ExoPlanet News
An Electronic Newsletter

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1 Editorial

Welcome to Edition 129 of the ExoPlanet News. Here in Switzerland (as may be the case for many of you), our academic and personal activities are quite altered by the current measures to limit the magnitude of the pandemic virus.

Nevertheless, we bring you abstracts of scientific papers, conference announcements, Exoplanet Archive updates, and an overview of exoplanet-related articles on astro-ph. Thank you to all of you who contributed to this issue of the newsletter!

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 14. April 2020.

Best regards from the editorial team,

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

2 Abstracts of refereed papers

Coherent radio emission from a quiescent red dwarf indicative of star–planet interaction

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Nature Astronomy, https://www.nature.com/articles/s41550-020-1011-9

Low-frequency ($\nu \leq 150$ MHz) stellar radio emission is expected to originate in the outer corona at heights comparable to and larger than the stellar radius. Such emission from the Sun has been used to study coronal structure, mass ejections and space-weather conditions around the planets. Searches for low-frequency emission from other stars have detected only a single active flare star that is not representative of the wider stellar population. Here we report the detection of low-frequency radio emission from a quiescent star, GJ 1151—a member of the most common stellar type (red dwarf or spectral class M) in the Galaxy. The characteristics of the emission are similar to those of planetary auroral emissions (for example, Jupiter's decametric emission), suggesting a coronal structure dominated by a global magnetosphere with low plasma density. Our results show that large-scale currents that power radio aurorae operate over a vast range of mass and atmospheric composition, ranging from terrestrial planets to main-sequence stars. The Poynting flux required to produce the observed radio emission cannot be generated by GJ 1151's slow rotation, but can originate in a sub-Alfvénic interaction of its magnetospheric plasma with a short-period exoplanet. The emission properties are consistent with theoretical expectations for interaction with an Earth-size planet in an approximately one- to five-day-long orbit.

Download/Website: `https://doi.org/10.1038/s41550-020-1011-9.`

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MOVES III. Simultaneous X-ray and ultraviolet observations unveiling the variable environment of the hot Jupiter HD 189733b

V. Bourrier[1], *P. J. Wheatley*[2,3], *A. Lecavelier des Etangs*[4], *G. King*[2,3], *T. Louden*[2,3], *D. Ehrenreich*[1], *R. Fares*[5], *Ch. Helling*[6,7], *J. Llama*[8], *M. M. Jardine*[9], *A. A. Vidotto*[10]

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Monthly Notices of the Royal Astronomical Society, in press (2020MNRAS.tmp..240B / arXiv:2001.11048)

In this third paper of the MOVES (Multiwavelength Observations of an eVaporating Exoplanet and its Star) programme, we combine Hubble Space Telescope far-ultraviolet observations with *XMM-Newton*/*Swift* X-ray observations to measure the emission of HD 189733 in various FUV lines, and its soft X-ray spectrum. Based on these measurements we characterise the interstellar medium toward HD 189733 and derive semi-synthetic XUV spectra of the star, which are used to study the evolution of its high-energy emission at five different epochs. Two flares from HD 189733 are observed, but we propose that the long-term variations in its spectral energy distribution have the most important consequences for the environment of HD 189733b. Reduced coronal and wind activity could favour the formation of a dense population of Si^{2+} atoms in a bow-shock ahead of the planet, responsible for pre- and in-transit absorption measured in the first two epochs. In-transit absorption signatures are detected in the Lyman-α line in the second, fourth and fifth epochs, which could arise from the extended planetary thermosphere and a tail of stellar wind protons neutralised via charge-exchange with the planetary exosphere. We propose that increases in the X-ray irradiation of the planet, and decreases in its EUV irradiation causing lower photoionisation rates of neutral hydrogen, favour the detection of these signatures by sustaining larger densities of H^0 atoms in the upper atmosphere and boosting charge-exchanges with the stellar wind. Deeper and broader absorption signatures in the last epoch suggest that the planet entered a different evaporation regime, providing clues as to the link between stellar activity and the structure of the planetary environment.

Download/Website: `https://doi.org/10.1093/mnras/staa256`

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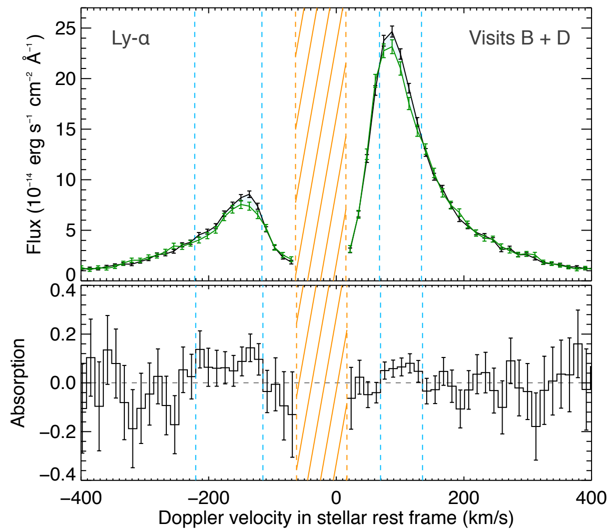

Figure 1: Top panel: Stellar Lyman-α line averaged over the second and fourth epochs of observations. Spectral ranges showing absorption during the transit of HD 189733 b (green spectrum) compared to pre-transit orbits (black spectrum) are highlighted in blue. This absorption is caused by the extended exosphere of neutral hydrogen trailing the planet. The dashed orange region is contaminated by geocoronal emission. Bottom panel: Absorption spectrum defined as the relative flux ratio between the in- and pre-transit spectra.

Hot Exoplanet Atmospheres Resolved with Transit Spectroscopy (HEARTS) III. Atmospheric structure of the misaligned ultra-hot Jupiter WASP-121b

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Astronomy & Astrophysics, in press (arXiv:2001.06836)

Ultra-hot Jupiters offer interesting prospects for expanding our theories on dynamical evolution and the properties of extremely irradiated atmospheres. In this context, we present the analysis of new optical spectroscopy for the transiting ultra-hot Jupiter WASP-121b. We first refine the orbital properties of WASP-121b, which is on a nearly polar (obliquity $\psi^{\rm North}$=88.1±0.25° or $\psi^{\rm South}$=91.11±0.20°) orbit, and exclude a high differential rotation for its fast-rotating (P<1.13 days), highly inclined ($i_\star^{\rm North}$=$8.1^{+3.0}_{-2.6}$° or $i_\star^{\rm South}$=$171.9^{+2.5}_{-3.4}$°) star. We then present a new method that exploits the reloaded Rossiter-McLaughlin technique to separate the contribution of the planetary atmosphere and of the spectrum of the stellar surface along the transit chord. Its application to HARPS transit spectroscopy of WASP-121b reveals the absorption signature from metals, likely atomic iron, in the planet atmospheric limb. The width of the signal (14.3±1.2 km s^{-1}) can be explained by the rotation of the tidally locked planet. Its blueshift (-5.2±0.5 km s^{-1}) could trace strong winds from the dayside to the nightside, or the anisotropic expansion of the planetary thermosphere.

