ExoPlanet News
An Electronic Newsletter

No. 130, 14 April 2020

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Contents

1 Editorial

Welcome to Edition 130 of the ExoPlanet News! Here in Switzerland, as probably also for you in other countries, we continue under lockdown. This means that many of us stopped analyzing simulations to take care of our children, or to recover from covid-19, or both.

It is therefore rewarding to see that some of you could still contribute to this newsletter! Thank you all!
In this April-issue you can find, as usual, abstracts of scientific papers, conference announcements/updates, Exoplanet Archive updates, and an overview of exoplanet-related articles on astro-ph.

We look forward to your paper abstract, job ad or meeting announcement. 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 19. May 2020.

Thanks again for your support.
Best healthy wishes from the editorial team,

Julia Venturini
Lokesh Mishra
Holly Capelo
Daniel Angerhausen
Timm-Emanuel Riesen

2 Abstracts of refereed papers

The subsurface habitability of small, icy exomoons

J.N.K.Y. Tjoa[1], *M. Mueller*[1,2,3], *F.F.S. van der Tak*[1,2]

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Astronomy & Astrophysics, in press (arXiv:2003.09231)

Context. Assuming our Solar System as typical, exomoons may outnumber exoplanets. If their habitability fraction is similar, they would thus constitute the largest portion of habitable real estate in the Universe. Icy moons in our Solar System, such as Europa and Enceladus, have already been shown to possess liquid water, a prerequisite for life on Earth.
Aims. We intend to investigate under what thermal and orbital circumstances small, icy moons may sustain subsurface oceans and thus be "subsurface habitable". We pay specific attention to tidal heating, which may keep a moon liquid far beyond the conservative habitable zone.
Methods. We made use of a phenomenological approach to tidal heating. We computed the orbit averaged flux from both stellar and planetary (both thermal and reflected stellar) illumination. We then calculated subsurface temperatures depending on illumination and thermal conduction to the surface through the ice shell and an insulating layer of regolith. We adopted a conduction only model, ignoring volcanism and ice shell convection as an outlet for internal heat. In doing so, we determined at which depth, if any, ice melts and a subsurface ocean forms.
Results. We find an analytical expression between the moon's physical and orbital characteristics and the melting depth. Since this expression directly relates icy moon observables to the melting depth, it allows us to swiftly put an upper limit on the melting depth for any given moon. We reproduce the existence of Enceladus' subsurface ocean; we also find that the two largest moons of Uranus (Titania & Oberon) could well sustain them. Our model predicts that Rhea does not have liquid water.
Conclusion. Habitable exomoon environments may be found across an exoplanetary system, largely irrespective of the distance to the host star. Small, icy subsurface habitable moons may exist anywhere beyond the snow line. This may, in future observations, expand the search area for extraterrestrial habitable environments beyond the circumstellar habitable zone.

Download/Website: `https://arxiv.org/abs/2003.09231`

Contact: `tjoa@mps.mpg.de`

Detection of Na, K, and Hα absorption in the atmosphere of WASP-52b using ESPRESSO

G. Chen[1]*, N. Casasayas-Barris*[2,3]*, E. Pallé*[2,3]*, F. Yan*[4]*, M. Stangret*[2,3]*, H. M. Cegla*[5]*, R. Allart*[5]*, C. Lovis*[5]

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Astronomy & Astrophysics, published (2020A&A...635A.171C)

WASP-52b is a low-density hot Jupiter orbiting a moderately active K2V star. Previous low-resolution studies have revealed a cloudy atmosphere and found atomic Na above the cloud deck. Here we report on the detection of excess absorption at the Na doublet, the Hα line, and the K D_1 line. We derived a high-resolution transmission spectrum based on three transits of WASP-52b, observed with the ultra-stable, high-resolution spectrograph ESPRESSO at the Very Large Telescope array. We measured a line contrast of $1.09 \pm 0.16\%$ for Na D_1, $1.31 \pm 0.13\%$ for Na D_2, $0.86 \pm 0.13\%$ for Hα, and $0.46 \pm 0.13\%$ for K D_1, with a line FWHM range of 11–22 $\mathrm{km\,s^{-1}}$. We also found that the velocity shift of these detected lines during the transit is consistent with the planet's orbital motion, thus confirming their planetary origin. We did not observe any significant net blueshift or redshift that could be attributed to planetary winds. We used activity indicator lines as control but found no excess absorption. However, we did notice signatures arising from the Center-to-Limb variation (CLV) and the Rossiter-McLaughlin (RM) effect at these control lines. This highlights the importance of the CLV + RM correction in correctly deriving the transmission spectrum, which, if not corrected, could resemble or cancel out planetary absorption in certain cases. WASP-52b is the second non-ultra-hot Jupiter to show excess Hα absorption after HD 189733b. Future observations targeting non-ultra-hot Jupiters that show Hα could help reveal the relation between stellar activity and the heating processes in the planetary upper atmosphere.

Download/Website: `https://ui.adsabs.harvard.edu/abs/2020arXiv200208379C/abstract`

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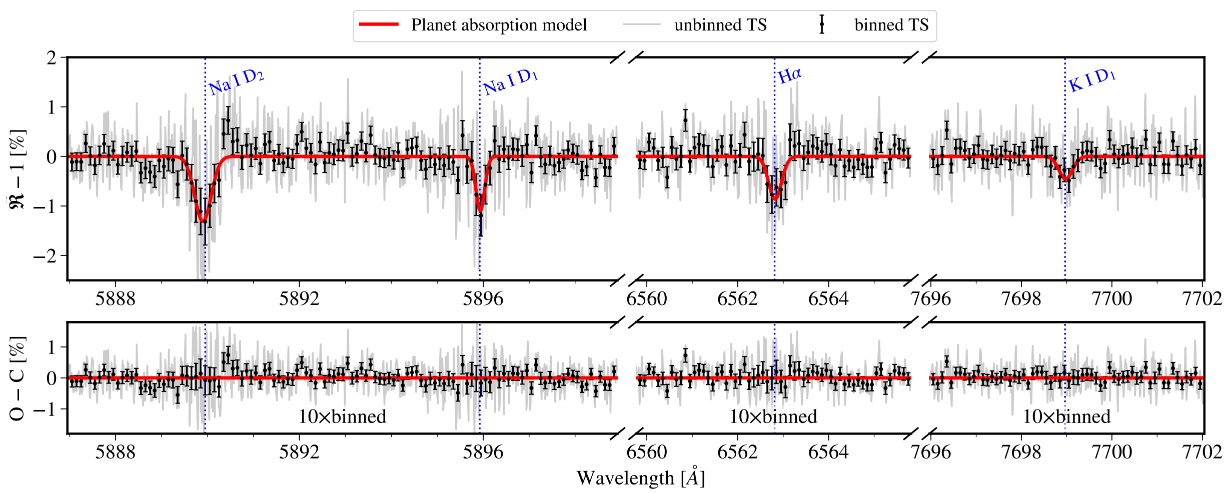

Figure 1: *Top row:* transmission spectrum of WASP-52b observed by ESPRESSO at the Na doublet, Hα, and K D_1 lines. Signatures arising from the center-to-limb variation and Rossiter-McLaughlin effects have been corrected. The gray line shows the unbinned transmission spectrum in grids of 0.01 $\AA$. The black circles are binned into intervals of 0.1 $\AA$ (i.e., 10$\times$binned). The red line shows the best-fit planet absorption model. The error bars show the propagated photon noise. *Bottom row:* best-fit residuals.

