ExoPlanet News
An Electronic Newsletter

No. 190, 8 April 2025

Editors: D. Angerhausen, H. Wang, J. Davoult, L. Schlarmann, & T.-E. Riesen
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Contents

1 Editorial

Welcome to Edition 190 of ExoPlanet News!

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

For next month, we look forward to continuing receiving your submissions of paper abstracts, job ads, or meeting announcements. Special announcements are also welcome. As always, we would also be happy to receive feedback concerning the newsletter. The LaTeX template (v2.0) for submitting contributions, as well as all previous editions of ExoPlanet News, can be found on the ExoPlanet News webpage (`https://nccr-planets.ch/exoplanetnews/`).

The next issue will appear on Tuesday, May 11th (with a submission deadline ending on Sun May 13th, 2025 CEST).

Thanks again for your support, and best wishes from the editorial team.

Daniel Angerhausen
Haiyang Wang
Jeanne Davoult
Leander Schlarmann
Timm-Emanuel Riesen

2 Abstracts of refereed papers

Identification of a Turnover in the Initial Mass Function of a Young Stellar Cluster Down to 0.5 M_J

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Astrophysical Journal Letters, published (doi:10.3847/2041-8213/adb96a, arXiv:2409.04624)

A successful theory of star formation should predict the number of objects as a function of their mass produced through star-forming events. Previous studies in star-forming regions and the solar neighborhood identify a mass function increasing from the hydrogen-burning limit down to about 10 M_J. Theory predicts a limit to the fragmentation process, providing a natural turnover in the mass function down to the opacity limit of turbulent fragmentation thought to be near 1-10 M_J. Programs to date have not been sensitive enough to probe the hypothesized opacity limit of fragmentation. We present the first identification of a turnover in the initial mass function below 12 M_J within NGC 2024, a young star-forming region. With JWST/NIRCam deep exposures across 0.7-5 μm, we identified several free floating objects down to roughly 3 M_J with sensitivity to 0.5 M_J. We present evidence for a double power law model increasing from about 60 M_J to roughly 12 M_J, consistent with previous studies, followed by a decrease down to 0.5 M_J. Our results support the predictions of star and brown dwarf formation theory, identifying the theoretical turnover in the mass function and suggest the fundamental limit of turbulent fragmentation near 3 M_J.

Download/Website: `https://iopscience.iop.org/article/10.3847/2041-8213/adb96a`

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Figure 1: Press release color image of NGC 2024. Filters F115W and F140M are blue, F182M is green, F360M is orange, and F430M is red. This shows one of the two NIRCam modules we explored to identify free floating planetary mass objects, shown with white circles in the frame and pullouts on the right. We find objects down to $\sim$ 3 M_J and define the mass function as an increasing power law from the hydrogren burning limit down to $\sim$ 12 M_J followed by a decreasing power law down to our sensitivity limit, 0.5 M_J. Credit: Alyssa Pagan, STScI.

High-contrast spectroscopy with the new VLT/ERIS instrument Molecular maps and radial velocity of the gas giant AF Lep b

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Astronomy & Astrophysics, in press (arXiv:2502.19961)

The Enhanced Resolution Imager and Spectrograph (ERIS) is the new Adaptive-Optics (AO) assisted Infrared instrument at the Very Large Telescope (VLT). Its refurbished Integral Field Spectrograph (IFS) SPIFFIER leverages a new AO module, enabling high-contrast imaging applications and giving access to the orbital and atmospheric characterisation of super-Jovian exoplanets. We test the detection limits of ERIS and demonstrate its scientific potential by exploring the atmospheric composition of the young super-Jovian AF Lep b and improving its orbital solution by measuring its radial velocity relative to its host star. We present new spectroscopic observations of AF Lep b in K-band at $R \sim 11000$ obtained with ERIS/SPIFFIER at the VLT. We reduce the data using the standard pipeline together with a custom wavelength calibration routine, and remove the stellar point spread function using principal component analysis along the spectral axis. We compute molecular maps by cross-correlating the residuals with molecular spectral templates and measure the radial velocity of the planet relative to the star. Furthermore, we compute contrast grids for molecular mapping by injecting fake planets. We detect a strong signal from H_2O and CO but not from CH_4 or CO_2. This result corroborates the hypothesis of chemical disequilibrium in the atmosphere of AF Lep b. Our measurement of the RV of the planet yields $\Delta v_{\mathrm{R,P}\star} = 7.8 \pm 1.7\mathrm{kms}^{-1}$. This enables us to disentangle the degeneracy of the orbital solution, namely the correct longitude of the ascending node is $\Omega = 248^{+0.4}_{-0.7}$ deg and the argument of periapsis is $\omega = 109^{+13}_{-21}$ deg. Our detection limits reach a contrast of $\Delta K = 11.5$ mag at 0.12" for the spectral templates of H_2O and CO, significantly extending the parameter space available to moderately high spectral resolution towards small angular separation. Our results demonstrate the competitiveness of the new ERIS/SPIFFIER instrument for the orbital and atmospheric characterisation of exoplanets at high contrast and small angular separation.

Download/Website: `https://arxiv.org/abs/2502.19961`

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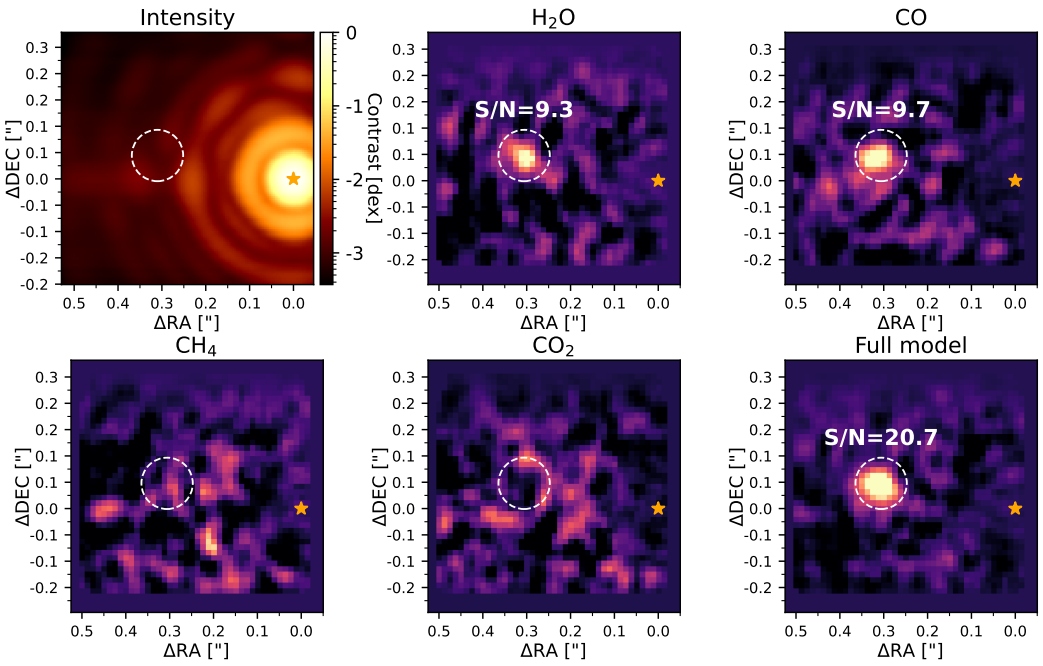

Figure 2: PSF intensity (*top left*) and molecular maps of the AF Lep system. The planet AF Lep b is revealed in the H_2O and CO maps, as well as with the full model from Balmer et al. 2025, but not in the CH_4 and CO_2 maps. The orange star indicates the position of the star, while the white dashed circle—whose radius is equal to $1\,\lambda/D$—indicates the position of the planet.

