# ExoPlanet News
An Electronic Newsletter

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# 1 Editorial

Welcome to Edition 171 of the ExoPlanet News!

First, we would like to thank Eleonora Alei from the editorial team for her contribution to the ExoPlanet News during the past year. It was a pleasure to work with you!
And let us welcome Leander Schlarmann, our new editor from the University of Bern!

Back to business: 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 October 10, 2023.

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

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

# 2 Abstracts of refereed papers

## Planetary evolution with atmospheric photoevaporation. II. Fitting the slope of the radius valley by combining boil-off and XUV-driven escape

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*Astronomy & Astrophysics, published (2023A&A...676A.119A)*

*Context.* Observations by the *Kepler* satellite have revealed a gap between larger sub-Neptunes and smaller super-Earths that atmospheric escape models had predicted as an evaporation valley prior to discovery.
*Aims.* We seek to contrast results from a simple X-ray and extreme-ultraviolet (XUV)-driven energy-limited escape model against those from a direct hydrodynamic model. The latter calculates the thermospheric temperature structure self-consistently, including cooling effects such as thermal conduction. Besides XUV-driven escape, it also includes the boil-off escape regime where the escape is driven by the atmospheric thermal energy and low planetary gravity, catalysed by stellar continuum irradiation. We coupled these two escape models to an internal structure model and followed the planets' temporal evolution.
*Methods.* To examine the population-wide imprint of the two escape models and to compare it to observations, we first employed a rectangular grid, tracking the evolution of planets as a function of core mass and orbital period over gigayear timescales. We then studied the slope of the valley also for initial conditions derived from the observed *Kepler* planet population.
*Results.* For the rectangular grid, we find that the power-law slope of the valley with respect to orbital period is $-0.18$ and $-0.11$ in the energy-limited and hydrodynamic model, respectively. For the initial conditions derived from the *Kepler* planets, the results are similar ($-0.16$ and $-0.10$). While the slope found with the energy-limited model is steeper than observed, the one of the hydrodynamic model is in excellent agreement with observations. The reason for the shallower slope is caused by the two regimes in which the energy-limited approximation fails. The first one are low-mass planets at low-to-intermediate stellar irradiation. For them, boil-off dominates mass loss. However, boil-off is absent in the energy-limited model, and thus it underestimates escape relative to the hydrodynamic model. The second one are massive compact planets at high XUV irradiation. For them, the energy-limited approximation overestimates escape relative to the hydrodynamic model because of cooling by thermal conduction, which is neglected in the energy-limited model.
*Conclusions.* The two effects act together in concert to yield, in the hydrodynamic model, a shallower slope of the valley that agrees very well with observations. We conclude that a hydrodynamic escape model that includes boil-off and a more realistic treatment of cooling mechanisms can reproduce one of the most important constraints for escape models, the valley slope.

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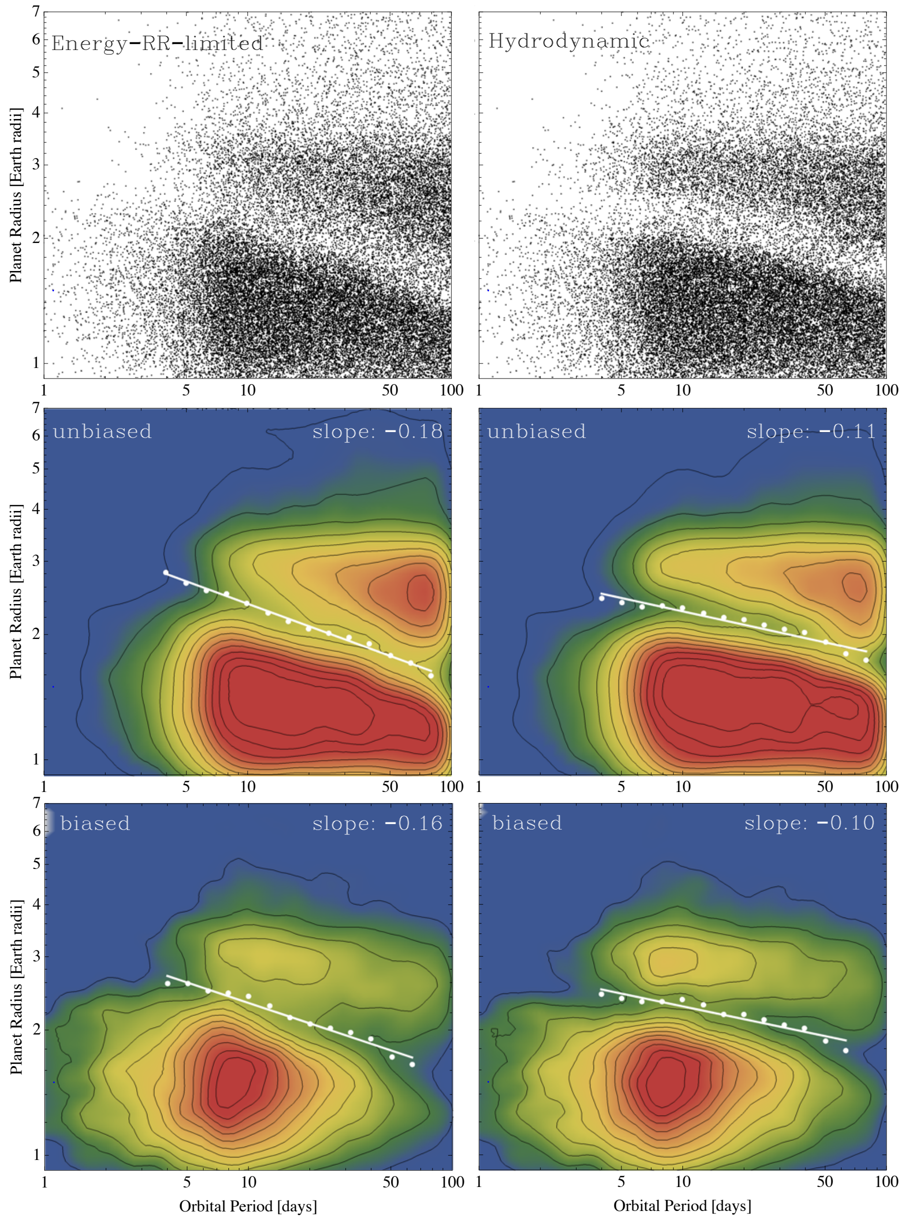


Figure 1: Transit radius as a function of orbital period at 5 Gyr for distributions of the initial envelope mass, core mass, and orbital period derived from Kepler observations (Rogers & Owen 2021). Left column: energy- and radiation-recombination-limited escape model. Right column: hydrodynamic escape model. Top row: raw scatter plot of the unbiased synthetic populations. Middle row: 2D Gaussian Kernel Density Estimation of the unbiased synthetic populations. Bottom row: as in the middle, but after applying a detection bias representative of the Kepler survey, which disfavours small distant planets. White dots and lines indicate the valley position. One notes in all cases the shallower slope in the hydrodynamic model.

## Tidal excitation of the obliquity of Earth-like planets in the habitable zone of M-dwarf stars

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*Astronomy & Astrophysics, published (2022A&A...665A.130V)*

Close-in planets undergo strong tidal interactions with the parent star that modify their spins and orbits. In the two-body problem, the final stage for tidal evolution is the synchronisation of the rotation and orbital periods, and the alignment of the planet spin axis with the normal to the orbit (zero planet obliquity). The orbital eccentricity is also damped to zero, but over a much longer timescale, that may exceed the lifetime of the system. For non-zero eccentricities, the rotation rate can be trapped in spin–orbit resonances that delay the evolution towards the synchronous state. Here we show that capture in some spin–orbit resonances may also excite the obliquity to high values rather than damp it to zero. Depending on the system parameters, obliquities of $60° - 80°$ can be maintained throughout the entire lifetime of the planet. This unexpected behaviour is particularly important for Earth-like planets in the habitable zone of M-dwarf stars, as it may help to sustain temperate environments and thus more favourable conditions for life.

