ExoPlanet News
An Electronic Newsletter

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

Contents

1 Editorial

Welcome to Edition 180 of the 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 the next month we look forward to your paper abstracts, job ads or meeting announcements. Also, special announcements are 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 (`http://nccr-planets.ch/exoplanetnews/`).

The next issue will appear on 9 July 2024.

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

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

Univ. of Bern, Univ. of Geneva, ETH Zürich, Univ. of Zürich, EPF Lausanne
The National Centers of Competence in Research (NCCR) are a research instrument of the Swiss National Science Foundation.

2 Abstracts of refereed papers

Gas, not dust: Migration of TESS/*Gaia* hot Jupiters possibly halted by the magnetospheres of protoplanetary disks

I. Mendigutía[1], *J. Lillo-Box*[1], *M. Vioque*[2,3], *J. Maldonado*[4], *B. Montesinos*[1], *N. Huélamo*[1], *J. Wang*[5]

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Astronomy & Astrophysics Letters, in press (arXiv:2405.00106)

The presence of short-period ($<$ 10 days) planets around main sequence (MS) stars has been associated either with the dust-destruction region or with the magnetospheric gas-truncation radius in the protoplanetary disks that surround them during the pre-MS phase. However, previous analyses have only considered low-mass FGK stars, making it difficult to disentangle the two scenarios. This exploratory study is aimed at testing whether it is the inner dust or gas disk driving the location of short-period, giant planets. By combining TESS and *Gaia* DR3 data, we identified a sample of 47 intermediate-mass (1.5 – 3 $M_\odot$) MS stars hosting confirmed and firm candidate hot Jupiters. We compared their orbits with the rough position of the inner dust and gas disks, which are well separated around their Herbig stars precursors. We also made a comparison with the orbits of confirmed hot Jupiters around a similarly extracted TESS/*Gaia* sample of low-mass sources (0.5 – 1.5 $M_\odot$). The orbits of hot Jupiters around intermediate-mass stars tend to be closer to the central sources than the inner dust disk, most generally consistent with the small magnetospheric truncation radii typical of Herbig stars ($< 5R_*$). A similar study considering the low-mass stars alone has been less conclusive due to the similar spatial scales of their inner dust and gas disks ($> 5R_*$). However, considering the whole sample, we do not find the correlation between orbit sizes and stellar luminosities that is otherwise expected if the dust-destruction radius limits the hot Jupiters' orbits. On the contrary, the comparative analysis reveals that such orbits tend to be closer to the stellar surface for intermediate-mass stars than for low-mass stars, with both being mostly consistent with the rough sizes of the corresponding magnetospheres. Our results suggest that the inner gas (and not the dust) disk limits the innermost orbits of hot Jupiters around intermediate-mass stars. These findings also provide tentative support to previous works that have claimed this is indeed the case for low-mass sources. We propose that hot Jupiters could be explained via a combination of the core-accretion paradigm and migration up to the gas-truncation radius, which may be responsible for halting inward migration regardless of the stellar mass regime. Larger samples of intermediate-mass stars with hot Jupiters are necessary to confirm our hypothesis, which implies that massive Herbig stars without magnetospheres ($>$ 3-4 $M_\odot$) may be the most efficient in swallowing their newborn planets.

Download/Website: `https://ui.adsabs.harvard.edu/abs/2024arXiv240500106M/abstract`
Contact: `imendigutia@cab.inta-csic.es`