Searching for hot water world candidates with CHEOPS: Refining the radii and analysing the internal structures and atmospheric lifetimes of TOI-238 b and TOI-1685 b

J. A. Egger [1], D. Kubyshkina [1,2], Y. Alibert [3,1], H. P. Osborn [3,4], A. Bonfanti [2], T. G. Wilson [5], A. Brandeker [6], M. N. Günther [7], M. Lendl [8], D. Kitzmann [1,3], L. Fossati [2], C. Mordasini [1,3], S. G. Sousa [9], V. Adibekyan [9], M. Fridlund [10,11], C. Pezzotti [12], D. Gandolfi [13], S. Ulmer-Moll [8,1,12], et al. (a complete list of authors can be found on the publication)

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Astronomy & Astrophysics, published (2025A&A...696A..28E)

Studying the composition of exoplanets is one of the most promising approaches to observationally constrain planet formation and evolution processes. However, this endeavour is complicated for small exoplanets by the fact that a wide range of compositions are compatible with their observed bulk properties. To overcome this issue, we identify triangular regions in the mass-radius space where part of this intrinsic degeneracy is lifted for close-in planets, since low-mass H/He envelopes would not be stable due to high-energy stellar irradiation. Planets in these Hot Water World triangles need to contain at least some heavier volatiles and are therefore interesting targets for atmospheric follow-up observations. We perform a demographic study to show that only few well-characterised planets in these regions are currently known and introduce our CHEOPS GTO programme aimed at identifying more of these potential hot water worlds. Here, we present CHEOPS observations for the first two targets of our programme, TOI-238 b and TOI-1685 b. Combined with TESS photometry and published RVs, we use the precise radii and masses of both planets to study their location relative to the corresponding Hot Water World triangles, perform an interior structure analysis, and study the possible lifetimes of H/He and water-dominated atmospheres under these conditions. We find that TOI-238 b lies, at the 1σ level, inside the corresponding triangle. While a pure H/He atmosphere would have evaporated after 0.4-1.3 Myr, it is likely that a water-dominated atmosphere would have survived until the current age of the system, which makes TOI-238 b a promising candidate for a hot water world. Conversely, TOI-1685 b lies below the mass-radius model for a pure silicate planet, meaning that even though a water-dominated atmosphere would be compatible both with our internal structure and evaporation analysis, we cannot rule out the planet being a bare core.

Download/Website: `https://www.aanda.org/articles/aa/abs/2025/04/aa53325-24/aa53325-24.html`

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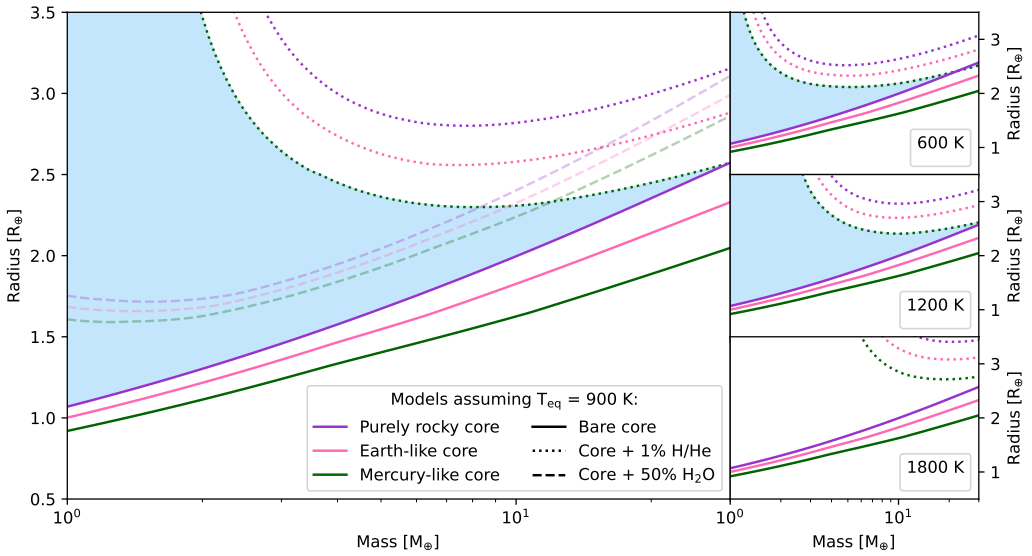

Figure 3: Definition of the Hot Water World triangles (light blue) in the mass–radius space. The left panel shows mass-radius models generated using the BICEPS forward model (Haldemann et al. 2024), for a fixed equilibrium temperature of 900 K. We generated models for three different core compositions, an iron-less, purely rocky core (in purple), an Earth-like core (33% inner iron core, 67% silicate mantle, in pink), and a Mercury-like core (70% inner iron core, 30% silicate mantle, in green). For each of these core compositions, we then show three different mass-radius relations, one assuming a bare core (solid lines), one with a 1% H/He envelope (dotted lines), and one with a 50% steam atmosphere (dashed lines). The three panels on the right show the temperature dependence of the Hot Water World triangles, with the same mass-radius relations as before now generated for different equilibrium temperatures of 600 K (top), 1200 K (middle), and 1800 K (bottom). See text for further details.

Cosmic ray ionisation of a post-impact early Earth atmosphere

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Astronomy & Astrophysics, in press (arXiv:2504.02596)