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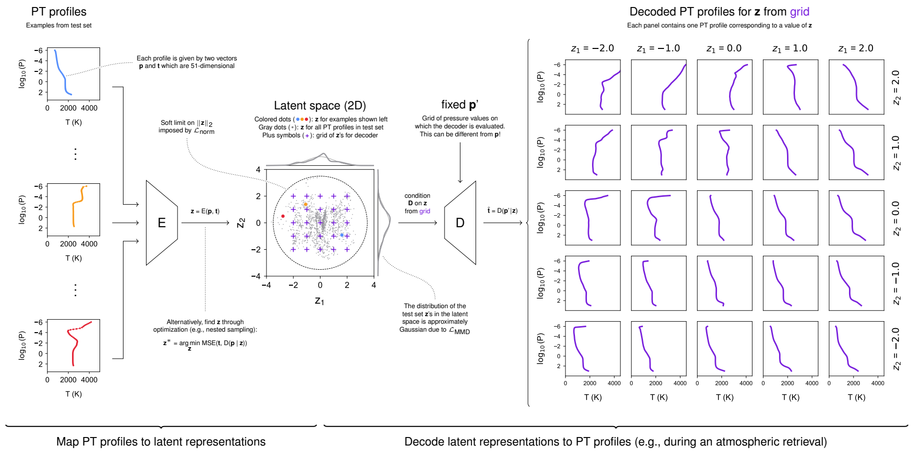


Figure 2: A visual illustration of the encoder $E$, the decoder $D$, and their connection via the latent space.

## Parameterizing pressure-temperature profiles of exoplanet atmospheres with neural networks

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*Astronomy & Astrophysics, in press (arXiv:2309.03075)*

Atmospheric retrievals (AR) of exoplanets typically rely on a combination of a Bayesian inference technique and a forward simulator to estimate atmospheric properties from an observed spectrum. A key component in simulating spectra is the pressure-temperature (PT) profile, which describes the thermal structure of the atmosphere. Current AR pipelines commonly use ad hoc fitting functions here that limit the retrieved PT profiles to simple approximations, but still use a relatively large number of parameters. In this work, we introduce a conceptually new, data-driven parameterization scheme for physically consistent PT profiles that does not require explicit assumptions about the functional form of the PT profiles and uses fewer parameters than existing methods. Our approach consists of a latent variable model (based on a neural network) that learns a distribution over functions (PT profiles). Each profile is represented by a low-dimensional vector that can be used to condition a decoder network that maps $P$ to $T$. When training and evaluating our method on two publicly available datasets of self-consistent PT profiles, we find that our method achieves, on average, better fit quality than existing baseline methods, despite using fewer parameters. In an AR based on existing literature, our model (using two parameters) produces a tighter, more accurate posterior for the PT profile than the five-parameter polynomial baseline, while also speeding up the retrieval by more than a factor of three. By providing parametric access to physically consistent PT profiles, and by reducing the number of parameters required to describe a PT profile (thereby reducing computational cost or freeing resources for additional parameters of interest), our method can help improve AR and thus our understanding of exoplanet atmospheres and their habitability.

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## Giant Tidal Tails of Helium Escaping the Hot Jupiter HAT-P-32 b

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*Science Advances, published (2023SciA....9F8736Z)*

Capturing planets in the act of losing their atmospheres provides rare opportunities to probe their evolution history. Such analysis has been enabled by observations of the helium triplet at 10833 Å, but past studies have focused on the narrow time window right around the planet's optical transit. We monitored the hot Jupiter HAT-P-32 b using high-resolution spectroscopy from the Hobby-Eberly Telescope covering the planet's full orbit. We detected helium escaping HAT-P-32 b at a $14\sigma$ significance, with extended leading and trailing tails spanning a projected length over 53 times the planet's radius. These tails are among the largest known structures associated with an exoplanet. We interpret our observations using three-dimensional hydrodynamic simulations, which predict Roche Lobe overflow with extended tails along the planet's orbital path.

*Download/Website:* `https://ui.adsabs.harvard.edu/abs/2023SciA....9F8736Z/abstract`

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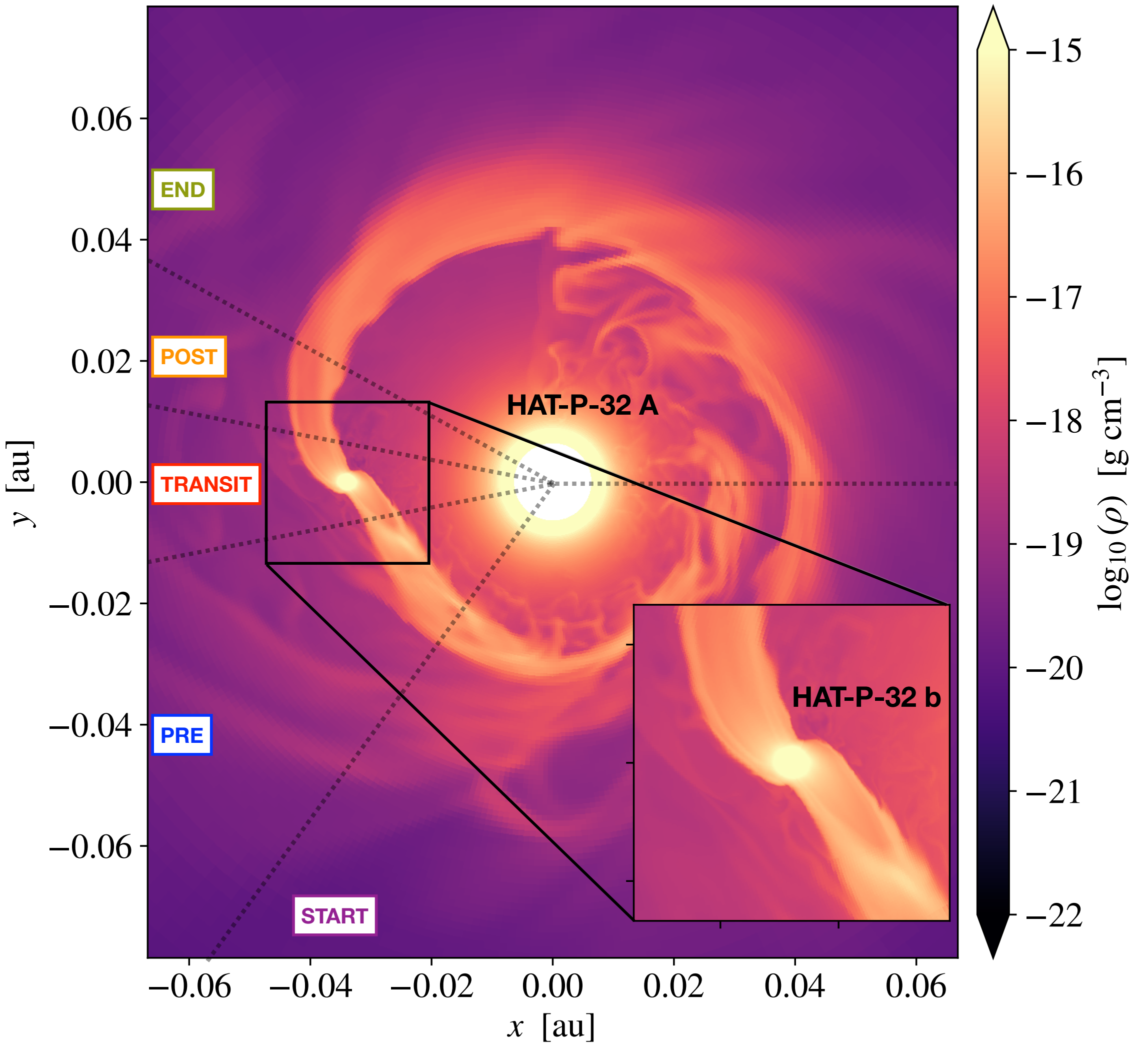


Figure 3: Slice through the orbital plane of a simulated system approximating HAT-P-32 A+b. The frame rotates with the planetary mean motion, so the position of observers rotates clockwise, with regions of START, PRE, TRANSIT, POST, and END shown in observations divided by black dotted lines. The logarithm of gas density is shown in the color scale. A low-density but relatively fast stellar wind expands from HAT-P-32 A at the coordinate origin and interacts with the outflow from HAT-P-32 b. The outflow from HAT-P-32 b is stretched into long, column-like tails leading and trailing the planet along the orbital path. These tidal tails are shaped by the advection of slow-moving planetary outflow in the star-planet gravitational field.