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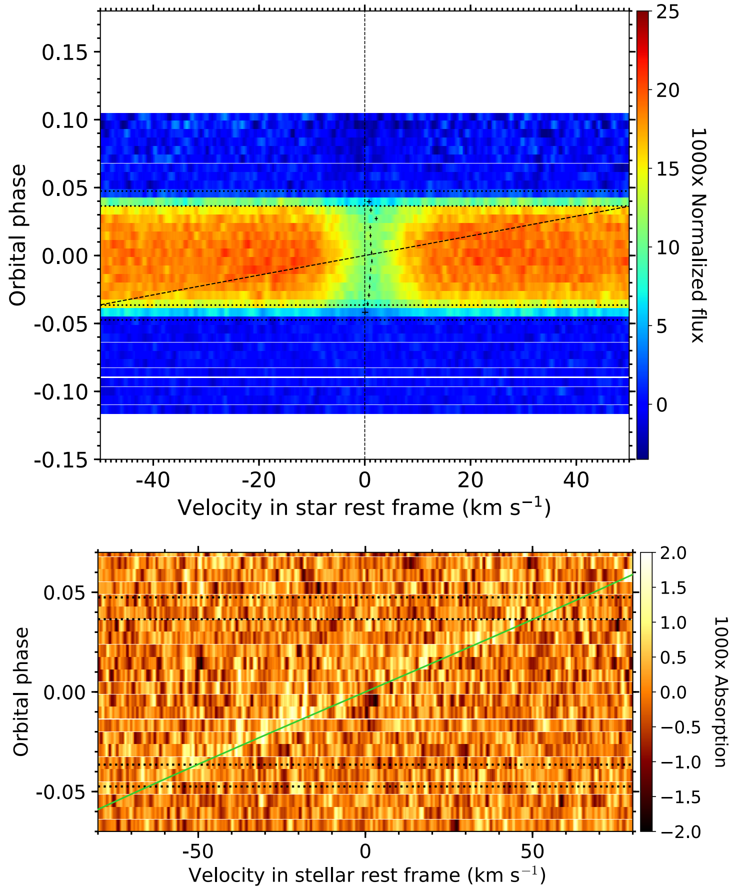

Figure 2: *Top panel:* Map of the residuals between the disk-integrated CCFs of WASP-121 and their master out-of-transit in one epoch of HARPS observation. Residuals are colored as a function of their flux, and plotted as a function of RV in the stellar rest frame (in abscissa) and orbital phase of the ultra-hot-Jupiter WASP-121b (in ordinate). Horizontal dotted lines are the transit contacts. In-transit residuals reveal the average local stellar line profile from the planet-occulted regions of the stellar disk (black crosses with error bars indicate their centroids). The slanted dashed black line tracks the orbital trajectory of the planet, along which can be extracted the CCFs of the absorption signal from the planetary atmosphere. *Bottom panel:* Map of the atmospheric CCFs binned over three epochs of observations, colored as a function of absorption, and plotted as a function of RV in the stellar rest frame (in abscissa) and orbital phase (in ordinate). The bright streak is the absorption signature from the planetary atmosphere. It follows the track of the planetary orbital motion (solid green curve), but with a slight blueshift.

Re-inflation of warm and hot Jupiters

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The Astrophysical Journal, Accepted (arXiv e-prints:2003.04877)

Understanding the anomalous radii of many transiting hot gas giant planets is a fundamental problem of planetary science. Recent detections of re-inflated warm Jupiters orbiting post-main-sequence stars and the re-inflation of hot Jupiters while their host stars evolve on the main-sequence may help constrain models for the anomalous radii of hot Jupiters. In this work, we present evolution models studying the re-inflation of gas giants to determine how varying the depth and intensity of deposited heating affects both main-sequence re-inflation of hot Jupiters and post-main-sequence re-inflation of warm Jupiters. We find that deeper heating is required to re-inflate hot Jupiters than is needed to suppress their cooling, and that the timescale of re-inflation decreases with increasing heating rate and depth. We find a strong degeneracy between heating rate and depth, with either strong shallow heating or weak deep heating providing an explanation for main-sequence re-inflation of hot Jupiters. This degeneracy between heating rate and depth can be broken in the case of post-main-sequence re-inflation of warm Jupiters, as the inflation must be rapid to occur within post-main-sequence evolution timescales. We also show that the dependence of heating rate on incident stellar flux inferred from the sample of hot Jupiters can explain re-inflation of both warm and hot Jupiters. TESS will obtain a large sample of warm Jupiters orbiting post-main-sequence stars, which will help to constrain the mechanism(s) causing the anomalous radii of gas giant planets.

Download/Website: `https://arxiv.org/abs/2003.04877`

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Peas in a Pod? Radius correlations in Kepler multi-planet systems

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The Astrophysical Journal, in press (arXiv:2003.02290)

We address the claim of Weiss et al. (2018) that the radii of adjacent planets in *Kepler* multi-planet systems are correlated. We explore two simple toy models—in the first the radii of the planets are chosen at random from a single universal distribution, and in the second we postulate several types of system with distinct radius distributions. We show that an apparent correlation between the radii of adjacent planets similar to the one reported by Weiss et al. (2018) can arise in both models. In addition the second model fits all other aspects of the radius distribution, including the signal-to-noise distribution of the observed planets. We also comment on the validity of a commonly used correction that is used to estimate intrinsic planet occurrence rates, based on weighting planets by the inverse of their detectability.

Download/Website: `https://arxiv.org/pdf/2003.02290.pdf`

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Shallow transit follow-up from NGTS: simultaneous observations of HD106315 with 11 identical telescopes

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Astronomischen Nachrichten, in press (arXiv:2002.05591)

The Next Generation Transit Survey (NGTS) is a photometric survey for transiting exoplanets, consisting of twelve identical 0.2-m telescopes. We report a measurement of the transit of HD106315 c using a novel observing mode in which multiple NGTS telescopes observed the same target with the aim of increasing the signal-to-noise. Combining the data allows the robust detection of the transit, which has a depth less than 0.1 per cent, rivalling the performance of much larger telescopes. We demonstrate the capability of NGTS to contribute to the follow-up of *K2* and TESS discoveries using this observing mode. In particular, NGTS is well-suited to the measurement of shallow transits of bright targets. This is particularly important to improve orbital ephemerides of relatively long-period planets, where only a small number of transits are observed from space.

