ExoPlanet News
An Electronic Newsletter

No. 165, 14 March 2023

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

1 Editorial

Welcome to Edition 165 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 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 April 11, 2023.

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

Haiyang Wang
Eleonora Alei
Jeanne Davoult
Daniel Angerhausen
Timm-Emanuel Riesen

2 Abstracts of refereed papers

Formation of Rocky Super-Earths From A Narrow Ring of Planetesimals

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Nature Astronomy, published (2023NatAs.tmp...10B)

The formation of super-Earths, the most abundant planets in the Galaxy, remains elusive. These planets have masses that typically exceed that of the Earth by a factor of a few, appear to be predominantly rocky, although often surrounded by H/He atmospheres, and frequently occur in multiples. Moreover, planets that encircle the same star tend to have similar masses and radii, whereas those belonging to different systems exhibit remarkable overall diversity. Here we advance a theoretical picture for rocky planet formation that satisfies the aforementioned constraints: building upon recent work, which has demonstrated that planetesimals can form rapidly at discrete locations in the disk, we propose that super-Earths originate inside rings of silicate-rich planetesimals at approximately 1 au. Within the context of this picture, we show that planets grow primarily through pairwise collisions among rocky planetesimals until they achieve terminal masses that are regulated by isolation and orbital migration. We quantify our model with numerical simulations and demonstrate that our synthetic planetary systems bear a close resemblance to compact, multi-resonant progenitors of the observed population of short-period extrasolar planets.

Download/Website: `https://doi.org/10.1038/s41550-022-01850-5`

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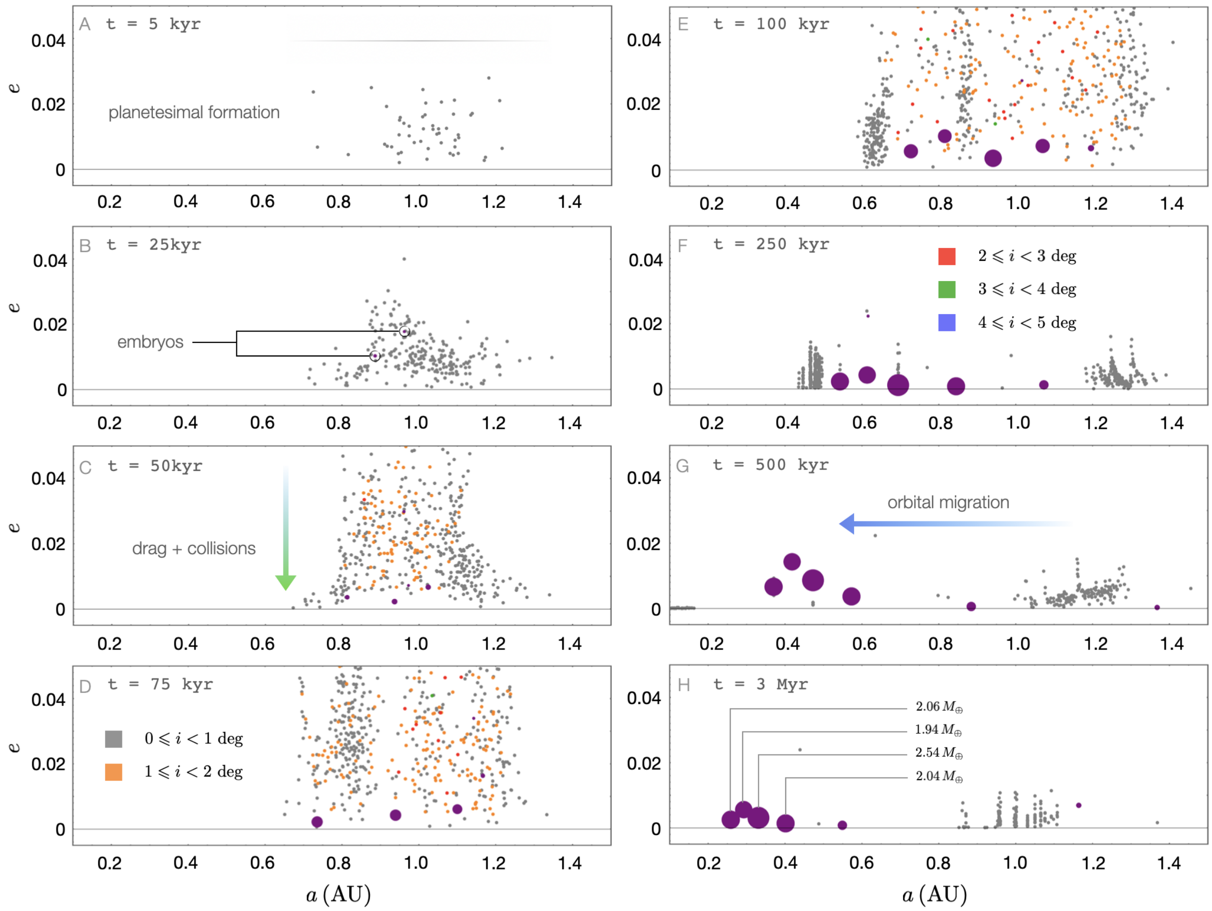

Figure 1: The formation sequence of a mass-uniform exoplanetary system. Over the course of the first 100,000 years (panels A-E), $\mathcal{D} = 100\,\mathrm{km}$ super-planetesimals (gray, orange, red, green, and blue points, labeled according to their inclinations) and lunar-mass planetary embryos (purple circles) – comprising $M_{\mathrm{ring}} \approx 20\,M_\oplus$ in total – are gradually introduced into the simulation domain. These objects originate with eccentricities and inclinations of $\langle e \rangle \sim \langle i \rangle \sim 0.01$, across a radial range spanned by the horizontal line shown in panel A. Growth of planetary embryos is driven primarily by accretion of planetesimals, with aerodynamic drag and collisional damping facilitating enhanced gravitational focusing (panels C-E). Injection of new material into the system terminates at the $t = 10^5$ year mark (panel E), and over the course of the following few hundred thousand years, multi-Earth-mass planets emerge, with the conglomeration process largely completed within the first $0.5\,\mathrm{Myr}$ (panel F, G). Over the course of the remaining lifetime of the disk, the formed planets migrate inwards, locking into a mass-uniform multi-resonant chain (panels H). Recent work has shown that tightly packed multi-resonant planetary configurations serve as ideal initial conditions for reproducing both the period ratio distribution of observed extrasolar planets as well as their inferred degree of mass-uniformity.

Dissipative Capture of Planets Into First-Order Mean-Motion Resonances

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Astrophysical Journal Letters, in press (arXiv:2303.02766)

The emergence of orbital resonances among planets is a natural consequence of the early dynamical evolution of planetary systems. While it is well-established that convergent migration is necessary for mean-motion commensurabilities to emerge, recent numerical experiments have shown that the existing adiabatic theory of resonant capture provides an incomplete description of the relevant physics, leading to an erroneous mass scaling in the regime of strong dissipation. In this work, we develop a new model for resonance capture that self-consistently accounts for migration and circularization of planetary orbits, and derive an analytic criterion based upon stability analysis that describes the conditions necessary for the formation of mean-motion resonances. We subsequently test our results against numerical simulations and find satisfactory agreement. Our results elucidate the critical role played by adiabaticity and resonant stability in shaping the orbital architectures of planetary systems during the nebular epoch, and provide a valuable tool for understanding their primordial dynamical evolution.