## ELemental abundances of Planets and brown dwarfs Imaged around Stars (ELPIS): I. Potential Metal Enrichment of the Exoplanet AF Lep b and a Novel Retrieval Approach for Cloudy Self-luminous Atmospheres

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*The Astronomical Journal, in press (2023arXiv230902488Z)*

AF Lep A+b is a remarkable planetary system hosting a gas-giant planet that has the lowest dynamical mass among directly imaged exoplanets. We present an in-depth analysis of the atmospheric composition of the star and planet to probe the planet's formation pathway. Based on new high-resolution spectroscopy of AF Lep A, we measure a uniform set of stellar parameters and elemental abundances (e.g., [Fe/H]= $-0.27 \pm 0.31$ dex). The planet's dynamical mass ($2.8^{+0.6}_{-0.5}$ $\mathrm{M_{Jup}}$) and orbit are also refined using published radial velocities, relative astrometry, and absolute astrometry. We use `petitRADTRANS` to perform chemically-consistent atmospheric retrievals for AF Lep b. The radiative-convective equilibrium temperature profiles are incorporated as parameterized priors on the planet's thermal structure, leading to a robust characterization for cloudy self-luminous atmospheres. This novel approach is enabled by constraining the temperature-pressure profiles via the temperature gradient $(d\ln T/d\ln P)$, a departure from previous studies that solely modeled the temperature. Through multiple retrievals performed on different portions of the $0.9-4.2$ $\mu$m spectrophotometry, along with different priors on the planet's mass and radius, we infer that AF Lep b likely possesses a metal-enriched atmosphere ([Fe/H]$>$ $1.0$ dex). AF Lep b's potential metal enrichment may be due to planetesimal accretion, giant impacts, and/or core erosion. The first process coincides with the debris disk in the system, which could be dynamically excited by AF Lep b and lead to planetesimal bombardment. Our analysis also determines $T_{\rm eff} \approx 800$ K, $\log{(g)} \approx 3.7$ dex, and the presence of silicate clouds and dis-equilibrium chemistry in the atmosphere. Straddling the L/T transition, AF Lep b is thus far the coldest exoplanet with suggested evidence of silicate clouds.

*Download/Website:* `https://ui.adsabs.harvard.edu/abs/2023arXiv230902488Z/abstract(supplementarymaterialareavaialbleinthisZenodorepository:https://zenodo.org/record/8267466)`

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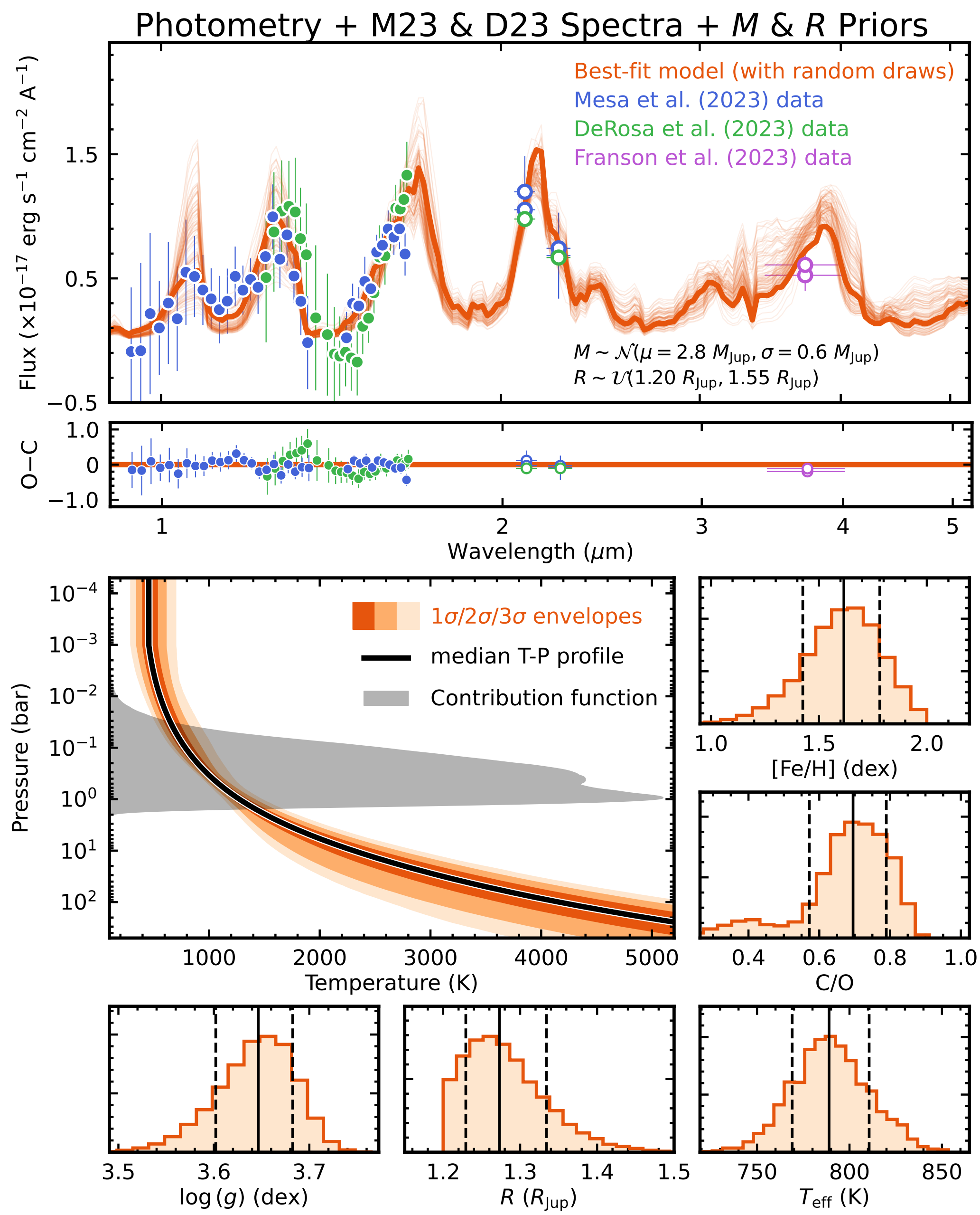


Figure 4: Results of the retrieval analysis on $K1/K2/L'$ photometry and both the Mesa et al. (2023) and De Rosa et al. (2023) spectra of AF Lep b (Section 7.2). In the top two panels, we compare the observed spectrophotometry (the wavelength errorbars of $K1/K2/L'$ photometric data represent the half effective widths of the corresponding filters) with the emission spectrum corresponding to the best-fit model (thick orange line). Emission spectra generated at 100 random draws from the parameter posteriors (thin orange lines) are overlaid. In the middle panel on the left, we present the $1\sigma/2\sigma/3\sigma$ confidence intervals (orange shades) of our retrieved temperature-pressure profiles. A profile with median T-P parameters is shown in black and the corresponding weighted contribution function (computed over the same wavelength range as the input data) is shown as a grey shade. The remaining panels present the posterior distributions of key physical parameters, including [Fe/H], C/O, $\log(g)$, $R$, and $T_{\rm eff}$. The median and confidence intervals of all parameters are summarized in Table 6.

## Sudden Extreme Obscuration of a Sun-like Main-sequence Star: Evolution of the Circumstellar Dust around ASASSN-21qj

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*The Astrophysical Journal, published (2023ApJ...954..140M)*

ASASSN-21qj is a distant Sun-like star that recently began an episode of deep dimming events after no prior recorded variability. Here we examine archival and newly obtained optical and near-infrared data of this star. The deep aperiodic dimming and absence of previous infrared excess are reminiscent of KIC 8462852 ("Boyajian's Star"). The observed occultations are consistent with a circumstellar cloud of submicron-sized dust grains composed of amorphous pyroxene, with a minimum mass of $1.50 \pm 0.04 \times 10^{-9}$ $M_{\oplus}$ derived from the deepest occultations, and a minimum grain size of $0.29^{+0.01}_{0.18}\mu$m assuming a power-law size distribution. We further identify the first evidence of near-infrared excess in this system from NEOWISE 3.4 and 4.6 $\mu$m observations. The excess emission implies a total circumstellar dust mass of around $10^{-6}$ $M_{\oplus}$, comparable to the extreme, variable disks associated with terrestrial planet formation around young stars. The quasiperiodic recurrence of deep dips and the inferred dust temperature (ranging from 1800 to 700 K across the span of observations) independently point to an orbital distance of $\simeq$0.2 au for the dust, supporting the occulting material and excess emission being causally linked. The origin of this extended, opaque cloud is surmised to be the breakup of one or more exocometary bodies.

