack will be used to facilitate discussion before, during, and after the workshop. The workshop will consist of live and pre-recorded talks, live discussions, hands-on sessions, contributed online posters and poster sessions, and virtual 'lunches with speakers'. As in previous years, all talks will be recorded and posted on the Sagan Summer Workshop YouTube channel.

The Sagan Summer Workshops are aimed at advanced undergraduates, grad students, and postdocs, however all are welcome to attend. Please visit the workshop website to register and for more information.

Download/Website: `http://nexsci.caltech.edu/workshop/2021`
Contact: `sagan_workshop@ipac.caltech.edu`

5 Exoplanet Archives

April Updates at the NASA Exoplanet Archive

The NASA Exoplanet Archive team
Caltech/IPAC-NASA Exoplanet Science Institute, MC 100-22 Pasadena CA 91125

Pasadena CA USA, May 11, 2021

Note: Unless otherwise noted, all planetary and stellar data mentioned in the news are in the Planetary Systems Table (`http://bit.ly/2Pt0tM1`), which provides a single location for all self-consistent planetary solutions, and its companion table the Planetary Systems Composite Parameters (`https://bit.ly/2Fer9NU`), which offers a more complete table of parameters combined from multiple references and calculations. Data can also be found in the Microlensing Planets Table (`https://bit.ly/3urUyZU`) or Direct Imaging Planets Table (`http://bit.ly/3ayD185`).

April 29, 2021

Archive 2.0 Has Landed

The Exoplanet Archive is excited to announce the Planetary Systems (PS) (`http://bit.ly/2Pt0tM1`) and the Planetary Systems Composite Parameters (PSCompPars) (`https://bit.ly/2Fer9NU`) tables are now the official archive tables. The Confirmed Planets, Extended Planet Data, and Composite Parameters tables have been retired and are no longer updated.

All of our services have been updated to interact with the PS and PSCompPars tables, including our new VO-compliant Table Access Protocol (TAP) service (`https://bit.ly/2Tajkgk`), which offers a new optional json output in addition to votable, csv, and tsv outputs. We've also connected the Emission Spectroscopy (`http://bit.ly/2vOLcem`) and Transmission Spectroscopy (`http://bit.ly/2B54JfR`) tables to the TAP service, as well as the Kepler Names (`https://bit.ly/3b9nwGd`) and K2 Names (`https://bit.ly/3b4Y5FW`) tables.

If you had API queries connected to the retired tables, they must be replaced with new TAP queries that point to the PS or PSCompPars table. Please note the database column names have also changed. See the TAP User Guide (`https://bit.ly/2Tajkgk`) for instructions on constructing new queries, as well as this document (`https://bit.ly/33q9viY`), which maps the columns names of the retired tables to the new PS tables.

The Microlensing Planets Table (`https://bit.ly/3urUyZU`) has also been redesigned and re-named (old: microlensing; new: ML), so existing API queries must be updated. Please note, this table is still connected to the original API service, but will be migrated to TAP at a future date. To update existing queries, read the API User Guide (`http://bit.ly/2JG8Xy0`) and consult this column mapping document (`https://bit.ly/33mS2Iw`).

Redesigned System Overviews

The multiple overview pages for confirmed planets, planetary candidates, and other objects have been consolidated into redesigned System Overview pages, which are now displayed by default from the Explore the Archive search on the home page. They're also linked to the Planet Name in the Planetary Systems tables.

For more information about the changes to the archive's tools and services, please see Developing a More Integrated Exoplanet Archive (https://bit.ly/3jLgrhl) and the Archive 2.0 Release Notes (https://bit.ly/3rVQPTx).

Let us know how you're enjoying our new services——and what could be better. You can send us feedback through the Helpdesk, follow the archive on social media, or subscribe to our email list to stay informed. See our Connect page (http://bit.ly/2uP9N1b) for links.

But Wait, There's More...Planets!