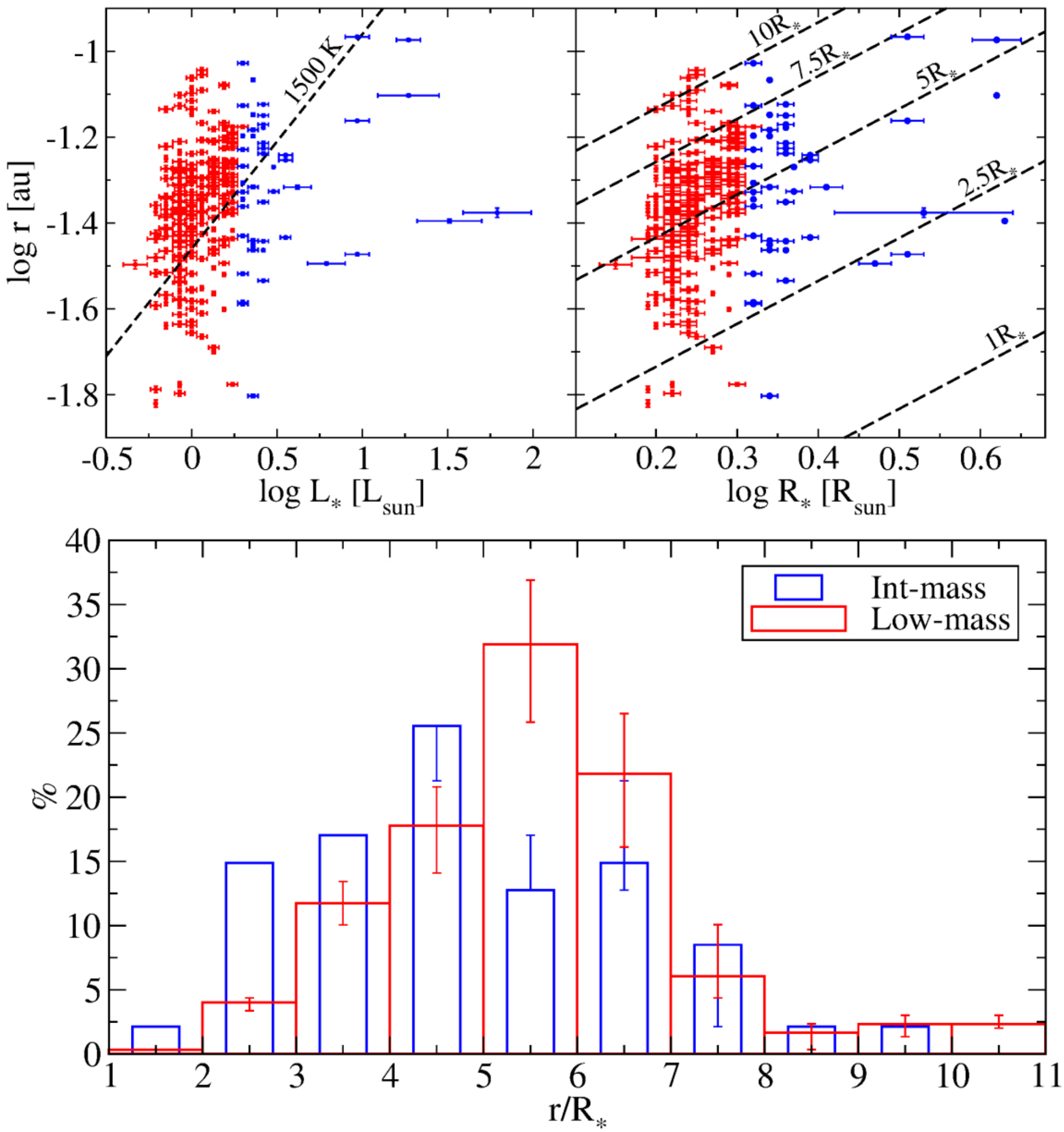

Figure 1: **Top:** Planetary orbital radii versus pre-MS stellar luminosities (left) and radii (right) at 3 Myr. Intermediate- and low-mass stars are displayed in blue and red (47 and 298 sources, respectively). In the left panel, the dashed line indicates the location of the inner dust disk below which dust is destroyed at a sublimation temperature of 1500 K. $\sim 70\%$ of the intermediate-mass stars have planets with orbits closer to the central source than the dust-destruction radius. In contrast, almost 80% of low-mass stars host planets in orbits equal or larger than the dust barrier. In the right panel, the dashed lines indicate the magnetospheric inner gas disk at 10, 7.5, 5, 2.5, and 1R$_*$. The location of $\sim 60\%$ of the hot jupiters around intermediate-mass stars is consistent with the small magnetospheres typical of Herbig stars (< 5R$_*$), while $\sim 65\%$ of the hot Jupiters around low-mass stars have orbits > 5R$_*$. **Bottom:** Distributions of planetary orbital radii in terms of of pre-MS stellar radii at 3 Myr. The orbits around intermediate- and low-mass stars dominate below and above 5R$_*$, respectively, which is the rough limit dividing between small and large magnetosphere sizes. A two-sample Kolmogorov-Smirnov test provides a 0.53% probability that the previous samples are drawn from the same parent distribution.