Orbital inclination and mass of the exoplanet candidate Proxima c

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Astronomy & Astrophysics Letters, published (2020A&A...635L..14K)

We analyse the orbital parameters of the exoplanet candidate Proxima c recently discovered by Damasso et al. (2020) using a combination of its spectroscopic orbital parameters and Gaia DR2 proper motion anomaly. We obtain an orbital inclination of $i = 152 \pm 14\,\mathrm{deg}$, corresponding to a planet mass of $m_c = 12^{+12}_{-5}\,M_{\oplus}$, comparable to Uranus and Neptune. While the derived orbital parameters are too uncertain to accurately predict the position of the planet for a given epoch, we present a map of its probability of presence relative to its parent star in the coming years.

Download/Website: https://doi.org/10.1051/0004-6361/202037551

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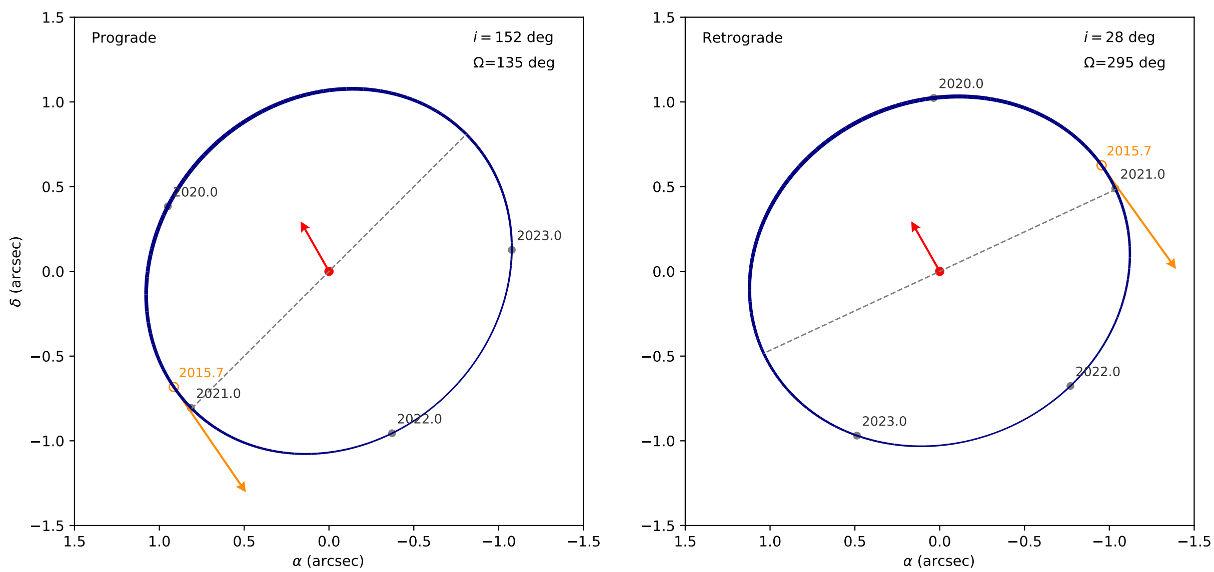

Figure 2: Orbital trajectories of Proxima c corresponding to the best-fit prograde (left panel) and retrograde (right panel) solutions. A thicker line indicates that the planet is closer to the Earth. The orange arrow shows the velocity vector of Proxima c at the effective GDR2 epoch, and the red arrow the corresponding reflex velocity of Proxima from its PMa (scaled by $10000\times$).

Stellar wind effects on the atmospheres of close-in giants: a possible reduction in escape instead of increased erosion

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:2003.10272)

The atmospheres of highly irradiated exoplanets are observed to undergo hydrodynamic escape. However, due to strong pressures, stellar winds can confine planetary atmospheres, reducing their escape. Here, we investigate under which conditions atmospheric escape of close-in giants could be confined by the large pressure of their host star's winds. For that, we simulate escape in planets at a range of orbital distances ([0.04, 0.14] au), planetary gravities ([36%, 87%] of Jupiter's gravity), and ages ([1, 6.9] Gyr). For each of these simulations, we calculate the ram pressure of these escaping atmospheres and compare them to the expected stellar wind external pressure to determine whether a given atmosphere is confined or not. We show that, although younger close-in giants should experience higher levels of atmospheric escape, due to higher stellar irradiation, stellar winds are also stronger at young ages, potentially reducing escape of young exoplanets. Regardless of the age, we also find that there is always a region in our parameter space where atmospheric escape is confined, preferably occurring at higher planetary gravities and orbital distances. We investigate confinement of some known exoplanets and find that the atmosphere of several of them, including π Men c, should be confined by the winds of their host stars, thus potentially preventing escape in highly irradiated planets. Thus, the lack of hydrogen escape recently reported for π Men c could be caused by the stellar wind.

Download/Website: `https://arxiv.org/abs/2003.10272`

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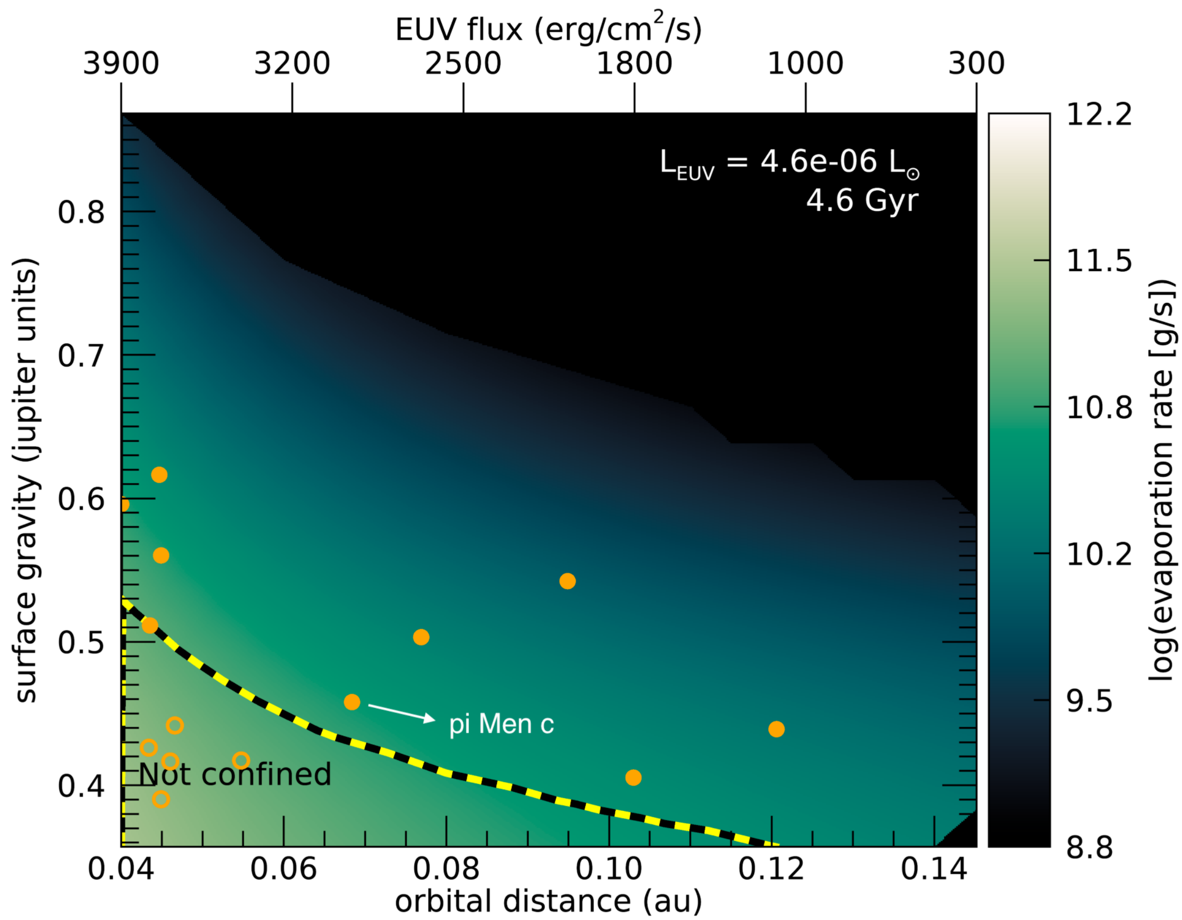