We also have eight new planets this week from the published literature: NGTS-15 b, NGTS-16 b, NGTS-17 b, NGTS-18 b, LHS 1478 b, TOI-257 b, and HD 5278 b & c.

April 26, 2021

Archive 2.0 Is Almost Here!

The final update to the Archive 2.0 transition is happening later this week.

We've been working hard for the past two years to bring you a more integrated user experience, with new data tables to replace three retiring tables, new system overviews, and a new Table Access Protocol (TAP) service, and other enhancements. The final update will be unveiled later this week, so stay tuned. (And yes, we'll also have new planets.)

If you're just joining us or need a refresher on what we've been up to, here you go: Developing a More Integrated NASA Exoplanet Archive (https://bit.ly/3jLgrhl) and the Archive 2.0 Release Notes (https://bit.ly/3rVQPTx).

April 1, 2021

No Fooling—Eight New Planets Added!

No April Fool's Day jokes here. Our very serious science data archive has added eight confirmed planets and new microlensing data this week.

The new planets are: GJ 740 b, GJ 1151 b, HD 60292 b, HD 112640 b, TOI-201 b, TOI-519 b, OGLE-2018-BLG-1428L b, and OGLE-2017-BLG-1049L b.

Download/Website: https://exoplanetarchive.ipac.caltech.edu

Contact: mharbut@caltech.edu

6 As seen on Exoplanet-talks.org

Download/Website: `http://exoplanet-talks.org`
Contact: `info@exoplanet-talks.org`

Instruction video: http://exoplanet-talks.org/talk/164

On the Correlation between Hot Jupiters and Stellar Clustering by *Laetitia Rodet* – talk/357
Characterizing weather in exoplanet atmospheres with JWST by *Thaddeus Komacek* – talk/356
Using polluted white dwarfs to understand the bulk composition of exo-planetary material by *Laura Rogers* – talk/355
SPECULOOS - A catalogue of low-mass stars to hunt for transiting exoplanets by *Daniel Sebastian* – talk/352
Automated Vetting and Validation Pipeline for TESS by *Andreas Hadjigeorghiou* – talk/351

7 As seen on astro-ph

astro-ph/2104.00264: **EXOPLINES: Molecular Absorption Cross-Section Database for Brown Dwarf and Giant Exoplanet Atmospheres** by *Ehsan Gharib-Nezhad et al.*

astro-ph/2104.00293: **KMT-2019-BLG-1715: planetary microlensing event with three lens masses and two source stars** by *Cheongho Han et al.*

astro-ph/2104.00345: **Generalization of a method by Mossotti for initial orbit determination** by *Giovanni F. Gronchi et al.*

astro-ph/2104.00496: **Machine Learning Applications to Kronian Magnetospheric Reconnection Classification** by *Tadhg M. Garton et al.*

astro-ph/2104.00497: **Dynamical structures of retrograde resonances: analytical and numerical studies** by *Hanlun Lei, Jian Li*

astro-ph/2104.00503: **The roles of latent heating and dust in the structure and variability of the northern Martian polar vortex** by *E. R. Ball et al.*

astro-ph/2104.01004: **Magnetic and tidal migration of close-in planets. Influence of secular evolution on their population** by *Jérémy Ahuir et al.*

astro-ph/2104.01035: **A molecular wind blows out of the Kuiper belt** by *Quentin Kral et al.*

astro-ph/2104.01091: **TRAPPIST Habitable Atmosphere Intercomparison (THAI) workshop report** by *Thomas J. Fauchez et al.*

astro-ph/2104.01224: **High pCO2 reduces sensitivity to CO2 perturbations on temperate, Earth-like planets throughout most of habitable zone** by *R.J. Graham*

astro-ph/2104.01240: **Long-Term Orbit Dynamics of Decommissioned Geostationary Satellites** by *Simone Proietti et al.*

astro-ph/2104.01425: **Efficiency of the oxygenic photosynthesis on Earth-like planets in the habitable zone** by *Giovanni Covone et al.*