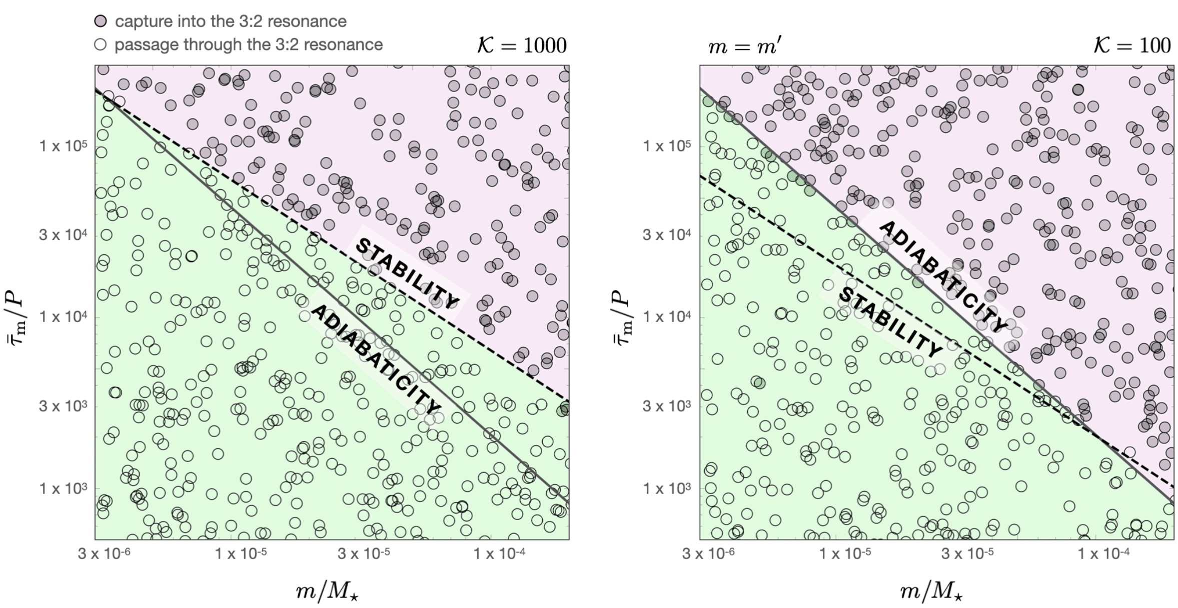

Figure 2: A dimensionless mass vs. migration time map of 3:2 resonance capture for an equal-mass planetary system. The filled circles indicate parameter combinations where numerical simulations yield successful resonant capture, whereas empty circles indicate passage through the 3:2 resonance. The left and right panels correspond to the heavily ($\mathcal{K} = 1000$) and moderately ($\mathcal{K} = 100$) damped regimes, respectively. Both panels additionally show analytic stability and adiabaticity capture criteria as dashed and solid lines. While the stability criterion regulates capture in the heavily-dissipated case, adiabaticity controls the outcome of resonant encounters in the moderately damped regime.

Download/Website: `https://arxiv.org/pdf/2303.02766.pdf`

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Improving circumbinary planet detections by fitting their binary's apsidal precession

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Monthly Notices of the Royal Astronomical Society, published (2023MNRAS.tmp..592B)

Apsidal precession in stellar binaries is the main non-Keplerian dynamical effect impacting the radial-velocities of a binary star system. Its presence can notably hide the presence of orbiting circumbinary planets because many fitting algorithms assume perfectly Keplerian motion. To first order, apsidal precession ($\dot{\omega}$) can be accounted for by adding a linear term to the usual Keplerian model. We include apsidal precession in the `kima` package, an orbital fitter designed to detect and characterise planets from radial velocity data. In this paper, we detail this and other additions to `kima` that improve fitting for stellar binaries and circumbinary planets including corrections from general relativity. We then demonstrate that fitting for $\dot{\omega}$ can improve the detection sensitivity to circumbinary exoplanets by up to an order of magnitude in some circumstances, particularly in the case of multi-planetary systems. In addition, we apply the algorithm to several real systems, producing a new measurement of aspidal precession in KOI-126 (a tight triple system), and a detection of $\dot{\omega}$ in the Kepler-16 circumbinary system. Although apsidal precession is detected for Kepler-16, it does not have a large effect on the detection limit or the planetary parameters. We also derive an expression for the precession an outer planet would induce on the inner binary and compare the value this predicts with the one we detect.

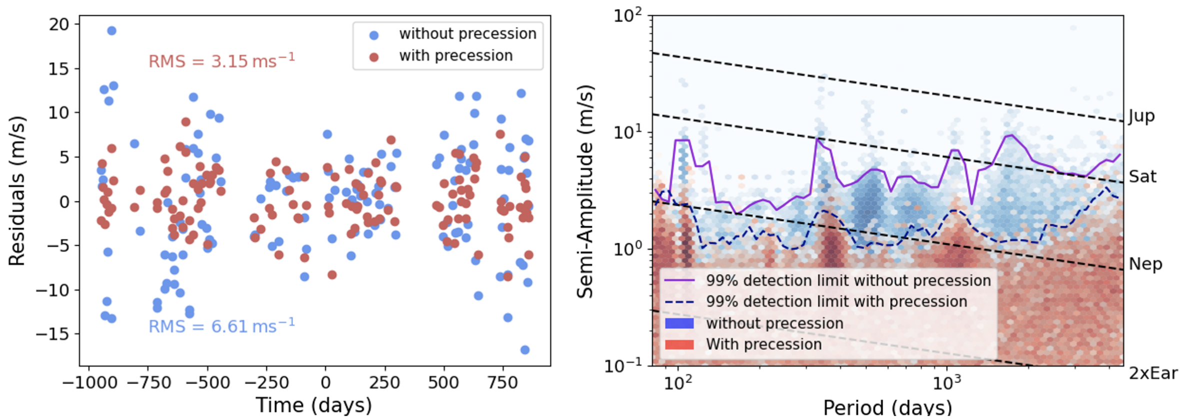

Figure 3: Improvement from including apsidal precession into the fit, for a simulated binary with precession induced by a cricumbinary planet. Left: a comparison of radial velocity residuals, after removing the binary's orbital solution, for SIM1 where apsidal precession is included in the `kima-binaries` model (in red) and not included in `kima` (in blue). Right: Detection limits for additional Keplerian signals using SIM1. The hexbins represent the density of posterior samples in each run. The purple dashed line and solid blue line are the 99% detection limits. The black dashed lines show where bodies of various masses would sit on this plot.

Download/Website: `https://arxiv.org/abs/2301.11372`

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Planetary line-to-accretion luminosity scaling relations: Extrapolating to higher-order hydrogen lines

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RNAAS, published (2022RNAAS...6..262M)

Aoyama et al. (2021, ApJL) provided scaling relations between hydrogen-line luminosities and the accretion luminosity for planetary-mass objects. These fits should be an improvement over blind extrapolations of stellar relations (e.g., Rigliaco et al. 2012; Alcalà et al. 2017). The fits go up only to the $n = 8$ electron energy level, but higher-n Balmer lines have been observed in the near-UV at Delorme 1 (AB)b with UVES (Ringqvist et al. 2023). We extend the scaling relations to higher-n levels for the Balmer and other series by fitting the fit coefficients $(a,\ b)$ themselves and extrapolating them. Within the assumption of an accretion shock as the source of line emission, these fits should be robust for accreting planetary-mass objects. The fits are conveniently implemented in the `species` package (see "Emission line" tutorial under `https://species.readthedocs.io`).

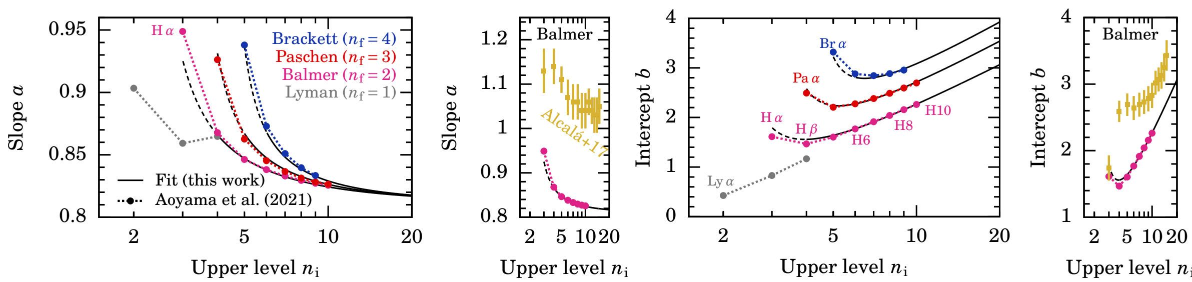

Figure 4: Empirical correlations are usually fit by $\log_{10}(L_{\rm acc}/L_\odot) = a \times \log_{10}(L_{\rm line}/L_\odot) + b$ (e.g., Alcalà et al. 2017), with regression coefficients a and b. We *fit the fit coefficients* of the planetary $L_{\rm acc}$–$L_{\rm line}$ relations (Aoyama et al. 2021), for Balmer to Brackett transitions. Each transition is defined by the initial $n_{\rm i}$ and final $n_{\rm f}$ energy levels (H α: $3 \rightarrow 2$). *Circles*: coefficients from the direct fits of $L_{\rm acc}$–$L_{\rm line}$, also for the Lyman series ($n_{\rm f} = 1$). *Black lines*: our fit of the coefficients with a simple function. The narrow panels compare to the fit coefficients for CTTSs (*golden squares*: Alcalà et al. 2017) for the Balmer series. Note the different y scales.