Figure 3: Planetary evaporation rates (colour) as a function of surface gravity (y axis) and orbital distances and EUV flux scaling (x axes). The black line shows the different regimes where planetary outflow will not be confined (below black line), in which case the planetary outflow rate should not be modified by the stellar wind, or will be confined (above black line). In the latter case, planetary escape models that do not take into account the presence of the stellar wind might be overestimating atmospheric escape rates (including our models above the black lines). The circles shown in this panel refers to 14 known exoplanets, including π Men c.

Exomoon indicators in high-precision transit light curves

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Astronomy & Astrophysics, accepted (2020arXiv200402259R)

While the solar system contains about 20 times more moons than planets, no moon has been confirmed around any of the thousands of extrasolar planets known so far. Considering the large computational load required for the statistical vetting of exomoon candidates in a star-planet-moon framework, tools for an uncomplicated identification of the most promising exomoon candidates could be beneficial to streamline follow-up studies. Here we study three exomoon indicators that emerge if well-established planet-only models are fitted to a planet-moon transit light curve: transit timing variations (TTVs), transit duration variations (TDVs), and apparent planetary transit radius variations (TRVs). We re-evaluate under realistic conditions the previously proposed exomoon signatures in the TTV and TDV series. We simulate light curves of a transiting exoplanet with a single moon, taking into account stellar limb darkening, orbital inclinations, planet-moon occultations, and noise from both stellar granulation and instrumental effects. These model light curves are then fitted with a planet-only transit model, pretending there were no moon, and we explore the resulting TTV, TDV, and TRV series for evidence of the moon. The previously described ellipse in the TTV-TDV diagram of an exoplanet with a moon emerges only for high-density moons. Low-density moons, however, distort the sinusoidal shapes of the TTV and the TDV series due to their photometric contribution to the combined planet-moon transit. Sufficiently large moons can nevertheless produce periodic apparent TRVs of their host planets that could be observable. We find that Kepler and PLATO have similar performances in detecting the exomoon-induced TRV effect around simulated bright ($m_V = 8$) stars. These stars, however, are rare in the Kepler sample but will be abundant in the PLATO sample. Moreover, PLATO's higher cadence yields a stronger TTV signal. We detect substantial TRVs of the Saturn-sized planet Kepler-856 b although an exomoon could only ensure Hill stability in a very narrow orbital range. The periodogram of the sequence of transit radius measurements can indicate the presence of a moon. The TTV and TDV series of exoplanets with moons can be more complex than previously assumed. We propose that TRVs could be a more promising means to identify exomoons in large exoplanet surveys.

Download/Website: `https://arxiv.org/abs/2004.02259`

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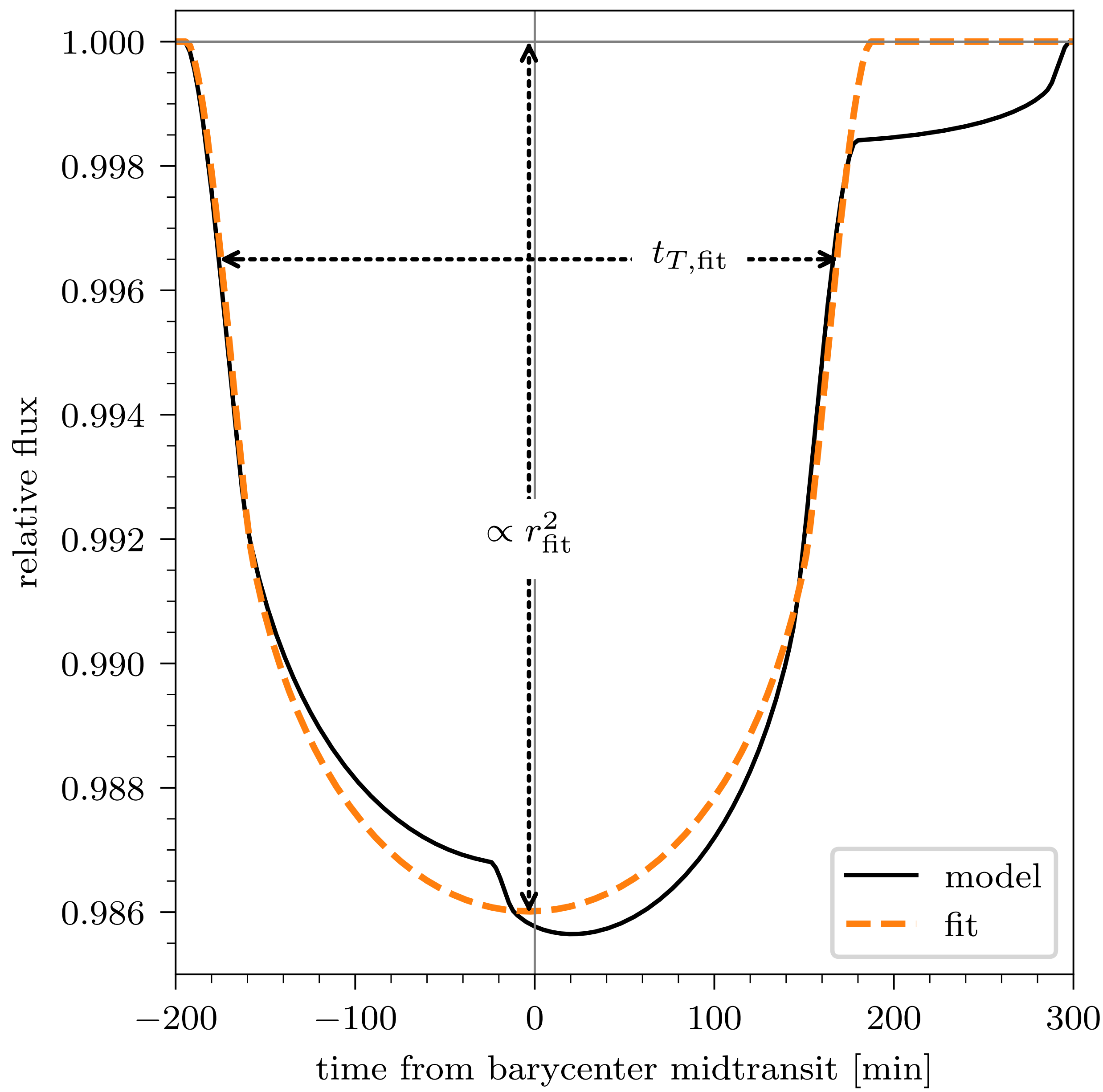