astro-ph/2104.01668: **The active centaur 2020 MK4** by *C. de la Fuente Marcos et al.*

astro-ph/2104.01683: **Of Aliens and Exoplanets: Why the search for life, probably, requires the search for water** by *Darius Modirrousta-Galian, Giovanni Maddalena*

astro-ph/2104.01873: **ARES V: No Evidence For Molecular Absorption in the HST WFC3 Spectrum of GJ 1132 b** by *Lorenzo V. Mugnai et al.*

astro-ph/2104.01913: **A Method for Accurate and Efficient Propagation of Satellite Orbits: A Case Study for a Molniya Orbit** by *Roberto Flores, Burhani Makame Burhani, Elena Fantino*

astro-ph/2104.01970: **Warm Jupiters in TESS Full-Frame Images: A Catalog and Observed Eccentricity Distribution for Year 1** by *Jiayin Dong et al.*

astro-ph/2104.02072: **Constraining planetesimal stirring: how sharp are debris disc edges?** by *Sebastian Marino*

astro-ph/2104.02079: **Wide-orbit exoplanets are common. Analysis of nearly 20 years of OGLE microlensing survey data** by *R. Poleski et al.*

astro-ph/2104.02088: **A detailed characterization of HR 8799's debris disk with ALMA in Band 7** by *Virginie Faramaz et al.*

astro-ph/2104.02157: **OGLE-2018-BLG-1185b : A Low-Mass Microlensing Planet Orbiting a Low-Mass Dwarf** by *Iona Kondo et al.*

astro-ph/2104.02179: **Significant improvement in planetary system simulations from statistical averaging** by *David M. Hernandez et al.*

astro-ph/2104.02355: **A long term study of Mars mesospheric clouds seen at twilight based on Mars Express VMC images** by *J. Hernandez-Bernal et al.*

astro-ph/2104.02435: **Bennu's global surface and two candidate sample sites characterized by spectral clustering of OSIRIS-REx multispectral images** by *J. L. Rizos et al.*

astro-ph/2104.02664: **Building the Galilean moons system via pebble accretion and migration: A primordial resonant chain** by *Gustavo Madeira, André Izidoro, Silvia M. Giuliatti Winter*

astro-ph/2104.02702: **Earth's carbon deficit caused by early loss through irreversible sublimation** by *Jie Li et al.*

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astro-ph/2104.02909: **Thermophysical model for realistic surface layers on airless small bodies: applied to study the spin orientation and surface dust properties of (24) Themis from WISE/NEOWISE multi-epoch thermal lightcurves** by *Liang-Liang Yu, Wing-Huen Ip*

astro-ph/2104.02991: **Quantifying the Classification of Exoplanets: in Search for the Right Habitability Metric** by *Margarita Safonova et al.*

astro-ph/2104.03022: **On dust evolution in planet-forming discs in binary systems. I – Theoretical and numerical modelling: radial drift is faster in binary discs** by *Francesco Zagaria, Giovanni P. Rosotti, Giuseppe Lodato*

astro-ph/2104.03119: **Mars' formation can constrain the primordial orbits of the gas giants** by *Jason Man Yin Woo et al.*

astro-ph/2104.03128: **Inside-Out Planet Formation: VI. Oligarchic Coagulation of Planetesimals from a Pebble Ring?** by *Maxwell X. Cai, Jonathan C. Tan, Simon Portegies Zwart*

astro-ph/2104.03159: **A transit timing variation observed for the long-period extremely low density exoplanet HIP 41378f** by *Edward M. Bryant et al.*

astro-ph/2104.03210: **Leveraging the ALMA Atacama Compact Array for Cometary Science: An Interferometric Survey of Comet C/2015 ER61 (PanSTARRS) and Evidence for a Distributed Source of Carbon Monosulfide** by *Nathan X. Roth et al.*