Gliese 12 b, A Temperate Earth-sized Planet at 12 Parsecs Discovered with TESS and CHEOPS

S.Dholakia[1], L. Palethorpe[2,3,4], A. Venner[1], A. Mortier[5], T. G. Wilson[6,7], C. X. Huang[1], K. Rice[2,3], V. Van Eylen[4], E. Nabbie[1], R. Cloutier[12], W. Boschin[8,9,10], D. Ciardi[11], L. Delrez[13,14,15], G. Dransfield[5], E. Ducrot[16], Z. Essack[17], M. E. Everett[18], M. Gillon[19], M. J. Hooton[20], M. Kunimoto[21,22], D. W. Latham[23], M. López-Morales[23], B. Li[24], F. Lin[24], S. McDermott[25], S. Murphy[1], C. A. Murray[26], S. Seager[21,27,28], M. Timmermans[13],A. H. M. J. Triaud[5], D. A. Turner[5], J. D. Twicken[24], A. Vanderburg[21], S. Wang[24], R. A. Wittenmyer[1], and D. Wright[1]

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Monthly Notices of the Royal Astronomical Society, published (2024MNRAS.531.1276D)

We report on the discovery of Gliese 12 b, the nearest transiting temperate, Earth-sized planet found to date. Gliese 12 is a bright ($V = 12.6$ mag, $K = 7.8$ mag) metal-poor M4V star only 12.162 ± 0.005 pc away from the Solar System with one of the lowest stellar activity levels known for an M-dwarf. A planet candidate was detected by *TESS* based on only 3 transits in sectors 42, 43, and 57, with an ambiguity in the orbital period due to observational gaps. We performed follow-up transit observations with *CHEOPS* and ground-based photometry with MINERVA-Australis, SPECULOOS, and Purple Mountain Observatory, as well as further *TESS* observations in sector 70. We statistically validate Gliese 12 b as a planet with an orbital period of 12.76144 ± 0.00006 days and a radius of 1.0 ± 0.1 $R_\oplus$, resulting in an equilibrium temperature of $\sim$315K. Gliese 12 b has excellent future prospects for precise mass measurement, which may inform how planetary internal structure is affected by the stellar compositional environment. Gliese 12 b also represents one of the best targets to study whether Earth-like planets orbiting cool stars can retain their atmospheres, a crucial step to advance our understanding of habitability on Earth and across the Galaxy.