Figure 4: Example of a planet-only fit (dashed orange line) to the planet-moon model (solid black line). The star is sun-like, the planet is Jupiter-sized and in a 30 d orbit around the star, and the moon is Neptune-sized and in a 3.55 d orbit around the planet. In this example, the fitted planet-to-star radius ratio (r_{fit}), which goes into the calculation of the transit depth with a power of 2, is slightly overestimated due to the moon's photometric signature. As a comparison between the amplitude of the moon signal and the expected noise, the noise from the Poisson statistics of an $m_V = 8$ star (using a 1 hr binning) is 12.6 ppm for PLATO and 6.0 ppm for Kepler. This is two magnitudes smaller than the amplitude of the moon signature but possibly comparable to the effect of stellar noise, e.g. from activity.

Radial velocity constraints on the long-period transiting planet Kepler-1625 b with CARMENES

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Astronomy & Astrophysics, published (2020A&A...635A..59T)

The star Kepler-1625 recently attracted considerable attention when an analysis of the stellar photometric time series from the Kepler mission was interpreted as showing evidence of a large exomoon around the transiting Jupiter-sized planet candidate Kepler-1625 b. The mass of Kepler-1625 b, however, has not been determined independently and its planetary nature has formally not been validated. Moreover, Kepler's long-period Jupiter-sized planet candidates, like Kepler-1625 b with an orbital period of about 287 d, are known to have a high false alarm probability. Hence, an independent confirmation of Kepler-1625 b is particularly important. We aim to detect the radial velocity (RV) signal imposed by Kepler-1625 b (and its putative moon) on the host star or, as the case may be, determine an upper limit on the mass of the transiting object (or the combined mass of the two objects). We took a total of 22 spectra of Kepler-1625 using CARMENES, 20 of which were useful. Observations were spread over a total of seven nights between October 2017 and October 2018, covering 125 % of one full orbit of Kepler-1625 b. We used the automatic Spectral Radial Velocity Analyser (SERVAL) pipeline to deduce the stellar RVs and uncertainties. Then we fitted the RV curve model of a single planet on a Keplerian orbit to the observed RVs using a χ^2 minimisation procedure. We derive upper limits on the mass of Kepler-1625 b under the assumption of a single planet on a circular orbit. In this scenario, the $1\,\sigma$, $2\,\sigma$, and $3\,\sigma$ confidence upper limits for the mass of Kepler-1625 b are $2.90\,M_{\rm J}$, $7.15\,M_{\rm J}$, and $11.60\,M_{\rm J}$, respectively ($M_{\rm J}$ being Jupiter's mass). An RV fit that includes the orbital eccentricity and orientation of periastron as free parameters also suggests a planetary mass but is statistically less robust. We present strong evidence for the planetary nature of Kepler-1625 b, making it the 10th most long-period confirmed planet known today. Our data does not answer the question about a second, possibly more short-period planet that could be responsible for the observed transit timing variation of Kepler-1625 b.

Download/Website: `https://ui.adsabs.harvard.edu/abs/2020A&A...635A..59T`

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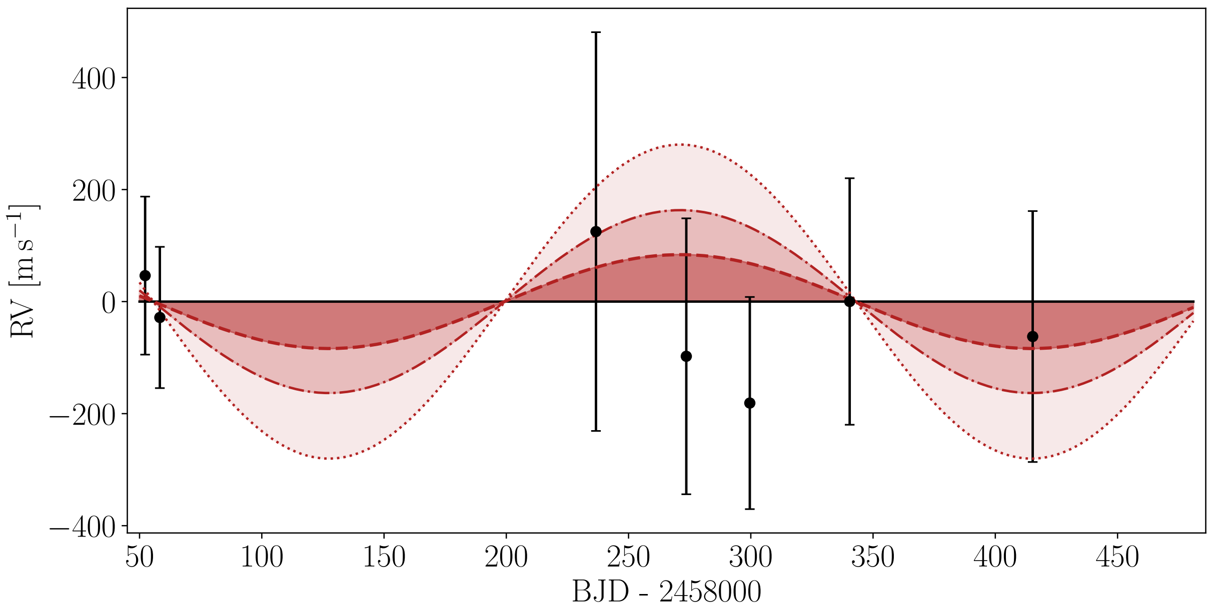

Figure 5: Derived RV values and RV curve for planetary masses (2.90, 7.15, 11.60 M_J) of different confidence levels (1σ, 2σ, 3σ). The lighter the shade of the colour, the higher the confidence regarding the corresponding mass limit.

Habitability is a continuous property of nature

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Nature Astronomy, DOI:10.1038/s41550-020-1063-x

In their recent comment, Cockell et al. argue that the habitability of an environment is fundamentally a binary property; that is to say, an environment can either support the metabolic processes of a given organism or not. The habitability of different environments, they argue, may have different degrees that could be determined at least in theory by answering the question: 'is this environment habitable to a given organism?' 'More' or 'less' habitable environments could then be related by the number of yes or no answers given to what is fundamentally a series of binary questions and decisions. In my opinion, there are at least three implicit assumptions made for this line of reasoning that are implausible and that sabotage the conclusions. The first is in the genetic diversity of the organisms, which I argue is fundamentally continuous in nature and a binary construction of the sample is not meaningful. The second misconception is in the assumption that an ecosystem can be decomposed into subsets of independent samples. The third problem is in the definition of an environment. The question of the environment is a continuous one in both space and time and thus any concept constructed to be applicable to a sample of environments must be continuous as well. In summary, the question of whether habitability is a binary quantity or not brings us back to the question of whether our concepts of life and of the environments that life thrives in (or not) are binary or non-binary. I argue that the latter is the case, and hence any modern concept of habitability must be continuous too.