Download/Website: `https://ui.adsabs.harvard.edu/abs/2022RNAAS...6..262M`

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Editorial note: Articles published on Research Notes of the American Astronomical Society are non-peer reviewed.

Imaging of exocomets with infrared interferometry

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Astronomy & Astrophysics, in press (arXiv:2302.10961)

Active comets have been detected in several exoplanetary systems, although so far only indirectly, when the dust or gas in the extended coma has transited in front of the stellar disk. The large optical surface and relatively high temperature of an active cometary coma also makes it suitable to study with direct imaging, but the angular separation is generally too small to be reachable with present-day facilities. However, future imaging facilities with the ability to detect terrestrial planets in the habitable zones of nearby systems will also be sensitive to exocomets in such systems. Here we examine several aspects of exocomet imaging, particularly in the context of the Large Interferometer for Exoplanets (*LIFE*), which is a proposed space mission for infrared imaging and spectroscopy through nulling interferometry. We study what capabilities *LIFE* would have for acquiring imaging and spectroscopy of exocomets, based on simulations of the *LIFE* performance as well as statistical properties of exocomets that have recently been deduced from transit surveys. We find that for systems with extreme cometary activities such as β Pictoris, sufficiently bright comets may be so abundant that they overcrowd the *LIFE* inner field of view. More nearby and moderately active systems such as ϵ Eridani or Fomalhaut may turn out to be optimal targets. If the exocomets have strong silicate emission features, such as in comet Hale-Bopp, it may become possible to study the mineralogy of individual exocometary bodies. We also discuss the possibility of exocomets as false positives for planets, with recent deep imaging of α Centauri as one hypothetical example. Such contaminants could be common, primarily among young debris disk stars, but should be rare among the main sequence population. We discuss strategies to mitigate the risk of any such false positives.

Download/Website: `https://arxiv.org/abs/2302.10961`

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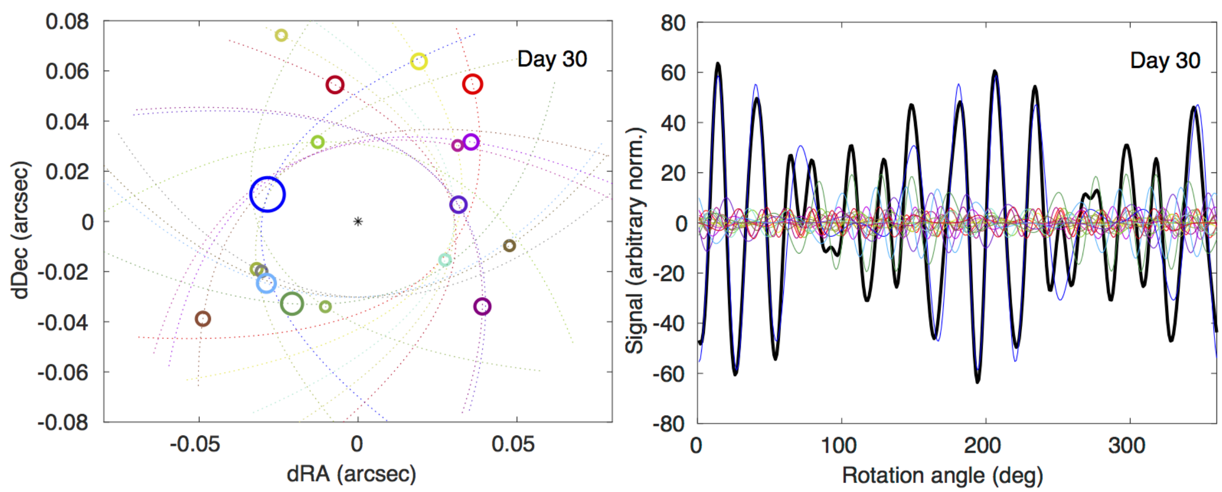

Figure 5: Example of a simulated crowded field of exocomets around a young star with high cometary activity. Left: Positions of the comets relative to the star (at center) at day 30 of the simulation. The size of each circle is proportional to the size of the exocometary coma. Right: The resulting nulling interferomtric output for the full field (thick black line), as well as the outputs that would have been measured for each comet in isolation (thin colored lines), with the same color coding as in the left panel.

Scattered polarized radiation of extrasolar circumplanetary rings

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Astronomy & Astrophysics, in press (arXiv:2302.06508)

Aims. We have investigated the impact of circumplanetary rings consisting of spherical micrometer-sized particles on the net scattered light polarization of extrasolar gas giants.
Methods. Using the three-dimensional Monte Carlo radiative transfer code POLARIS, we studied the impact of the macroscopic parameters that define the ring, such as its radius and inclination, and the chemical composition of the ring particles on the net scattered polarization. For the spherical ring particles, we applied the Mie scattering theory. We studied the flux and polarization of the scattered stellar radiation as a function of planetary phase angle and wavelength from the optical to the near-infrared.
Results. For the chosen grain size distribution, the dust particles in the ring show strong forward scattering at the considered wavelengths. Thus, the reflected flux of the planet dominates the total reflected and polarized flux at small phase angles. However, the scattered and polarized flux of the ring increase at large phase angles and exceeds the total reflected planetary flux. For large rings that contain silicate particles, the total reflected flux is dominated by the radiation scattered by the dust in the ring at all phase angles. As a result, the orientation of polarization is parallel to the scattering plane at small phase angles. In contrast, for a ring that contains water ice particles, the orientation of polarization is parallel to the scattering plane at large phase angles. Depending on the ring inclination and orientation, the total reflected and polarized flux show a specific distribution as well. Large particles show a strong polarization at large phase angles compared to smaller particles. For a Jupiter-like atmosphere that contains methane and aerosols, methane absorption features are missing in the spectrum of a ringed planet.
Conclusions. Scattering of the stellar radiation by dust in circumplanetary rings of extrasolar planets results in unique features in the phase-angle- and wavelength-dependent reflected and polarized net flux. Thus, exoplanet polarimetry provides the means to study not only the planetary atmosphere and surface, but also to identify the existence and constrain the properties of exoplanetary rings.