Context. Cosmic rays, both solar and Galactic, have an ionising effect on the Earth's atmosphere and are thought to be important in the production of prebiotic molecules. In particular, the H_2-dominated atmosphere that follows an ocean-vaporising impact is considered favourable to prebiotic molecule formation. As a first step in determining the role that cosmic rays might have played in the origin of life we need to understand the significance of their ionising effect.
Aims. We model the transport of solar and Galactic cosmic rays through a post-impact early Earth atmosphere at 200 Myr. We aim to identify the differences in the resulting ionisation rates - particularly at the Earth's surface during a period when the Sun was very active.
Methods. We use a Monte Carlo model for describing cosmic ray transport through the early Earth atmosphere, giving the cosmic ray spectra as a function of atmospheric height. Using these spectra we calculate the ionisation and ion-pair production rates as a function of height due to Galactic and solar cosmic rays. The Galactic and solar cosmic ray spectra are both affected by the Sun's rotation rate, Ω, because the solar wind velocity and magnetic field strength both depend on Ω and influence cosmic ray transport. We consider a range of input spectra resulting from the range of possible rotation rates of the young Sun - from $3.5 - 15\,\Omega_\odot$. To account for the possibility that the Galactic cosmic ray spectrum outside the Solar System is not constant over Gyr timescales, we compare the ionisation rate at the top of the Earth's atmosphere resulting from two different scenarios. We also consider the suppression of the cosmic ray spectra by a planetary magnetic field.
Results. We find that the ionisation and ion-pair production rates due to cosmic rays are dominated by solar cosmic rays in the early Earth atmosphere for most cases. The corresponding ionisation rate at the surface of the early Earth ranges from $5 \times 10^{-21}\mathrm{s}^{-1}$ for $\Omega = 3.5\,\Omega_\odot$ to $1 \times 10^{-16}\mathrm{s}^{-1}$ for $\Omega = 15\,\Omega_\odot$. Thus if the young Sun was a fast rotator ($\Omega = 15\,\Omega_\odot$), it is likely that solar cosmic rays had a significant effect on the chemistry at the Earth's surface at the time when life is likely to have formed.
Conclusions. Cosmic rays, particularly solar cosmic rays, are a source of ionisation that should be taken into account in chemical modelling of the post-impact early Earth atmosphere. Modelling of cosmic ray transport and effects on chemistry will also be of interest for the characterisation of H_2-dominated exoplanet atmospheres.

Download/Website: `https://arxiv.org/abs/2504.02596v1`

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The atmospheric entry of cometary impactors

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Monthly Notices of the Royal Astronomical Society, published (10.1093/mnras/staf507)

Cometary impacts play an important role in the early evolution of Earth, and other terrestrial exoplanets. Here, we present a numerical model for the interaction of weak, low-density cometary impactors with planetary atmospheres, which includes semi-analytical parameterisations for the ablation, deformation, and fragmentation of comets. Deformation is described by a pancake model, as is appropriate for weakly cohesive, low-density bodies, while fragmentation is driven by the growth of Rayleigh-Taylor instabilities. The model retains sufficient computational simplicity to investigate cometary impacts across a large parameter space, and permits simple description of the key physical processes controlling the interaction of comets with the atmosphere. We apply our model to two case studies. First, we consider the cometary delivery of prebiotic feedstock molecules. This requires the survival of comets during atmospheric entry, which is determined by three parameters: the comet's initial radius, bulk density, and atmospheric surface density. There is a sharp transition between the survival and catastrophic fragmentation of comets at a radius of about 150 m, which increases with increasing atmospheric surface density and decreasing cometary density. Second, we consider the deposition of mass and kinetic energy in planetary atmospheres during cometary impacts, which determines the strength and duration of any atmospheric response. We demonstrate that mass loss is dominated by fragmentation, not ablation. Small comets deposit their entire mass within a fraction of an atmospheric scale height, at an altitude determined by their initial radius. Large comets lose only a small fraction of their mass to ablation in the lower atmosphere.

Download/Website: `https://doi.org/10.1093/mnras/staf507`

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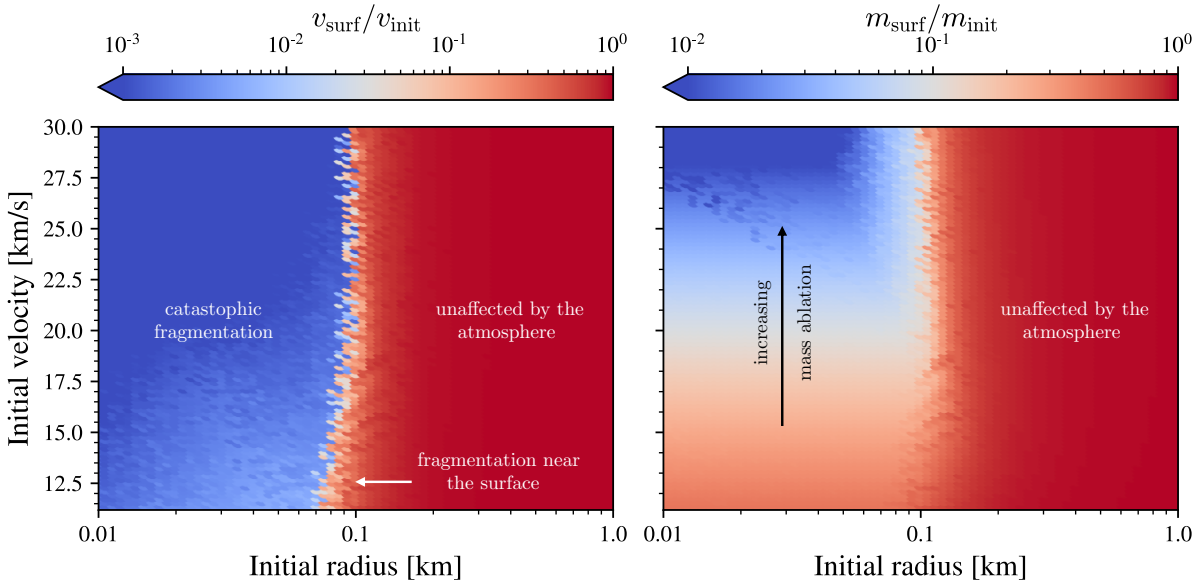

Figure 4: The effects of atmospheric entry on comets' impact velocity at the surface (left), and remaining mass (right) is shown as a function of initial radius, and velocity for an Earth-like atmosphere (with surface density $1.225\,\mathrm{kg\,m^{-3}}$). For comets that fragment (i.e., with small initial radius), this is given as the (mass-weighted) average velocity, and total mass of fragments that reach the surface. There is a sharp transition in the response to the atmosphere at an initial radius of about 100 m, in agreement with analytical predictions (equation 6).

3 Jobs and Positions

Postdoctoral Researcher in Exoplanet Atmospheres

Daniel Koll

Peking University, Beijing, Starting Fall 2025 or Spring 2026

Applications are invited for a postdoctoral position in the Department of Atmospheric and Oceanic Sciences (AOS) at Peking University (PKU). PKU hosts a vibrant research community with multiple AOS faculty members working on planetary climates and habitability. We seek a motivated researcher to join Prof Daniel Koll's research group (danielkoll.github.io) and work on theory and simulations of exoplanet atmospheres. The successful candidate will be expected to lead an effort to characterize the atmospheres and surfaces of rocky exoplanets, leveraging recent advances in modeling, theory, and JWST observations.
All research will be conducted in English. Individuals will have excellent opportunities for professional development, including the potential to advise student projects, to participate in international collaborations, and to work with cutting-edge telescope data. The compensation is competitive with other international postdocs and includes PKU staff benefits. Candidates are also eligible to combine the position with PKU's Boya prize postdoctoral fellowship.
Applicants should possess a PhD or equivalent qualification in Climate Science, Planetary Science, Astronomy, or related field by the time the appointment begins. The start date is flexible but expected to be in the fall of 2025 or spring of 2026. The position is for two years, with potential for extension.
Interested candidates should submit the following materials:

- Curriculum Vitae and list of publications
- Statement of research interests (max 2 pages)
- Name and contact details of two references

Please contact Prof Daniel Koll for any questions.