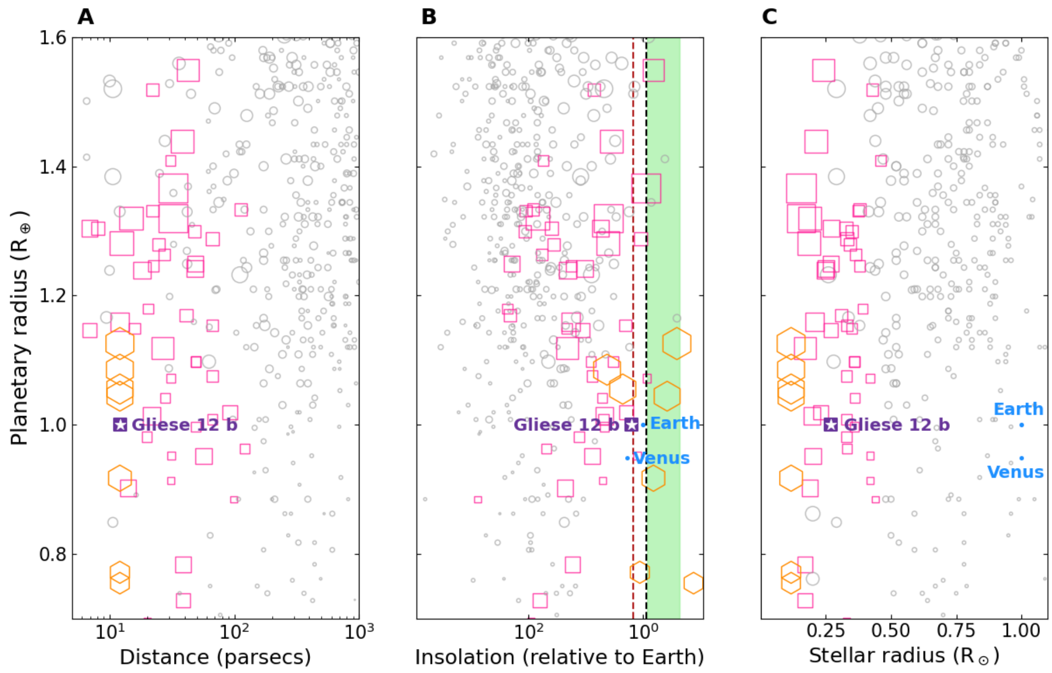

Figure 2: Planetary radius versus distance, insolation, and stellar radius, respectively. Planets were taken from the Extrasolar Planets Encyclopaedia, with those orbiting M dwarfs highlighted as pink squares, and the rest shown as grey circles. Gliese 12 b is highlighted by the white star in the purple square. The orange hexagons correspond to the TRAPPIST-1 planets; nearby planets around small stars that are most accessible to characterization by the James Webb Space Telescope (*JWST*). The green shaded region in **B** is the M-dwarf habitable zone, the black dashed line corresponds to a runaway greenhouse atmosphere, and the dark red dashed line corresponds to recent Venus (Kopparapu et al. 2013). We note that this habitable zone is only appropriate for planets orbiting M dwarfs. The size of each marker is proportional to the transit depth and hence observational accessibility.

Download/Website: `https://doi.org/10.1093/mnras/stae1152`

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BEBOP V. Homogeneous Stellar Analysis of Potential Circumbinary Planet Hosts

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:2406.03094)

Planets orbiting binary systems are relatively unexplored compared to those around single stars. Detections of circumbinary planets and planetary systems offer a first detailed view into our understanding of circumbinary planet formation and dynamical evolution. The BEBOP (Binaries Escorted by Orbiting Planets) radial velocity survey plays a special role in this adventure as it focuses on eclipsing single-lined binaries with an FGK dwarf primary and M dwarf secondary allowing for the highest-radial velocity precision using the HARPS and SOPHIE spectrographs. We obtained 4512 high-resolution spectra for the 179 targets in the BEBOP survey which we used to derive the stellar atmospheric parameters using both equivalent widths and spectral synthesis. We furthermore derive stellar masses, radii, and ages for all targets. With this work, we present the first homogeneous catalogue of precise stellar parameters for these eclipsing single-lined binaries.

Download/Website: `https://arxiv.org/pdf/2406.03094`

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Feasibility study on retrieving exoplanetary cloud cover distributions using polarimetry

S. Winning, M. Lietzow-Sinjen, S. Wolf
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Astronomy & Astrophysics, published (ADS-Bibcode: 2024A&A...685A.172W)

Context. As a new growing field, exocartography aims to map the surface features of exoplanets that are beyond the resolution of traditional observing techniques. While photometric approaches have been discussed extensively, polarimetry has received less attention despite its promising prospects.
Aims. We demonstrate that the limb polarization of an exoplanetary atmosphere offers valuable insights into its cloud cover distribution. Specifically, we determine an upper limit for the polarimetric precision, which is required to extract information about the latitudinal cloud cover of temperate Jovian planets for scenarios of observations with and without host stars.
Methods. To compute the scattered stellar radiation of an exoplanetary atmosphere and to study the polarization at various planetary phase angles, we used the three-dimensional Monte Carlo radiative transfer code POLARIS.
Results. When the planetary signal can be measured separately from the stellar radiation, information about the latitudinal cloud cover for polar cap models is accessible at polarimetric sensitivities of $0.1\,\%$. In contrast, a precision of about $10^{-3}\,\mathrm{ppm}$ is required when the stellar flux is included to gain this information.

