ExoPlanet News

An Electronic Newsletter

No. 122, August 19, 2019

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1 Editorial

Welcome to edition 122 of the ExoPlanet News!

Thanks very much to all who contributed to this edition of the exoplanet newsletter. Have a look and share with anyone who might be interested!

In addition to abstracts from recently accepted, peer-reviewed papers we also have two abstracts from white papers in this issue that were submitted to the European Space Agency in the context of the "Voyage 2050" programme to support ESA's planning of science missions in the 2035-2050 timeframe. In case some of you were involved in other exoplanet-related white papers, please feel free to submit the abstract for the next issue of the newsletter; we'd be happy to include them and inform the community about your activities and ideas!

Also, while we have a nice list of upcoming meetings and conferences announced in more detail in this newsletter, there are a few additional meetings worth mentioning. There is the Goddard/UMD SEEC Symposium "Rocky Planets in the Era of JWST: Theory and Observation", hosted at NASA Goddard from November 4 – 8. Please visit the Symposium website, https://seec.gsfc.nasa.gov/Symposium.html, for a full description of the Symposium as well as a list of Invited Overview talks and speakers. Then we have the PLATO Extra-Solar Planets 2019 (ESP2019) workshop, to be held at the University of Warwick, 2–4th of September 2019. The topic of this workshop is "Single, Shallow, and Strange transits". The aims of the workshop are to examine what we can learn about the long-period planet population from the detection and modelling of single transits, and to discuss the photometric signatures produced by other objects such as exomoons, exocomets, evaporating / fragmenting planets, or planet accretion. More information about PLATO ESP2019 can be found at https://platoesp.org/, including a link to the registration form. The closing date for registration is Monday 26th of August 2019 at 8pm UTC+1 (please note that spaces are limited). Finally, there is "Rocky Worlds: from the Solar System to Exoplanets" taking place Monday 6th – Wednesday 8th January 2020 at the Kavli Institute, Cambridge, UK. Registration for the Rocky Worlds meeting is open, please register at https://www.kicc.cam.ac.uk/events/rocky-worlds-from-the-solar-system-to-exoplanets/registration-1.

The Latex template for submitting contributions for future issues of the exoplanet newsletter, as well as all previous editions of ExoPlanet News, can be found on the ExoPlanet News webpage (http://nccr-planets.ch/exoplanetnews/). We are looking forward to your contributions!

The next issue of the ExoplanetNews will appear **Tuesday**, September 17, 2019. For logistical reasons from now on all future issues will be distributed on Tuesdays (with the deadline for contributions still on the preceding Sunday).

Thanks for all your support and best regards from Switzerland,

Sascha P. Quanz
Christoph Mordasini
Yann Alibert
Adrien Leleu

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

2 Abstracts of refereed papers & white papers

The Hubble PanCET program: An extensive search for metallic ions in the exosphere of GJ 436 b

L. A. dos Santos[1], *D. Ehrenreich*[1], *V. Bourrier*[1], *A. Lecavelier des Etangs*[2], *M. López-Morales*[3], *D. K. Sing*[4,5], *G. Ballester*[6], *L. Ben-Jaffel*[2], *L. A. Buchhave*[7], *A. García Muñoz*[8], *G. W. Henry*[9], *T. Kataria*[10], *B. Lavie*[1], *P. Lavvas*[11], *N. K. Lewis*[12], *T. Mikal-Evans*[13], *J. Sanz-Forcada*[14], *H. Wakeford*[15]

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Astronomy & Astrophysics, in press (arXiv:1907.05906)

The quiet M2.5 star GJ 436 hosts a warm Neptune that displays an extended atmosphere that dwarfs its own host star. Predictions of atmospheric escape in such planets state that H atoms escape from the upper atmosphere in a collisional regime and that the flow can drag heavier atoms to the upper atmosphere. It is unclear, however, what astrophysical mechanisms drive the process. We leveraged the extensive coverage of observations of the far-ultraviolet (FUV) spectrum of GJ 436 obtained with the Cosmic Origins Spectrograph (COS) to search for signals of metallic ions in the upper atmosphere of GJ 436 b, as well as study the activity-induced variability of the star. GJ 436 displays flaring events with a rate of $\sim$10 d^{-1} and there is evidence for a possibly long-lived active region or longitude that modulates the FUV metallic lines of the star with amplitudes up to 20%. Despite the strong geocoronal contamination in the COS spectra, we detected in-transit excess absorption signals of $\sim$50% and $\sim$30% in the blue and red wings, respectively, of the Lyman-α line. Further, we rule out a wide range of excess absorption levels in the metallic lines of the star during transit. The large atmospheric loss of GJ 436 b observed in Lyman-α transmission spectra is stable over the timescale of a few years, and the red wing signal supports the presence of a variable hydrogen absorption source besides the stable exosphere. The previously claimed in-transit absorption in the Si III line is likely an artifact resulting from the stellar magnetic cycle. The non-detection of metallic ions in absorption could indicate that the escape is not hydrodynamic or that the atmospheric mixing is not efficient in dragging metals high enough for sublimation to produce a detectable escape rate of ions to the exosphere.

Download/Website: `https://arxiv.org/abs/1907.05906`

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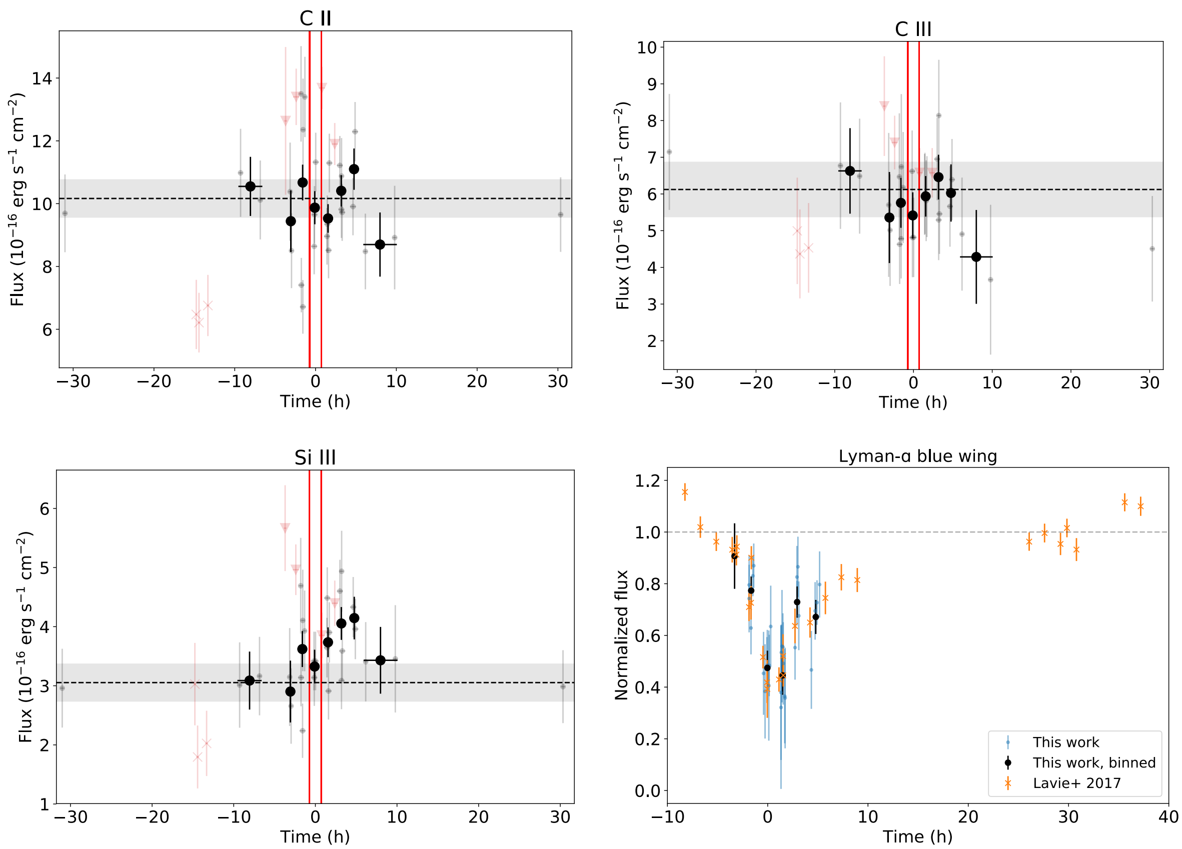