Download/Website: `https://arxiv.org/abs/2002.05591`

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An Eclipsing Substellar Binary in a Young Triple System discovered by SPECULOOS

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Nature Astronomy, published (arXiv:2001.07175)

Mass, radius and age are three of the most fundamental parameters for celestial objects, enabling insight into the evolution and internal physics of stars, brown dwarfs and planets. Brown dwarfs are hydrogen-rich objects that are unable to sustain core fusion reactions but are supported against collapse by electron degeneracy pressure. As they age, brown dwarfs cool, reducing their radius and luminosity. Young exoplanets follow a similar behaviour. Brown dwarf evolutionary models are relied upon to infer the masses, radii and ages of young brown dwarfs. Similar models are also used to infer the mass and radius of directly imaged exoplanets. Unfortunately, only sparse empirical mass, radius and age measurements are currently available, and so the models remain mostly unvalidated. Double-line eclipsing binaries provide the most direct route towards the absolute determination of the masses and radii of stars. Here we report the discovery by SPECULOOS (Search for habitable Planets EClipsing ULtra-cOOl Stars) of the 2M1510A triple system, consisting of a nearby, eclipsing, double-line brown dwarf binary and a widely separated tertiary brown dwarf companion. We find that the system is a member of Argus, a 45 ± 5 million-year-old moving group. The systemÕs age matches those of currently known directly imaged exoplanets so 2M1510A provides an opportunity to benchmark evolutionary models of brown dwarfs and young planets. We find that widely used evolutionary models do reproduce the mass, radius and age of the binary components remarkably well, but overestimate their luminosity by up to 0.65 magnitudes, which could result in underestimations of 20% to 35%of photometric masses for directly imaged exoplanets and young-field brown dwarfs.

Download/Website: `https://www.nature.com/articles/s41550-020-1018-2`

Download/Website: `https://arxiv.org/abs/2001.07175`

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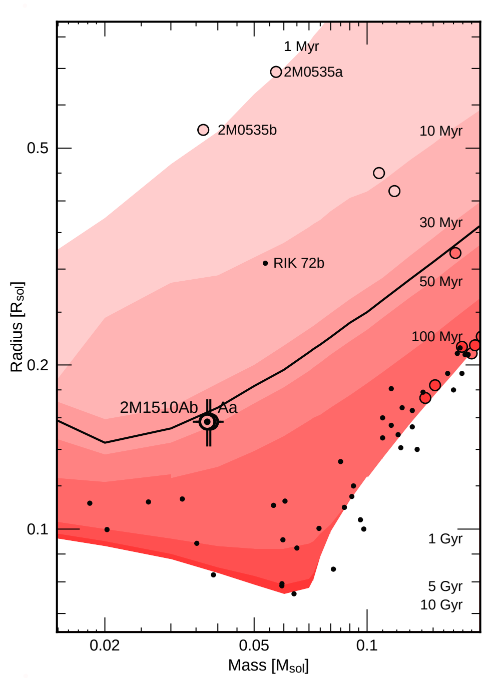

Figure 3: **Mass-radius diagram showing the position of the 2M1510Aab eclipsing pair** (shown in black with their 1σ uncertainties). The red-shaded areas separate the tracks of the Exeter/Lyon evolutionary models, with ages labelled. Circles delineate mass/radius measurements obtained for previously detected double-line eclipsing binaries, with their colour corresponding to the age estimated for each binary. Dark dots depict mass/radius measurements for interferometric measurements, single-line eclipsing binaries and transiting exoplanets. The young brown dwarfs 2M0535AB and RIK 27b are labelled. 2M1510AOs parameters are consistent with the 45 ± 5 Myr age of the Argus moving group, just below a 40-Myr isochrone highlighted in black. 2M1510Aab, our double-line eclipsing system, is in an area of parameter space with no equivalent systems. Literature measurements are reported in Supplementary Tables 5 and 6.

The white dwarf planet WD J0914+1914 b: barricading potential rocky pollutants?

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MNRAS, In Press, arXiv:2003.00020

An ice giant planet was recently reported orbiting white dwarf WD J0914+1914 at an approximate distance of 0.07 au. The striking non-detection of rocky pollutants in this white dwarf's photosphere contrasts with the observations of nearly every other known white dwarf planetary system. Here, I analyze the prospects for exterior extant rocky asteroids, boulders, cobbles and pebbles to radiatively drift inward past the planet due to the relatively high luminosity $(0.1L_{\odot})$ of this particularly young (13 Myr) white dwarf. Pebbles and cobbles drift too slowly from Poynting-Robertson drag to bypass the planet, but boulders and asteroids are subject to the much stronger Yarkovsky effect. In this paper, I (i) place lower limits on the timescales for these objects to reach the planet's orbit, (ii) establish 3 m as the approximate limiting radius above which a boulder drifts too slowly to avoid colliding with the planet, and (iii) compute bounds on the fraction of boulders which succeed in traversing mean motion resonances and the planet's Hill sphere to eventually pollute the star. Overall, I find that the planet acts as a barrier against rather than a facilitator for radiatively-driven rocky pollution, suggesting that future rocky pollutants would most likely originate from distant scattering events.

Download/Website: `https://arxiv.org/abs/2003.00020`

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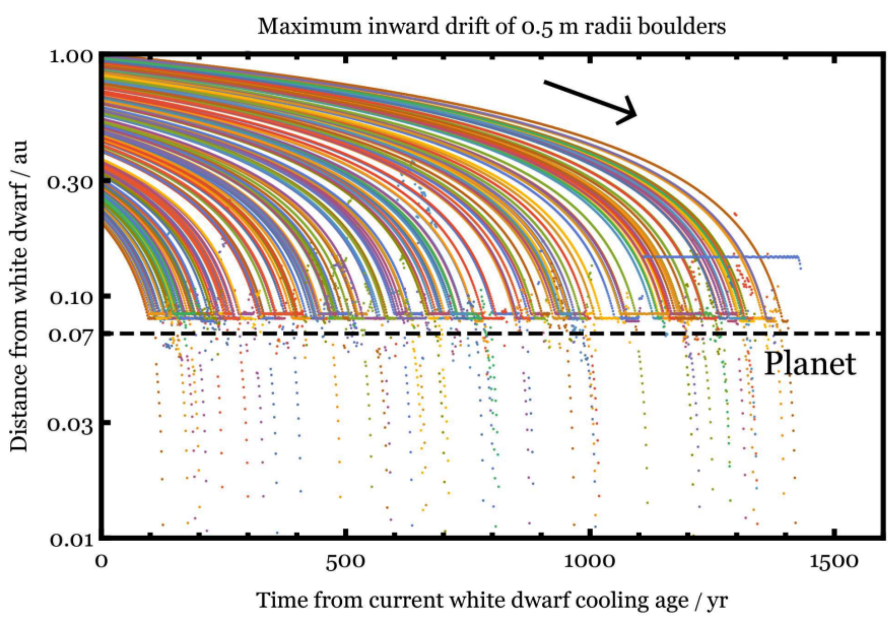

Figure 4: Rocky debris approaching the star and being stopped in their tracks by a giant planet, which eventually engulfs the debris.