Download/Website: `https://arxiv.org/abs/2405.12727`

Contact: `simon.winning@stu.uni-kiel.de`

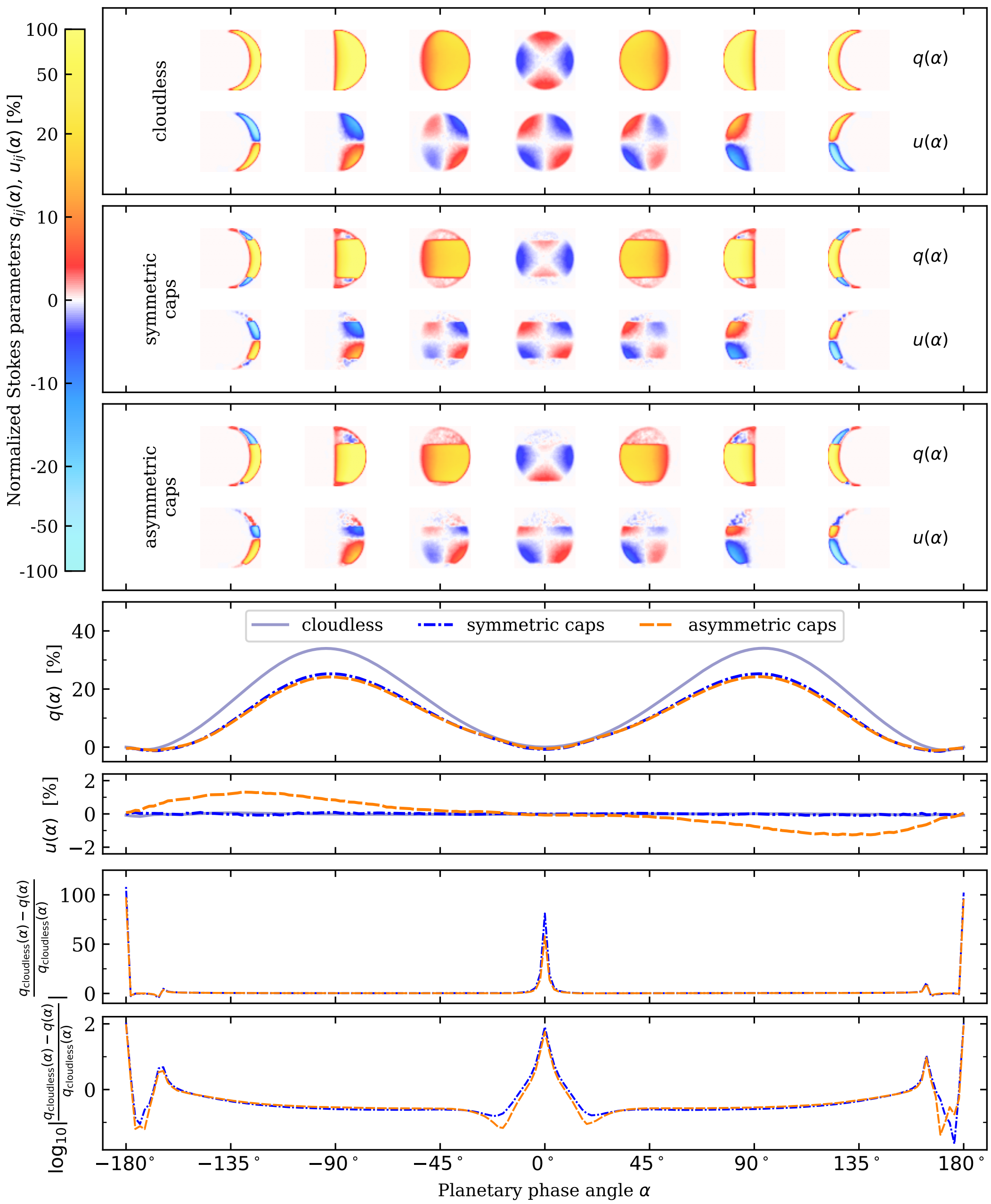

Figure 3: Polarization of planetary phase functions for the cases of two cloud cap configurations and for a cloud-free atmosphere to illustrate the effect of locally obscured limb polarization on the net phase function at wavelengths of $\lambda = 550\,\mathrm{nm}$. The upper three panels show the spatially resolved normalized Stokes parameters $q(\alpha)$ and $u(\alpha)$ for selected phase angles α of spatially resolved planetary disks. Below, the resulting net normalized Stokes parameters $q(\alpha)$ and $u(\alpha)$ are shown. The bottom two panels show the relative differences of $q(\alpha)$ and the reference case of a cloudless atmosphere at a linear and logarithmic scale. For all figures, the phase angles range from $-180°$ to $180°$. A full planetary orbit is therefore considered.