Download/Website: `https://www.nature.com/articles/s41550-020-1063-x`

Contact: `heller@mps.mpg.de`

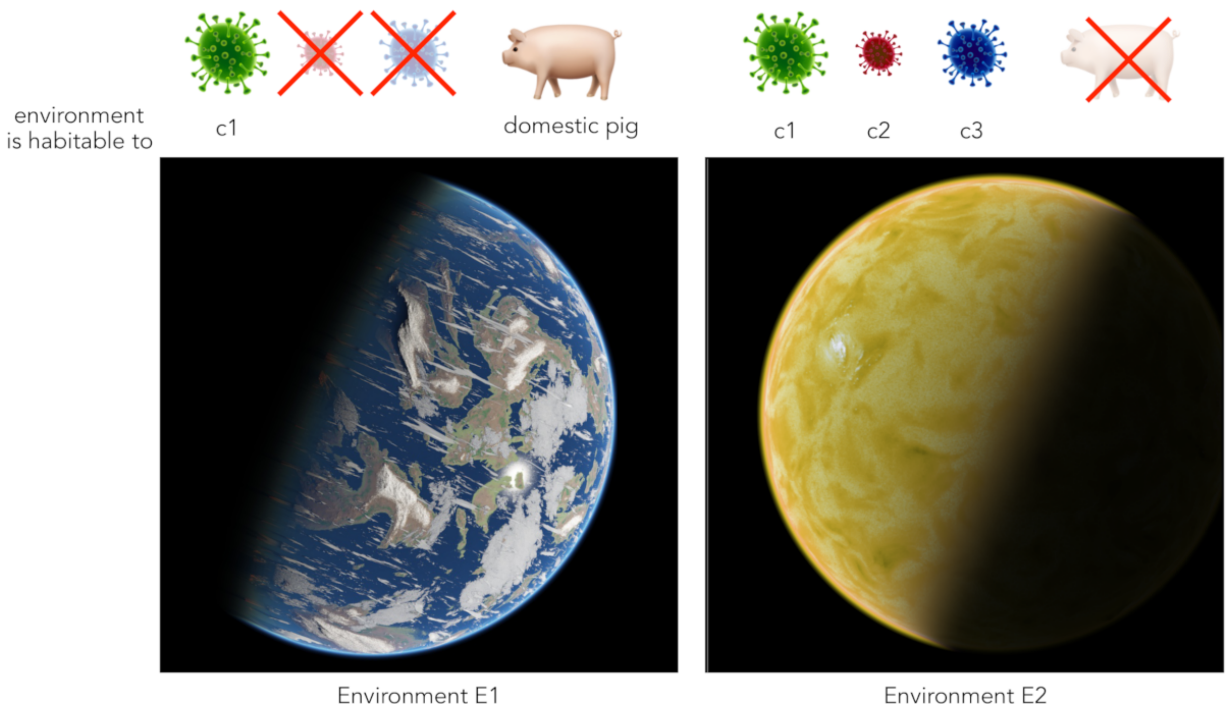

Figure 6: Habitability ranking based on a binary interpretation of habitability. Consider two environments E1 (left) and E2 (right). E1 is an Earth-like planet that offers habitable conditions for cyanobacterium c1 and pigs, whereas E2 is a highly saline ocean world that only harbors cyanobacteria and that is habitable to c1, c2, and c3. In the binary interpretation of habitability, E2 is more habitable than E1 although it is genetically less diverse.

3 Jobs and Positions

Fizeau exchange visitors program in optical interferometry - call for applications

European Interferometry Initiative

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

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

The deadline for applications is May 15 for visits to be carried out between mid July 2020 and December 2020!.

Note: requests for support for the Fizeau VLTI school in September are NOT part of this call. Such requests will be handled by the school organizers.

Further informations and application forms can be found at: www.european-interferometry.eu
The program is funded by OPTICON/H2020.

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

Looking forward to your applications,
Josef Hron & Péter Ábrahám
(for the European Interferometry Initiative)

Download/Website: `http://www.european-interferometry.eu`

Contact: `fizeau@european-interferometry.eu`

PhD positions in the CHAMELEON ITN: Virtual Laboratories for Exoplanets and Planet-Forming Disks

Peter Woitke, Inga Kamp

[1] School of Physics and Astronomy, Centre for Exoplanet Science, University of St Andrews, UK
[2] Kapteyn Astronomical Institute, University of Groningen, The Netherlands

University of St Andrews, University of Groningen, application deadline May 25th, 2020

We invite applicants to join the European Marie Sklodowska-Curie Innovative Training Network (ITN) entitled "CHAMELEON" for two PhD positions in modelling the chemistry and grain charges in planet-forming disks. Our disk models are based on chemical rate networks that are to be expanded to include the relevant processes in the warm inner disk (ESR 8) and the size-dependent statistical charging of grains that may cause lightning in disks (ESR 7). Details about the individual projects can be found here: http://chameleon.wp.st-andrews.ac.uk/recruitment/.
This European ITN will hire 15 PhD students altogether and combines the expertise from the Universities of St Andrews, Antwerp, Copenhagen, Groningen, Leuven and Edinburgh, the Netherlands Institute for Space Research and the Max-Planck Institute in Heidelberg to cover all physical, chemical, radiative and numerical aspects for modelling planetary atmospheres and planet-forming disks, including data analysis, machine learning and interpretation. Virtual laboratories play an essential role in simulating yet unexplored physico-chemical environments of the diverse exoplanet population known so far, and they are key find out whether our Solar System is unique and how life emerged.
We seek excellent students with a strong background in numerical modelling and astrochemistry. Successful candidates must hold a Masters degree or equivalent. Previous research experience on aspects of exoplanet atmospheres, planet-forming disks, analysis of astronomical spectra, and/or astro-chemistry and astro-biology, scientific coding and a track record of team work/mobility will be important criteria for the selection.

Download/Website: `http://chameleon.wp.st-andrews.ac.uk/recruitment/`

Contact: `pw31@st-andrews.ac.uk and kamp@astro.rug.nl`

4 Conferences

Exoplanet Demographics I Conference

J. Christiansen
NASA Exoplanet Science Institute, California Institute of Technology, Pasadena, CA, USA

Pasadena, CA, November 9-12, 2020

Registration is open for the first Exoplanet Demographics conference, hosted by the NASA Exoplanet Science Institute. It will be held November 9-12, 2020, and there is no registration fee. The current plan is to hold the conference at the California Institute of Technology in Pasadena, California, but the organizers are monitoring the current coronavirus situation closely.

This conference will bring together community members working both theoretically and observationally on understanding exoplanet demographics focusing on the following themes.

- What are the current limitations on our ability to discern the true underlying planet population from the observed distribution?
- What can the size and/or mass distribution of exoplanets teach us about the dominant planet formation, migration, and evolution pathways?
- What properties of stars affect the types of planets that form, and how can we use the properties of stars to study planet formation?
- What can we learn from planetary systems or disks around stellar remnants and substellar objects?
- How will upcoming missions advance our understanding of exoplanet demographics?

We are accepting abstract submissions for three kinds of presentations with different deadlines for the Review Talks vs. the Contributed Talks/Posters. If you want to submit more than one abstract, please re-register separately for each submission.