Download/Website: `https://danielkoll.github.io`

Contact: `dkoll@pku.edu.cn`

Research Fellow in Planet Formation and Protoplanetary Discs

Dr Farzana Meru

University of Warwick, ASAP

The University of Warwick seeks to appoint a Research Fellow within the group of Dr Farzana Meru on the topic of protoplanetary discs. The appointment will be until 10 April 2027 (subject to a grant extension the post may be extended up to a maximum of 27 months). Applications for a part-time position and those from underrepresented minorities are particularly encouraged and welcome.

The successful candidate will work with Dr Farzana Meru on a topic that is complementary to her research interests: self-gravitating discs, protoplanetary disc evolution, dust growth, planet formation, planet-disc interactions, and connections with observed protoplanetary discs. The post is primarily expected to involve numerical simulations, but where relevant, an observational connection will certainly be encouraged. The candidate is expected to develop their own research ideas and will be encouraged to contribute to Dr Meru's wider research focus on planet formation and evolution.

Dr Meru's group is based in the University of Warwick's Astronomy & Astrophysics group – a leading UK institution for exoplanet & disc research, with 96 researchers including 16 faculty members working on discs and exoplanets. The group was recently donated $\pounds 3.5$m to spend on PhD students and postdoctoral fellowships, attracting high quality international researchers. The exoplanet research is extremely active and the vibrant discs research group spans the fields of protoplanetary, debris, white dwarf and black hole discs.

The continuing professional development of her group is of great importance to Dr Meru, including developing students and researchers in ways that give them a career boost. The candidate will have the opportunity to develop their CV, e.g. through supervising PhD and undergraduate research projects, and taking on other responsibilities that will enhance their development in positive ways for their future goals.

The candidate will have an expertise in one or more of: protoplanetary discs, planet formation, planet-disc interactions, dust evolution, accretion disc physics and numerical simulations. Areas outside these are encouraged if they complement the group's research. Applicants should demonstrate a proven research track record, be an enthusiastic communicator capable of working effectively both independently and as part of a research team, and will have excellent interpersonal skills. The candidate will possess excellent planning & time management skills to ensure their research objectives are achieved. The candidate will have a commitment to and/or lived experience of addressing Equity, Diversity & Inclusion issues in the workplace.

Candidates should submit a formal application along with the following: (i) an up-to-date CV complete with publication list and metrics (max 2 pages plus publications list), (ii) a concise (max 2 pages) statement of research describing their past research accomplishments, as well as their relevant scientific and technical experience, (iii) an ANONYMOUS statement of future research plans along with how they link to the advertised post (max 2 pages), (iv) a statement about Equity, Diversity and Inclusion (max 1 page).

For equity purposes, the panel will firstly assess the future research blindly and on the merit of scientific ideas. Please provide details of three referees (letters will only be requested if needed). All applications will be given equal consideration. Examples of how to write an anonymous research proposal can be found by following the below weblink. Please direct all informal inquiries about the role and the group's Equity, Diversity and Inclusion culture to Dr Farzana Meru. Deadline: 27th April 2025

Download/Website: `https://warwick.ac.uk/fac/sci/physics/research/astro/vacancies/`

Contact: f.meru@warwick.ac.uk

4 Conferences and Workshops

Smashing It: How Impacts Forge Formation, Dynamics, and Climates of (Exo)Planets

Dmitry Semenov[1,2] *and Felipe Gomez*[3]

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[2] Max Planck Institute for Astronomy, Heidelberg, Germany
[3] El Centro de Astrobiologia, CSIC-INTA, Madrid, Spain

University House, Leeds, UK, June 3-5, 2025

Dear colleagues,
We invite you to attend the international workshop **"Smashing It: How Impacts Forge Formation, Dynamics, and Climates of (Exo)Planets"** at the University of Leeds, UK. The workshop will be held from Tuesday, June 3rd, to Thursday, June 5th, 2025.

This workshop will bring together about 50 researchers to explore how impacts influence the formation, dynamics, and habitability of rocky (exo)planets. The program will feature a balanced schedule of contributed talks from experts in astronomy, planetary science, geoscience, meteoritics, and laboratory experiments, with plenty of time for both formal sessions and informal discussions.

The key scientific topics include:

- Exocomets and debris disks
- Impacts and pollution of gas giants, white dwarfs, and other stars
- Material delivery onto rocky (exo)planets
- Architecture and dynamics of small bodies in (exo)planetary systems
- The chain between interstellar, circumstellar, minor bodies (e.g., comets), atmospheric chemistry, and surface chemistry
- Impacts by size (from dust to planets)
- The role of impacts on climate (1D versus 3D models) and habitability of (exo)planets

There is no conference fee to attend. We can partially cover the expenses of up to 20 young researchers to help with travel costs, accommodation, and meals. Please note that all participants will be responsible for booking their own travel and lodging.

To apply to attend this meeting and find more details regarding the scope, program, venue, and other practicalities, please visit our website:

`https://sites.google.com/view/wg4workshop/home`

The final deadline for all applications is April 30th. Please don't book or organize any travel or accommodation until we confirm that your application to attend this meeting has been accepted.

Please circulate this announcement among your wider colleagues, collaborators, and team members, as it is not a prerequisite to be a member of the Action to apply to join the workshop.

We hope to see you in Leeds this June!

Best regards, Dmitry Semenov and Felipe Gomez

On behalf of the SOC and LOC: Amy Bonsor (Cambridge), Auriol Rae (Edinburgh), Catherine Walsh (Leeds), Dima Semenov (MPIA Heidelberg), Felipe Gomez (CSIC Madrid), Felix Sainsbury-Martinez (Leeds), Lucy Evans (Leeds), Meg Schwamb (Queen's University Belfast), Paul Rimmer (Cambridge), Steve Mojzsis (Hungarian Academy of Science)

Download/Website: `https://sites.google.com/view/wg4workshop/home`

Contact: `semenov@mpia.de`

Rocky Worlds 4

Groningen, 19-23 January 2026

Dear Colleagues,

We would like to announce the Rocky Worlds 4 conference to be held in Groningen, Netherlands, from 19-23 January 2026.

Scope:
Applying the detailed empirical understanding gleaned from the terrestrial planets of our own Solar System is crucial in our interpretation of exoplanetary systems. With the ongoing and upcoming surveys to search for small planets around nearby stars, 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 form, evolve, and are distributed throughout the galaxy. The Rocky Worlds Meeting Series brings together planetary scientists, astronomers, and earth scientists to foster discussion and build the collaborations that will pave the way for the next frontiers of rocky exoplanet discovery and characterisation.