TOI-6883.01: A Single-transit Planet Candidate Detected from TESS

G. Conzo[1], *M. Moriconi*[1]
[1] Gruppo Astrofili Palidoro, Fiumicino, Italy

*Research Notes of the AAS, Volume 8, Number 2**,

A new candidate exoplanet, proposed in ExoFOP by authors, it was promoted from TIC 393818343 to TOI-6883.01 at coordinates $R.A.(J2000)20:41:10.01 decl.(J2000)+3:38:17.87$ in the Delphinus constellation and its distance is $(93.73 \pm 0.35)pc$ from Earth. The target star is a Sun-type having G0 class according to Skiff spectral classification and it has photometric magnitude $V(Johnson) = 9.5mag$. We analyzed the transit light curve using Transit Exoplanet Survey Satellite's ExoMAST tool, and evaluated the Lightcurve Analysis Tool for Transiting Exoplanets-report by excluding false positives, studying the background, satellite and centroid motion, and analyzing the pixels in sector 55 to define the source goodness. The candidate exoplanet transit has a duration of $TD = 3.957hr$, $Depth = 0.1196\%$ and mid-transit time occurs at $TBJD = 2811.24$. Only one event was observed, so the orbital period cannot be evaluated.

Download/Website: `https://iopscience.iop.org/article/10.3847/2515-5172/ad2c85`

Note: Exoplanet TOI-6883 b was discovered by Conzo G. and Moriconi M, 2024 and confirmed by Sgro L. et al, 2024

*Editorial note: AAS research notes are non-peer reviewed.

3 Jobs and Positions

2 postdoctoral positions related to PLATO science

J. Cabrera
Institute of Planetary Research, DLR, Rutherfordstr. 2, 12489 Berlin, Germany

Berlin, Germany, starting not ealier than September 2024

The DLR Institute of Planetary Research is a central DLR site for the construction and operational use of scientific instruments for satellite missions in the science and exploration programmes of ESA, NASA and JAXA.
These postdoctoral positions are located in the Institute of Planetary Research and are assigned to the department Extrasolar Planets and Atmospheres in close collaboration with the department of Planetary Physics at DLR, and the Planetary Sciences and Remote Sensing group at FU Berlin.
The focus of the activities is closely related to the PLATO Mission (PLAnetary Transits and Oscillations of stars, the 3rd mission of M-class in the Cosmic Vision programme by ESA), whose goal is the search and characterization of extrasolar planets, including Earth-like planets.
In particular, the candidates will:

- Investigate the interior structure of planets with the aim of clearly determining their composition using observational constraints obtained with PLATO: http://s.dlr.de/c48lL.
- Investigate the statistical properties of planetary systems with the aim of understanding the processes of planetary formation and evolution in the PLATO context: http://s.dlr.de/1FvH4

The application details are provided in the links above. If interested, candidates are encouraged to apply for both positions. Please, submit your application through the DLR portal by June 23rd. The expected starting date is not earlier than September 2024. The duration of the contract is 3 years.
The interface for the application is currently only available in German because of technical reasons. However, knowledge of German is not required. We accept applications in English language.
For any inquiries, including the English version of the application text, please contact juan.cabrera@dlr.de.

Download/Website: `http://s.dlr.de/c48lL`

Download/Website: `http://s.dlr.de/1FvH4`

Contact: `juan.cabrera@dlr.de`

PhD Position in Space Science

PD Dr. Audrey Vorburger
Sidlerstrasse 5, 3012 Bern, Switzerland

Bern, Switzerland, 01/09/2024

The Space Research and Planetology Division at the University of Bern is seeking a highly motivated PhD student to join its esteemed Space Science Group. Our group specializes in studying the composition of tenuous gases near solar system objects using time-of-flight mass spectrometers and determining surface compositions with advanced laser ablation techniques. Notably, we developed and built the mass spectrometer for ESA's JUICE mission and are responsible for the preparation and analysis of the measurements it will conduct once the mission arrives in the Jupiter system in July 2031. This research project focuses on preparing measurements by the mass spectrometers on board ESA's JUICE and NASA's Europa Clipper missions to study the plumes tentatively observed on Europa, one of Jupiter's icy moons.

This PhD project aims to model the gas phase of Europa's plumes, crucial for assessing the moon's habitability. It involves developing a simulation to track changes in plume chemistry from liquid to gas. The candidate will work with Monte Carlo and DSMC models, providing insights for ESA's JUICE and NASA's Europa Clipper missions. This research will enhance our understanding of Europa's potential to support life and prepare for mass spectrometer measurements by JUICE/NIM and Europa Clipper/MASPEX. The student will collaborate closely with both mission teams, potentially visiting US counterparts to share expertise.

Key Responsibilities: Qualifications:

- MSc in Physics, Astrophysics, or a field related to the research project.
- Proficient English language skills, both written and spoken; German language skills are a plus.
- Experience in programming is highly desirable.
- Strong motivation and ability to work independently as well as collaboratively.