Figure 1: Light curves of FUV fluxes of GJ 436 phase-folded to the orbital period of GJ 436 b. Each panel correspond to a different species. Lyman-α fluxes were measured between Doppler velocities [-120, -40] km s^{-1}. Horizontal dashed lines correspond to the out-of-transit fluxes. Vertical red lines represent the ingress and egress of the planet.

Exploring the M-dwarf Luminosity - Temperature - Radius Relationships using Gaia DR2

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Monthly Notices of the Royal Astronomical Society, in press (arxiv:1908.03025)

There is growing evidence that M-dwarf stars suffer radius inflation when compared to theoretical models, suggesting that models are missing some key physics required to completely describe stars at effective temperatures ($T_{\rm SED}$) less than about 4000K. The advent of Gaia DR2 distances finally makes available large datasets to determine the nature and extent of this effect. We employ an all-sky sample, comprising of >15 000 stars, to determine empirical relationships between luminosity, temperature and radius. This is accomplished using only geometric distances and multiwave-band photometry, by utilising a modified spectral energy distribution fitting method. The radii we measure show an inflation of $3-7\%$ compared to models, but no more than a $1-2\%$ intrinsic spread in the inflated sequence. We show that we are currently able to determine M-dwarf radii to an accuracy of 2.4% using our method. However, we determine that this is limited by the precision of metallicity measurements, which contribute 1.7% to the measured radius scatter. We also present evidence that stellar magnetism is currently unable to explain radius inflation in M-dwarfs.
We present $T_{\rm SED} - R_*$ and $L_{\rm SED} - R_*$ relationships which can be used directly with transit measurements to determine the radii of exoplanets around M-dwarf hosts. They are presented in the supplementary material for the publication and are available in tabulated form from the University of Exeter ORE repository (`https://doi.org/10.24378/exe.1683`), the GitHub repository of supplementary material (`https://github.com/sammorrell/mn19-supplementary-material`) and soon at CDS via anonymous ftp to cdsarc.u-strasbg.fr (130.79.128.5) or via `http://cdsarc.u-strasbg.fr/viz-bin/qcat?VI/156`

Download/Website: `https://arxiv.org/abs/1908.03025`

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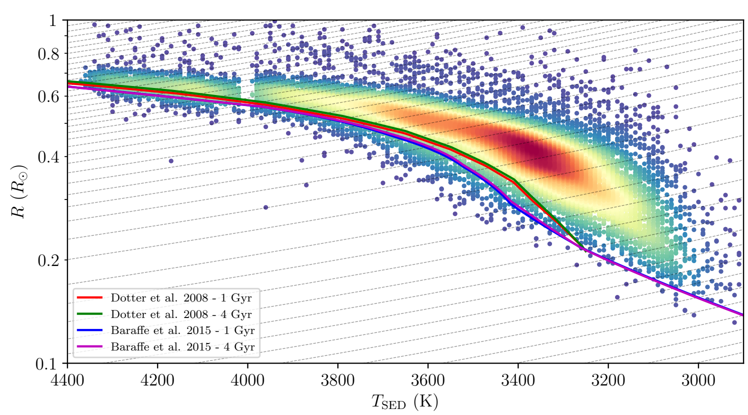

Figure 2: The observed radii as a function of temperature for our sample of $> 15\,000$ low-mass stars. For comparison we include the Dotter et al. (2008) isochrones for $z = 0.018$ at 1 and 4 Gyr and the Baraffe et al. (2015) isochrones for 1 and 4 Gyr as red, green, blue and purple lines respectively. The colour map is the result of a kernel density estimator, which represents the density of points within the plot. The dashed lines trace constant luminosity, drawn every 100K along the Baraffe et al. (2015) isochrone. This illustrates well that the $T_{\rm SED}$ and R_* we observe differs from that prescribed by both models for main sequence M-dwarfs.

Mass Loss from the Exoplanet WASP-12b Inferred from Spitzer Phase Curves

Taylor J. Bell,[1,2], *Michael Zhang,*[3] *Patricio E. Cubillos,*[4] *Lisa Dang,*[1,2] *Luca Fossati,*[4] *Kamen O. Todorov,*[5] *Nicolas B. Cowan,*[1,2,6] *Drake Deming,*[7] *Robert T. Zellem,*[8] *Kevin B. Stevenson,*[9] *Ian J. M. Crossfield,*[10] *Ian Dobbs-Dixon,*[11] *Jonathan J. Fortney,*[12] *Heather A. Knutson,*[13] *Michael R. Line*[14]

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MNRAS, published (2019MNRAS.tmp.1956B)

The exoplanet WASP-12b is the prototype for the emerging class of ultrahot, Jupiter-mass exoplanets. Past models have predicted—and near ultraviolet observations have shown—that this planet is losing mass. We present an analysis of two sets of 3.6 μm and 4.5 μm *Spitzer* phase curve observations of the system which show clear evidence of infrared radiation from gas stripped from the planet, and the gas appears to be flowing directly toward or away from the host star. This accretion signature is only seen at 4.5 μm, not at 3.6 μm, which is indicative either of CO emission at the longer wavelength or blackbody emission from cool, $<$600 K gas. It is unclear why WASP-12b is the only ultrahot Jupiter to exhibit this mass loss signature, but perhaps WASP-12b's orbit is decaying as some have claimed, while the orbits of other exoplanets may be more stable; alternatively, the high energy irradiation from WASP-12A may be stronger than the other host stars. We also find evidence for phase offset variability at the level of 6.4σ ($46.2°$) at 3.6 μm.