Linking the formation and fate of exo-Kuiper belts within solar system analogues

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MNRAS, In Press, arXiv:2002.08372

Escalating observations of exo-minor planets and their destroyed remnants both passing through the solar system and within white dwarf planetary systems motivate an understanding of the orbital history and fate of exo-Kuiper belts and planetesimal discs. Here we explore how the structure of a 40-1000 au annulus of asteroids orbiting inside of a solar system analogue that is itself initially embedded within a stellar cluster environment varies as the star evolves through all of its stellar phases. We attempt this computationally challenging link in four parts: (1) by performing stellar cluster simulations lasting 100 Myr, (2) by making assumptions about the subsequent quiescent 11 Gyr main-sequence evolution, (3) by performing simulations throughout the giant branch phases of evolution, and (4) by making assumptions about the belt's evolution during the white dwarf phase. Throughout these stages, we estimate the asteroids' gravitational responses to analogues of the four solar system giant planets, as well as to collisional grinding, Galactic tides, stellar flybys, and stellar radiation. We find that the imprint of stellar cluster dynamics on the architecture of $\gtrsim 100$ km-sized exo-Kuiper belt objects is retained throughout all phases of stellar evolution unless violent gravitational instabilities are triggered either (1) amongst the giant planets, or (2) due to a close ($\ll 10^3$ au) stellar flyby. In the absence of these instabilities, these minor planets simply double their semimajor axis while retaining their primordial post-cluster eccentricity and inclination distributions, with implications for the free-floating asteroid population and metal-polluted white dwarfs.

Download/Website: `https://arxiv.org/abs/2002.08372`

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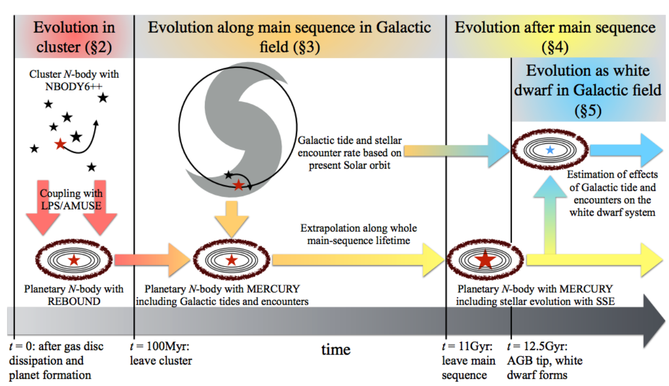

Figure 5: The combination of life stages of an exo-Kuiper belt that were modelled. Included are all of the numerical codes used.

Generating metal-polluting debris in white dwarf planetary systems from small-impact crater ejecta

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MNRAS, In Press, arXiv:2003.01127

Metal pollution in white dwarf photospheres originates from the accretion of some combination of planets, moons, asteroids, comets, boulders, pebbles and dust. When large bodies reside in dynamically stagnant locations – unable themselves to pollute nor even closely approach the white dwarf – then smaller reservoirs of impact debris may become a complementary or the primary source of metal pollutants. Here, we take a first step towards exploring this possibility by computing limits on the recoil mass that escapes the gravitational pull of the target object following a single impact onto an atmosphere-less surface. By considering vertical impacts only with the full-chain analytical prescription from Kurosawa & Takada (2019), we provide lower bounds for the ejected mass for basalt, granite, iron and water-rich target objects across the radii range 10^{0-3} km. Our use of the full-chain prescription as opposed to physical experiments or hydrocode simulations allows us to quickly sample a wide range of parameter space appropriate to white dwarf planetary systems. Our numerical results could be used in future studies to constrain freshly-generated small debris reservoirs around white dwarfs given a particular planetary system architecture, bombardment history, and impact geometries.

Download/Website: `https://arxiv.org/abs/2003.01127`

Contact: `d.veras@warwick.ac.uk`

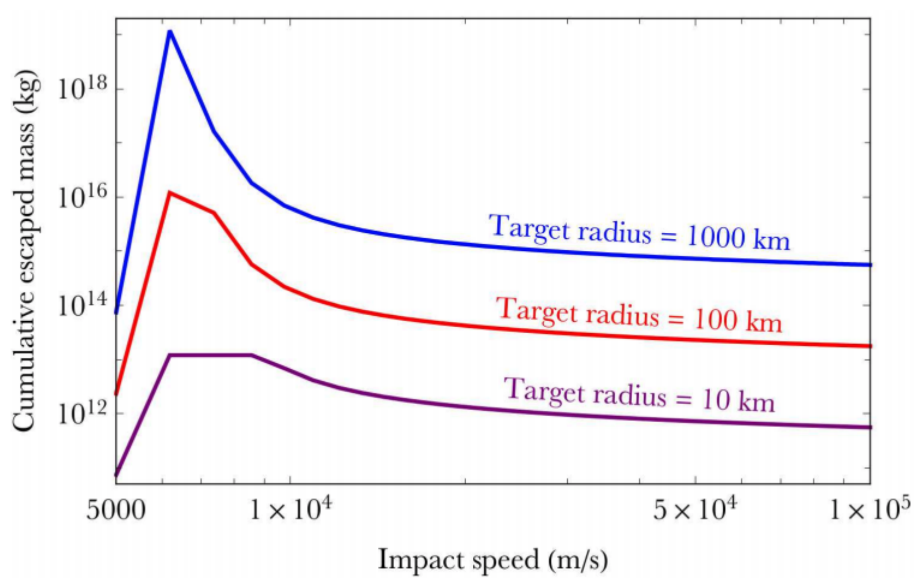

Figure 6: Amount of mass which is first excavated from an impact crater and then escapes the target body, to potentially be ingested by the white dwarf.