Review Talks: abstract submission by May 8 with notifications by May 22
Review talks are longer (∼30 minute) presentations intended to address one or more of the conference themes. The review talks will provide the framework for the conference agenda, and therefore the submission deadline for review talks is May 8 and speakers can expect to be notified by May 22 of the outcome.

Contributed Talks: abstract submission by July 9 with notifications by August 6
Contributed talks are shorter (∼15 minute) presentations. We hope to accommodate as many requests as possible.

Poster Presentations: abstract submission by July 9 with notifications by August 6
Poster presenters will have the opportunity to present a 1-2 minute poster POP during the conference. There will also be dedicated poster sessions. Each poster will have a 1.2 m x 1.2 m area for display.

<u>Selection criteria:</u> The SOC is committed to building an inclusive conference agenda, and is looking for ways to facilitate vibrant, thoughtful, and respectful discussions between all participants. Submissions are widely solicited and encouraged. Abstracts will be anonymously ranked in three career stage categories (student, postdoc, and staff) using three criteria: originality of the work, relevance to the conference themes, and results.

Download/Website: `http://nexsci.caltech.edu/workshop/2020`
Contact: `sagan_workshop@ipac.caltech.edu`

4.1 Conferences postponed/modified due to the COVID-19 pandemic

Dear colleagues,

Due to the COVID-19 pandemic and its global impact, we sadly decided to postpone the conference ”TOE3: From solar system to exoplanets” originally scheduled for June 1-5 2020 in Lamego, Portugal. Due to the high number of conferences that have been and will be postponed, we have not decided on the new date yet. We will inform you as soon as possible.

Best wishes & stay safe,
The LOC of the TOE3 conference.

Update on the 2020 Sagan Summer Workshop: Extreme Precision Radial Velocity

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

Pasadena, CA, July 20-23, 2020

Given the current coronavirus situation and its likely evolution over the coming months, we have decided to transform the workshop into a virtual meeting while aiming to preserve the content and spirit of the in-person workshop. This workshop will provide an introduction to the basics of the PRV technique, a summary of planet demographics from PRV surveys, and an evaluation of the importance of planet masses and orbits to imaging missions and of the challenges in advancing PRV precision by the factor of 10-30 needed to detect terrestrial analogs in orbit around nearby solar type stars.

The workshop will be shortened to four days, July 20-23, 2020, with the online meeting taking place for a few hours earlier in the day Pacific Time. We will be using Zoom and Slack for presentations and questions, as well as Jupyter notebooks for the modified hands-on sessions. As in previous years, we will record all talks for posting on the Sagan Summer Workshop YouTube channel: https://www.youtube.com/channel/UCytsRiMvdj5VTZWfj6dBadQ/. We ask that you still register so that we can plan for our online attendance and communicate information for the workshop with attendees ahead of time. Note that there is no registration fee for the workshop.

We are disappointed not to be able to welcome you to Pasadena this summer for the 20th Sagan Summer Workshop, but we want everyone to be safe and healthy. We look forward to our virtual meeting and hope you will still find it useful and effective.

Download/Website: http://nexsci.caltech.edu/workshop/2020
Contact: sagan_workshop@ipac.caltech.edu

5 Exoplanet Archive Updates

March 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, April 14, 2020

Note: All new planetary data can be viewed in the Confirmed Planets (`http://bit.ly/2MqFnub`), Composite Planet Data (`http://bit.ly/2l84Qw9`), and Extended Planet Data (`http://bit.ly/2NLy1Ci`) tables. New microlensing solutions are in the Microlensing Data table (`http://bit.ly/2JQr180`).

Also, the new alpha release of the Planetary Systems table allows you to browse ALL the planet and host star solutions (`http://bit.ly/2Pt0tM1`), and clicking on a planet name in the table takes you to the planet's redesigned system Overview page.

March 19, 2020
This week's update includes data for six new planets, including the first ever planet in the Galactic thick disk, discovered by TESS, and transmission spectroscopy for three known planets. The new planets are: OGLE-2013-BLG-0911L b, KMT-2016-BLG-1836L b, OGLE-2016-BLG-1227L b, NGTS-10 b, MASCARA-4 b, and LHS 1815 b (TESS discovery).

The new transmission spectroscopy data are for K2-18 b, KELT-9 b, and HAT-P-41 b, all of which are are browsable in the Transmission Spectroscopy interactive table (`http://bit.ly/2B54JfR`).

March 16, 2020
It's official: all Kepler/K2 user support has been transitioned to the NASA Exoplanet Archive (at NExScI) and the Mikulski Archive for Space Telescopes (MAST). See the Kepler/K2 User Support page (`http://bit.ly/33CU4Dx`) for details.

Also, as a reminder, the Kepler Data Products Overview page (`http://bit.ly/2EfdENe`) provides an exhaustive list of Kepler data products and documentation.

March 5, 2020
There are nine new planets in the archive this week, including the new circumbinary system Kepler-1661—a reminder that archival Kepler data continue to yield discoveries. There is also a new TESS planet, TOI-132 b.

The new planets are: Kepler-1661 b, TOI-132 b, GJ 1061 b, c, d, HATS-47 b, HATS-48 A b, HATS-49 b, and HATS-72 b.

Download/Website: `https://exoplanetarchive.ipac.caltech.edu`
Contact: `mharbut@caltech.edu`

6 As seen on astro-ph

The following list contains the entries relating to exoplanets that we spotted on astro-ph during March 2020.

March 2020

astro-ph/2003.00020: **The white dwarf planet WD J0914+1914 b: barricading potential rocky pollutants?** by *Dimitri Veras*

astro-ph/2003.00079: **Dust depleted inner disks in a large sample of transition disks through long-baseline ALMA observations** by *Logan Francis, Nienke van der Marel*

astro-ph/2003.00228: **Global maps of Venus nightside mean infrared thermal emissions obtained by VIRTIS on Venus Express** by *A. Cardesin-Moinelo et al.*

astro-ph/2003.00285: **Linearized model for satellite station-keeping and tandem formations under the effects of atmospheric drag** by *David Arnas*

astro-ph/2003.00375: **Birth environment of circumbinary planets: are there CBPs on the inclined orbits?** by *Chuan-Tao Ma et al.*

astro-ph/2003.00536: **Into the UV: A precise transmission spectrum of HAT-P-41b using Hubble's WFC3/UVIS G280 grism** by *H.R. Wakeford et al.*

astro-ph/2003.00650: **Global Major-Element Maps of Mercury from Four Years of MESSENGER X-Ray Spectrometer Observations** by *Larry R. Nittler et al.*

astro-ph/2003.00670: **Evolution of MU69 from a binary planetesimal into contact by Kozai-Lidov oscillations and nebular drag** by *Wladimir Lyra, Andrew N. Youdin, Anders Johansen*

astro-ph/2003.01126: **A free-floating or wide-orbit planet in the microlensing event OGLE-2019-BLG-0551** by *P. Mroz et al.*

astro-ph/2003.01127: **Generating metal-polluting debris in white dwarf planetary systems from small-impact crater ejecta** by *Dimitri Veras, Kosuke Kurosawa*

astro-ph/2003.01136: **A pair of TESS planets spanning the radius valley around the nearby mid-M dwarf LTT 3780** by *Ryan Cloutier et al.*