Download/Website: `https://arxiv.org/abs/1906.04742`

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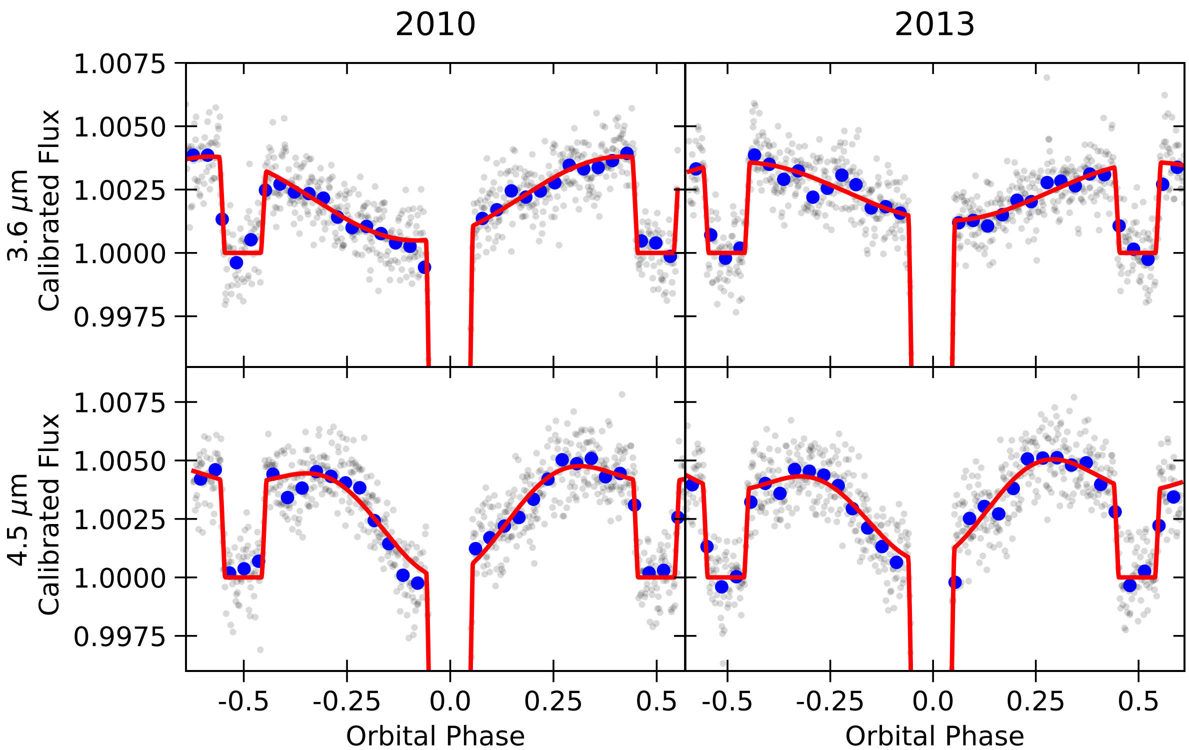

Figure 3: Fiducial analyses of 3.6 μm (top) and 4.5 μm (bottom) *Spitzer*/IRAC phase curve observations of WASP-12b taken in 2010 (left) and 2013 (right). Both 3.6 μm phase curves show one maximum per planetary orbit, while both 4.5 μm phase curves exhibit two maxima per planetary orbit. The detector systematics have been removed from the data, and our fiducial astrophysical models for each data set are overplotted in red. Grey data points show binned values from each *Spitzer* data cube (64 frames), and the blue points show more coarsely binned values (1664 frames).

Transit timing variations in the WASP-4 planetary system

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1907.08269)

Transits in the planetary system WASP-4 were recently found to occur 80 s earlier than expected in observations from the TESS satellite. We present 22 new times of mid-transit that confirm the existence of transit timing variations, and are well fitted by a quadratic ephemeris with period decay $(-1.95 \pm 0.23) \times 10^{-10}$ d per orbital period. We rule out instrumental issues, stellar activity and the Applegate mechanism as possible causes. The light-time effect is also not favoured due to the non-detection of changes in the systemic velocity. Orbital decay and apsidal precession are plausible but unproven. WASP-4 b is only the third hot Jupiter known to show transit timing variations to high confidence. We discuss a variety of observations of this and other planetary systems that would be useful in improving our understanding of WASP-4 in particular and orbital decay in general.

Download/Website: `https://arxiv.org/abs/1907.08269`

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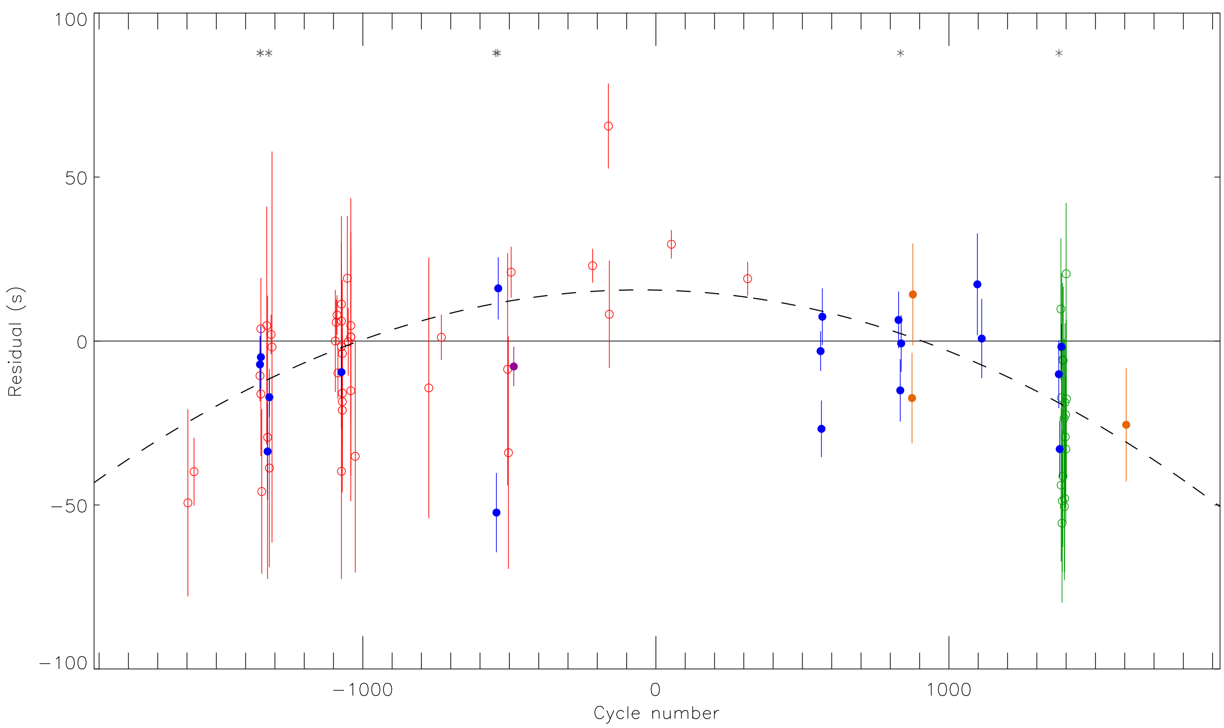