astro-ph/2104.03352: **Five carbon- and nitrogen-bearing species in a hot giant planet's atmosphere** by *Paolo Giacobbe et al.*

astro-ph/2104.03400: **Testing photoevaporation and MHD disk wind models through future high-angular resolution radio observations: the case of TW Hydrae** by *Luca Ricci et al.*

astro-ph/2104.03451: **Calibration and validation of the lunar exploration neutron detector (LEND) observations for the study of the moon volatiles** by *J.J. Su et al.*

astro-ph/2104.03559: **The EOS/Resolution Conspiracy: Convergence in Proto-Planetary Collision Simulations** by *Thomas Meier, Christian Reinhardt, Joachim Stadel*

astro-ph/2104.03769: **Observational signatures of eccentric Jupiters inside gas cavities in protoplanetary discs** by *Clément Baruteau et al.*

astro-ph/2104.03796: **Extending a grid of hydrodynamic planetary upper atmosphere models** by *Daria Kubyshkina, Luca Fossati*

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astro-ph/2104.04101: **ACCESS: An optical transmission spectrum of the high-gravity, hot Jupiter HAT-P-23b** by *Ian C. Weaver et al.*

astro-ph/2104.04271: **The rarity of very red TNOs in the scattered disk** by *Mohamad Ali-Dib et al.*

astro-ph/2104.04296: **Catalogue of exoplanets accessible in reflected starlight to the Nancy Grace Roman Space Telescope. A population study and prospects for phase-curve measurements** by *Óscar Carrión-González et al.*

astro-ph/2104.04777: **Two-body model for the spatial distribution of dust ejected from an atmosphereless body** by *Anastasiia Ershova, Jürgen Schmidt*

astro-ph/2104.04887: **A Stellar Activity F-statistic for Exoplanet Surveys (SAFE)** by *Parker H. Holzer et al.*

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astro-ph/2104.05653: **Hot planets around cool stars – two short-period mini-Neptunes transiting the late K-dwarf TOI-1260** by *I. Y. Georgieva et al.*

astro-ph/2104.05713: **No Sub-Saturn Mass Planet Desert in the CORALIE/HARPS Radial Velocity Sample** by *David P. Bennett, Clément Ranc, Rachel B. Fernandes*

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astro-ph/2104.07790: **Primary Velocity and Orbital Phase Effects on Planetary Detectability from Small Epoch Number Data Sets** by *Cam Buzard et al.*

astro-ph/2104.07821: **Investigating the Relative Gas and Small Dust Grain Surface Heights in Protoplanetary Disks** by *Evan A. Rich et al.*

astro-ph/2104.07864: **An Empirical Bayesian Approach to Limb-darkening in Modeling WASP-121b Transit Light Curves** by *Fan Yang et al.*

astro-ph/2104.07906: **Shortest Microlensing Event with a Bound Planet: KMT-2016-BLG-2605** by *Yoon-Hyun Ryu et al.*

astro-ph/2104.07909: **Effect of ice sheet thickness on formation of the Hiawatha impact crater** by *Elizabeth A. Silber et al.*

astro-ph/2104.08217: **Collisional Evolution of the Inner Zodiacal Cloud** by *J. R. Szalay et al.*

astro-ph/2104.08285: **Discovery of a directly imaged planet to the young solar analog YSES 2** by *Alexander J. Bohn et al.*

astro-ph/2104.08306: **Searching for Extragalactic Exoplanetary Systems: the Curious Case of BD+20 2457** by *Helio D. Perottoni et al.*