EDEN: Sensitivity Analysis and Transiting Planet Detection Limits for Nearby Late Red Dwarfs

A. Gibbs[1,2], A. Bixel[1,3], B. Rackham[4], D. Apai[1,3,5], M. Schlecker[6], N. Espinoza[7], L. Mancini[8,6,9,10], W.P. Chen[11], T. Henning[6], P. Gabor[12], R. Boyle[12], J.P. Chavez[1], A. Mousseau[1], J. Dietrich[1], Q.J. Socia[1], W. Ip[11], C.C Ngeow[11], A. Tsai[11], A. Bhandare[6], V. Marian[6], H. Baehr[6], S. Brown[6], M. Häberle[6], M. Keppler[6], K. Molaverdikhani[6], P. Sarkis[6]

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The Astronomical Journal, in press (arXive-2002.10017)

Small planets are common around late-M dwarfs and can be detected through highly precise photometry by the transit method. Planets orbiting nearby stars are particularly important as they are often the best-suited for future follow-up studies. We present observations of three nearby M dwarfs referred to as EIC-1, EIC-2, and EIC-3, and use them to search for transits and set limits on the presence of planets. On most nights our observations are sensitive to Earth-sized transiting planets, and photometric precision is similar to or better than *TESS* for faint late-M dwarfs of the same magnitude ($I \approx 15$ mag). We present our photometry and transit search pipeline, which utilizes simple median detrending in combination with transit-least-squares based transit detection. For these targets, and transiting planets between one and two Earth radii, we achieve an average transit detection probability of$\sim$60% between periods of 0.5 and 2 days, $\sim$30% between 2 and 5 days, and $\sim$10% between 5 and 10 days. These sensitivities are conservative compared to visual searches.

Download/Website: `https://arxiv.org/abs/2002.10017`

Contact: `agibbs@astro.ucla.edu`

3 Conferences

TOEIII - From Solar System to Exoplanets (Douro Valley, Portugal) Early Registation NEW deadline: 31st March

O. Demangeon, S. Sousa, G. Gilli, N. Santos
Instituto de Astrofísica e Ciências do Espaço (IA), Portugal

Lamego, Douro Valley, Portugal, 1-5 June 2020

Atmosphere, Interior, formation and evolution of planets and planetary systems. The Solar System Planets and Exoplanets communities aim at answering similar questions, but seldom interact due to the different datasets they have access to. Our goal is to discuss how the detailed and in situ datasets from Solar System planets can inform the often under constrained exoplanetary models. We will try to understand how the diversity and large sample offered by exoplanets can put in context and inform our understanding of Solar System planets, focusing on each of these categories:

1. Super-Earths, Mercury, Venus, Mars and Earth
2. Ice giants, Uranus and Neptune
3. Gas giants, Jupiter and Saturn
4. Planetary System architecture

Invited Speakers:		**SOC:**	
Agustin Sanchez-Lavega	Seth Jacobson	David Ehrenreich	Jonathan Fortney
Courtney Dressing	Shogo Tachibana	Victoria Meadows	Antonio Garcia Munoz
Michel Mayor	Vardan Adibekyan	Caroline Dorn	Tristan Guillot
Ravit Helled	Vincent Bourrier	Heike Rauer	Li Zeng
Robin Wordsworth	Yamila Miguel	Christophe Mordasini	Alessandro Morbidelli
Sean Raymond	David Latham	Rebecca Dawson	Gabriella Gilli
Jens Hoeijmakers	Victoria Meadows	Sérgio Sousa	Nuno Santos
Leigh Fletcher	-	Olivier Demangeon	-

Key dates:
26 Jun. 2019: 1st announcement
15 Nov. 2019: 2nd announcement
5 Feb. 2020: 3rd announcement
31 Mar. 2020: Early registration deadline
5 Apr. 2020: Deadline for abstract submission
30 Apr. 2020: Late registration deadline
1-5 June 2020: Conference week
Regarding the COVID-19 situation: As of today, there is no restriction coming from the Portuguese government.

Therefore, the organization of the conference continues as planned from the 1st to the 5th of June. However, it is difficult to predict how the situation will evolve. We are thus keeping a close eye on restrictions regarding international travels and meetings. If the conference has to be canceled, the registration fees will be 100% refunded. Consequently, we encourage you to submit abstracts and register, but we advise that you delay your bookings [travel and hotels] as much as possible.

Download/Website: http://www.iastro.pt/toe3/

Contact: toe3@iastro.pt

Manifestations of star-planet interactions

Rim Fares[1], *Antoine Strugarek*[2], *Aline Vidotto*[3]
[1] United Arab Emirates University, UAE
[2] DAp-AIM, CEA Paris-Saclay, France
[3] Trinity College Dublin, Ireland

Toulouse, France, 25 June 2020

We are glad to invite the community to our splinter session 'Manifestations of star-planet interactions', to take place during Cool Stars 21 Conference (22-26 June 2020), in Toulouse, France. We aim to bring together observers and theoreticians to discuss what we can learn from Star-Planet Interactions (SPIs), how the knowledge acquired by the solar system community can help us tackle SPIs in exosystems, and how to better disentangle SPI signals from stellar activity signals. More information about the splinter, invited speakers, and abstract submission can be found on the splinter webpage.
Deadline for Abstract Submission: 30 April 2020.

Download/Website: `https://avidotto.github.io/cs21/SPI_splinter.html`

Contact: `cs21spi@gmail.com`

4 Exoplanet Archive Updates

February Updates at the NASA Exoplanet Archive

The NASA Exoplanet Archive team
Caltech/IPAC-NASA Exoplanet Science Institute, MC 100-22 Pasadena CA 91125

Pasadena CA USA, March 20, 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 takes you to the planet's redesigned system Overview page.

February 13, 2020
We have a few exciting updates to announce this week!

10 More Planets!
We've added 10 confirmed planets: five discovered by the transit method, and five discovered using the radial velocity method. This brings our total confirmed planet count to **4,126**.

The new planets are: GJ 180 d, GJ 229 A c, GJ 433 d, GJ 3082 b, GJ 1252 b, EPIC 249893012 b, c, & d, L 168-9 b, and TOI-125 d.

New Table of Directly Imaged Planets!
We're pleased to announce a NEW Direct Imaging table (`http://bit.ly/3ayD185`)! This interactive table focuses on observational and model parameters specific to directly imaged confirmed planets. Additional parameters sets will be added over the next few months.