Figure 4: Plot of the residuals of the timings of mid-transit versus a linear ephemeris. The results from this work are shown with filled circles: blue for the Danish telescope, orange for the SAAO 1.0m, and purple for the NTT. Published results are shown using open circles: red for the literature data collected by B19 and green for the TESS timings from B19. The dotted line shows the difference between the best-fitting linear and quadratic ephemerides. Grey asterisks have been placed near the top of the figure to indicate transit times measured from a light curve with a spot crossing event.

Effect of nucleation on icy pebble growth in protoplanetary discs

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Astronomy & Astrophysics, in press (arXiv:1907.08471)

Solid particles in protoplanetary discs can grow by direct vapour deposition outside of ice lines. The presence of microscopic silicate particles may nevertheless hinder growth into large pebbles, since the available vapour is deposited predominantly on the small grains that dominate the total surface area. Experiments on heterogeneous ice nucleation, performed to understand ice clouds in the Martian atmosphere, show that the formation of a new ice layer on a silicate surface requires a substantially higher water vapour pressure than the deposition of water vapour on an existing ice surface. In this paper, we investigate how the difference in partial vapour pressure needed for deposition of vapour on water ice versus heterogeneous ice nucleation on silicate grains influences particle growth close to the water ice line. We developed and tested a dynamical 1D deposition and sublimation model, where we include radial drift, sedimentation, and diffusion in a turbulent protoplanetary disc. We find that vapour is deposited predominantly on already ice-covered particles, since the vapour pressure exterior of the ice line is too low for heterogeneous nucleation on bare silicate grains. Icy particles can thus grow to centimetre-sized pebbles in a narrow region around the ice line, whereas silicate particles stay dust-sized and diffuse out over the disc. The inhibition of heterogeneous ice nucleation results in a preferential region for growth into planetesimals close to the ice line where we find large icy pebbles. The suppression of heterogeneous ice nucleation on silicate grains may also be the mechanism behind some of the observed dark rings around ice lines in protoplanetary discs, as the presence of large ice pebbles outside ice lines leads to a decrease in the opacity there.

Download/Website: `https://arxiv.org/abs/1907.08471`

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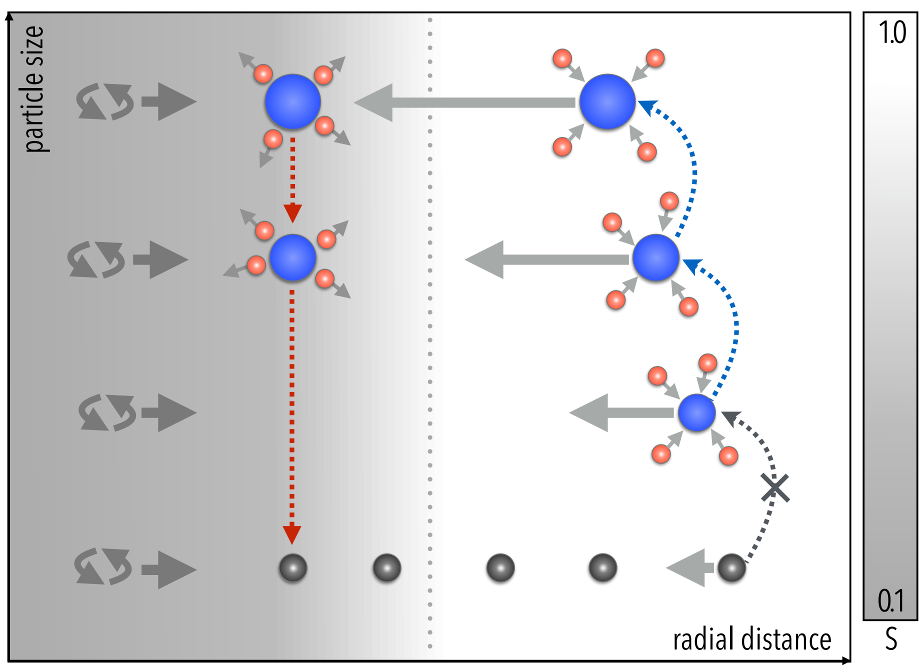

Figure 5: Sketch of the physical processes included in our model. Ice-covered particles (blue) grow by the deposition of vapour (red) in a region where the saturation ratio is unity. Ice particles crossing into a region where the saturation ratio is lower than unity sublimate and, if they stay in this region long enough, eventually leave behind their silicate cores (grey) in addition to the sublimated vapour. Bare dust grains cannot acquire a new ice mantle since the saturation ratio does not reach the critical saturation ratio required for heterogenous nucleation. Dynamical processes are represented by grey arrows, with the left-directed arrows representing the size-dependent radial drift, and the arrows pointing to the right representing the outwards-directed part of the turbulent diffusion. Collisions are not included in this model.

The gravitational-wave detection of exoplanets orbiting white dwarf binaries using LISA

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Nature Astronomy, published (2019NatAs.tmp..381T)

So far, around 4,000 exoplanets have been discovered orbiting a large variety of stars. Owing to the sensitivity limits of the currently used detection techniques, these planets populate zones restricted either to the solar neighbourhood or towards the galactic bulge. This selection problem prevents us from unveiling the true galactic planetary population and is not set to change for the next two decades. Here, we present a detection method that overcomes this issue and that will allow us to detect massive exoplanets using gravitational-wave astronomy. We show that the Laser Interferometer Space Antenna (LISA) mission can characterize new circumbinary exoplanets orbiting white dwarf binaries everywhere in our Galaxy – a population of exoplanets so far completely unprobed – as well as detecting extragalactic bound exoplanets in the Magellanic Clouds. Such a method is not limited by stellar activity and, in extremely favourable cases, will allow LISA to detect planets down to 50 Earth masses.