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astro-ph/2104.08360: **Composition of Terrestrial Exoplanet Atmospheres from Meteorite Outgassing Experiments** by *Maggie A. Thompson et al.*

astro-ph/2104.08379: **A dusty filament and turbulent CO spirals in HD135344B - SAO206462** by *Simon Casassus et al.*

astro-ph/2104.08832: **Evidence of energy-, recombination-, and photon-limited escape regimes in giant planet H/He atmospheres** by *M. Lampón et al.*

astro-ph/2104.08906: **A major asymmetric ice trap in a planet-forming disk: I. Formaldehyde and methanol** by *N. van der Marel et al.*

astro-ph/2104.08908: **A major asymmetric ice trap in a planet-forming disk: II. prominent SO and SO2 pointing to C/O ¡ 1** by *A.S. Booth et al.*

astro-ph/2104.08979: **Phase curve pollution of exoplanet transmission spectra** by *G. Morello et al.*

astro-ph/2104.09285: **Recovery of Spectra of Phosphine in Venus' Clouds** by *Jane S. Greaves et al.*

astro-ph/2104.09530: **A dynamical measurement of the disk mass in Elias 2-27** by *Benedetta Veronesi et al.*

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astro-ph/2104.10264: **The Atacama Cosmology Telescope: A search for Planet 9** by *Sigurd Naess et al.*

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astro-ph/2104.10612: **The effect of core formation on surface composition and planetary habitability** by *Brendan Dyck, Jon Wade, Richard Palin*

astro-ph/2104.10643: **Minimal Data Fidelity for Detection of Stellar Features or Companions** by *Sahil Agarwal, John S. Wettlaufer*

astro-ph/2104.10688: **HST PanCET Program: A Complete Near-UV to Infrared Transmission Spectrum for the Hot Jupiter WASP-79b** by *Alexander D. Rathcke et al.*

astro-ph/2104.10704: **Rapid Formation of Jupiter and Wide-Orbit Exoplanets in Disks with Pressure Bumps** by *John Chambers*

astro-ph/2104.10787: **Restoration of the Parameters of a Gas-Dust Disk Based on Its Synthetic Images** by *A. M. Skliarevskii, Ya. N. Pavlyuchenkov, E. I. Vorobyov*

astro-ph/2104.10854: **ExoMol molecular line lists – XLII: Rovibronic molecular line list for the low-lying states of NO** by *Qianwei Qu, Sergei N. Yurchenko, Jonathan Tennyson*

astro-ph/2104.10924: **Identification of a new spectral signature at 3 m over Martian northern high latitudes: implications for surface composition** by *Aurélien Stcherbinine et al.*

astro-ph/2104.10950: **Observational constraints to the dynamics of dust particles in the coma of comet 67P/Churyumov-Gerasimenko** by *Elisa Frattin et al.*

astro-ph/2104.11246: **Dynamical avenues for Mercury's origin I: The lone survivor of a primordial generation of short-period proto-planets** by *Matthew S. Clement, John E. Chambers, Alan P. Jackson*

astro-ph/2104.11251: **Direct imaging and spectroscopy of exoplanets with the ELT/HARMONI high-contrast module** by *Mathis Houllé et al.*

astro-ph/2104.11252: **Dynamical avenues for Mercury's origin II: in-situ formation in the inner terrestrial disk** by *Matthew S. Clement, John E. Chambers*

astro-ph/2104.11611: **Inclination-type resonance in two-planet systems** by *Sotiris Sotiriadis, Anne-Sophie Libert*

astro-ph/2104.11628: **Formation of Earth-sized planets within the Kepler-1647 System Habitable Zone** by *G. O. Barbosa et al.*

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astro-ph/2104.11750: **The New Generation Planetary Population Synthesis (NGPPS). V. Predetermination of planet types in global core accretion models** by *M. Schlecker et al.*

astro-ph/2104.11961: **Turbulence in the Magnetospheres of the Outer Planets** by *Joachim Saur*

astro-ph/2104.12033: **Morphological Comparison of Blocks in Chaos Terrains on Pluto, Europa, and Mars** by *Helle L. Skjetne et al.*

astro-ph/2104.12078: **TOI-1431b/MASCARA-5b: A Highly Irradiated Ultra-Hot Jupiter Orbiting One of the Hottest Brightest Known Exoplanet Host Stars** by *Brett Christopher Addison et al.*

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