Confirmed Keynote Speakers:
- Hannah Diamond-Lowe (STScI) – Atmospheres
- Lena Noack (FU Berlin) – Astrobiology
- Charles-Édouard Boukaré (York University) – Interiors
- Heike Rauer (DLR Berlin) – Instrumentation
- Mariana Sanchez (Leiden University) – Formation: astronomical perspective
- Damanveer Grewal (Yale) – Formation: geochemical perspective

SOC:
Tim Lichtenberg, Yamila Miguel, Oliver Shorttle, Amy Bonsor, Inga Kamp, Quentin Changeat,
Inge Loes ten Kate, Floris van der Tak, Wim van Westrenen, Nienke van der Marel, Ignas Snellen, Jean-Michel Desert, Michiel Min, Stephanie Cazaux

Anticipated Abstract and Registration Timeline:
- 1 Jun 2025: Abstract submission opens
- 1 Sep 2025: Registration opens
- 14 Sep 2025: Abstract submission deadline
- Oct 2025: Programme announcement
- 14 Nov 2025: Early-bird registration deadline
- 14 Dec 2025: Registration deadline
- 19-23 Jan 2026: Rocky Worlds 4 in Groningen

Please subscribe to https://forms.gle/tdLWPLBVnY54GTqD9 if you want to stay informed about conference announcements. **We look forward to welcoming you to Groningen in 2026!**

Download/Website: `https://groningen2026.rockyworlds.org`
Contact: `https://forms.gle/tdLWPLBVnY54GTqD9`

PhD summer school: Dust to DNA

Anders Johansen, Elishevah van Kooten, Michiel Lambrechts, Richard Löffler, Martin Schiller
Globe Institute, University of Copenhagen

Copenhagen, Denmark, 18–22 August 2025

We would like to promote a one-week PhD summer school at the Globe Institute (Copenhagen), from 18 to 22 August.
The course covers the journey from interstellar dust to habitable planets and the conditions for life. Students will participate in interdisciplinary lectures and hands-on sessions, using perspectives from astronomy, cosmochemistry, geology, and astrobiology, within the framework of exoplanet systems and the potential for life to emerge.
Already confirmed teachers: Laurie Barge (NASA JPL) / Martin Bizzarro (Globe) / James Connelly (Globe)/ Hannah Diamond-Lowe (Space Telescope Science Institute) / Anders Johansen (Globe) / Elishevah van Kooten (Globe) / Jens Hoeijmakers (Lund University) / Richard Löffler (Globe) / Michiel Lambrechts (Globe) / Martin Schiller (Globe) / Haiyang Wang (Globe) /...
More practical information, including on how to sign up, can be found at www.dust2dna.dk. The registration deadline is 31/05/2025. Please feel free to forward this message to anyone who might be interested.

Download/Website: `www.dust2dna.dk`

Contact: `michiel.lambrechts@sund.ku.dk`

The Fate of Neptunian Worlds: exploring demographics, atmospheres and evolution

D. Armstrong & V. Bourrier

University of Warwick, Coventry, UK, 15th to 17th September 2025

The formation, life and fate of Neptunian worlds combines a wide range of physical effects. Do close-in planets reach their locations through high eccentricity migration, disc-driven migration, or a combination of the two? How are their atmospheres affected by these processes, photoevaporation at short orbital periods, and their environment? Can we better understand this population and these processes through observable planet demographics and a better theoretical picture of the combined processes involved?

We aim to bring together different communities working on Neptunian exoplanets, to allow observations and theory to inform each other and help push towards a unified understanding of these fascinating worlds that sit between rocky planets and Jupiter-scale gas giants.

Download/Website:
https://warwick.ac.uk/fac/sci/physics/research/astro/research/meetings/neptunian_worlds

Contact: vincent.bourrier@unige.ch

12th Joint Workshop on High Pressure, Planetary, and Plasma Physics

Thomas Tschentscher, Karen Appel, Hanns-Peter Liermann, Nicola Tosi, Doris Breuer, Ronald Redmer, Gerd Steinle-Neumann

We are pleased to announce the 12th Joint Workshop on High Pressure Planetary and Plasma Physics (HP4) to be held at the European XFEL, Holzkoppel 4, D-22869 Schenefeld, Germany, September 22-24, 2025 (noon-noon).

The goal of the workshop series is to bring together scientists from different fields that contribute to a better understanding of solar and extrasolar planets of all types, brown dwarfs, and stars (interior, evolution, magnetic field). We aim at an informal exchange of ideas across traditional disciplinary boundaries. Some of the topics covered are:

- Dynamic and ultrafast processes in strongly excited matter
- Compression experiments using high-power optical and free electron lasers
- Laboratory experiments using multi-anvil and diamond-anvil cells
- Ab-initio simulation studies for matter under extreme conditions
- Equations of state, petrology, and chemistry of planetary materials
- Melting and phase relations of materials at extreme conditions
- Evolution and structure of giant planet interiors
- Structure, composition, and internal dynamics of solid planets
- Physics and chemistry of impact processes

We have put together an interesting list of invited speaker that you can find, along with other information, on the website of the workshop at https://indico.desy.de/event/46193/

The deadline for registration and abstract submission is July 31, 2025. Post-deadline registration is possible. The workshop is free of registration charge. In case of questions please contact local organizers (Nicoletta Mattioli and Thomas Tschentscher) or the program chair (Gerd Steinle-Neumann).

Download/Website: `https://indico.desy.de/event/46193`

EPSC-DPS—EXOA13: Bridging geosciences and astronomy to interpret rocky (exo)planet observations

R. Spaargaren[1], *C.M. Guimond*[2], *M.A. Thompson*[3,4], *O. Herbort*[5], *L. Boldt-Christmas*[6], *P. Baumeister*[7], *Y. Miguel*[8,9]

[1] Kapteyn Astronomical Institute, University of Groningen, the Netherlands
[2] Atmospheric, Oceanic, and Planetary Physics, University of Oxford, UK
[3] Department of Earth and Planetary Sciences, ETH Zurich, Switzerland
[4] Earth and Planets Laboratory, Carnegie Institution for Science, USA
[5] Department of Astrophysics, University of Vienna, Austria
[6] Department of Physics and Astronomy, University of Uppsala, Sweden
[7] Department of Earth Sciences, Freie Universität Berlin, Germany
[8] Leiden Observatory, the Netherlands
[9] SRON, the Netherlands

EPSC-DPS Joint Meeting, Finland Hall, Finland, 7-12 September 2025

The coming years will be revolutionary for rocky planet research, with JWST, ELT, ARIEL, and PLATO providing unprecedented observations of rocky exoplanets in our galaxy. At the same time, BepiColombo, the Mars sample return mission, and the Decade of Venus missions will greatly enhance our understanding of the rocky bodies within the Solar System. These missions will offer valuable new observations of the atmospheres and surfaces of these rocky bodies, while Solar System missions will also probe magnetic fields. Interpreting these observations, and leveraging them to constrain the body's interior properties, requires a deeper understanding of how a planet's surface, atmosphere, and interior interact.

Rocky planet atmospheres and surfaces form and evolve under close interaction with their deeper interiors. Whether a planet has formed an atmosphere by volatile exchange with a magma ocean, by volcanic outgassing, or lost its atmosphere completely, understanding its observed state requires knowledge of interconnected processes operating across a wide range of spatial and temporal scales. Processes governing atmospheric evolution, and how it interacts with the interior, include volcanism, weathering, tectonics, magnetic field generation, interior and atmospheric volatile chemistry, and atmospheric loss. These processes operate on various timescales, from rapid magma-atmosphere equilibration, to the shaping of tectonics on the early Earth, to long-term climate feedbacks that sustain temperate conditions on planets like Earth. Studying these interactions - both in the Solar System and beyond - demands a fundamentally multidisciplinary understanding of rocky planets, spanning astronomy, geosciences, and planetary sciences.