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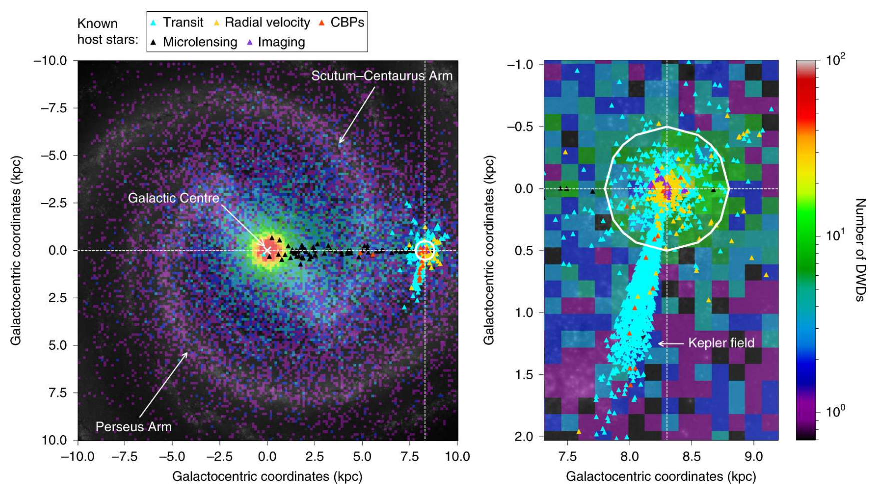

Figure 6: Location of known planets and expected LISA DWDs. Left: The plot represents both known stars hosting planetary companion(s) (triangles, retrieved from https://exoplanetarchive.ipac.caltech.edu) and the number of DWD detections expected with LISA (colour bar on the right). Right: Zoom-in on the Solar region. The top legend shows the exoplanet detection method used for the discovery and its colour code. Note that the white dwarf binary population is built assuming spherical symmetry, and that data overlay a face-on black-and-white image of the Milky Way for galactic location reference purposes. We also highlight the known CBPs (P-type, red triangles) and the horizon (500 pc, white circle) for exoplanet detection of the Gaia nominal mission (5 years). Dashed lines represent the galactocentric coordinates of the Sun. Credit for the background image of the Milky Way in both panels: NASA / JPL-Caltech / R. Hurt (SSC/Caltech).

ESA Voyage 2050 White Paper: Detecting life outside our solar system with a large high-contrast-imaging mission

Ignas Snellen, Simon Albrecht, Guillem Anglada-Escude, Isabelle Baraffe, Pierre Baudoz, Willy Benz, Jean-Luc Beuzit, Beth Biller, Jayne Birkby, Anthony Boccaletti, Roy van Boekel, Jos de Boer, Matteo Brogi, Lars Buchhave, Ludmila Carone, Mark Claire, Riccardo Claudi, Brice-Olivier Demory, Jean-Michel Desert, Silvano Desidera, Scott Gaudi, Raffaele Gratton, Michael Gillon, John Lee Grenfell, Olivier Guyon, Thomas Henning, Sasha Hinkley, Elsa Huby, Markus Janson, Christiane Helling, Kevin Heng, Markus Kasper, Christoph Keller, Matthew Kenworthy, Oliver Krause, Laura Kreidberg, Nikku Madhusudhan, Anne-Marie Lagrange, Ralf Launhardt, Tim Lenton, Manuel Lopez-Puertas, Anne-Lise Maire, Nathan Mayne, Victoria Meadows, Bertrand Mennesson, Giuseppina Micela, Yamila Miguel, Julien Milli, Michiel Min, Ernst de Mooij, David Mouillet, Mamadou N'Diaye, Valentina D'Orazi, Enric Palle, Isabella Pagano, Giampaolo Piotto, Didier Queloz, Heike Rauer, Ignasi Ribas, Garreth Ruane, Franck Selsis, Frans Snik, Alessandro Sozzetti, Daphne Stam, Christopher Stark, Arthur Vigan, Pieter de Visser

White paper, ESA Voyage 2050

In this white paper, we recommend the European Space Agency plays a proactive role in developing a global collaborative effort to construct a large high-contrast imaging space telescope, e.g. as currently under study by NASA. Such a mission will be needed to characterize a sizable sample of temperate Earth-like planets in the habitable zones of nearby Sun-like stars and to search for extraterrestrial biological activity. We provide an overview of relevant European expertise, and advocate ESA to start a technology development program towards detecting life outside the Solar system.

Download/Website: https://arxiv.org/abs/1908.01803

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ESA Voyage 2050 White Paper: Atmospheric characterization of terrestrial exoplanets in the mid-infrared: biosignatures, habitability & diversity

Quanz, Sascha P.; Absil, Olivier; Angerhausen, Daniel; Benz, Willy; Bonfils, Xavier; Berger, Jean-Philippe; Brogi, Matteo; Cabrera, Juan; Danchi, William C.; Defrere, Denis; van Dishoeck, Ewine; Ehrenreich, David; Ertel, Steve; Fortney, Jonathan; Gaudi, Scott; Girard, Julien; Glauser, Adrian; Grenfell, John Lee; Ireland, Michael; Janson, Markus Kammerer, Jens; Kitzmann, Daniel; Kraus, Stefan; Krause, Oliver; Labadie, Lucas; Lacour, Sylvestre; Lichtenberg, Tim; Line, Michael; Linz, Hendrik; Loicq, Jerome; Mennesson, Bertrand; Meyer, Michael R.; Miguel, Yamila; Monnier, John; N'Diaye, Mamadou; Palle, Enric; Queloz, Didier; Rauer, Heike; Ribas, Ignasi; Rugheimer, Sarah; Selsis, Franck; Serabyn, Gene; Snellen, Ignas; Sozzetti, Alessandro; Stapelfeldt, Karl R.; Triaud, Amaury; Udry, Stephane; Wyatt, Mark

White paper, ESA Voyage 2050

Exoplanet science is one of the most thriving fields of modern astrophysics. A major goal is the atmospheric characterization of dozens of small, terrestrial exoplanets in order to search for signatures in their atmospheres that indicate biological activity, assess their ability to provide conditions for life as we know it, and investigate their expected atmospheric diversity. None of the currently adopted projects or missions, from ground or in space, can address these goals. In this White Paper we argue that a large space-based mission designed to detect and investigate thermal emission spectra of terrestrial exoplanets in the MIR wavelength range provides unique scientific potential to address these goals and surpasses the capabilities of other approaches. While NASA might be focusing on large missions that aim to detect terrestrial planets in reflected light, ESA has the opportunity to take leadership and spearhead the development of a large MIR exoplanet mission within the scope of the "Voyage 2050" long-term plan establishing Europe at the forefront of exoplanet science for decades to come. Given the ambitious science goals of such a mission, additional international partners might be interested in participating and contributing to a roadmap

that, in the long run, leads to a successful implementation. A new, dedicated development program funded by ESA to help reduce development and implementation cost and further push some of the required key technologies would be a first important step in this direction. Ultimately, a large MIR exoplanet imaging mission will be needed to help answer one of mankind's most fundamental questions: "How unique is our Earth?"