Position Details and Application Instructions:

- Starting Date: Flexible, but not before September 2024
- Salary: In accordance with the personnel regulations of the Canton of Bern
- Application Deadline: 31 July 2024

Application Instructions: Submit your application as a single PDF file consisting of:

1. Cover letter describing your motivation and qualifications for the position
2. Curriculum Vitae (CV)
3. List of publications (if applicable)
4. Names and contact information of three references

to audrey.vorburger@unibe.ch

Download/Website: `https://ohws.prospective.ch/public/v1/jobs/ff9471de-a04b-4391-bca6-36ea418ab450`

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4 Conferences and Workshops

Kick-off Meeting for the COST Action - PLANETS - The birth of solar systems

Dr Catherine Walsh
University of Leeds, UK

Coperunicus Hotel Torun, 9 - 11 July 2024

The COST Action PLANETS - The birth of solar systems - will hold its kick-off meeting on 9 - 11 July 2024 in Torun in Poland. Further information on the Action members and objectives can be found at the link below.

A COST Action is an interdisciplinary research network that enables researchers to interact and investigate a specific topic, in our case, planet formation (https://www.cost.eu/cost-actions/what-are-cost-actions/). The mission of this Action is to "Build an interdisciplinary network, with expertise in experimental studies, observations, and models, to advance our understanding of planet formation, by determining the computational and data needs of the community, and how to best exploit current and future observations." COST Actions provide funding over four years to fund meetings, training schools, attendance at conferences (to report research results under the remit of the Action), short-term scientific missions (to visit international collaborators or build new collaborations) and dissemination (e.g., publications) and public engagement material (https://www.cost.eu/what-do-we-fund/).

The Action kick-off meeting will take place at the Hotel Copurnicus in Torun, Poland, and will consist of a combination of scientific talks under the remit of the five scientific working groups of the Action,

- Planet formation: laboratory perspectives
- Advancing planet formation models
- Planet formation theory confronts observations
- Emerging habitable environments
- Towards the first database on planet-forming discs

as well as dedicated discussion sessions to draft ideas and plans on how to meet the aims and objectives and ultimately, the deliverables, of the Action (which can be found in the MoU: https://e-services.cost.eu/files/domain_files/CA/Action_CA22133/mou/CA22133-e.pdf).

We currently have capacity for additional in-person and online attendees at the kick-off meeting, and we cordially invite members of the community working in planet formation and/or exoplanets to join the Action, and also to register and take part in the meeting. We also have capacity for poster presentations for in-person attendees to the meeting; note that there is no conference fee. Instructions on how to book the hotel and sample travel itineraries to Torun will be sent to all new in-person registrations.

Next steps are:

- Step 1: Set up an eCOST account - https://e-services.cost.eu/user/login
- Step 2: Join the Action - https://e-services.cost.eu/action/CA22133/working-groups/apply
- Step 3: Register for the meeting - https://forms.office.com/e/vNHyTM3jbM

If you have any questions, you can contact the Action Chair at the e-mail address below.

Download/Website: *https://www.cost.eu/actions/CA22133/*

Contact: c.walsh1@leeds.ac.uk

5 As seen on astro-ph

The following list contains exoplanet related entries appearing on astro-ph in May 2024.
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.

May 2024

astro-ph/2405.00106: **Gas, not dust: Migration of TESS/Gaia hot Jupiters possibly halted by the magnetospheres of protoplanetary disks** *by I. Mendigutía et al.*
astro-ph/2405.00160: **Planetesimal drift in eccentric disks: possible outward migration** *by Kedron Silsbee*
astro-ph/2405.00296: **Migration of Accreting Planets and Black Holes in Disks** *by JT Laune et al.*
astro-ph/2405.00375: **Spatial distribution of crystalline silicates in protoplanetary disks: How to interpret mid-infrared observations** *by Hyerin Jang et al.*
astro-ph/2405.00573: **JWST/NIRCam Detection of the Fomalhaut C Debris Disk in Scattered Light** *by Kellen Lawson et al.*
astro-ph/2405.00615: **Chemistry in externally FUV irradiated disks in the outskirts of the Orion Nebula** *by Javiera K. Díaz-Berríos et al.*
astro-ph/2405.00850: **Evolution of Flare Activity in GKM Stars Younger than 300 Myr over Five Years of TESS Observations** *by Adina D. Feinstein et al.*
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