Download/Website: `https://arxiv.org/abs/2302.06508`

Contact: `mlietzow@astrophysik.uni-kiel.de`

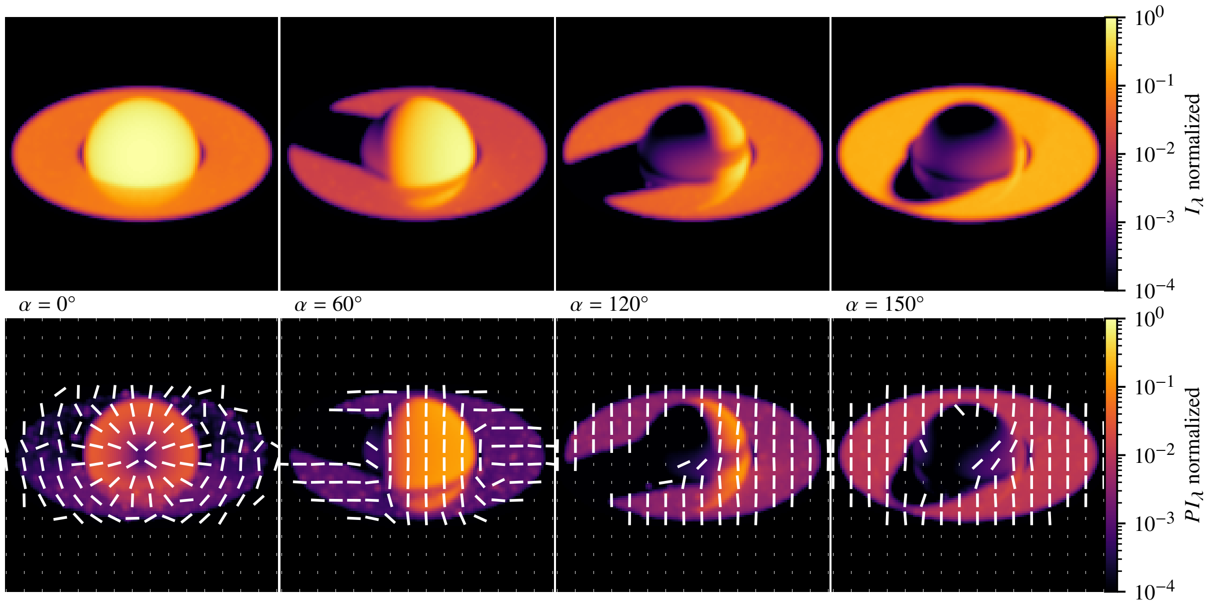

Figure 6: Total reflected flux, I_λ (*top*), and polarized flux, PI_λ (*bottom*), at four different planetary phase angles, α, at a wavelength of $0.55\,\mu\mathrm{m}$.

The McDonald Accelerating Stars Survey (MASS): Architecture of the Ancient Five-Planet Host System Kepler-444

Z. Zhang[1,2], B. P. Bowler[2], T. J. Dupuy[3], T. D. Brandt[4], G. M. Brandt[4], W. D. Cochran[5], M. Endl[6], P. J. MacQueen[6], K. M. Kratter[7], H. T. Isaacson[8], K. Franson[2], A. L. Kraus[2], C. V. Morley[2], Y. Zhou[2]

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The Astronomical Journal, published (2023AJ....165...73Z)

We present the latest and most precise characterization of the architecture for the ancient (≈ 11 Gyr) Kepler-444 system, which is composed of a K0 primary star (Kepler-444 A) hosting five transiting planets, and a tight M-type spectroscopic binary (Kepler-444 BC) with an A-BC projected separation of 66 au. We have measured the system's relative astrometry using the adaptive optics imaging from Keck/NIRC2 and Kepler-444 A's radial velocities from the Hobby Eberly Telescope, and re-analyzed relative radial velocities between BC and A from Keck/HIRES. We also include the Hipparcos-Gaia astrometric acceleration and all published astrometry and radial velocities into an updated orbit analysis of BC's barycenter. These data greatly extend the time baseline of the monitoring and lead to significant updates to BC's barycentric orbit compared to previous work, including a larger semi-major axis ($a = 52.2^{+3.3}_{-2.7}$ au), a smaller eccentricity ($e = 0.55 \pm 0.05$), and a more precise inclination ($i = 85.^\circ4^{+0.^\circ3}_{-0.^\circ4}$). We have also derived the first dynamical masses of B and C components. Our results suggest Kepler-444 A's protoplanetary disk was likely truncated by BC to a radius of ≈ 8 au, which resolves the previously noticed tension between Kepler-444 A's disk mass and planet masses. Kepler-444 BC's barycentric orbit is likely aligned with those of A's five planets, which might be primordial or a consequence of dynamical evolution. The Kepler-444 system demonstrates that compact multi-planet systems residing in hierarchical stellar triples can form at early epochs of the Universe and survive their secular evolution throughout cosmic time.

Download/Website: `https://ui.adsabs.harvard.edu/abs/2023AJ....165...73Z/abstract`
Contact: `zhangdirac@gmail.com`

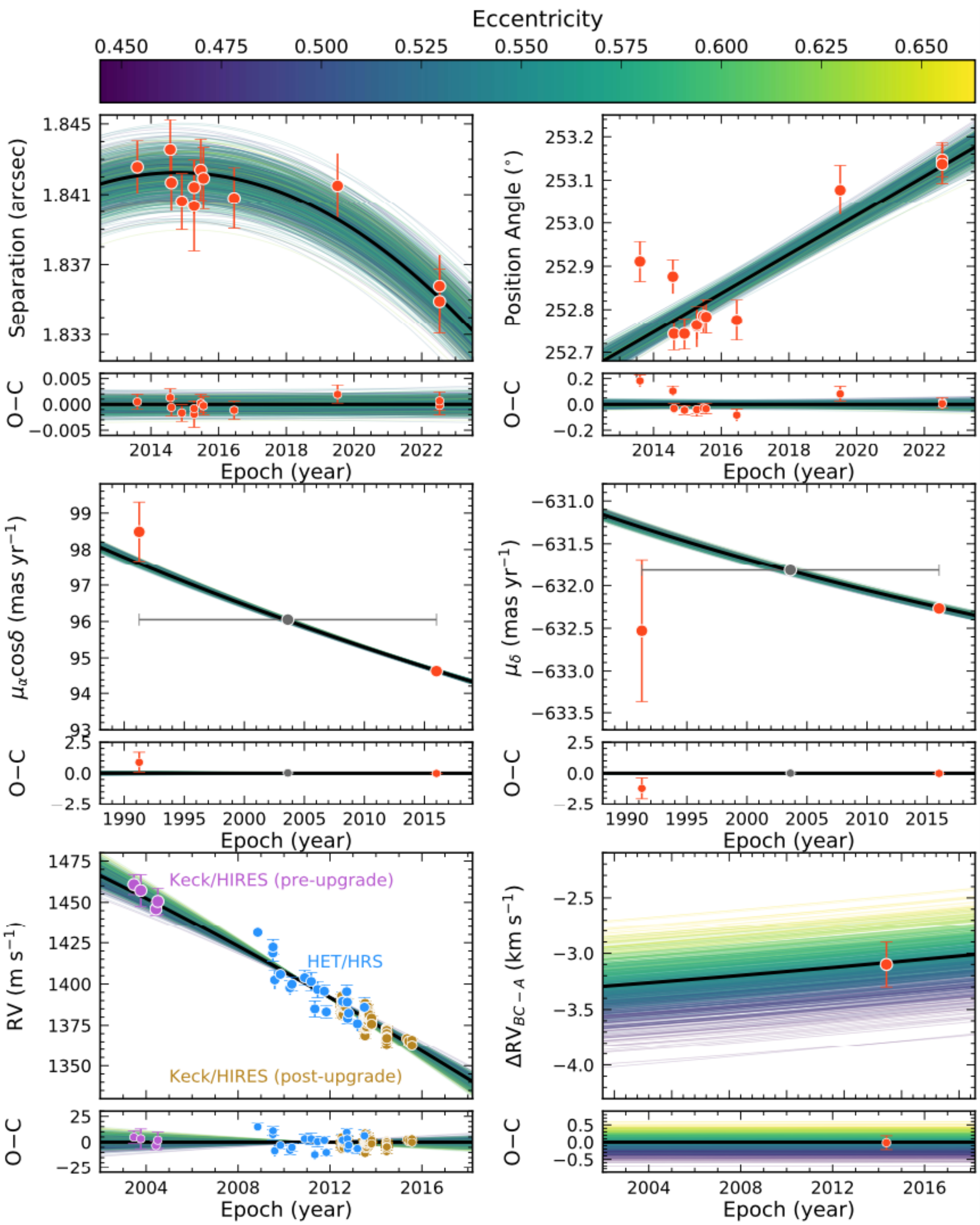

Figure 7: Model predictions overlaid on the observed relative astrometry from Keck/NIRC2 (top), absolute astrometry from Hipparcos (J1991.25) and Gaia EDR3 (J2016; middle), Kepler-444 A's multi-epoch RVs from HET/HRS and Keck/HIRES (bottom left), and the single-epoch BC-A relative RV from Keck/HIRES (bottom right). In each panel, we show the observed data (top) and residuals (bottom) using orange circles, except (1) the middle panels where we use grey circles to present the weighted-mean proper motion between Hipparcos and Gaia at J2003.625, the value that `orvara` uses to constrain the model-predicted proper motions of Kepler-444 A (Brandt et al. 2021), and (2) the bottom left panel where we use different colors to label RVs collected by different instruments. Predictions of 1000 randomly drawn orbits from the MCMC trials are overlaid in each panel color-coded by eccentricities. Predictions from the best-fit orbit are shown as black solid lines.