*Download/Website:* `https://iopscience.iop.org/article/10.3847/1538-4357/ace629/pdf`

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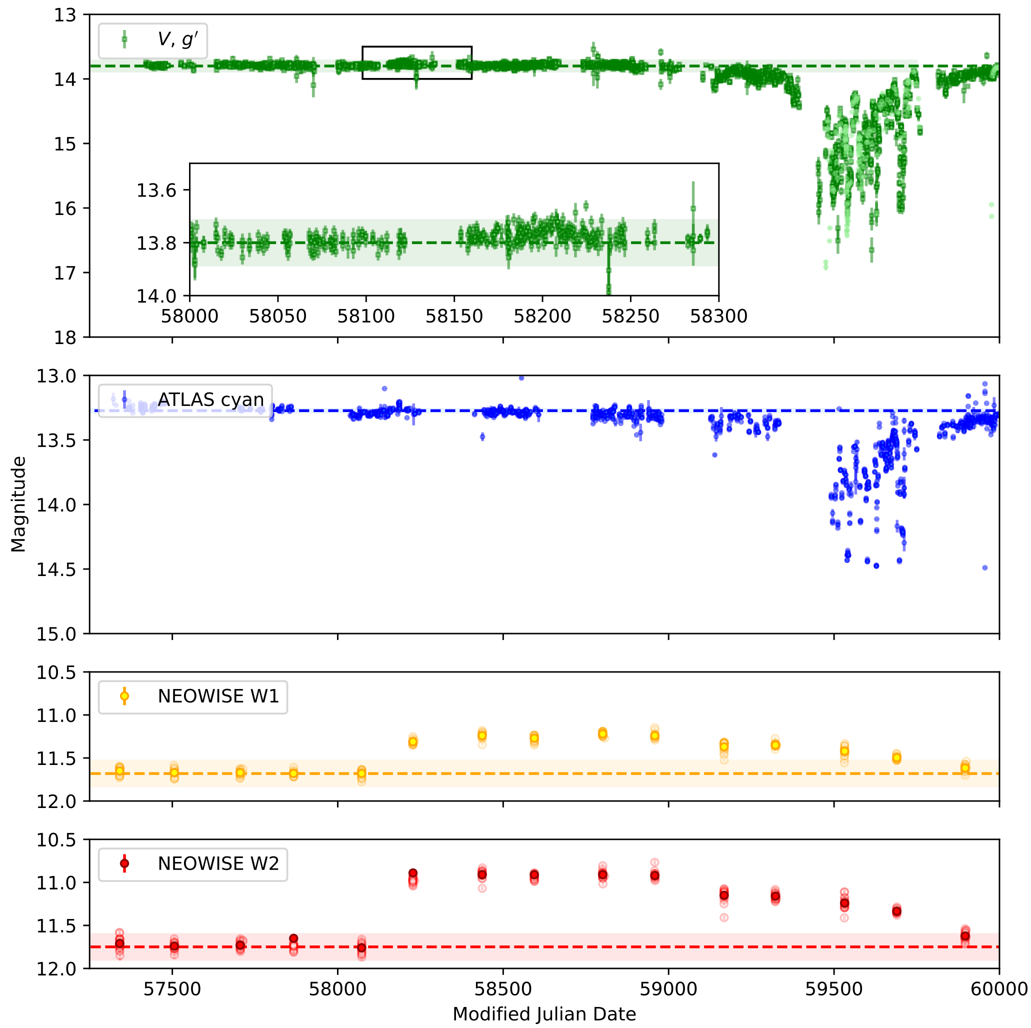
V, g′
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## A super-massive Neptune-sized planet

*L. Naponiello*[1,2,3,4] *et al (a complete list of authors can be found on the publication)*
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*Nature, published online on the 30th of August 2023 (Arxiv: 2309.01464)*

The paucity of Neptune-type planets at short orbital periods was recognised in the statistical studies of exoplanet populations and is known as 'hot-Neptune desert'. As many Neptune planets have been discovered with longer orbital periods, this dearth is believed not to be caused by observational biases but primarily by atmospheric photo-evaporation effects. Since then, the desert has been increasingly populated with planets having a wide range of different and, in some cases, unusual characteristics such as the high-density planets HD 95338 b, TOI-849 b and TOI-2196 b, which are either made of a significant amount of water or a rocky interior with a thin atmosphere. Here we report the discovery of the transiting planet TOI-1853 b, which has a radius of $3.46 \pm 0.08$ Earth radii and orbits a dwarf, K2.5V star every $1.24$ days. This planet has a mass of $73.2 \pm 2.7$ Earth masses, almost twice that of any other Neptune-sized planet known so far, and a density of $9.7 \pm 0.8$ grams per cubic centimetre (see Figure 1). These values place TOI-1853 b in the middle of the Neptunian desert and imply that heavy elements dominate its mass. The remarkable properties of TOI-1853 b present a puzzle for conventional theories of planetary formation and evolution, as pebble accretion shuts off when the core of a planet is massive enough to disrupt the proto-planetary disk (at $\approx 30-40 M_{\oplus}$). Therefore, we suggest that TOI-1853 b could be the result of multiple proto-planet collisions or the final state of an initially high-eccentricity gas giant that migrated inward and lost its outer layers during close encounters with its parent star.

*Download/Website:* `https://arxiv.org/abs/2309.01464`
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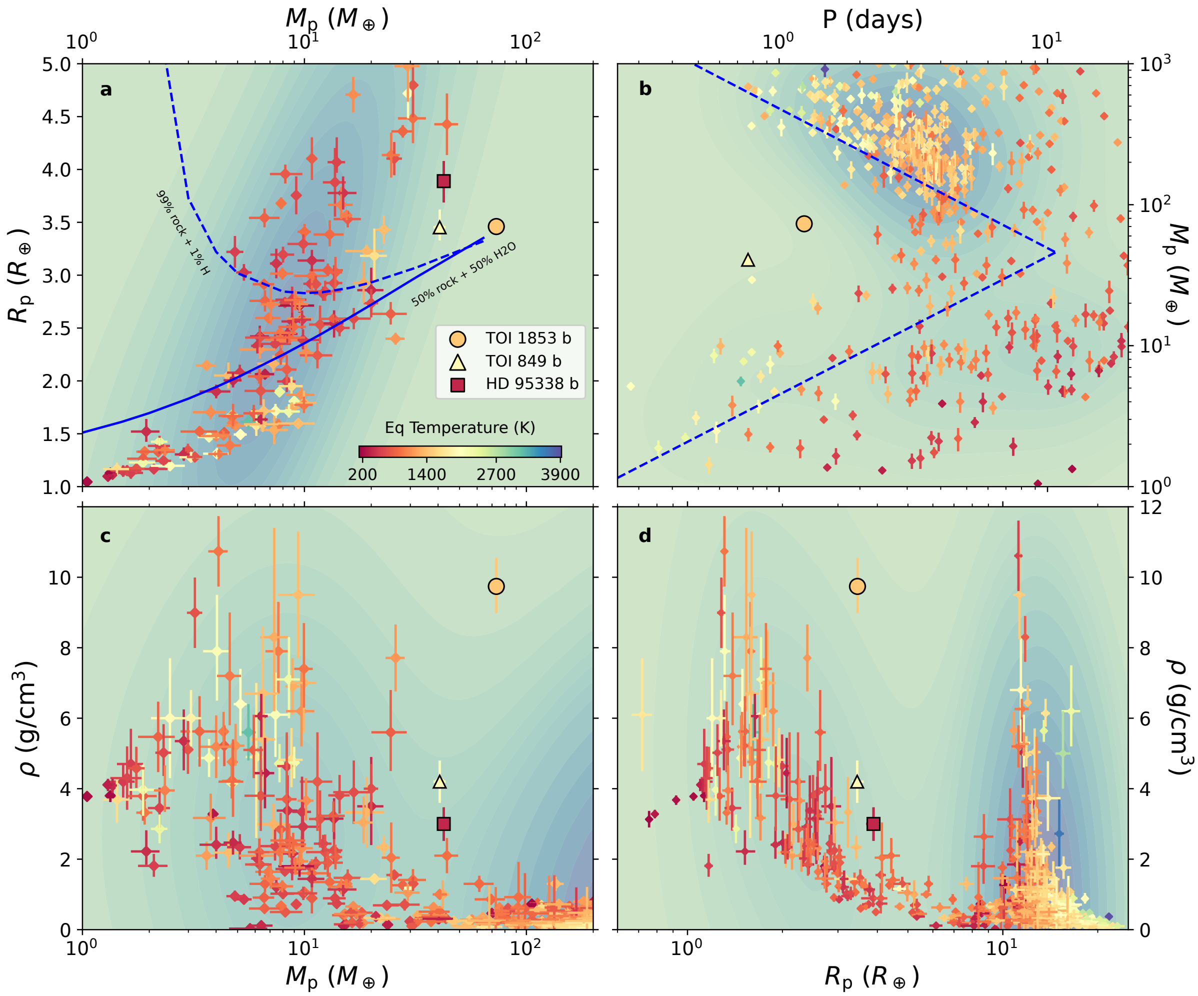