This session aims to bring together scientists from astronomy, geosciences, and planetary sciences, to explore how interior-atmosphere interaction shapes rocky (exo)planet surfaces and atmospheres. We welcome contributions spanning experimental work, observational efforts, and modelling studies. By combining insights from exoplanets, which serve as a natural laboratory for rocky world diversity, and Solar System planets, which provide the detailed observations needed to build and validate models, we can develop a robust framework for interpreting observations of any rocky body. We encourage discussions that span all related fields, fostering new collaborative approaches to studying rocky planet evolution.

Download/Website: `https://meetingorganizer.copernicus.org/EPSC-DPS2025/session/55189`

Contact: `claire.guimond@physics.ox.ac.uk`

EPSC-DPS—EXOA16: Advances in Terrestrial Planet Formation: A Comparison of the Three Currently Leading Scenarios

Nader Haghighipour[1,2,3], *Nikolaos Georgakarakos*[4], *Jeffrey Sudol*[5]

[1] Planetary Science Institute, USA
[2] Institute for Astronomy, University of Hawaii, USA
[3] Institute for Advanced Planetary Astrophysics, USA
[4] New York University, Abu Dhabi
[3] Westchester University, USA

EPSC/DPS Joint Meeting, Finland Hall, Finland, 7-12 September 2025

Dear Colleagues,

It gives us the greatest pleasure to announce the EPSC/DPS session EXOA16 on the leading theories of terrestrial planet formation:

EXOA16: Advances in Terrestrial Planet Formation: A Comparison of the Three Currently Leading Scenarios

The past few years have witnessed major developments in the field of terrestrial planet formation. Thanks to the advances in computational technology, the three leading scenarios, namely, the traditional model, pebble accretion, and formation in rings, have become more complex, and have demonstrated their broad and expansive success. How these three approaches compare, and how they contribute to developing a comprehensive model of terrestrial planet formation are now among the most outstanding questions in planetary astrophysics. Through a collection of invited talks and contributed oral and poster presentations, this session aims at introducing each approach and assessing their capabilities by comparing their results to our knowledge of terrestrial planets in our solar system and extrasolar planets. As part of this session, we also plan to organize a press conference or town hall, where renowned experts from each formation scenario will answer questions from the press and an audience of peers.

We cordially invite all experts and interested colleagues to submit abstracts for oral and poster contributions in all areas related to theoretical, observational, and experimental studies of terrestrial planet formation in our solar system and extrasolar planets.

Abstracts can be submitted using the link below. When submitting your abstract, please make sure to select session EXOA16. **The deadline is 7 May 2025, 13:00 CEST.**

https://www.epsc-dps2025.eu/programme/how-to-submit.html

We strongly encourage contributions from early career scientists.

Looking forward to seeing you in Helsinki.
Convenors: Nader Haghighipour, Jeffrey Sudol, Nikolaos Georgakarakos

EPSC-DPS—EXOA18: Investigating Habitability and Biosignatures within Exoplanet Atmospheres

Benjamin Taysum[1], *Hamish Innes*[1,2], *Konstantin Herbst*[3], *Nicola Tosi*[1], *John Lee Grenfell*[1]

[1] Institute of Planetary Research, German Aerospace Center (DLR), Berlin, Germany
[2] Frei Üniversität Berlin, Institute of Geological Sciences, Berlin, Germany
[3] Center for Planetary Habitability (PHAB), University of Oslo, Norway

EPSC/DPS Joint Meeting, Finland Hall, Finland, 7-12 September 2025

Dear Colleagues,

We are proud to announce the acceptance of the EPSC/DPS 2025 session EXO18, covering the science of exoplanet biosignatures and habitability:

EXOA18: Investigating Habitability and Biosignatures within Exoplanet Atmospheres

JWST has enabled researchers across the globe to probe the atmospheric composition of exoplanets and investigate the properties of distant planetary systems. Future confirmed and conceptual campaigns such as the ELT, HWO and LIFE aim to pay greater attention to Earth-mass planets orbiting within the habitable zones of their host stars. In anticipation of these missions, this session focuses on the current and future search for biosignatures within the atmospheres of exoplanets, the identification of habitable worlds and the exploration of planetary conditions that support habitability. It solicits contributions from both observers using data collected by past and present instrumentation, as well as atmospheric, stellar activity, and interior modellers looking towards future observations. The session aims to foster new collaborations with observers, modellers, and instrument team members to assess how markers of life and habitability in distant systems may present themselves to us, and the requirements that future observing campaigns need to reliably identify them within planetary parameter space.

Abstracts can be submitted using the link below. When submitting your abstract, please make sure to select session EXOA18. **The deadline is 7 May 2025, 13:00 CEST.**

https://www.epsc-dps2025.eu/programme/how-to-submit.html
Convenors: Benjamin Taysum, Hamish Innes, Konstantin Herbst, Nicola Tosi, and John Lee Grenfell

EPSC-DPS—EXOA19: AI for exoplanet and brown dwarf studies

Yann Alibert[1], Jeanne Davoult[2], Sara Marques[3], Romain Eltschinger[3], Adrien Leleu[4], Carles Cantero Mitjans[4], Kai Hou (Gordon) Yip[5], Jo Ann Egger[3]

[1] Center for Space and Habitability, University of Bern, Switzerland
[2] Institute for planetary science, German Aerospace Center (DLR), Germany
[3] Space research and planetary science (WP), University of Bern, Switzerland
[4] Observatoire de Genève, University of Geneva, Switzerland
[5] UCL, England

EPSC-DPS Joint Meeting, Finland Hall, Finland, 7-12 September 2025

Dear Colleagues,

We are happy to invite you to submit your abstract to our session at EPSC-DPS joint meeting:

EXOA19: AI for exoplanet and brown dwarf studies

Artificial intelligence (AI) is revolutionizing planetary sciences, enabling new insights from vast and complex datasets, both for solar system exploration and the study of exoplanets and brown dwarfs.
This session will explore AI-driven approaches for studies, focusing on innovative techniques such as image analysis, curriculum learning, diffusion models, generative models for data augmentation and simulation, machine learning techniques for analyzing large-scale surveys. We will also discuss applications of natural language processing for scientific literature mining, and uncertainty quantification in AI-driven models. By bringing together experts in AI and exoplanetary science, this session aims to foster interdisciplinary collaborations and advance the field.

Abstracts can be submitted using the link below. **The deadline is 7 May 2025, 13:00 CEST.**

https://meetingorganizer.copernicus.org/EPSC-DPS2025/sessionprogramme

We are looking forward discovering your work and seeing you in Helsinki.
Convenors: Yann Alibert, Jeanne Davoult, Sara Marques, Romain Eltschinger, Adrien Leleu, Carles Cantero Mitjans, Kai Hou Yip and Jo Ann Egger.