3 Jobs and Positions

Postdoctoral Scholar in Exoplanet Atmospheres

Thaddeus Komacek

College Park, MD, USA, Fall 2023

The University of Maryland Department of Astronomy invites applications for a postdoctoral associate position in the study of exoplanet atmospheres. The postdoctoral associate would work with Assistant Professor Thaddeus Komacek on projects focused on developing three-dimensional atmospheric circulation models of exoplanets and applying them to interpret observations. The successful applicant would have the opportunity to work on projects including but not limited to studying the radiative feedback due to mineral clouds on the atmospheric dynamics of hot and ultra-hot Jupiters, the influence of magnetic fields on their thermal structure and deep dynamics, and the coupling of interior evolution models to atmospheric circulation models. Prior experience with general circulation models and familiarity with observational characterization of exoplanets is preferred. The candidate must have a Ph.D in astronomy, planetary science, geophysics, or a related field by the start date of the position. The appointment will be for two years, with continuation for one more year contingent on performance and the availability of funding. The expected start date is Fall 2023, and is negotiable. Along with salary and benefits, the appointment will include limited allowances for travel and moving expenses. To apply, please submit an online application at https://forms.gle/UQZFqHT8SBt5PHhu9. The requested materials include a full CV with a list of publications along with a brief (2 pages of text) description of research interests. Please also arrange for 2-3 letters of reference to be sent via the same application form. All materials should be received by March 17, 2023. Applications will not be considered until all materials are received.

Download/Website: https://jobregister.aas.org/ad/369bc0eb

Contact: tkomacek@umd.edu

4 Conferences and Workshops

4^{th} Advanced School on Exoplanetary Science:

"Astrophysics of Transiting Exoplanets"

Katia Biazzo [1], Valerio Bozza [2], Luigi Mancini [3], Alessandro Sozzetti [4]

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Vietri sul Mare (Salerno), Italy, from 22 to 26 May, 2023

Rationale: The Advanced School on Exoplanetary Science - taking place close to the enchanting Amalfi Coast - is aimed at providing a comprehensive, state-of-the-art picture of the rich variety of relevant aspects of the fast-developing, highly interdisciplinary field of exoplanet research (both from an observational and theoretical viewpoint). The School is addressed to graduate students and young post-doctoral researchers, and offers the fascinating possibility to interact with world-class experts engaged in different areas of the astrophysics of planetary systems. The 4^{th} edition of the School will be focused on the *Astrophysics of Transiting Exoplanet Systems*, covering both the theoretical and observational perspectives. In particular, the following kew questions will be addressed:

- the history and frontier of transiting exoplanets demographics (methodology and results), as a means for improved understanding of their formation and evolution;
- successes as well as astrophysical and methodological challenges in the determination of accurate and precise transiting exoplanet masses and radii;
- multi-transiting systems as tools for improving our knowledege of the origin and evolution of close-in, compact, high-multiplicity planetary systems;
- theoretical mechanisms and observations of atmospheric escape from highly irradiated transiting planets, as probes of their physical evolution;
- atmospheric characterization of transiting exoplanets (via transmission and emission spectroscopy), in the wake of the first results from the James Webb Space Telescope.

Organizing Committee: K. Biazzo (INAF - Rome Astronomical Observatory), V. Bozza (University of Salerno), L. Mancini (University of Rome "Tor Vergata"), A. Sozzetti (INAF - Turin Astrophysical Observatory)

Confirmed School Lecturers:
Statistics of Transiting Exoplanets: Prof. Courtney Dressing, University of California at Berkeley, USA
Accurate radii and masses: Dr. Aldo Bonomo, INAF – Turin Astrophysical Observatory, Italy
Multitransiting systems: Prof. Eric Ford, Pennsylvania State University, USA
Transiting exoplanet atmospheres: Prof. Laura Kreidberg, Max Planck Institute for Astronomy, Germany
Atmospheric escape: Dr. James Owen, Imperial College London, UK

Fee: The registration fee is 350 Euro and includes a conference kit, coffee breaks, social dinner and full access to the video recordings of the lectures.
Registration, abstract submission: Registrations are possible until April 3, 2023. There is a limited number of time slots for brief seminars of participants to present their own research. Title/Abstract submission is possible at any later moment after registration by sending an email to the Organizing Committee (deadline: April 15, 2023). All participants are allowed and encouraged to bring a poster.

Download/Website: `https://ases4.web.roma2.infn.it/`

Contact: `lmancini@roma2.infn.it - facebook.com/ases2023 - twitter.com/ases2023 - #ases4`

The 5th Workshop on Extremely Precise Radial Velocities

J. Burt, B. J. Fulton, SOC Co-Chairs

Conference, March 27-30, 2023

EPRV 5 will provide an opportunity to discuss key technical and scientific issues after a gap of four years since the last comparable meeting. The conference will feature talks from all major instrument and data analysis teams, to ensure that the community is aware of what each independent node is working towards and what challenges they are facing. We will invite representatives from stellar physics and heliophysics to increase the knowledge transfer between our fields and to hopefully spark new, cross disciplinary collaborations. A primary objective of the meeting agenda will be to allow ample time for discussion both during and after talk sessions, so that participants can engage in the level of detailed conversation that has made previous iterations such a boon to the field.
Registration to join the conference online is available through mid-March. Please check the conference website for the complete information including the agenda and email us at eprv5@lists.astro.caltech.edu if you have any questions.

Download/Website: `https://conference.ipac.caltech.edu/eprv5/`

Contact: `eprv5@lists.astro.caltech.edu`

2023 Sagan Summer Hybrid Workshop
Characterizing Exoplanet Atmospheres: The Next Twenty Years

T. Chen, D. Gelino
NASA Exoplanet Science Institute, California Institute of Technology, Pasadena, CA, USA

Hybrid Workshop, July 24-28, 2023

Observations of an exoplanets atmosphere provide the best hope for distinguishing the makeup of its outer layers, and the only hope for understanding the interplay between formation, natal composition, chemical and disequilibrium processes, and dynamics and circulation. The field is entering a revolution in our understanding of exoplanet atmospheres thanks to measurements from the ground, from space, and particularly from JWST, the superlative facility for exoplanet studies. In the longer term, such observations will also be essential for seeking signs of biosignature gasses in nearby exoplanets using future, next-generation observatories.
Workshop Topics include:

- Atmosphere Fundamentals
- Direct Imaging and Spectroscopy
- Transmission, Secondary Eclipses, and Phase Curves
- Interferometric Observations
- Star-Planet Interactions
- Lessons Learned from Brown Dwarfs and the Solar System
- Atmospheric Escape and Mass Loss
- Observations of Terrestrial Exoplanet Atmospheres
- Retrievals and Fitting models to Data
- JWST Transit Science and Imaging

This year's workshop will cover theoretical modeling, interpretation, and observations of exoplanets using a variety of telescopes, techniques, and hands-on exercises, presented by leading experts in the field. The hands-on sessions will address reducing and fitting JWST data and also give attendees experience with tools for modeling and retrieving exoplanet atmospheres. The agenda can be found on the workshop website.
We plan to hold the 2023 workshop as a hybrid with both in-person and on-line attendance. It is unclear at this time what, if any, public health restrictions will be in place in July 2023 due to COVID.
The Sagan Summer Workshops are aimed at advanced undergraduates, grad students, and postdocs, however all are welcome to attend. Attendees will also participate in hands-on tutorials and have the chance to meet in smaller groups with our speakers.
There is no registration fee for this workshop and registration to attend both in person and online is now available. We have limited funds available to support local expenses (hotel and per diem) for in person attendees. The deadline to apply for these funds is March 23 and decisions will be announced by April 14. Please see the workshop website for registration and travel support application information.
Please contact us with any questions or to be added to the email list.