astro-ph/2003.01140: **The CARMENES search for exoplanets around M dwarfs. Two planets on the opposite sides of the radius gap transiting the nearby M dwarf LP 729-54** by *G. Nowak et al.*

astro-ph/2003.01167: **Dust dynamics and vertical settling in gravitoturbulent protoplanetary discs** by *A. Riols et al.*

astro-ph/2003.01374: **Irradiance Variations due to Orbital and Solar Inertial Motion: The Effect on Earth's Surface Temperature** by *Gerald E. Marsh*

astro-ph/2003.01486: **Disentangling Atmospheric Compositions of K2-18 b with Next Generation Facilities** by *Quentin Changeat et al.*

astro-ph/2003.01508: **Planetary Felsic Crust Formation at Shallow Depth** by *Anastassia Y. Borisova et al.*

astro-ph/2003.01644: **The Imprint of the Protoplanetary Disk in the Accretion of Super-Earth Envelopes** by *Mohamad Ali-Dib, Andrew Cumming, Douglas N. C. Lin*

astro-ph/2003.01720: **Origin of (2014) MU69-like Kuiper-belt contact binaries from wide binaries** by *Evgeni Grishin et al.*

astro-ph/2003.01738: **Physical models of streaming instabilities in protoplanetary disks** by *Jonathan Squire, Philip F. Hopkins*

astro-ph/2003.01739: **Joint Radial Velocity and Direct Imaging Planet Yield Calculations: I. Self-consistent Planet Populations** by *Shannon D. Dulz et al.*

astro-ph/2003.01781: **Formation of the polar debris disc around 99 Herculis** by *Jeremy L. Smallwood et al.*

astro-ph/2003.01814: **ExoReLR: A Bayesian Inverse Retrieval Framework For Exoplanetary Reflected Light Spectra** by *Mario Damiano, Renyu Hu*

astro-ph/2003.01839: **Alfnoor: A Retrieval Simulation of the Ariel Target List** by *Quentin Changeat et al.*

astro-ph/2003.01965: **Breaking Resonant Chains: Destabilization of Resonant Planets due to Long-term Mass Evolution** by *Yuji Matsumoto, Masahiro Ogihara*
astro-ph/2003.02036: **Proxima Centauri b: A Strong Case for including Cosmic-Ray-induced Chemistry in Atmospheric Biosignature Studies** by *M. Scheucher et al.*
astro-ph/2003.02061: **A Three Dimensional View of Gomez's Hamburger** by *Richard Teague et al.*
astro-ph/2003.02184: **First year of coordinated science observations by Mars Express and ExoMars 2016 Trace Gas Orbiter** by *A. Cardesin-Moinelo et al.*
astro-ph/2003.02290: **Peas in a Pod? Radius correlations in Kepler multi-planet systems** by *Lena Murchikova, Scott Tremaine*
astro-ph/2003.02298: **Importance of radiative effects in gap opening by planets in protoplanetary disks** by *Alexandros Ziampras, Wilhelm Kley, Cornelis P. Dullemond*
astro-ph/2003.02325: **Analysing the region of the rings and small satellites of Neptune** by *D.M. Gaslac Gallardo et al.*
astro-ph/2003.02375: **KMT-2019-BLG-1339L: an M Dwarf with a Giant Planet or a Companion Near the Planet/Brown Dwarf Boundary** by *Cheongho Han et al.*
astro-ph/2003.02385: **Orbital Refinement and Stellar Properties for the HD 9446, HD 43691, and HD 179079 Planetary Systems** by *Michelle L. Hill et al.*
astro-ph/2003.02595: **Wave propagation in semi-convective regions of giant planets** by *Christina M. Pontin et al.*
astro-ph/2003.02724: **Doppler Tomographic Measurement of the Nodal Precession of WASP-33b** by *Noriharu Watanabe, Norio Narita, Marshall C. Johnson*
astro-ph/2003.02982: **Effects of scattering, temperature gradients, and settling on the derived dust properties of observed protoplanetary disks** by *Anibal Sierra, Susana Lizano*
astro-ph/2003.02983: **Ogle-2018-blg-0677lb: A super earth near the galactic bulge** by *Antonio Herrera-Martín et al.*
astro-ph/2003.03116: **Linking studies of tiny meteoroids, zodiacal dust, cometary dust and circumstellar disks** by *Anny-Chantal Levasseur-Regourd, Clément Baruteau, Jérémie Lasue, Julien Milli, Jean-Baptiste Renar et al.*
astro-ph/2003.03231: **Atmospheric Escape Processes and Planetary Atmospheric Evolution** by *Guillaume Gronoff et al.*
astro-ph/2003.03349: **A statistical search for Star-Planet Interaction in the UltraViolet using GALEX** by *Gayathri Viswanath et al.*
astro-ph/2003.03388: **Sub-Neptune Formation: The View from Resonant Planets** by *Nick Choksi, Eugene Chiang*
astro-ph/2003.03628: **The Atmospheres of Rocky Exoplanets I. Outgassing of Common Rock and the Stability of Liquid Water** by *Oliver Herbort et al.*
astro-ph/2003.04348: **Architectures of Exoplanetary Systems. II: An Intrinsic Relation between Planetary System Occurrence and Spectral Type for Kepler's FGK Dwarfs** by *Matthias Y. He, Eric B. Ford, Darin Ragozzine*
astro-ph/2003.04397: **Searching the Entirety of Kepler Data. I. 17 New Planet Candidates Including 1 Habitable Zone World** by *Michelle Kunimoto, Jaymie M. Matthews, Henry Ngo*
astro-ph/2003.04504: **Probability of simultaneous parallax detection for free-floating planet microlensing events near Galactic Centre** by *M. Ban*
astro-ph/2003.04525: **LHS 1815b: The First Thick-Disk Planet Detected By TESS** by *Tianjun Gan et al.*
astro-ph/2003.04650: **Detection of Fe I and Fe II in the atmosphere of MASCARA-2b using a cross-correlation method** by *M. Stangret et al.*
astro-ph/2003.04810: **Revisiting the distributions of Jupiter's irregular moons: I. physical characteristics** by *Fabao Gao, Xia Liu*
astro-ph/2003.04851: **Revisiting the distributions of Jupiter's irregular moons: II. orbital characteristics** by