Download/Website: https://arxiv.org/pdf/1908.01316

Contact: sascha.quanz@phys.ethz.ch

3 Jobs and Positions

51 Pegasi b Fellowship

Michael R. Meyer (on behalf of the 51 Pegasi b Fellowship Search Committee at the University of Michigan

Ann Arbor, Michigan, U.S.A., Late Summer 2020 (flexible)

Now is a great time to study exoplanets at the University of Michigan! We are pleased to announce that the University of Michigan is an approved Host Institution for the 51 Pegasi b Fellowship Program, sponsored by the Heising-Simons Foundation. Applications are due September 20, 2019. More information can be found at: $https://www.hsfoundation.org/programs/science/51-pegasi-b-fellowship/$.

The University of Michigan is home to several research groups focused on planet formation, exoplanet science, and solar system exploration, utilizing theoretical, numerical, and observational methods, including the development of novel instrumentation. Potential faculty hosts include Fred Adams, Ted Bergin, Nuria Calvet, Lia Corrales, Elena Gallo, Lee Hartmann, Michael Meyer, John Monnier, Emily Rauscher, as well as others. We also anticipate that additional post-doctoral research positions in the areas of planet formation and exoplanets will be advertised this fall. The University of Michigan hosts a vibrant astrophysics research community within the Departments of Astronomy and Physics, as well as significant expertise in planetary sciences within the Earth & Environmental Sciences and Climate & Space Sciences Departments. We have a particular strength in the interrelated study of stars, planets, and their formation. Postdoctoral researchers in our department can apply as PI to any of our telescope facility partnerships, currently including the Magellan Telescopes in Chile, the MDM Observatory in Arizona, the CHARA Interferometer, the SWIFT space telescope, and the NOEMA mm array. Significant computing resources are available through the Department and through the University of Michigan. The Michigan Institute for Research in Astrophysics funds cross-disciplinary efforts, including a series of intellectually stimulating conferences, and conversations on inclusion and equity, while the Michigan Institute for Data Science advances cross-cutting data science methodology and applications relevant to solving fundamental research problems in planetary science.

The University of Michigan is recognized as a top academic employer and Ann Arbor, Michigan is routinely celebrated for its high quality of life. We are a department that values diversity, equity, and inclusion as essential to scientific excellence and encourage applications from those with identities underrepresented in astronomy.

Please share this information with potentially interested persons, and do not hesitate to contact individual members of the scientific staff to learn more about research opportunities in planetary science.

Download/Website: `https://lsa.umich.edu/astro`

Contact: `mrmeyer@umich.edu`

Faculty and Postdoctoral Positions in School of Earth and Planetary Sciences (SEPS), National Institute of Science Education and Research (NISER), Bhubaneswar, India

NISER is one of India's premier research-driven academic institutes. SEPS/NISER is a unique center in India that has been established to emerge and excel in high quality and interdisciplinary scientific research works in Planetary Sciences, Earth Sciences, and Atmospheric-Ocean Sciences. NISER provides start-up grant and academic freedom for promising candidates.

SEPS seeks faculty applications from highly motivated and promising candidates for faculty positions at various level. Interested candidates should send their application to **fa@niser.ac.in**

Current faculty members in SEPS are involved actively in Indian and large international collaborative projects and astronomy/planetary/exoplanetary missions, e.g., SKA, TMT, ALMA, NASA's JWST, SOFIA and Dawn. Interdisciplinary works on astrochemistry & astrobiology, star & planet formation, radio/sub-mm/infrared astronomy, exoplanets, planetary minerology & morphology, small bodies & meteorites, planetary remote sensing, land-atmosphere coupling, boundary layer dynamics, current challenges in climate change, etc., have been initiated already.

Applications and positions are subject to rolling basis as per NISER/DAE norms:

https://www.niser.ac.in/notices/2017/recruitments/Faculty-Rolling-Advertisement-2017.pdf

NISER/SEPS also highly welcome candidates who are interested in prestigious independent faculty/fellowship program, for example, Ramanujan Fellowship, DST INSPIRE Faculty, SERB-NPDF etc.

Download/Website: `https://www.niser.ac.in/seps/`
Contact: `cpseps@niser.ac.in`

Call for Applications for the 2020 NASA Hubble Fellowship Program

Dr. Andrew Fruchter[1]*, Dr. Dawn M. Gelino*[2]*,Dr. Paul Green*[3]
[1] Space Telescope Science Institute
[2] NASA Exoplanet Science Institute
[3] Smithsonian Astrophysical Observatory

Applications Due: November 4, 2019 at 7:00 PM EST (4:00 PM PST 24:00 UTC),

On behalf of the NASA Astrophysics Division, the Space Telescope Science Institute (STScI) announces the annual call for applications for postdoctoral fellowships under the NASA Hubble Fellowship Program (NHFP), to begin in the Fall of 2020.

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

The NHFP is open to applicants of any nationality who have earned (or will have earned) their doctoral degree on or after January 1, 2017 in astronomy, physics, or related disciplines. The duration of the Fellowship is up to three years: an initial one-year appointment, and two annual renewals contingent on satisfactory performance and availability of NASA funds.

Eligibility may extend to those who received their PhD as early as January 1, 2016, if professional work was necessarily delayed by personal or family considerations. Such extended eligibility must be justified in an email to nhfp@stsci.edu at least 2 weeks in advance of the application deadline.

We anticipate offering up to 24 NHFP Fellowships this year. The Fellowships are tenable at a U.S. host institution of the fellow's choice, subject to a maximum of two new fellows per host institution per year, and no more than 5 granted to a single host institution in any 3 year period.

The Announcement of Opportunity, which includes detailed program policies and application instructions, will be available September 3 at: http://nhfp.stsci.edu. Applicants should follow the instructions in the Announcement and also read the Frequently Asked Questions page. Please send further inquiries to nhfp@stsci.edu.

NHFP Fellowships are open to English-speaking citizens of all nations. All applicants will receive consideration without regard to race, creed, color, age, gender, gender identity or expression, sexual orientation or national origin. Women and members of minority groups are strongly encouraged to apply.

Key Dates

- November 4, 2019, 7:00 PM EST (4:00 PM PST 24:00 UTC): Applications due
- November 8, 2019: Letters of reference due
- By early February 2020: Award offers made; new appointments to begin on or about Sept. 1, 2020

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

4 Conferences & Workshops

NAOJ Science Workshop II: Planet Formation Workshop 2019

Akimasa Kataoka (Chair), Takahiro Ueda (Co-Chair), Hideko Nomura, Shinsuke Takasao, Takashi Tsukagoshi, Misako Tatsuuma
National Astronomical Observatory of Japan, Mitaka, Tokyo, Japan

NAOJ, Mitaka, Tokyo, Japan, November 25th-28th, 2019

In the last few years, our field has been dramatically developing especially achieved by ALMA and other fascinating telescopes. This workshop aims at sharing and discussing the latest understandings of planet formation and protoplanetary disks as well as numerical and theoretical developments in this field. We especially expect active participation from the East Asia for learning this excitingly developing field and finding a new network in geographically close collaborators, while participation from any countries and regions are welcome. In addition, we encourage early-stage researchers such as master and Ph.D. students and postdocs to join this workshop.