5 Others

Simple step-by-step procedure to apply for CHEOPS Guest Observers time

European Space Agency (ESA)

The European Space Agency's (ESA's) Characterising Exoplanet Satellite (CHEOPS) mission has opened its 6th Announcement of Opportunity (AO-6). This Call invites the submission of research proposals to the Guest Observers (GO) Programme.
Key Dates: The AO-6 Call is foreseen to close on the **8 May 2025 (12:00 CEST)**.
Observing Cycle: The selected proposals will be part of the observing cycle from 1 October 2025 to 30 September 2026. This period marks the last year of the first mission extension of CHEOPS.
Scientific Opportunities: CHEOPS provides observers with access to space-based ultra-high precision photometry. Research areas include the observations of exoplanet transits, eclipse, occultations, and phase curves. Furthermore, the scientific scope may extend to phenomena such as exomoons, ring structures, stellar activity, and trans-Neptunian objects.
Collaborative Synergies: The timely overlap of several space- and ground-based missions may provide exciting opportunities for synergies with NASA/ESA/CSA JWST, NASA/ESA HST, NASA TESS, ESO ground-based facilities, and more.
Novelties in this Announcement of Opportunity:

- More targets: only 50 GTO reserved targets, with all the rest being open to the entire community
- More time: up to 30% science observing time dedicated to the GO Programme
- Double-anonymous peer-review of proposals
- Modernised tools: zero-installation process to submit Phase-1 proposals

Simple step-by-step procedure to apply for time: Please find below a simple procedure with seven steps to prepare and submit a proposal for the Guest Observers Programme:
https://www.cosmos.esa.int/web/cheops-guest-observers-programme/ao-6#Tutorials
Find out more about the CHEOPS mission via https://www.cosmos.esa.int/web/cheops, stay up-to-date about this opportunity via https://www.cosmos.esa.int/web/cheops-guest-observers-programme, and feel free to contact "cheops-support [at] cosmos.esa.int" with any questions. We look forward to receiving your observing proposals and advancing our understanding of exoplanetary and stellar systems.
Happy proposing!

Contact: `cheops-support@cosmos.esa.int`

6 As seen on astro-ph

The following list contains exoplanet related entries appearing on astro-ph in March 2025.
Disclaimer: The hyperlinks to the astro-ph articles are provided for the convenience of the reader, but the ExoPlanet News cannot be responsible for their accuracy and perpetuity.

March 2025

astro-ph/2503.00208: **Thermal Phase Curves in Hot Gas Giant Exoplanets Exhibit a Complex Dependence on Planetary Properties** *by Mark R Swain et al.*
astro-ph/2503.00636: **The Simons Observatory: Science Goals and Forecasts for the Enhanced Large Aperture Telescope** *by The Simons Observatory Collaboration et al.*
astro-ph/2503.00872: **Formation of Ultra-short-period Planet in Hot Jupiter Systems: Application to WASP-47** *by Su Wang et al.*
astro-ph/2503.02098: **Re-recognized universality of Kozai oscillation on three-body dynamics** *by Masanori Iye, Takashi Ito*
astro-ph/2503.02084: **Convective Overstability in Radially Global Protoplanetary Disks. II. Impact on planetesimal formation** *by Marius Lehmann, Min-Kai Lin*
astro-ph/2503.02066: **Global Hall-magnetohydrodynamic simulations of transition disks** *by Eleftheria Sarafidou et al.*
astro-ph/2503.01973: **The stochastic nature of migration of disc instability protoplanets in three-dimensional hydrodynamical and MHD simulations of fragmenting discs** *by Noah Kubli et al.*
astro-ph/2503.01946: **Water dissociation and rotational broadening in the atmosphere of KELT-20 b from high-resolution spectroscopy** *by Luke Finnerty et al.*
astro-ph/2503.01957: **Mapping the merging zone of late infall in the AB Aur planet-forming system** *by Jessica Speedie et al.*
astro-ph/2503.02025: **The Diversity of Cold Worlds: a blended-light binary straddling the T/Y transition in brown dwarfs** *by Daniella C. Bardalez Gagliuffi et al.*
astro-ph/2503.01745: **Gone with the wind: the outward migration of eccentric giant planets in windy disks** *by Gaylor Wafflard-Fernandez, Geoffroy Lesur*
astro-ph/2503.01656: **The Interplay between Dust Dynamics and Turbulence Induced by the Vertical Shear Instability** *by Pinghui Huang, Xue-Ning Bai*
astro-ph/2503.01599: **A temperate super-Jupiter imaged with JWST in the mid-infrared** *by E. C. Matthews et al.*
astro-ph/2503.01570: **A Population Synthesis Study on the Formation of Cold Jupiters from Truncated Planetesimal Disks** *by Kangrou Guo et al.*
astro-ph/2503.01137: **Dust coagulation assisted by streaming instability in protoplanetary disks** *by Ryosuke T. Tominaga, Hidekazu Tanaka*
astro-ph/2503.01499: **Shape and spin state model of contact binary (388188) 2006 DP14 using combined radar and optical observations** *by Richard E. Cannon et al.*
astro-ph/2503.01142: **Quantified Estimation of Molecular Detections across Different Classes of Neptunian Atmospheres Using Cross-Correlation Spectroscopy: Prospects for Future Extremely Large Telescopes with High-Resolution Spectrographs** *by Dwaipayan Dubey et al.*
astro-ph/2503.02979: **Discovery of Radio Recombination Lines from Proplyds in the Orion Nebula Cluster** *by Ryan D. Boyden et al.*
astro-ph/2503.02451: **No Robust Statistical Evidence for a Population of Water Worlds in a 2025 Sample of Planets Orbiting M Stars** *by Silke Dainese, Simon H. Albrecht*
astro-ph/2503.02193: **Extension of the creep tide theory to exoplanet systems with high stellar obliquity. The dynamic tide of CoRoT-3b** *by Hugo Folonier et al.*

astro-ph/2503.03931: **Rapid characterization of exoplanet atmospheres with the Exoplanet Transmission Spectroscopy Imager (ETSI)** *by Luke M. Schmidt et al.*

astro-ph/2503.03930: **Ground-Based Reconnaissance Observations of 21 Exoplanet Atmospheres with the Exoplanet Transmission Spectroscopy Imager** *by Ryan J. Oelkers et al.*

astro-ph/2503.03895: **HST Transmission Spectra of the Hot-Neptune HD 219666 b: Detection of Water and the Challenge of Constraining Both Water and Methane with HST** *by Matthew M. Murphy et al.*

astro-ph/2503.03839: **Too fast to be single: Tidal evolution and photometric identification of stellar and planetary companions** *by Ilay Kamai, Hagai B. Perets*

astro-ph/2503.03105: **Positive Feedback: How a Synergy Between the Streaming Instability and Dust Coagulation Forms Planetesimals** *by Daniel Carrera et al.*

astro-ph/2503.03814: **A Time-Resolved High-Resolution Spectroscopic Analysis of Ionized Calcium and Dynamical Processes in the Ultra-Hot Jupiter HAT-P-70 b** *by Adam B. Langeveld et al.*

astro-ph/2503.03745: **Evidence for Primordial Alignment II: Insights from Stellar Obliquity Measurements for Hot Jupiters in Compact Multiplanet Systems** *by Brandon Thomas Radzom et al.*