Figure 5: The properties of all known transiting exoplanets, with precise measurements of mass, have been extracted from TEPCat and shown as diamonds, their colour being associated with their equilibrium temperature. Horizontal and vertical error bars represent one standard deviation. TOI-1853 b, TOI-849 b and HD 95338 b are shown as circles, triangles and squares, respectively. **a**: Radius–mass diagram with blue lines representing different internal compositions (dashed line, 99% Earth-like rocky interior + 1% H layer (at temperature and pressure of 1,000 K and 1 mbar, respectively); solid line, 50% Earth-like + 50% water). **b**: Period–mass diagram, in which the dashed blue line encloses the Neptunian desert ($P_{orb} \approx 55$ days for HD 95338 b). **c**: Mass–density diagram. **d**: Radius–density diagram.

## The space weather around the exoplanet GJ 436b
## I. The large-scale stellar magnetic field

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*Astronomy & Astrophysics, in press (arXiv:2306.15391)*

The space environment in which planets are embedded depends mainly on the host star and impacts the evolution of the planetary atmosphere. The quiet M dwarf GJ 436 hosts a close-in hot Neptune which is known to feature a comet-like tail of hydrogen atoms escaped from its atmosphere due to energetic stellar irradiation. Understanding such star-planet interactions is essential to shed more light on planet formation and evolution theories, in particular the scarcity of Neptune-size planets below 3 d orbital period, also known as "Neptune desert".
We aimed at characterising the stellar environment around GJ 436, which requires an accurate knowledge of the stellar magnetic field. The latter is studied efficiently with spectropolarimetry, since it is possible to recover the geometry of the large-scale magnetic field by applying tomographic inversion on time series of circularly polarised spectra.
We used spectropolarimetric data collected in the optical domain with Narval in 2016 to compute the longitudinal magnetic field, examine its periodic content via Lomb-Scargle periodogram and Gaussian Process Regression analysis, and finally reconstruct the large-scale field configuration by means of Zeeman-Doppler Imaging.
We found an average longitudinal field of $-12$ G and a stellar rotation period of 46.6 d using a Gaussian Process model and 40.1 d using Zeeman-Doppler Imaging, both consistent with the literature. The Lomb-Scargle analysis did not reveal any significant periodicity. The reconstructed large-scale magnetic field is predominantly poloidal, dipolar and axisymmetric, with a mean strength of 16 G. This is in agreement with magnetic topologies seen for other stars of similar spectral type and rotation rate.

*Download/Website:* `https://ui.adsabs.harvard.edu/abs/2023arXiv230615391B/abstract`

*Contact:* `bellotti@strw.leidenuniv.nl`

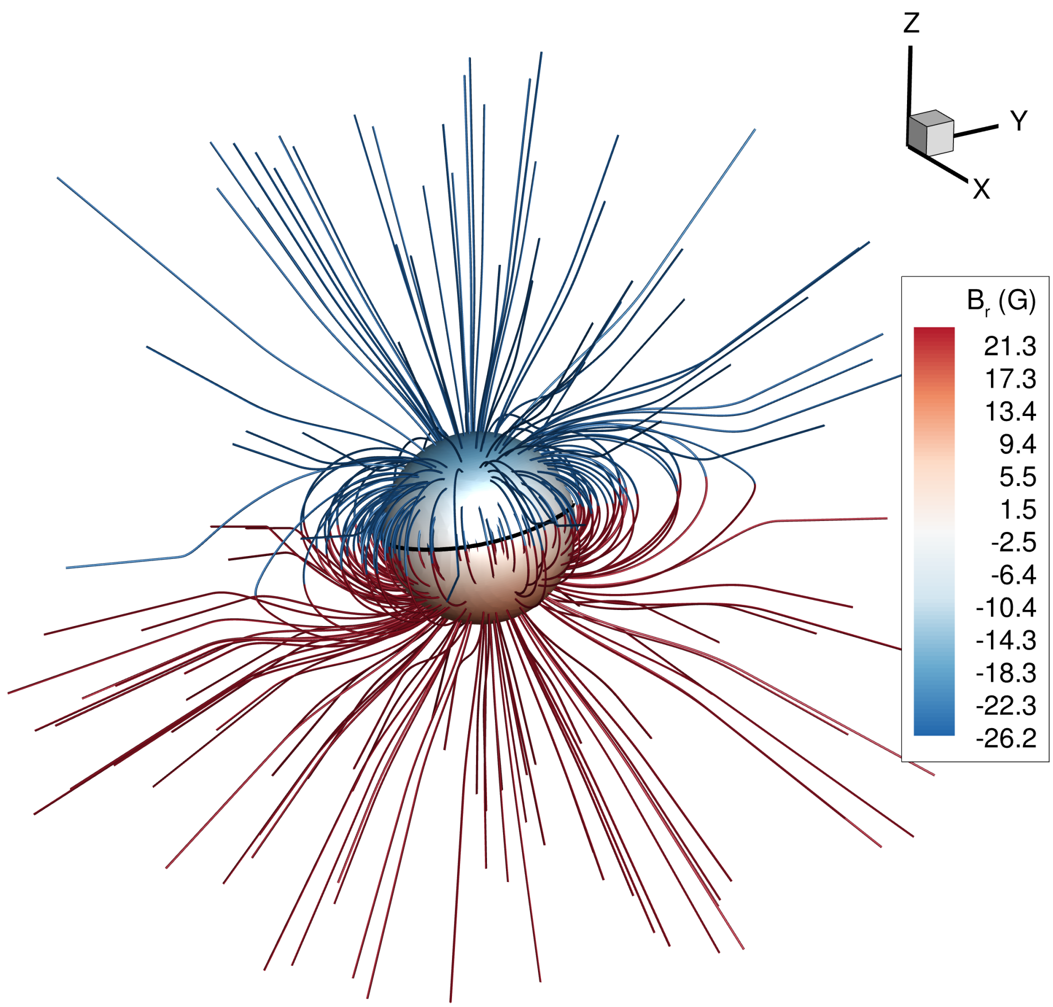


Figure 6: Three dimensional view of the extrapolated large-scale magnetic field of GJ 436. The colours at the surface of the star represent the radial magnetic field strength, while the blue and red colours along the magnetic field lines represent negative and positive polarities of the radial field. The rotation axis of the star is along the Z axis and the source surface has been set to four stellar radii, beyond which the field lines are fully open.

## Forming Gas Giants Around a Range of Protostellar M-dwarfs by Gas Disk Gravitational Instability

*Alan P. Boss and Shubham Kanodia*
Earth and Planets Laboratory, Carnegie Institution, Washington, DC, USA

*Astrophysical Journal, in press*

Recent discoveries of gas giant exoplanets around M-dwarfs (GEMS) from transiting and radial velocity (RV) surveys are difficult to explain with core-accretion models. We present here a homogeneous suite of 162 models of gravitationally unstable gaseous disks. These models represent an existence proof for gas giants more massive than 0.1 Jupiter masses to form by the gas disk gravitational instability (GDGI) mechanism around M-dwarfs for comparison with observed exoplanet demographics and protoplanetary disk mass estimates for M-dwarf stars. We use the Enzo 2.6 adaptive mesh refinement (AMR) 3D hydrodynamics code to follow the formation and initial orbital evolution of gas giant protoplanets in gravitationally unstable gaseous disks in orbit around M-dwarfs with stellar masses ranging from 0.1 $M_{\odot}$ to 0.5 $M_{\odot}$. The gas disk masses are varied over a range from disks that are too low in mass to form gas giants rapidly to those where numerous gas giants are formed, therefore revealing the critical disk mass necessary for gas giants to form by the GDGI mechanism around M-dwarfs. The disk masses vary from 0.01 $M_{\odot}$ to 0.05 $M_{\odot}$ while the disk to star mass ratios explored range from 0.04 to 0.3. The models have varied initial outer disk temperatures (10 K to 60 K) and varied levels of AMR grid spatial resolution, producing a sample of expected gas giant protoplanets for each star mass. Broadly speaking, disk masses of at least 0.02 $M_{\odot}$ are needed for the GDGI mechanism to form gas giant protoplanets around M-dwarfs.