INVITED SPEAKERS:
Chris Ormel (University of Amsterdam → Tsinghua Univ., China)
Gregory J. Herczeg (KIAA, China)
Kenji Furuya (Tsukuba Univ., Japan)
Min-Kai Lin (ASIAA, Taiwan)
Satoshi Okuzumi (Tokyo Tech., Japan)
Woojin Kwon (KASI, Korea)
Xue-Ning Bai (Tsinghua Univ., China)
Ya-Wen Tang (ASIAA, Taiwan)

TOPICS:
Formation of protoplanetary disks
Evolution of protoplanetary disks
Disk observations
Evolution of solids in disks
Formation of planetary system
Debris disks

IMPORTANT DATES:
Registration open: currently open
Abstract submission deadline: September 1st, 2019
Announcement of program: mid of September, 2019
Registration deadline: October 25th, 2019
Workshop dates: November 25th-28th, 2019

Download/Website: `http://th.nao.ac.jp/meeting/planet-formation-workshop2019/`

Contact: `planet-formation-workshop2019@th.nao.ac.jp`

1st announcement: TOEIII - From Solar System to Exoplanets (Douro Valley, Portugal)

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. We aim 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 uncover 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

Scientific Organization Commitee: David Ehrenreich, Jonathan Fortney, Victoria Meadows, Antonio Garcia Munoz, Caroline Dorn, Tristan Guillot. Heike Rauer, Li Zeng, Christophe Mordasini, Alessandro Morbidelli, Rebecca Dawson, Gabriella Gilli, Sergio Sousa, Nuno Santos, Olivier Demangeon.

Download/Website: `http://www.iastro.pt/toe3/`
Contact: `toe3@iastro.pt`

8th Joint Workshop on High Pressure, Planetary, and Plasma Physics

Dominik Kraus, Ronald Redmer, Gerd Steinle-Neumann and Frank Sohl

We are pleased to announce the 8th Joint Workshop on High Pressure Planetary and Plasma Physics (HP4) in Dresden, October 9-11, 2019 (noon-noon).

As in previous years, we plan to bring together scientists from different fields that contribute to the understanding of the interior of planets of all types, brown dwarfs and stars. We aim at an informal exchange of ideas across traditional disciplinary boundaries. Some of the topics covered are:

- Evolution, structure and dynamics of gas and solid planet interiors
- Physics and chemistry of impact processes
- Equations of state, petrology, and geochemistry of planetary materials
- Melting relations and phase transformations of materials at extreme states
- Compression experiments using high-power optical and free electron lasers
- Static compression using diamond anvil cells and multi-anvil presses
- Ab-initio simulation studies for matter under extreme conditions

We have put together an interesting list of invited speaker that you can find, along with other information, on the website of the workshop at https://indico.desy.de/indico/event/22763/overview

The abstract submission deadline is September 15, registration is open until October 01. The workshop is free of registration charge.

Download/Website: `https://indico.desy.de/indico/event/22763/overview`

5 Exoplanet Archive Updates

July 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, August 19, 2019

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`).

July 25, 2019

We have nine new planets this week, featuring HR 858 b, c, & d, a compact three-planet system of super-Earths confirmed with TESS photometry, and a new FIFTH planet in the Kepler-82 system, with four previously known planets. There are also three new K2 planets, another new TESS planet, a new microlensing planet, and new sets of planet parameters.

The new planets are: HR 858 b, c, & d, Kepler-82 f, K2-310 b & c, K2-311 b, WASP-166 b, and KMT-2017-BLG-0165L b.

July 11, 2019

This week we have added seven new planets: DS Tuc A b, DE CVn b, HIP 79098 AB b, Kepler-411 d & e, OGLE-2015-BLG-1670L b and OGLE-2018-BLG-0596L b.

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

6 As seen on astro-ph

The following list contains all the entries relating to exoplanets that we spotted on astro-ph during July 2019.

July 2019

astro-ph/1907.00189: **Unveiling Dust Aggregate Structure in Protoplanetary Disks by Millimeter-wave Scattering Polarization** by *Ryo Tazaki et al.*

astro-ph/1907.00449: **A Sub-Neptune Exoplanet with a Low-Metallicity Methane-Depleted Atmosphere and Mie-Scattering Clouds** by *Björn Benneke et al.*

astro-ph/1907.00571: **New constraints on the dust and gas distribution in the LkCa 15 disk from ALMA** by *Sheng Jin et al.*

astro-ph/1907.00827: **Runaway climate cooling of ocean planets in the habitable zone: a consequence of seafloor weathering enhanced by melting of high-pressure ice** by *Akifumi Nakayama et al.*

astro-ph/1907.00915: **Pairwise Tidal Equilibrium States and the Architecture of Extrasolar Planetary Systems** by *Fred C. Adams*

astro-ph/1907.01020: **Chasing star-planet magnetic interactions: the case of Kepler-78** by *A. Strugarek et al.*

astro-ph/1907.01026: **Synergies between space telescopes in the photometric characterization of the atmospheres of Hot Jupiters** by *Vikash Singh, G. Scandariato, I. Pagano*

astro-ph/1907.01290: **The Concentration and Growth of Solids in Fragmenting Circumstellar Disks** by *Hans Baehr, Hubert Klahr*

astro-ph/1907.01741: **OGLE-2018-BLG-1011Lb,c: Microlensing Planetary System with Two Giant Planets Orbiting a Low-mass Star** by *Cheongho Han et al.*

astro-ph/1907.01822: **How well do we understand the belt/zone circulation of Giant Planet atmospheres?** by *Leigh N. Fletcher et al.*

astro-ph/1907.01910: **The Natural History of 'Oumuamua** by *The 'Oumuamua ISSI Team*

astro-ph/1907.01951: **Envelopes of embedded super-Earths I. Two-dimensional simulations** by *William Béthune, Roman R. Rafikov*

astro-ph/1907.02048: **Bias and robustness of eccentricity estimates from radial velocity data** by *N. C. Hara et al.*

astro-ph/1907.02074: **On the patterns observed in Kepler multi-planet systems** by *Wei Zhu*

astro-ph/1907.02476: **Planetesimals Around Stars with TESS (PAST): I. Transient Dimming of a Binary Solar Analog at the End of the Planet Accretion Era** by *E. Gaidos et al.*

astro-ph/1907.02615: **Small Solar System Bodies as granular media** by *D. Hestroffer et al.*

astro-ph/1907.02627: **Final Masses of Giant Planets III: Effect of Photoevaporation and a New Planetary Migration Model** by *Hidekazu Tanaka, Kiyoka Murase, Takayuki Tanigawa*