astro-ph/2503.03614: **Abundance analysis of stars hosting gas-rich debris disks** *by Sandipan P. D. Borthakur et al.*

astro-ph/2503.03336: **High angular resolution evidence of dust traps from deep ALMA Band 3 observations of LkCa15** *by Anibal Sierra et al.*

astro-ph/2503.04669: **HD 163296 and its Giant Planets: Creation of Exo-comets, Interstellar Objects and Transport of Volatile Material** *by D. Polychroni et al.*

astro-ph/2503.04600: **Parameter degeneracies associated with interpreting HST WFC3 transmission spectra of exoplanetary atmospheres** *by Aline Novais et al.*

astro-ph/2503.04531: **MIRI-LRS spectrum of a cold exoplanet around a white dwarf: water, ammonia, and methane measurements** *by Maël Voyer et al.*

astro-ph/2503.04364: **Characterisation of magnetic activity of M dwarfs. Possible impact on the surface brightness** *by R. V. Ibañez Bustos et al.*

astro-ph/2503.05872: **Turbulence in protoplanetary disks: A systematic analysis of dust settling in 33 disks** *by M. Villenave et al.*

astro-ph/2503.05581: **Constraining the Scattered Light properties of LTT 9779 b Using HST/WFC3 UVIS** *by Michael Radica et al.*

astro-ph/2503.05501: **CARMENES as an Instrument for Exoplanet Research** *by José A. Caballero et al.*

astro-ph/2503.05952: **First detection of variable radio emission originating from the infant planetary system V1298 Tau** *by M. Damasso et al.*

astro-ph/2503.05359: **Resonant Drag Instabilities for Polydisperse Dust, I. The Acoustic Resonant Drag Instability** *by Sijme-Jan Paardekooper, Hossam Aly*

astro-ph/2503.05345: **Characterising planetary material accreted by cool helium atmosphere white dwarfs using an exponentially decaying disc model** *by Mairi W. O'Brien et al.*

astro-ph/2503.05288: **Earth's infrared background** *by Ofer Shamir, Edwin P. Gerber*

astro-ph/2503.05115: **An Oasis in the Brown Dwarf Desert: Confirmation of Two Low-mass Transiting Brown Dwarfs Discovered by TESS** *by Elina Y. Zhang et al.*

astro-ph/2503.05055: **An Oxidation Gradient Straddling the Small Planet Radius Valley** *by Collin Cherubim et al.*

astro-ph/2503.06004: **Unveiling the Infrared Excess of SIPS J2045-6332: Evidence for a Young Stellar Object with Potential Low-Mass Companion** *by Michiharu Hyogo et al.*

astro-ph/2503.06787: **Polar circumtriple planets and disks around misaligned hierarchical triple stars** *by Stephen Lepp et al.*

astro-ph/2503.07723: **PEPSI Investigation, Retrieval, and Atlas of Numerous Giant Atmospheres (PIRANGA). III. Composition and winds in the atmosphere of TOI-1518 b** *by Connor Basinger et al.*

astro-ph/2503.07529: **TESS and HARPS-N unveil two planets transiting TOI-1453. A super-Earth and one of**

the lowest mass sub-Neptunes *by M. Stalport et al.*

astro-ph/2503.07719: **PEPSI Investigation, Retrieval, and Atlas of Numerous Giant Atmospheres (PIRANGA). II. Phase-Resolved Cross-Correlation Transmission Spectroscopy of KELT-20b** *by Calder Lenhart et al.*

astro-ph/2503.07311: **Mid-infrared absorption spectra and mass absorption coefficients for 23 chondrites: dependence on composition and grain size** *by Grace A. Batalla-Falcon et al.*

astro-ph/2503.08583: **The Case for Edge-On Binaries: An Avenue Toward Comparative Exoplanet Demographics** *by Joseph E. Hand et al.*

astro-ph/2503.08905: **Towards High Precision Mass Measurements of Two Sub-Neptunes in the K2-266 Planetary System Through Transit Timing** *by Ing-Guey Jiang et al.*

astro-ph/2503.08592: **There's more to life in reflected light: Simulating the detectability of a range of molecules for high-contrast, high-resolution observations of non-transiting terrestrial exoplanets** *by Miles H. Currie, Victoria S. Meadows*

astro-ph/2503.08523: **T CrA has a companion: First direct detection of T CrA B with VLTI/MATISSE** *by J. Varga et al.*

astro-ph/2503.08405: **HADES RV Programme with HARPS-N at TNG. XVI. A super-Earth in the habitable zone of the GJ 3998 multi-planet system** *by A. K. Stefanov et al.*

astro-ph/2503.08347: **Precise Parameters from Bayesian SED Fitting Indicate Thermally-Driven Mass Loss Likely Driver of Radius Valley** *by David Jordan, Inseok Song*

astro-ph/2503.08095: **Four sub-Earth planets orbiting Barnard's Star from MAROON-X and ESPRESSO** *by Ritvik Basant et al.*

astro-ph/2503.08514: **The Gaia Ultracool Dwarf Sample – VI. Spectral Types and Properties of 51 Ultracool Dwarfs** *by Gemma Cheng et al.*

astro-ph/2503.09734: **The dearth of high-mass hydrogen-atmosphere metal-polluted white dwarfs within 40 pc** *by Tim Cunningham et al.*

astro-ph/2503.09698: **Low 4.5 μm Dayside Emission Disfavors a Dark Bare-Rock scenario for the Hot Super-Earth TOI-431 b** *by Christopher Monaghan et al.*

astro-ph/2503.09265: **Resonant drag instabilities for polydisperse dust. II. The streaming and settling instabilities** *by Sijme-Jan Paardekooper, Hossam Aly*

astro-ph/2503.09136: **Earth as an Exoplanet: Investigating the effects of cloud variability on the direct-imaging of atmospheres** *by Soumil Kelkar et al.*

astro-ph/2503.08988: **Probing 2D Asymmetries of an Exoplanet Atmosphere from Chromatic Transit Variation** *by Shotaro Tada et al.*

astro-ph/2503.10309: **Beyond monoculture: polydisperse moment methods for sub-stellar atmosphere cloud microphysics I. Examining properties of the exponential distribution** *by Elspeth K. H. Lee*

astro-ph/2503.10339: **C3PO IV: co-natal stars depleted in refractories are magnetically more active – possible imprints of planets** *by Jie Yu et al.*

astro-ph/2503.10441: **Transit Timing Variations of the Sub-Saturn Exoplanet HAT-P-12b** *by Kaviya Parthasarathy et al.*

astro-ph/2503.10765: **Nearly a Decade of Groundbreaking Speckle Interferometry at the International Gemini Observatory** *by Steve B. Howell et al.*

astro-ph/2503.10856: **Signatures of Atmospheric Mass Loss and Planet Migration in the Time Evolution of Short-Period Transiting Exoplanets** *by Rachel B. Fernandes et al.*

astro-ph/2503.10914: **Breaking long-period resonance chains with stellar flybys** *by C. Charalambous et al.*

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