The columns available in this table are listed and defined in the documentation (`http://bit.ly/39rcfyi`). For more information about the detection technique and resources available in the Exoplanet Archive, see the Directly Imaged Planet Resources page (`http://bit.ly/39rTESs`).

To compare and review imaged planets against other confirmed planets, please use the Confirmed Planets, Composite Planet Data, or Planetary Systems interactive tables.

TOIs Added to the Transit and Ephemeris Service!
Our Transit and Ephemeris Service (`http://bit.ly/2DnAv6c`) has been updated to include the TESS Objects of Interest (TOIs) list, which are objects stored in the TESS Project Candidates table that includes previously known planets, TESS confirmed planets, planet candidates, and false positives. Selecting the **TESS Objects of Interest** checkbox in the service's web form will include all of these in the ephemeris calculations, drawing input parameters directly from the TESS Project Candidate table.
Fun Fact: The ExoFOP-TESS site (`http://bit.ly/2DWCKO5`) reached 50,000 uploaded files this week!

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

Contact: `mharbut@caltech.edu`

5 As seen on astro-ph

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

Feb 2020

astro-ph/2002.00231: **Water delivery to dry protoplanets by hit-and-run collisions** by *C. Burger et al.*
astro-ph/2002.00405: **Accretion disks around young stars: the cradles of planet formation** by *Dmitry A. Semenov*
astro-ph/2002.00691: **triceratops: A Tool for Rapid Validation of TESS Objects of Interest and Application to 424 Planet Candidates** by *Steven Giacalone, Courtney D. Dressing*
astro-ph/2002.00773: **Understanding and Mitigating Biases when Studying Inhomogeneous Emission Spectra with JWST** by *Jake Taylor et al.*
astro-ph/2002.00906: **The CARMENES search for exoplanets around M dwarfs. Dynamical characterization of the multiple planet system GJ 1148 and prospects of habitable exomoons around GJ 1148 b** by *T. Trifonov et al.*
astro-ph/2002.01063: **A comparison of exoplanet spectroscopic retrieval tools** by *Joanna K. Barstow et al.*
astro-ph/2002.01198: **Three-dimensional modelling of absorption by various species for hot Jupiter HD 209458b** by *I F Shaikhislamov et al.*
astro-ph/2002.01495: **A Framework for Optimizing Exoplanet Target Selection for the James Webb Space Telescope** by *Charles D. Fortenbach, Courtney D. Dressing*
astro-ph/2002.01755: **Three planets transiting the evolved star EPIC 249893012: a hot 8.8-M_e super-Earth and two warm 14.7 and 10.2-M_e sub-Neptunes** by *D. Hidalgo et al.*
astro-ph/2002.01772: **The CARMENES search for exoplanets around M dwarfs. Characterization of the nearby ultra-compact multiplanetary system YZ Ceti** by *S.Stock et al.*
astro-ph/2002.01807: **ISPY – NACO Imaging Survey for Planets around Young stars: Survey description and results from the first 2.5 years of observations** by *R. Launhardt et al.*
astro-ph/2002.01832: **Resonance libration and width at arbitrary inclination** by *Fathi Namouni, Helena Morais*
astro-ph/2002.01834: **Exo-MerCat: a merged exoplanet catalog with Virtual Observatory connection** by *Eleonora Alei et al.*
astro-ph/2002.01936: **The frequency of gaseous debris discs around white dwarfs** by *Christopher J. Manser et al.*
astro-ph/2002.02015: **On the impact of tides on the transit-timing fits to the TRAPPIST-1 system** by *Emeline Bolmont et al.*
astro-ph/2002.02166: **The Bimodal Distribution in Exoplanet Radii: Considering Varying Core Compositions and H2 Envelop Sizes** by *Darius Modirrousta-Galian, Daniele Locci, Giuseppina Micela*
astro-ph/2002.02197: **A new orbital ephemeris for WASP-128b** by *Alexis M. S. Smith et al.*
astro-ph/2002.02203: **On the vortex evolution in non-isothermal protoplanetary discs** by *D. Tarczay-Nehéz, Zs. Regály, E. Vorobyov*
astro-ph/2002.02280: **Intermittent planet migration and the formation of multiple dust rings and gaps in protoplanetary disks** by *Gaylor Wafflard-Fernandez, Clément Baruteau*
astro-ph/2002.02455: **Planetary evolution with atmospheric photoevaporation I. Analytical derivation and numerical study of the evaporation valley and transition from super-Earths to sub-Neptunes** by *Christoph Mordasini*
astro-ph/2002.02549: **The Impact of Planetary Rotation Rate on the Reflectance and Thermal Emission Spectrum of Terrestrial Exoplanets Around Sun-like Stars** by *Scott D. Guzewich et al.*
astro-ph/2002.02573: **Occurrence Rates of Planets Orbiting M Stars: Applying ABC to Kepler DR25, Gaia DR2, and 2MASS Data** by *Danley C. Hsu, Eric B. Ford, Ryan Terrien*
astro-ph/2002.02606: **The continuing search for evidence of tidal orbital decay of hot Jupiters** by *Kishore C. Patra et al.*

astro-ph/2002.02795: **Non-detection of TiO and VO in the atmosphere of WASP-121b using high-resolution spectroscopy** by *Stephanie R. Merritt et al.*

astro-ph/2002.02840: **Occurrence and Architecture of Kepler Planetary Systems as Functions of Stellar Mass and Effective Temperature** by *Jia-Yi Yang (Nanjing), Ji-Wei Xie (Nanjing), Ji-Lin Zhou (Nanjing)*

astro-ph/2002.02945: **Unveiling cloudy exoplanets: the influence of cloud model choices on retrieval solutions** by *Joanna K. Barstow*

astro-ph/2002.02977: **Atmospheric Erosion by Giant Impacts onto Terrestrial Planets** by *J. A. Kegerreis et al.*

astro-ph/2002.02983: **Rocking shadows in broken circumbinary discs** by *Rebecca Nealon, Daniel Price, Christophe Pinte*

astro-ph/2002.03204: **Evolution of porous dust grains in protoplanetary discs – I. Growing grains** by *Anthony J. L. Garcia, Jean-François Gonzalez*

astro-ph/2002.03248: **Implications of Abiotic Oxygen Buildup for Earth-like Complex Life** by *Manasvi Lingam*

astro-ph/2002.03390: **Rotational Disruption of Dust and Ice by Radiative Torques in Protoplanetary Disks and Implications for Observations** by *Ngo-Duy Tung, Thiem Hoang*

astro-ph/2002.03958: **HD 191939: Three Sub-Neptunes Transiting a Sun-like Star Only 54 pc Away** by *Mariona Badenas-Agusti et al.*