Download/Website: `http://nexsci.caltech.edu/workshop/2023`

Contact: `sagan_workshop@ipac.caltech.edu`

5 Exoplanet Archives

February 2023 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, March 14, 2023

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

February 24, 2023

Twenty-two Microlensing Planets

This week's planetary system haul is a bumper crop of microlensing exoplanets—22 of them, in fact. Here's the full list:

OGLE-2016-BLG-1093 b, KMT-2016-BLG-1105L b, KMT-2017-BLG-0428L b, KMT-2017-BLG-1003L b, KMT-2017-BLG-1194L b, OGLE-2017-BLG-1806L b, OGLE-2018-BLG-0506L b, OGLE-2018-BLG-0516L b, OGLE-2018-BLG-0977L b, KMT-2019-BLG-0253L b, KMT-2019-BLG-0953L b, KMT-2019-BLG-1042L b, OGLE-2019-BLG-1053L b, KMT-2019-BLG-1367L b, OGLE-2019-BLG-1492L b, KMT-2019-BLG-1552L b, KMT-2019-BLG-1806L b, KMT-2019-BLG-2974L b, KMT-2021-BLG-0748L b, KMT-2021-BLG-1253L b, KMT-2021-BLG-1372L b, and KMT-2021-BLG-1391L b.

February 9, 2023

Eight Planets and Three More JWST Spectra

We're now hosting all four WASP-39 b transiting spectra taken by JWST's Early Release Science (ERS) program!

We've added three more WASP-39 b spectra from NASA's Webb Telescope to our Transmission Spectroscopy table (`http://bit.ly/transitspec`), which provides a single place to access publicly available spectra taken by various telescopes for this object, including NASA's Hubble and Spitzer, the Very Large Telescope, and Chile's Observatorio Astronomico Nacional. **Pro Tip:** To only view WASP-39 b entries, enter **WASP-39** b in the Planet Name column; enter **webb** in the Facility column to only display JWST entries.

We've also added eight planets: TOI-1669 b, TOI-1694 b & c, TOI-4342 b & c, TOI-4562 b, and OGLE-2019-BLG-0468L b & c.

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

Contact: `mharbut@caltech.edu`

6 As seen on astro-ph

The following list contains exoplanet related entries appearing on astro-ph in February 2023.
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.

February 2023

astro-ph/2302.00009: **Evidence that Core-Powered Mass-Loss Dominates Over Photoevaporation in Shaping the Kepler Radius Valley** *by Travis A. Berger et al.*
astro-ph/2302.00020: **Binary asteroid scattering around white dwarfs** *by Catriona H. McDonald, Dimitri Veras*
astro-ph/2302.00699: **An Earth-sized Planet around an M5 Dwarf Star at 22 pc** *by Teruyuki Hirano et al.*
astro-ph/2302.00580: **A Dynamical Systems Approach to the Theory of Circumbinary Orbits in the Circular Restricted Problem** *by Andrew Langford, Lauren M. Weiss*
astro-ph/2302.00473: **The tidal excitation of r modes in a solar type star orbited by a giant planet companion and the effect on orbital evolution I: The aligned case** *by J. C. B. Papaloizou, G. J. Savonije*
astro-ph/2302.01293: **QLP Data Release Notes 003: GPU-based Transit Search** *by Michelle Kunimoto et al.*
astro-ph/2302.00413: **A dynamical mass for GJ 463 b: A massive super-Jupiter companion beyond the snow line of a nearby M dwarf** *by A. Sozzetti*
astro-ph/2302.00280: **Threshold velocity for collisional growth of porous dust aggregates consisting of cohesive frictionless spheres** *by Sota Arakawa et al.*
astro-ph/2302.00420: **On the follow-up efforts of long-period transiting planet candidates detected with Gaia astrometry** *by A. Sozzetti et al.*
astro-ph/2302.01436: **Stellar Variability in Ground-Based Photometric Surveys: An Overview** *by M. Catelan*
astro-ph/2302.01433: **Empirical constraints on turbulence in proto-planetary discs** *by Giovanni P. Rosotti*
astro-ph/2302.01352: **A new dynamical modeling of the WASP-47 system with CHEOPS observations** *by V. Nascimbeni et al.*
astro-ph/2302.01221: **A dynamical survey of the trans-Neptunian region I.: Mean-motion resonances with Neptune** *by E. Forgács-Dajka et al.*
astro-ph/2302.01165: **NEOROCKS project: surface properties of small near-Earth asteroids** *by T. Hromakina et al.*
astro-ph/2302.01102: **TESS Asteroseismic Analysis of HD 76920: The Giant Star Hosting An Extremely Eccentric Exoplanet** *by Chen Jiang et al.*
astro-ph/2302.01168: **OGLE-2016-BLG-1195Lb: A Sub-Neptune Beyond the Snow Line of an M-dwarf Confirmed by Keck AO** *by Aikaterini Vandorou et al.*
astro-ph/2302.01119: **Fractal aggregates of sub-micron-sized grains in the young planet-forming disk around IM Lup** *by Ryo Tazaki et al.*
astro-ph/2302.01949: **Modest dust settling in the IRAS04302+2247 Class I protoplanetary disk** *by M. Villenave et al.*
astro-ph/2302.01853: **A full transit of μ^2 Lupi d and the search for an exomoon in its Hill sphere with CHEOPS** *by D. Ehrenreich et al.*
astro-ph/2302.01794: **VPNEP: Detailed characterization of TESS targets around the Northern Ecliptic Pole** *by K. G. Strassmeier et al.*
astro-ph/2302.01514: **Three-dimensional Global Simulations of Type-II Planet-disk Interaction with a Magnetized Disk Wind: I. Magnetic Flux Concentration and Gap Properties** *by Yuhiko Aoyama, Xuening Bai*
astro-ph/2302.01479: **Absence of extended atmospheres in low-mass star radius-gap planets GJ 9827 b, GJ 9827 d and TOI-1235 b** *by Vigneshwaran Krishnamurthy et al.*
astro-ph/2302.01702: **The low density, hot Jupiter TOI-640 b is on a polar orbit** *by Emil Knudstrup et al.*

astro-ph/2302.02135: **Magnetic activity variability from Hα line intensive monitoring for two F-type stars having a hot-Jupiter, τ Bootis A and υ Andromedae A** *by Sanghee Lee et al.*

astro-ph/2302.02183: **Discovering planets with PLATO: Comparison of algorithms for stellar activity filtering** *by G. Canocchi et al.*

astro-ph/2302.03163: **Formation of the First Planetesimals via the Streaming Instability in Globally Turbulent Protoplanetary Disks?** *by Paul R. Estrada, Orkan M. Umurhan*

astro-ph/2302.03070: **When, where, and how many planets end up in first-order resonances?** *by Shuo Huang, Chris Ormel*

astro-ph/2302.03055: **The Demographics of Terrestrial Planets in the Venus Zone** *by Colby Ostberg et al.*

astro-ph/2302.02981: **Astrometric Reduction of Saturnian Satellites with Cassini-ISS Images Degraded by Trailed Stars** *by Qing-Feng Zhang et al.*

astro-ph/2302.02854: **NA-SODINN: a deep learning algorithm for exoplanet image detection based on residual noise regimes** *by Carles Cantero et al.*

astro-ph/2302.02810: **The 10 parsec sample in the Gaia era: first update** *by C. Reyle et al.*

astro-ph/2302.02710: **Glancing through the debris disk: Photometric analysis of DE Boo with CHEOPS** *by Á. Boldog et al.*

astro-ph/2302.02674: **Origin of Water in the Terrestrial Planets: Insights from Meteorite Data and Planet Formation Models** *by Andre Izidoro, Laurette Piani*

astro-ph/2302.02897: **Understanding and predicting cadence effects in the characterization of exoplanet transits** *by Julio Hernandez Camero et al.*

astro-ph/2302.03726: **A potential site for wide-orbit giant planet formation in the IM Lup disk** *by Arthur Bosman et al.*

astro-ph/2302.03721: **Radiation shielding of protoplanetary discs in young star-forming regions** *by Martijn J. C. Wilhelm et al.*

astro-ph/2302.03430: **Planetary nurseries: vortices formed at smooth viscosity transition** *by Zs. Regaly et al.*

astro-ph/2302.03377: **The SPIRou Legacy Survey Rotation period of quiet M dwarfs from circular polarization in near-infrared spectral lines: I. The SPIRou APERO analysis** *by P. Fouqué et al.*