Fabao Gao, Xia Liu

astro-ph/2003.04856: **Searching for Thermal Inversion Agents in the Transmission Spectrum of MASCARA-2b/KELT-20b: Detection of Neutral Iron and Ionised Calcium HK Lines** by *Stevanus K. Nugroho et al.*

astro-ph/2003.04872: **Modelling the He I triplet absorption at 10830 Angstroms in the atmosphere of HD 209458 b** by *M. Lampón et al.*

astro-ph/2003.04877: **Re-inflation of warm and hot Jupiters** by *Thaddeus D. Komacek et al.*

astro-ph/2003.04931: **Resonance in the K2-19 system is at odds with its high reported eccentricities** by *Antoine C. Petit et al.*

astro-ph/2003.05040: **Dynamical instabilities in systems of multiple short-period planets are likely driven by secular chaos: a case study of Kepler-102** by *Kathryn Volk, Renu Malhotra*

astro-ph/2003.05052: **Formation of single-moon systems around gas giants** by *Yuri I. Fujii, Masahiro Ogihara*

astro-ph/2003.05121: **The reliability of the Titius-Bode relation and its implications for the search for exoplanets** by *Patricia Lara, Guadalupe Cordero-Tercero, Christine Allen*

astro-ph/2003.05354: **Atmospheric compositions and observability of nitrogen dominated ultra-short period super-Earths** by *Mantas Zilinskas et al.*

astro-ph/2003.05366: **Normalized angular momentum deficit: A tool for comparing the violence of the dynamical histories of planetary systems** by *D. Turrini, A. Zinzi, J. A. Belinchon*

astro-ph/2003.05397: **A weak spectral signature of water vapour in the atmosphere of HD 179949 b at high spectral resolution in the L-band** by *Rebecca K. Webb et al.*

astro-ph/2003.05458: **Realistic gravitational focusing of meteoroid streams** by *Althea V. Moorhead, Tiffany D. Clements, Denis Vida*

astro-ph/2003.05486: **Subsolar Al/Si and Mg/Si ratios of non-carbonaceous chondrites reveal planetesimal formation during early condensation in the protoplanetary disk** by *A. Morbidelli et al.*

astro-ph/2003.05528: **Nightside condensation of iron in an ultra-hot giant exoplanet** by *David Ehrenreich et al.*

astro-ph/2003.05704: **Venusian Habitable Climate Scenarios: Modeling Venus through time and applications to slowly rotating Venus-Like Exoplanets** by *M.J. Way, Anthony, D. Del Genio*

astro-ph/2003.05714: **SPHERE+: Imaging young Jupiters down to the snowline** by *A. Boccaletti et al.*

astro-ph/2003.05932: **Three Short Period Jupiters from TESS** by *L. D. Nielsen et al.*

astro-ph/2003.05934: **Unified simulations of planetary formation and atmospheric evolution: Effects of pebble accretion, giant impacts, and stellar irradiations on super-Earth formation** by *Masahiro Ogihara, Yasunori Hori*

astro-ph/2003.05943: **Strong biases in retrieved atmospheric composition caused by strong day-night chemical heterogeneities** by *William Pluriel et al.*

astro-ph/2003.06306: **Earths polar night boundary layer as an analogue for dark side inversions on synchronously rotating terrestrial exoplanets** by *Manoj Joshi et al.*

astro-ph/2003.06407: **Systematic Phase Curve Study of Known Transiting Systems from Year 1 of the TESS Mission** by *Ian Wong et al.*

astro-ph/2003.06424: **HST/STIS transmission spectrum of the ultra-hot Jupiter WASP-76 b confirms the presence of sodium in its atmosphere** by *C. von Essen et al.*

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limit using N-body simulations by *Mariana B. Sánchez, Gonzalo C. de Elía, Juan José Downes*
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astro-ph/2003.08901: **Testing the isotropy of the Dark Energy Survey's extreme trans-Neptunian objects** by *Pedro H. Bernardinelli et al.*
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astro-ph/2003.13796: **Robustly detecting changes in warm Jupiters' transit impact parameters** by *Rebekah I. Dawson*

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astro-ph/2003.14044: **Thermally Driven Angular Momentum Transport in Hot Jupiters** by *Cong Yu*

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astro-ph/2003.14311: **Outstanding Challenges of Exoplanet Atmospheric Retrievals** by *Joanna K. Barstow, Kevin Heng*

astro-ph/2003.14371: **Allesfitter: Flexible Star and Exoplanet Inference From Photometry and Radial Velocity** by *Maximilian N. Günther, Tansu Daylan*

astro-ph/2003.00632: **Empirical Photometric Control of Mars Context Camera Images** by *Stuart J. Robbins, Michelle R. Kirchoff, Rachael H. Hoover*

astro-ph/2003.00743: **The disk of 2MASS 15491331-3539118 = GQ Lup C as seen by HST and WISE** by *C. Lazzoni et al.*

astro-ph/2003.00984: **The UV surface habitability of Proxima b: first experiments revealing probable life survival to stellar flares** by *Ximena C. Abrevaya et al.*

astro-ph/2003.01141: **Resonant capture in quadruple stellar systems** by *Scott Tremaine*

astro-ph/2003.02145: **Original use of MUSE's laser tomography adaptive optics to directly image young accreting exoplanets** by *Julien H. Girard et al.*

astro-ph/2003.02430: **Accurate Machine Learning Atmospheric Retrieval via a Neural Network Surrogate Model for Radiative Transfer** by *Michael D. Himes et al.*

astro-ph/2003.03390: **Most Stars (and Planets?) Are Born in Intense Radiation Fields** by *Eve J. Lee, Philip F. Hopkins*

astro-ph/2003.03468: **Characterizing the Radio Quiet Region Behind the Lunar Farside for Low Radio Frequency Experiments** by *Neil Bassett et al.*

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astro-ph/2003.06870: **HD 145263: Spectral Observations of Silica Debris Disk Formation via Extreme Space Weathering?** by *C.M. Lisse et al.*

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astro-ph/2003.08812: **Global trends in winds of M dwarf stars** by *Amanda Mesquita, Aline Vidotto*

astro-ph/2003.08851: **An Extreme Precision Radial Velocity Pipeline: First Radial Velocities from EXPRES** by *Ryan R. Petersburg et al.*

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astro-ph/2003.10792: **Evolving grain-size distributions embedded in gas flows** by *Rosie Sumpter, Sven Van Loo*

astro-ph/2003.10949: **New ultracool dwarf neighbours within 20pc from Gaia DR2** by *Ralf-Dieter Scholz*

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astro-ph/2003.11980: **The Planetary Luminosity Problem: "Missing Planets" and the Observational Consequences of Episodic Accretion** by *Sean D. Brittain et al.*

astro-ph/2003.12284: **The MESAS Project: ALMA observations of the F-type stars Lep, Vir A, and Vir B** by *Jacob Aaron White et al.*

astro-ph/2003.13106: **Orbital inclination and mass of the exoplanet candidate Proxima c** by *Pierre Kervella, Frédéric Arenou, Jean Schneider*

astro-ph/2003.13692: **Focal Plane Wavefront Sensing with the FAST TGV Coronagraph** by *Benjamin Gerard,* *Christian Marois*

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astro-ph/2003.05407: **Dependence of Intensities of Major Geomagnetic Storms (Dst -100 nT) on Associated Solar Wind Parameters** by *Gui-Ming Le, Gui-Ang Liu, Ming-Xian Zhao*

astro-ph/2003.06604: **Measurements of the neutral particle spectra on Mars by MSL/RAD from 2015-11-15 to 2016-01-15** by *Jingnan Guo et al.*

astro-ph/2003.06629: **Thermodynamic anomalies and three distinct liquid-liquid transitions in warm dense liquid hydrogen** by *Hua Y. Geng et al.*

astro-ph/2003.08287: **Magmatic intrusions control Io's crustal thickness** by *D. C. Spencer, R. F. Katz, I. J. Hewitt*

astro-ph/2003.08959: **On-deck seismology: Lessons from InSight for future planetary seismology** by *Mark P. Panning et al.*

astro-ph/2003.09387: **Rapid 14C excursion at 3372-3371 BCE not observed at two different locations, a comment on Wang et al. (2017)** by *AJ Timothy Jull et al.*

astro-ph/2003.13981: **The search for life and a new logic** by *Douglas Scott, Ali Frolop*