astro-ph/2002.04798: **The TRAPPIST-1 JWST Community Initiative** by *Michaël Gillon et al.*

astro-ph/2002.04984: **Chemical modelling of FU Ori protoplanetary disks** by *Tamara Molyarova et al.*

astro-ph/2002.05164: **Inner Boundary Condition in Quasi-Lagrangian Simulations of Accretion Disks** by *Adam M. Dempsey, Diego Muñoz, Yoram Lithwick*

astro-ph/2002.05243: **Irradiated ocean planets bridge super-Earth and sub-Neptune populations** by *Olivier Mousis et al.*

astro-ph/2002.05310: **One Planet or Two Planets? The Ultra-sensitive Extreme-magnification Microlensing Event KMT-2019-BLG-1953** by *Cheongho Han et al.*

astro-ph/2002.05453: **Outer Planet Single-Transit Detections with LSST** by *Derek Buzasi*

astro-ph/2002.05591: **Shallow transit follow-up from NGTS: simultaneous observations of HD106315 with 11 identical telescopes** by *Alexis M. S. Smith et al.*

astro-ph/2002.05656: **Dynamics of Planetary Systems Within Star Clusters: Aspects of the Solar System's Early Evolution** by *Konstantin Batygin et al.*

astro-ph/2002.05727: **Planetary Architectures in Interacting Stellar Environments** by *Yi-Han Wang, Rosalba Perna, Nathan W. C. Leigh*

astro-ph/2002.05756: **Planet formation: key mechanisms and global models** by *Sean N. Raymond, Alessandro Morbidelli*

astro-ph/2002.05764: **The origin of tail-like structures around protoplanetary disks** by *E. I. Vorobyov*

astro-ph/2002.05776: **HATS-47b, HATS-48Ab, HATS-49b and HATS-72b: Four Warm Giant Planets Transiting K Dwarfs** by *J. D. Hartman et al.*

astro-ph/2002.05892: **Evidence for Spin-orbit Alignment in the TRAPPIST-1 System** by *Teruyuki Hirano et al.*

astro-ph/2002.06162: **The Breakthrough Listen Search for Intelligent Life: A 3.95-8.00 GHz Search for Radio Technosignatures in the Restricted Earth Transit Zone** by *Sofia Z. Sheikh et al.*

astro-ph/2002.06321: **Cascade Model for Planetesimal Formation by Turbulent Clustering** by *Thomas Hartlep, Jeffrey N. Cuzzi*

astro-ph/2002.06373: **Stellar activity consequence on the retrieved transmission spectra through chromatic Rossiter-McLaughlin observations** by *S. Boldt et al.*

astro-ph/2002.06466: **Coupled Thermal and Compositional Evolution of Photo Evaporating Planet Envelopes** by *Isaac Malsky, Leslie A. Rogers*

astro-ph/2002.07185: **On the coexistence of the streaming instability and the vertical shear instability in protoplanetary disks** by *Urs Schäfer, Anders Johansen, Robi Banerjee*

astro-ph/2002.07188: **How efficient is the streaming instability in viscous protoplanetary disks?** by *Kan Chen (Cambridge), Min-Kai Lin (ASIAA)* astro-ph/2002.07457: **3D magneto-hydrodynamical simulations of stellar convective noise for improved exoplanet detection. I. Case of regularly sampled radial velocity observations** by *S. Sulis, D. Mary, L. Bigot*

astro-ph/2002.07850: **No Massive Companion to the Coherent Radio-Emitting M Dwarf GJ 1151** by *Benjamin J. S. Pope et al.*

astro-ph/2002.08036: **Architecture of three-planet systems predicted from the observed protoplanetary disk of HL Tau** by *Shijie Wang et al.*

astro-ph/2002.08072: **The Stellar Variability Noise Floor for Transiting Exoplanet Photometry with PLATO** by *Brett M. Morris et al.*

astro-ph/2002.08077: **The role of disc torques in forming resonant planetary systems** by *S. Ataiee, W. Kley*

astro-ph/2002.08217: **Model of a gap formed by a planet with fast inward migration** by *Kazuhiro D. Kanagawa et al.*

astro-ph/2002.08227: **Can we detect the stellar differential rotation of WASP-7 through theRossiter-McLaughlin observations?** by *Luisa Maria Serrano et al.*

astro-ph/2002.08319: **Spectral and atmospheric characterisation of a new benchmark brown dwarf HD13724B** by *E. L. Rickman et al.*

astro-ph/2002.08366: **Giant planet swaps during close stellar encounters** by *Yi-Han Wang, Rosalba Perna, Nathan W. C. Leigh*

astro-ph/2002.08372: **Linking the formation and fate of exo-Kuiper belts within solar system analogues** by *Dimitri Veras et al.*

astro-ph/2002.08379: **Detection of Na, K, and H**α absorption in the atmosphere of WASP-52b using ESPRESSO by *G. Chen et al.*

astro-ph/2002.08381: **The Dark Planets of the WASP-47 Planetary System** by *Stephen R. Kane, Tara Fetherolf, Michelle L. Hill*

astro-ph/2002.08522: **Rapid Evolution of Volatile CO from the Protostellar Disk Stage to the Protoplanetary Disk Stage** by *Ke Zhang, Kamber R. Schwarz, Edwin A. Bergin*

astro-ph/2002.08529: **Excess C/H in Protoplanetary Disk Gas from Icy Pebble Drift across the CO Snowline** by *Ke Zhang, Arthur D. Bosman, Edwin A. Bergin*

astro-ph/2002.08600: **Stabilization of dayside surface liquid water via tropopause cold trapping on arid slowly rotating tidally locked planets** by *Feng Ding, Robin D. Wordsworth*

astro-ph/2002.08727: **Coherent radio emission from a quiescent red dwarf indicative of star-planet interaction** by *H. K. Vedantham et al.*

astro-ph/2002.08776: **Observational Constraints on the Great Filter** by *Jacob Haqq-Misra, Ravi Kumar Kopparapu, Edward Schwieterman*

astro-ph/2002.09042: **Chemical Diversity of Super-Earths As a Consequence of Formation** by *Jennifer Scora et al.*

astro-ph/2002.09271: **Fly-by encounters between two planetary systems II: Exploring the interactions of diverse planetary system architectures** by *Daohai Li, Alexander J. Mustill, Melvyn B. Davies*

astro-ph/2002.09918: **Hydrogen recombination line luminosities and -variability from forming planets** by *J. Szulágyi, B. Ercolano*