astro-ph/2302.03897: **Improved precision of radial velocity measurements after correction for telluric absorption** *by A. Ivanova et al.*

astro-ph/2302.04138: **EDEN Survey: Small Transiting Planet Detection Limits and Constraints on the Occurrence Rates for Late M Dwarfs within 15 pc** *by Jeremy Dietrich et al.*

astro-ph/2302.04242: **The Occurrence Rate of Terrestrial Planets Orbiting Nearby Mid-to-late M Dwarfs from TESS Sectors 1-42** *by Kristo Ment, David Charbonneau*

astro-ph/2302.04273: **Debris Disk Color with the Hubble Space Telescope** *by Bin B. Ren et al.*

astro-ph/2302.04946: **Presence of liquid water during the evolution of exomoons orbiting ejected free-floating planets** *by Giulia Roccetti et al.*

astro-ph/2302.04922: **Validating AU Microscopii d with Transit Timing Variations** *by Justin M. Wittrock et al.*

astro-ph/2302.04898: **Chaotic winds from a dying planet: a one-dimensional map for evolving atmospheres** *by Joshua Bromley, Eugene Chiang*

astro-ph/2302.04893: **Testing the Interaction Between a Substellar Companion and a Debris Disk in the HR 2562 System** *by Stella Yimiao Zhang et al.*

astro-ph/2302.04891: **Demographics of Protoplanetary Disks: A Simulated Population of Edge-on Systems** *by Isabel Angelo et al.*

astro-ph/2302.04794: **The hot Neptune WASP-166 b with ESPRESSO III: A blue-shifted tentative water signal constrains the presence of clouds** *by M. Lafarga et al.*

astro-ph/2302.04980: **Functionality of Ice Line Latitudinal EBM Tenacity (FILLET). Protocol Version 1.0. A CUISINES intercomparison project** *by Russell Deitrick et al.*

astro-ph/2302.04711: **Revisiting collisional dust growth in Class 0/I protostellar disks: Sweep-up can convert a few $10M_\oplus$ of dust into kg pebbles in 0.1 Myr** *by Wenrui Xu, Philip J. Armitage* astro-ph/2302.04646: **Pathways of Survival of Exomoons and Inner Exoplanets** *by Valeri V. Makarov, Michael Efroimsky*

astro-ph/2302.04629: **Analysing the SEDs of protoplanetary disks with machine learning** *by T. Kaeufer et al.*

astro-ph/2302.04574: **Correcting Exoplanet Transmission Spectra for Stellar Activity with an Optimised Retrieval Framework** *by Alexandra Thompson et al.*

astro-ph/2302.04757: **An In-Depth Look at TOI-3884b: a Super-Neptune Transiting a M4 Dwarf with Persistent Star Spot Crossings** *by Jessica E. Libby-Roberts et al.*

astro-ph/2302.04535: **Temporal albedo variability in the phase curve of KELT-1b** *by Hannu Parviainen*

astro-ph/2302.05420: **Astrometric Accelerations as Dynamical Beacons: A Giant Planet Imaged Inside the Debris Disk of the Young Star AF Lep** *by Kyle Franson et al.*

astro-ph/2302.05452: **About the atomic and molecular databases in the planetary community – A contribution in the Laboratory Astrophysics Data WG IAU 2022 GA session** *by M. Rengel*

astro-ph/2302.05230: **Microlensing due to free-floating moon-planet systems** *by Sedighe Sajadian, Parisa Sangtarash*

astro-ph/2302.05064: **Detecting Solar System Analogs through Joint Radial Velocity/Astrometric Surveys** *by Daniel A. Yahalomi et al.*

astro-ph/2302.05223: **Protoplanetary Disk Science with the Orbiting Astronomical Satellite Investigating Stellar Systems (OASIS) Observatory** *by Kamber Schwarz et al.*

astro-ph/2302.05028: **XMM-Newton Detection of X-ray Emission from the Metal-Polluted White Dwarf G 29-38** *by S. Estrada-Dorado et al.*

astro-ph/2302.05694: **TOI-2525 b and c: A pair of massive warm giant planets with a strong transit timing variations revealed by TESS** *by Trifon Trifonov et al.*

astro-ph/2302.05718: **Synergies between Venus & Exoplanetary Observations** *by M. J. Way et al.*

astro-ph/2302.05659: **ALMA Band 6 high-resolution observations of the transitional disk around SY Cha** *by Ryuta Orihara et al.*

astro-ph/2302.05921: **About the loss of a primordial atmosphere of super-Earths by planetesimal impacts** *by Michael Lozovsky et al.*

astro-ph/2302.06744: **DIAmante TESS AutoRegressive Planet Search (DTARPS): III. Understanding the DTARPS Candidate Transiting Planet Catalogs** *by Elizabeth J. Melton et al.*

astro-ph/2302.06724: **DIAmante TESS AutoRegressive Planet Search (DTARPS): II. Hundreds of New TESS Candidate Exoplanets** *by Elizabeth J. Melton et al.*

astro-ph/2302.06700: **DIAmante TESS AutoRegressive Planet Search (DTARPS): I. Analysis of 0.9 Million Light Curves** *by Elizabeth J. Melton et al.*

astro-ph/2302.06641: **The Dynamical Consequences of a Super-Earth in the Solar System** *by Stephen R. Kane*

astro-ph/2302.06508: **Scattered polarized radiation of extrasolar circumplanetary rings** *by M. Lietzow, S. Wolf*

astro-ph/2302.06302: **Flybys in debris disk systems with Gaia eDR3** *by Leonardo Bertini et al.*

astro-ph/2302.06332: **Direct imaging discovery of a super-Jovian around the young Sun-like star AF Leporis** *by Robert J. De Rosa et al.*

astro-ph/2302.06213: **AF Lep b: the lowest mass planet detected coupling astrometric and direct imaging data** *by D. Mesa et al.*

astro-ph/2302.06500: **Imaging the inner astronomical unit of Herbig Be star HD 190073** *by Nour Ibrahim et al.*

astro-ph/2302.07874: **C14 Automatic Imaging Telescope Photometry of GJ1214** *by Gregory W. Henry, Jacob L. Bean*

astro-ph/2302.07274: **Discovery of Dust Emission Activity Emanating from Main-belt Asteroid 2015 FW412** *by Colin Orion Chandler et al.*

astro-ph/2302.06995: **Parameters for $>$ 300 million Gaia stars: Bayesian inference vs. machine learning** *by F. Anders et al.*

astro-ph/2302.07057: **Morphology of the gas-rich debris disk around HD 121617 with SPHERE observations in polarized light** *by Clément Perrot et al.*

astro-ph/2302.07156: **Understanding planet formation using microgravity experiments** *by Gerhard Wurm, Jens Teiser*

astro-ph/2302.07954: **ATLAS-TEIDE: The next generations of ATLAS units for the Teide Observatory** *by Javier Licandro et al.*

astro-ph/2302.07916: **The CARMENES search for exoplanets around M dwarfs. Line-by-line sensitivity to activity in M dwarfs** *by M. Lafarga et al.*

astro-ph/2302.07902: **Accounting for non-ideal mixing effects in the hydrogen-helium equation of state** *by Saburo Howard, Tristan Guillot*

astro-ph/2302.07900: **Non-perturbative investigation of low eccentricity exterior mean motion resonances** *by Renu Malhotra, Zherui Chen*

astro-ph/2302.07939: **Retrieval study of cool, directly imaged exoplanet 51 Eri b** *by Niall Whiteford et al.*

astro-ph/2302.07713: **Characterization of low-mass companions to *Kepler* objects of interest observed with APOGEE-N** *by Caleb I. Cañas et al.*

astro-ph/2302.07656: **Interior and Evolution of the Giant Planets** *by Yamila Miguel, Allona Vazan*

astro-ph/2302.07714: **TOI-3984 A b and TOI-5293 A b: two temperate gas giants transiting mid-M dwarfs in wide binary systems** *by Caleb I. Cañas et al.*

astro-ph/2302.08317: **The Compositional Dimension of Planet Formation** *by Diego Turrini*

astro-ph/2302.08358: **The effect of thermal non-equilibrium on kinetic nucleation** *by Sven Kiefer et al.*