*Download/Website:* `https://aboss.dtm.carnegiescience.edu/ftp-files/GDGI-Mdwarfs.pdf`

*Contact:* aboss@carnegiescience.edu

# 3 Conferences and Workshops

## COST Action CA22133 : The birth of solar systems

*Catherine Walsh*
University of Leeds, UK

*CA22133, September 2023*

I am pleased to announce the successful award of the COST Action CA22133, "The birth of solar systems". 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/`).

We aim to recruit researchers (both theorists and observers) working in the areas of protoplanetary disks, planet formation, habitability, and exoplanets (including studies of exoplanet host stars), as well as researchers working in laboratory experiments related to planet formation and habitability. COST Actions are fully open for anyone to join: the only requirement is that you are affiliated with a legal entity such as a university or scientific organisation. If you are based in a COST member state (`https://www.cost.eu/about/members/`), it is possible to apply for membership of the management committee to represent your country. We especially encourage applications from young researchers and innovators ($< 40$ years old) to join the management committee. Please contact your Country National Coordinator (CNC) who can guide through the nomination process: `https://www.cost.eu/about/who-is-who/national-coordinators/`

Applications to join the Action working groups (listed below) are also now open to all:

- WG1: Planet formation: laboratory perspectives
- WG2: Advancing planet formation models
- WG3: Planet formation theory confronts observations
- WG4: Emerging habitable environments
- WG5: Dissemination, public engagement, and outreach
- WG6: Training the next generation of researchers
- WG7: Towards the first database on planet-forming discs

We encourage everyone to join at least two working groups to have good linkage and coverage between and across the groups. You can apply at the COST Action webpage below: look for the "How can I participate?" information on the right-hand side. If you do not already have an eCOST profile you will need to first register.

For more information, please visit the Action page (link below), or you can contact me for any further information (address below).

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

*Contact:* `c.walsh1@leeds.ac.uk`

# 4 Jobs and Positions

## Call for Applications for the 2024 NASA Hubble Fellowship Program

*Dr. Andrew Fruchter, Space Telescope Science Institute*

*Dr. Dawn M. Gelino, NASA Exoplanet Science Institute*

*Dr. Paul Green, Smithsonian Astrophysical Observatory*

*Applications Due: November 2, 2023 at 7:00 PM EST (4:00 PM PST 24:00 UTC),*

On behalf of the NASA Astrophysics Division, the Space Telescope Science Institute (STScI) announces the call for applications for postdoctoral fellowships under the NASA Hubble Fellowship Program (NHFP) beginning in Fall 2024. The NHFP supports postdoctoral scientists performing independent research that contributes to NASA Astrophysics (see https://science.nasa.gov/astrophysics/ for more information). The research may be theoretical, observational, and/or instrumental. If your application is successful and you accept our offer, you will become an NHFP Einstein, Hubble, or Sagan fellow depending on the area of your research. We are continuing the legacy of those three earlier programs in this way, and through joint management of the program by STScI in collaboration with the Chandra X-ray Center and the NASA Exoplanet Science Institute.

The NHFP is open to applicants of any nationality who have or will have completed all requirements for their doctoral degree on or after January 1, 2020 in astronomy, physics or related disciplines. The duration of the Fellowship is up to three years: an initial one-year appointment, and two annual renewals contingent on satisfactory performance and availability of NASA funds.

We anticipate offering up to 24 NHFP Fellowships this year. The Fellowships are tenable at a U.S. host institution of the fellow's choice, subject to a maximum of two new fellows per host institution per year, and no more than five fellows at any single host institution, except for short periods of overlap. Host institutions must have verified their compliance with the NHFP employment policy. The policy and a list of those hosts can be found at https://www.stsci.edu/stsci-research/fellowships/nasa-hubble-fellowship-program/nhfp-host-institution-employment-policy/host-institutions

The Announcement of Opportunity is available at the website: http://nhfp.stsci.edu. The application submission page will be open from September 5 until the application deadline on November 2, 2023. Applicants should follow the instructions given in the Announcement and also examine the Frequently Asked Questions. Please send any further inquiries about the NHFP to nhfp@stsci.edu.

**Important Dates**

- Thursday, November 2, 2023, 7:00 PM EST (4:00 PM PST 24:00 UTC): Applications due
- Thursday, November 9, 2023: Letters of reference due (applications are due one week before the letters)

Offers will be made in early February 2024 and new appointments should begin on or about September 1, 2024. NHFP Fellowships are open to English-speaking citizens of all nations. All applicants will receive consideration without regard to race, creed, color, age, gender, gender identity or expression, sexual orientation or national origin. Women and members of minority groups are strongly encouraged to apply. Applicants should follow the instructions in the Announcement of Opportunity (http://nhfp.stsci.edu).

*Download/Website:* `http://nhfp.stsci.edu`
*Contact:* `nhfp@stsci.edu`

# 5 Exoplanet Archives

## August 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, September 10, 2023*

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

**August 24, 2023**

**Six Planets, Three Spectra**

One of this week's six new planets is MWC 758 c, a directly imaged giant planet forming spiral arms around its very young star, which still has its protoplanetary disk. The other planets are HD 36384 b, TOI-198 b, TOI-2095 b & c, and TOI-4860 b. This week's update brings the archive's total planet count to 5,502.

There are also three new transmission spectra in our Atmospheric Spectroscopy Table for TOI-270 d, WASP-79 b, and WASP-189 b.

**August 11, 2023**

**Thirteen New Planets**

This week's update of 13 new planets brings the archive's confirmed planet count to **5,496**.

The new planets are DMPP-4 b, TOI-1470 b, TOI-1470 c, GJ 367 c, GJ 367 d, HN Lib b, TOI-1052 b, TOI-1052 c, HD 6860 b, HD 112300 b, TOI-262 b, TOI-444 b, and TOI-470 b.

*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 August 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.

**August 2023**

astro-ph/2308.00020: **Mapping out the parameter space for photoevaporation and core-powered mass-loss** *by James E. Owen, Hilke E. Schlichting*

astro-ph/2308.00057: **Grid-Based Atmospheric Retrievals for Reflected-Light Spectra of Exoplanets using PSGnest** *by Nicholas Susemiehl et al.*

astro-ph/2308.00103: **A Unified Treatment of Kepler Occurrence to Trace Planet Evolution I: Methodology** *by Anne Dattilo et al.*

astro-ph/2308.00701: **Statistical methods for exoplanet detection with radial velocities** *by Nathan C. Hara, Eric B. Ford*

astro-ph/2308.00648: **Bayesian Analysis for Remote Biosignature Identification on exoEarths (BARBIE) I: Using Grid-Based Nested Sampling in Coronagraphy Observation Simulations for H2O** *by Natasha Latouf et al.*

astro-ph/2308.00283: **The Mass Fractionation of Helium in the Escaping Atmosphere of HD 209458b** *by Lei Xing et al.*

astro-ph/2308.00585: **The Role of Magma Oceans in Maintaining Surface Water on Rocky Planets Orbiting M-Dwarfs** *by Keavin Moore et al.*

astro-ph/2308.00592: **Interior dynamics of super-Earth 55 Cancri e** *by Tobias G. Meier et al.*

astro-ph/2308.01454: **TOI-4860 b, a short-period giant planet transiting an M3.5 dwarf** *by J. M. Almenara et al.*

astro-ph/2308.01354: **An Introduction to High Contrast Differential Imaging of Exoplanets and Disks** *by Katherine B Follette*

astro-ph/2308.01348: **Sub-m ŝ$\{-1\}$ upper limits from a deep HARPS-N radial-velocity search for planets orbiting HD 166620 and HD 144579** *by Ancy Anna John et al.*