astro-ph/2002.10017: **EDEN: Sensitivity Analysis and Transiting Planet Detection Limits for Nearby Late Red Dwarfs** by *Aidan Gibbs et al.*

astro-ph/2002.10368: **Distinguishing multicellular life on exoplanets by testing Earth as an exoplanet** by *Christopher E. Doughty et al.*

astro-ph/2002.10370: **Extrasolar enigmas: from disintegrating exoplanets to exoasteroids** by *Jan Budaj, Petr Kabath, Enric Palle*

astro-ph/2002.10492: **Circumbinary Planets – The Next Steps** by *David V. Martin*

astro-ph/2002.10562: **The GAPS Programme at TNG XXI – A GIARPS case-study of known young planetary candidates: confirmation of HD 285507 b and refutation of AD Leo b** by *I. Carleo et al.*

astro-ph/2002.10595: **Is there NaI in the atmosphere of HD 209458b? Effect of the centre-to-limb variation and Rossiter-McLaughlin effect in transmission spectroscopy studies** by *N. Casasayas-Barris et al.*

astro-ph/2002.10661: **Energy Optimization in Extrasolar Planetary Systems: The Transition from Peas-in-a-Pod to Runaway Growth** by *Fred C. Adams et al.*

astro-ph/2002.10823: **Spatial distribution of exoplanet candidates based on Kepler and Gaia data** by *Andrii Maliuk, Jan Budaj*

astro-ph/2002.10950: **TRAPPIST-1 Habitable Atmosphere Intercomparison (THAI). Motivations and protocol version 1.0** by *Thomas J. Fauchez et al.*

astro-ph/2002.11115: **The interior and atmosphere of the habitable-zone exoplanet K2-18b** by *Nikku Madhusudhan et al.*

astro-ph/2002.11131: **Obliquity Constraints on an Extrasolar Planetary-Mass Companion** by *Marta L. Bryan et al.*

astro-ph/2002.11135: **Fingerprints of giant planets in the composition of solar twins** by *Richard A. Booth, James E. Owen*

astro-ph/2002.11161: **Low mass planet migration in three dimensional wind-driven inviscid discs: A negative corotation torque** by *Colin P. McNally et al.*

astro-ph/2002.11422: **Can planetary rings explain the extremely low density of HIP 41378f?** by *B. Akinsanmi et al.*

astro-ph/2002.11734: **Frequency of Planets in Binaries** by *Mariangela Bonavita, Silvano Desidera*

astro-ph/2002.12006: **Planets in Binaries: Formation and Dynamical Evolution** by *Francesco Marzari, Philippe Thebault*

astro-ph/2002.12375: **TYCHO – Realistically Simulating Exoplanets within Stellar Clusters I: Improving the Monte Carlo Approach** by *Joseph P. Glaser et al.*

astro-ph/2002.12650: **Indexing Exoplanets with Physical Conditions Potentially Suitable for Rock-Dependent Extremophiles** by *Madhu Kashyap Jagadeesh et al.*

astro-ph/2002.01086: **Temporal Evolution of Spatially-Resolved Individual Star Spots on a Planet-Hosting Solar-type Star: Kepler 17** by *Kosuke Namekata et al.*

astro-ph/2002.01943: **Two intermediate-mass brown dwarfs from the TESS mission** by *Theron W. Carmichael et al.*

astro-ph/2002.01946: **Discovery of a low-mass companion embedded in the disk of the young massive star MWC 297 with VLT/SPHERE** by *M. Giulia Ubeira-Gabellini et al.*

astro-ph/2002.02254: **Magnetorotational Instability in Diamagnetic, Misaligned Protostellar Discs** by *Ebru Devlen, Ayse Ulubay, E. Rennan Pekünlü*

astro-ph/2002.02473: **A Novel Survey for Young Substellar Objects with the W-band filter II. The Coolest and Lowest Mass Members of the Serpens-South Star-forming Region** by *Jessy Jose et al.*

astro-ph/2002.03739: **ExoSim: the Exoplanet Observation Simulator** by *Subhajit Sarkar et al.*

astro-ph/2002.03901: **Radio eclipses of exoplanets by the winds of their host stars** by *R. D. Kavanagh, A. A. Vidotto*

astro-ph/2002.04651: **Chemistry Along Accretion Streams in a Viscously-Evolving Protoplanetary Disk** by *Ellen M. Price, L. Ilsedore Cleeves, Karin I. Öberg*

astro-ph/2002.04762: PRECISION**: A fast python pipeline for high-contrast imaging – application to SPHERE observations of the red supergiant VX Sagitariae** by *P. Scicluna et al.*

astro-ph/2002.05172: **Impact of magneto-rotational instability on grain growth in protoplanetary disks: I. Relevant turbulence properties** by *Munan Gong et al.*

astro-ph/2002.05275: **Lithium Enrichment Signatures of Planetary Engulfment Events in Evolved Stars** by *M. Soares-Furtado et al.*

astro-ph/2002.05543: **A mid-infrared interferometric survey of the planet-forming region around young Sun-like stars** by *J. Varga et al.*

astro-ph/2002.06844: **Stellar masks and bisector's shape for M-type stars observed in the GAPS Programme**

with HARPS-N at TNG by *Monica Rainer, Francesco Borsa, Laura Affer*

astro-ph/2002.06939: **Empirical Line Lists in the ExoMol Database** by *Yixin Wang, Jonathan Tennyson, Sergei N. Yurchenko*

astro-ph/2002.07283: **Variable Accretion onto Protoplanet Host Star PDS 70** by *Thanawuth Thanathibodee et al.*

astro-ph/2002.09058: **Probing UV-Sensitive Pathways for CN and HCN Formation in Protoplanetary Disks with the Hubble Space Telescope** by *Nicole Arulanantham et al.*

astro-ph/2002.09135: **A Relationship Between Stellar Age and Spot Coverage** by *Brett M. Morris*

astro-ph/2002.09468: **Solar Contamination in Extreme Precision Radial Velocity Measurements: Deleterious Effects and Prospects for Mitigation** by *Arpita Roy et al.*

astro-ph/2002.10195: **ALMA chemical survey of disk-outflow sources in Taurus (ALMA-DOT): I. CO, CS, CN, and H2CO around DG Tau B** by *Antonio Garufi et al.*

astro-ph/2002.10379: **The effect of internal gravity waves on cloud evolution in sub-stellar atmospheres** by *Amy Parent et al.*

astro-ph/2002.10762: **Fourth-order Coronagraph for High-Contrast Imaging of Exoplanets with Off-axis Segmented Telescopes** by *Satoshi Itoh, Taro Matsuo*

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