astro-ph/2302.08487: **The Optical Aurorae of Europa, Ganymede and Callisto** *by Katherine de Kleer et al.*

astro-ph/2302.08532: **Revising Properties of Planet-Host Binary Systems. III. There is No Observed Radius Gap For Kepler Planets in Binary Star Systems** *by Kendall Sullivan et al.*

astro-ph/2302.08596: **High-fidelity reaction kinetic modeling of hot-Jupiter atmospheres incorporating thermal and UV photochemistry enhanced by metastable CO(a3Pi)** *by Jeehyun Yang et al.*

astro-ph/2302.10189: **FluxCT: A Web Tool for Identifying Contaminating Flux in Kepler and TESS Target Pixel Files** *by Jessica Schonhut-Stasik, Keivan G. Stassun*

astro-ph/2302.08962: **The Hubble PanCET program: The near-ultraviolet transmission spectrum of WASP-79b** *by A. Gressier et al.*

astro-ph/2302.08736: **CRIRES+ detection of CO emissions lines and temperature inversions on the dayside of WASP-18b and WASP-76b** *by F. Yan et al.*

astro-ph/2302.09280: **Detecting microbiology in the upper atmosphere: relative-velocity filtered sampling** *by Arjun Berera et al.*

astro-ph/2302.09396: **Oxygenic photosynthetic responses of cyanobacteria exposed under an M-dwarf starlight simulator: Implications for exoplanet's habitability** *by Mariano Battistuzzi et al.*

astro-ph/2302.09452: **ALMA ACA study of the H_2S/OCS ratio in low-mass protostars** *by Tanya Kushwahaa et al.*

astro-ph/2302.09525: **A Mini-Chemical Scheme with Net Reactions for 3D GCMs II. 3D thermochemical modelling of WASP-39b and HD 189733b** *by Elspeth K. H. Lee et al.*

astro-ph/2302.09576: **The Effect of Metallicity on the Non-Equilibrium Abundance of Hydrogen Dominated Exoplanet Atmosphere** *by Vikas Soni, Kinsuk Acharyya*

astro-ph/2302.10919: **Multiverse Predictions for Habitability: Element Abundances** *by McCullen Sandora et al.*

astro-ph/2302.10111: **Reflection, emission, and polarization properties of surfaces made of hyperfine grains, and implications for the nature of primitive small bodies** *by Robin Sultana et al.*

astro-ph/2302.10310: **Doppler Constraints on Planetary Companions to Nearby Sun-like Stars: An Archival Radial Velocity Survey of Southern Targets for Proposed NASA Direct Imaging Missions** *by Katherine Laliotis et al.*

astro-ph/2302.10008: **TOI-3235 b: a transiting giant planet around an M4 dwarf star** *by Melissa J. Hobson et al.*

astro-ph/2302.09987: **Mid-infrared spectroscopy of planetary analogs: A database for planetary remote sens-**

ing *by A. Morlok et al.*
astro-ph/2302.10085: **Hiding Dust Around ϵ Eridani** *by Schuyler G. Wolff et al.*
astro-ph/2302.10259: **Flares, Rotation, Activity Cycles and a Magnetic Star-Planet Interaction Hypothesis for the Far Ultraviolet Emission of GJ 436** *by R. O. Parke Loyd et al.*
astro-ph/2302.11028: **Kinematics signature of a giant planet in the disk of AS 209** *by D. Fedele et al.*
astro-ph/2302.11020: **Comparisons of the core and mantle compositions of earth analogs from different terrestrial planet formation scenarios** *by Jesse T. Gu et al.*
astro-ph/2302.10961: **Imaging of exocomets with infrared interferometry** *by Markus Janson et al.*
astro-ph/2302.10947: **Using helium 10830 Å transits to constrain planetary magnetic fields** *by Ethan Schreyer et al.*
astro-ph/2302.10838: **A 2:1 Mean-Motion Resonance Super-Jovian pair revealed by TESS, FEROS, and HARPS** *by Vladimir Bozhilov et al.*
astro-ph/2302.10833: **Imaging exoplanets with coronagraphic instruments** *by Raphaël Galicher, Johan Mazoyer*
astro-ph/2302.10752: **Coplanar circumbinary planets can be unstable to large tilt oscillations in the presence of an inner polar planet** *by Anna C. Childs et al.*
astro-ph/2302.10507: **Fe and Mg Isotope compositions Indicate a Hybrid Mantle Source for Young Chang'E 5 Mare Basalts** *by Jiang Y. et al.*
astro-ph/2302.10528: **The CARMENES search for exoplanets around M dwarfs. Guaranteed time observations Data Release 1 (2016-2020)** *by I. Ribas et al.*
astro-ph/2302.10376: **Reconstructing the XUV Spectra of Active Sun-like Stars Using Solar Scaling Relations with Magnetic Flux** *by Kosuke Namekata et al.*
astro-ph/2302.10664: **TOI-1055 b: Neptunian planet characterised with HARPS, TESS, and CHEOPS** *by A. Bonfanti et al.*
astro-ph/2302.10712: **AOTF based spectro-polarimeter for observing Earth as an Exoplanet** *by Bhavesh Jaiswal et al.*
astro-ph/2302.11592: **The ALMA view of MP Mus (PDS 66): a protoplanetary disk with no visible gaps down to 4 au scales** *by Á. Ribas et al.*
astro-ph/2302.11690: **Effects of Barnett magnetic dipole-dipole interaction on grain growth and destruction** *by Thiem Hoang, Bao Truong*
astro-ph/2302.11561: **Sporadic Spin-Orbit Variations in Compact Multi-planet Systems and their Influence on Exoplanet Climate** *by Howard Chen et al.*
astro-ph/2302.11302: **Confirmation and Keplerian motion of the gap-carving protoplanet HD 169142 b** *by Iain Hammond et al.*
astro-ph/2302.11495: **A precise blue-optical transmission spectrum from the ground: Evidence for haze in the atmosphere of WASP-74b** *by Petros Spyratos et al.*
astro-ph/2302.12340: **Revealing magnetic field structure at the surfaces of protoplanetary disks via near-infrared circular polarization** *by Ilse de Langen, Ryo Tazaki*
astro-ph/2302.12101: **Lessons learned from the NEAR experiment and prospects for the upcoming mid-IR HCI instruments** *by Prashant Pathak et al.*
astro-ph/2302.12824: **Disk Evolution Study Through Imaging of Nearby Young Stars (DESTINYS): Diverse outcomes of binary-disk interactions** *by Yapeng Zhang et al.*
astro-ph/2302.12778: **Evidence for Hidden Nearby Companions to Hot Jupiters** *by Dong-Hong Wu et al.*
astro-ph/2302.12723: **JWST Observations of the Enigmatic Y Dwarf WISE 1828+2650: I. Limits to a Binary Companion** *by Matthew De Furio et al.*
astro-ph/2302.12841: **Resolved imaging of an extrasolar radiation belt around an ultracool dwarf** *by Melodie M. Kao et al.*
astro-ph/2302.12566: **Observing M Dwarfs UV and optical flares from a CubeSat and their implications for exoplanets habitability** *by Julien Poyatos et al.*
astro-ph/2302.12518: **3D climate simulations of the Archean find that methane has a strong cooling effect at**

high concentrations *by Jake K. Eager-Nash et al.*

astro-ph/2302.12376: **Multiverse Predictions for Habitability: Planetary Characteristics** *by M. Sandora et al.*

astro-ph/2302.13354: **Direct Imaging Explorations for Companions around Mid-Late M Stars from the Subaru/IRD Strategic Program** *by Taichi Uyama et al.*

astro-ph/2302.13544: **Systematic KMTNet Planetary Anomaly Search. VIII. Complete Sample of 2019 Subprime Field Planets** *by Youn Kil Jung et al.*

astro-ph/2302.13969: **Magnetic Effects and 3D Structure in Theoretical High-Resolution Transmission Spectra of Ultrahot Jupiters: the Case of WASP-76b** *by Hayley Beltz et al.*

astro-ph/2302.14100: **Terrestrial planet formation from a ring** *by J. M. Y. Woo et al.*

astro-ph/2302.14425: **Circumplanetary disk ices II. Composition** *by Nickolas Oberg et al.*