astro-ph/2308.01343: **Impacts of high-contrast image processing on atmospheric retrievals** *by Evert Nasedkin et al.*

astro-ph/2308.01335: **On the origin of planetary-mass objects in NGC1333** *by Richard J. Parker, Catarina Alves de Oliveira*

astro-ph/2308.01234: **Eccentric Gas Disk Orbiting the White Dwarf SDSS J1228+1040** *by Ates Goksu et al.*

astro-ph/2308.01160: **The Oxygen Bottleneck for Technospheres** *by Amedeo Balbi, Adam Frank*

astro-ph/2308.00892: **Magnetohydrodynamical torsional oscillations from thermo-resistive instability in hot jupiters** *by Raphaël Hardy et al.*

astro-ph/2308.02002: **Outflowing helium from a mature mini-Neptune** *by Michael Zhang et al.*

astro-ph/2308.01880: **Biosignature false positives in potentially habitable planets around M dwarfs: the effect of UV radiation from one flare** *by Arturo Miranda-Rosete et al.*

astro-ph/2308.01972: **Gravitational instability, spiral substructure, and modest grain growth in a typical protostellar disk: Modeling multi-wavelength dust continuum observation of TMC1A** *by Wenrui Xu et al.*

astro-ph/2308.02253: **An M dwarf accompanied by a close-in giant orbiter with SPECULOOS** *by Amaury H. M. J. Triaud et al.*

astro-ph/2308.01478: **Large Interferometer For Exoplanets (LIFE): XI. Phase-space synthesis decomposition for planet detection and characterization** *by Taro Matsuo et al.*

astro-ph/2308.02333: **Long-term Evolution of Warps in Debris Disks – Application to the Gyr-old system HD 202628** *by Madison Brady et al.*

astro-ph/2308.02486: **JWST/NIRCam Coronagraphy of the Young Planet-hosting Debris Disk AU Microscopii** *by Kellen Lawson et al.*

astro-ph/2308.02712: **A Search for Technosignatures Around 11,680 Stars with the Green Bank Telescope at 1.15-1.73 GHz** *by Jean-Luc Margot et al.*

astro-ph/2308.03881: **Measuring the Numerical Viscosity in Simulations of Protoplanetary Disks in Cartesian Grids – The Viscously Spreading Ring Revisited** *by Jibin Joseph et al.*

astro-ph/2308.03504: **Three-temperature radiation hydrodynamics with PLUTO: Tests and applications to**

**protoplanetary disks** *by Dhruv Muley et al.*

astro-ph/2308.04587: **Metrics for Optimizing Searches for Tidally Decaying Exoplanets** *by Brian Jackson et al.*

astro-ph/2308.04523: **Time-resolved transmission spectroscopy of the ultra-hot Jupiter WASP-189 b** *by Bibiana Prinoth et al.*

astro-ph/2308.04335: **Size-dependent charging of dust particles in protoplanetary disks Can turbulence cause charge separation and lightning?** *by Thorsten Balduin et al.*

astro-ph/2308.04282: **TCF periodogram's high sensitivity: A method for optimizing detection of small transiting planets** *by Yash Gondhalekar et al.*

astro-ph/2308.05149: **Small but mighty: High-resolution spectroscopy of ultra-hot Jupiter atmospheres with compact telescopes. KELT-9 b's transmission spectrum with Wendelstein's FOCES Spectrograph** *by N. W. Borsato et al.*

astro-ph/2308.05057: **Deuterium Escape on Photoevaporating Sub-Neptunes** *by Pin-Gao Gu, Howard Chen*

astro-ph/2308.04966: **Tidal Response and Shape of Hot Jupiters** *by Sean M. Wahl et al.*

astro-ph/2308.04839: $N$**-body simulation of planetary formation through pebble accretion in a radially structured protoplanetary disk** *by Tenri Jinno et al.*

astro-ph/2308.05790: **A dependence of binary and planetary system destruction on subtle variations in the substructure in young star-forming regions** *by Richard J. Parker*

astro-ph/2308.05726: **CUTE reveals escaping metals in the upper atmosphere of the ultra-hot Jupiter WASP-189b** *by A. G. Sreejith et al.*

astro-ph/2308.05669: **A review of planetary systems around HD 99492, HD 147379 and HD 190007 with HARPS-N** *by M. Stalport et al.*

astro-ph/2308.05626: **A linearized approach to radial velocity extraction** *by Sahar Shahaf, Barak Zackay*

astro-ph/2308.05613: **An inner warp discovered in the disk around HD 110058 using VLT/SPHERE and HST/STIS** *by S. Stasevic et al.*

astro-ph/2308.05417: **Multi techniques approach to identify and/or constrain radial velocity sub-stellar companions** *by F. Philipot et al.*

astro-ph/2308.05343: **Revisiting Planetary Systems in Okayama Planet Search Program: A new long-period planet, RV astrometry joint analysis, and multiplicity-metallicity trend around evolved stars** *by Huan-Yu Teng et al.*

astro-ph/2308.05647: **Sublimation of refractory minerals in the gas envelopes of accreting rocky planets** *by Marie-Luise Steinmeyer et al.*

astro-ph/2308.06324: **Measuring Tidal Dissipation in Giant Planets from Tidal Circularization** *by Mohammad M. Mahmud et al.*

astro-ph/2308.06236: **Forming rocky exoplanets around K-dwarf stars** *by P. Hatalova et al.*

astro-ph/2308.06066: **The Transient Outgassed Atmosphere of 55 Cancri e** *by Kevin Heng*

astro-ph/2308.06263: **ACCESS, LRG-BEASTS, & MOPSS: Featureless Optical Transmission Spectra of WASP-25b and WASP-124b** *by Chima D. McGruder et al.*

astro-ph/2308.05994: **A Search for exoplanets around northern circumpolar stars VIII. filter out a planet cycle from the multi-period radial velocity variations in M giant HD 3638** *by Byeong-Cheol Lee et al.*

astro-ph/2308.05946: **Polycyclic Aromatic Hydrocarbons in Exoplanet Atmospheres I. Thermochemical Equilibrium Models** *by Dwaipayan Dubey et al.*

astro-ph/2308.05899: **Potential Atmospheric Compositions of TRAPPIST-1 c constrained by JWST/MIRI Observations at 15** $\mu$**m** *by Andrew P. Lincowski et al.*

astro-ph/2308.06026: **Heating and ionization by non-thermal electrons in the upper atmospheres of water-rich exoplanets** *by A. García Muñoz*

astro-ph/2308.06650: **Avalanches and the Distribution of Reconnection Events in Magnetized Circumstellar Disks** *by Marco Fatuzzo et al.*

astro-ph/2308.07157: **High-resolution emission spectroscopy retrievals of MASCARA-1b with CRIRES+: Strong detections of CO, H_2O and Fe emission lines and a C/O consistent with solar** *by Swaetha*

*Ramkumar et al.*
astro-ph/2308.07165: **The Orbit of Warm Jupiter WASP-106 b is aligned with its Star** *by Jan-Vincent Harre et al.*
astro-ph/2308.07532: **SOLES VII: The Spin-Orbit Alignment of WASP-106 b, a Warm Jupiter Along the Kraft Break** *by Josette Wright et al.*
astro-ph/2308.07604: **Searching for Novel Chemistry in Exoplanetary Atmospheres using Machine Learning for Anomaly Detection** *by Roy T. Forestano et al.*
astro-ph/2308.07685: **The CARMENES search for exoplanets around M dwarfs. Behaviour of the Paschen lines during flares and quiescence** *by B. Fuhrmeister et al.*
astro-ph/2308.07839: **Tidal interactions shape period ratios in planetary systems with three-body resonant chains** *by Carolina Charalambous et al.*
astro-ph/2308.07910: **Tracing snowlines and C/O ratio in a planet-hosting disk: ALMA molecular line observations towards the HD169142 disk** *by Alice S. Booth et al.*
astro-ph/2308.07994: **Bound circumplanetary orbits under the influence of radiation pressure: Application to dust in directly imaged exoplanet systems** *by Brad M. S. Hansen, Kevin Hayakawa*
astro-ph/2308.08297: **Infrared spectra of TiO2 clusters for hot Jupiter atmospheres** *by J. P. Sindel et al.*
astro-ph/2308.08490: **Reflected spectroscopy of small exoplanets III: probing the UV band to measure biosignature gasses** *by Mario Damiano et al.*
astro-ph/2308.08687: **CHEOPS and TESS view of the ultra-short period super-Earth TOI-561 b** *by J. A. Patel et al.*
astro-ph/2308.09841: **Can a binary star host three giant circumbinary planets?** *by Cheng Chen et al.*
astro-ph/2308.09808: **Asteroseismology and Spectropolarimetry of the Exoplanet Host Star $\lambda$ Serpentis** *by Travis S. Metcalfe et al.*
astro-ph/2308.09646: **Large Interferometer For Exoplanets (LIFE). X. Detectability of currently known exoplanets and synergies with future IR/O/UV reflected-starlight imaging missions** *by Óscar Carrión-González et al.*
astro-ph/2308.09588: **A Six-Planet Resonance Chain in K2-138?** *by M. Cerioni, C. Beaugé*
astro-ph/2308.09554: **A magnetically driven disc wind in the inner disc of PDS 70** *by Justyn Campbell-White et al.*
astro-ph/2308.09505: **A mineralogical reason why all exoplanets cannot be equally oxidising** *by Claire Marie Guimond et al.*
astro-ph/2308.09255: **A $5M\_ntext\{Jup\}$ Non-Transiting Coplanar Circumbinary Planet Around Kepler-1660AB** *by Max Goldberg et al.*
astro-ph/2308.09617: **Identification of the Top TESS Objects of Interest for Atmospheric Characterization of Transiting Exoplanets with JWST** *by Benjamin J. Hord et al.*
astro-ph/2308.10326: **Planet-Driven Scatterings of Planetesimals Into a Star: Probability, Timescale and Applications** *by Laetitia Rodet, Dong Lai*
astro-ph/2308.10378: **A Non-Detection of Iron in the First High-Resolution Emission Study of the Lava Planet 55 Cnc e** *by Kaitlin C. Rasmussen et al.*
astro-ph/2308.10391: **How much large dust could be present in hot exozodiacal dust systems?** *by T. A. Stuber et al.*
astro-ph/2308.10763: **Transit Timing Variations in the three-planet system: TOI-270** *by Laurel Kaye et al.*
astro-ph/2308.10937: **Solar Photospheric Spectrum Microvariability I. Theoretical searches for proxies of radial-velocity jittering** *by Dainis Dravins, Hans-Günter Ludwig*
astro-ph/2308.10624: **PyATMOS: A Scalable Grid of Hypothetical Planetary Atmospheres** *by Aditya Chopra et al.*
astro-ph/2308.10615: **Beyond 2-D Mass-Radius Relationships: A Nonparametric and Probabilistic Framework for Characterizing Planetary Samples in Higher Dimensions** *by Shubham Kanodia et al.*
astro-ph/2308.11812: **YARARA V2: Reaching sub m/s precision over a decade using PCA on line-by-line RVs**

*by M. Cretignier et al.*

astro-ph/2308.12309: **GJ 9404 b: a confirmed eccentric planet, and not a candidate** *by Thomas A. Baycroft et al.*

astro-ph/2308.11714: **MagAO-X and HST high-contrast imaging of the AS209 disk at H$\alpha$** *by Gabriele Cugno et al.*

astro-ph/2308.11699: **MAPS: Constraining Serendipitous Time Variability in Protoplanetary Disk Molecular Ion Emission** *by Abygail R. Waggoner et al.*

astro-ph/2308.11394: **Refining the properties of the TOI-178 system with CHEOPS and TESS** *by L. Delrez et al.*

astro-ph/2308.11125: **Interplanetary Shock Data Base** *by Denny M. Oliveira*

astro-ph/2308.12107: **UNCOVER: JWST Spectroscopy of Three Cold Brown Dwarfs at Kiloparsec-scale Distances** *by Adam J. Burgasser et al.*

astro-ph/2308.12144: **Kinematic signatures of a low-mass planet with a moderately inclined orbit in a protoplanetary disk** *by Kazuhiro D. Kanagawa et al.*

astro-ph/2308.12137: **TOI-332 b: a super dense Neptune found deep within the Neptunian desert** *by Ares Osborn et al.*

astro-ph/2308.12160: **The potential of VLTI observations for the study of circumstellar disk variability** *by A. Bensberg et al.*

astro-ph/2308.13108: **The Dusty Rossby Wave Instability (DRWI): Linear Analysis and Simulations of Turbulent Dust-Trapping Rings in Protoplanetary Discs** *by Hanpu Liu, Xue-Ning Bai*

astro-ph/2308.13105: **Nonthermal hydrogen loss at Mars: Contributions of photochemical mechanisms to escape and identification of key processes** *by Bethan S. Gregory et al.*

astro-ph/2308.13039: **Using Photometrically-Derived Properties of Young Stars to Refine TESS's Transiting Young Planet Survey Completeness** *by Rachel B. Fernandes et al.*

astro-ph/2308.12903: **Forming Gas Giants Around a Range of Protostellar M-dwarfs by Gas Disk Gravitational Instability** *by Alan P. Boss, Shubham Kanodia*

astro-ph/2308.12854: **Lowest accreting protoplanetary discs consistent with X-ray photoevaporation driving their final dispersal** *by Barbara Ercolano et al.*

astro-ph/2308.12571: **Effective reaction temperatures of irreversible dust chemical reactions in a protoplanetary disk** *by Lily Ishizaki et al.*

astro-ph/2308.12946: **On the importance of disc chemistry in the formation of protoplanetary disc rings** *by C. A. Nolan et al.*

astro-ph/2308.13667: **Fully fluorinated non-carbon compounds NF3 and SF6 as ideal technosignature gases** *by Sara Seager et al.*

astro-ph/2308.13621: **Thermal properties of the leading hemisphere of Callisto inferred from ALMA observations** *by Maria Camarca et al.*

astro-ph/2308.13614: **Lava planets interior dynamics govern the long-term evolution of their magma oceans** *by Charles-Édouard Boukaré et al.*

astro-ph/2308.13622: **Detection of atmospheric species and dynamics in the bloated hot Jupiter WASP-172˜b with ESPRESSO** *by J. V. Seidel et al.*

astro-ph/2308.13593: **Constraints on sub-terrestrial free-floating planets from Subaru microlensing observations** *by William DeRocco et al.*

astro-ph/2308.13310: **A compact multi-planet system transiting HIP 29442 (TOI-469) discovered by TESS and ESPRESSO. Radial velocities lead to the detection of transits with low signal-to-noise ratio** *by M. Damasso et al.*

astro-ph/2308.13253: **Impact of hot exozodiacal dust on the polarimetric analysis of close-in exoplanets** *by Kevin Ollmann et al.*

astro-ph/2308.13745: **CO, H_2O, and CH_4 in the Dusty Atmosphere of a $nle$5 Myr-old Exoplanet** *by Eric Gaidos, Teruyuki Hirano* astro-ph/2308.13923: **Evolution of the Planetary Obliquity: The Eccentric Kozai-Lidov Mechanism Coupled with Tide** *by Xiumin Huang et al.*

astro-ph/2308.14896: **Buoyancy response of a disk to an embedded planet: a cross-code comparison at high resolution** *by Alexandros Ziampras et al.*

astro-ph/2308.14855: **Deformable mirror-based pupil chopping for exoplanet imaging and adaptive optics** *by Javier Perez Soto et al.*

astro-ph/2308.14804: **Earth as a Transiting Exoplanet: A Validation of Transmission Spectroscopy and Atmospheric Retrieval Methodologies for Terrestrial Exoplanets** *by Jacob Lustig-Yaeger et al.*

astro-ph/2308.14511: **ATMOSPHERIX: II- Characterising exoplanet atmospheres through transmission spectroscopy with SPIRou** *by F. Debras et al.*

astro-ph/2308.14510: **ATMOSPHERIX: I- An open source high resolution transmission spectroscopy pipeline for exoplanets atmospheres with SPIRou** *by B. Klein et al.*

astro-ph/2308.14347: **Formation of inner planets in the presence of a Cold Jupiter: orbital evolution and relative velocities of planetesimals** *by Kangrou Guo, Eiichiro Kokubo*

astro-ph/2308.15110: **Water Condensation Zones around Main Sequence Stars** *by Martin Turbet et al.*

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