astro-ph/1907.02763: **Envelopes of embedded super-Earths II. Three-dimensional isothermal simulations** by *William Béthune, Roman R. Rafikov*

astro-ph/1907.02978: **Planetary Magnetic Field Control of Ion Escape from Weakly Magnetized Planets** by *Hilary Egan et al.*

astro-ph/1907.03377: **Evidence for 3 new multi-planet systems from TESS using a Bayesian N-body retrieval and machine learning** by *Kyle A. Pearson*

astro-ph/1907.03732: **Signatures of the Core-Powered Mass-Loss Mechanism in the Exoplanet Population: Dependence on Stellar Properties and Observational Predictions** by *Akash Gupta, Hilke E. Schlichting*

astro-ph/1907.03760: **External photoevaporation of circumstellar disks constrains the timescale for planet formation** by *Francisca Concha-Ramírez et al.*

astro-ph/1907.03846: **Observational constraints on dust disk sizes in tidally truncated protoplanetary disks in multiple systems in the Taurus region** by *C.F. Manara et al.*

astro-ph/1907.04334: **Combining high contrast imaging and radial velocities to constrain the planetary architecture of nearby stars** by *A. Boehle et al.*

astro-ph/1907.04368: **Spinning up planetary bodies by pebble accretion** by *R.G. Visser et al.*
astro-ph/1907.04445: **Diffuser-Assisted Infrared Transit Photometry for Four Dynamically Interacting *Kepler* Systems** by *Shreyas Vissapragada et al.*
astro-ph/1907.04556: **Radiative-equilibrium model of Jupiter's atmosphere and application to estimating stratospheric circulations** by *Sandrine Guerlet et al.*
astro-ph/1907.04602: **Prevalent externally-driven protoplanetary disc dispersal as a function of the galactic environment** by *Andrew J. Winter et al.*
astro-ph/1907.04621: **Formation of rocky and icy planetesimals inside and outside the snow line: Effects of diffusion, sublimation and back-reaction** by *Ryuki Hyodo, Shigeru Ida, Sébastien Charnoz*
astro-ph/1907.04800: **A statistically significant lack of debris discs in medium separation binary systems** by *Ben Yelverton et al.*
astro-ph/1907.04933: **Hydrodynamical interaction of stellar and planetary winds: effects of charge exchange and radiation pressure on the observed Lyα absorption** by *A. Esquivel et al.*
astro-ph/1907.05088: **Detecting volcanically produced tori along orbits of exoplanets using UV spectroscopy** by *Kristina G. Kislyakova et al.*
astro-ph/1907.05245: **Expanding the Timeline for Earth's Photosynthetic Red Edge Biosignature** by *Jack T. O'Malley-James, Lisa Kaltenegger*
astro-ph/1907.05427: **Searching the Moon for Extrasolar Material and the Building Blocks of Extraterrestrial Life** by *Manasvi Lingam, Abraham Loeb*
astro-ph/1907.05437: **Circumbinary disk inner radius as a diagnostic for disk–binary misalignment** by *Alessia Franchini, Stephen H. Lubow, Rebecca G. Martin*
astro-ph/1907.05495: **Do the planets in the HD 34445 system really exist?** by *Nikolaos Georgakarakos, Ian Dobbs-Dixon*
astro-ph/1907.05506: **The Composition and Mineralogy of Rocky Exoplanets: A Survey of ¿4,000 Stars from the Hypatia Catalog** by *Keith D. Putirka, John C. Rarick*
astro-ph/1907.05536: **Dynamics of multiple bodies in a corotation resonance: Conserved quantities and relevance to ring arcs** by *Joseph A. A'Hearn, Matthew M. Hedman, Maryame El Moutamid*
astro-ph/1907.05710: **Simulating Radial Velocity Observations of Trappist-1 with SPIRou** by *Baptiste Klein, Jean-François Donati*
astro-ph/1907.05906: **The Hubble PanCET program: an extensive search for metallic ions in the exosphere of GJ 436 b** by *L. A. dos Santos et al.*
astro-ph/1907.06127: **Formation and delivery of complex organic molecules to the Solar System and early Earth** by *Sun Kwok*
astro-ph/1907.06362: **Quasi-static contraction during runaway gas accretion onto giant planets** by *Michiel Lambrechts et al.*
astro-ph/1907.06427: **A multi-wavelength study of the debris disc around 49 Cet** by *Nicole Pawellek et al.*
astro-ph/1907.06451: **Final spin states of eccentric ocean planets** by *Pierre Auclair-Desrotour et al.*
astro-ph/1907.06501: **Zinc isotope analyses of singularly small samples (¡5 ng Zn): investigating chondrule-matrix complementarity in Leoville** by *Elishevah van Kooten, Frederic Moynier*
astro-ph/1907.06534: **Kepler Object of Interest Network III. Kepler-82f: A new non-transiting 21$M_\oplus$ planet from photodynamical modelling** by *J. Freudenthal et al.*
astro-ph/1907.06660: **Nekhoroshev Estimates for the Survival Time of Tightly Packed Planetary Systems** by *Almog Yalinewich, Cristobal Petrovich*
astro-ph/1907.06662: **A Substellar Companion to a Hot Star in K2's Campaign 0 Field** by *S. Dholakia et al.*
astro-ph/1907.06908: **Stable attitude dynamics of planar helio-stable and drag-stable sails** by *Narcís Miguel, Camilla Colombo*
astro-ph/1907.06977: **Astro2020 APC White Paper: Durable Agency Support for Exoplanet Catalogs and Archives** by *Joshua Pepper et al.*
astro-ph/1907.07130: **Effect of the Solar dark matter wake on planets** by *Indranil Banik, Pavel Kroupa*

astro-ph/1907.07267: **High-resolution transmission spectroscopy of four hot inflated gas giant exoplanets** by *Jiri Zak et al.*

astro-ph/1907.07459: **Role of planetary obliquity in regulating atmospheric escape: G-dwarf vs. M-dwarf Earth-like exoplanets** by *Chuanfei Dong, Zhenguang Huang, Manasvi Lingam*

astro-ph/1907.07584: **Constraining the initial planetary population in the gravitational instability model** by *Jack Humphries et al.*

astro-ph/1907.07773: **Architectures of Exoplanetary Systems. I: A Clustered Forward Model for Exoplanetary Systems around Kepler's FGK Stars** by *Matthias Y. He, Eric B. Ford, Darin Ragozzine*

astro-ph/1907.07777: **The Intrinsic Temperature and Radiative-Convective Boundary Depth in the Atmospheres of Hot Jupiters** by *Daniel P. Thorngren, Peter Gao, Jonathan J. Fortney*

astro-ph/1907.08060: **First detections of H13CO+ and HC15N in the disk around HD 97048: Evidence for a cold gas reservoir in the outer disk** by *Alice S. Booth et al.*

astro-ph/1907.08148: **The multiplicity distribution of Kepler's exoplanets** by *Emily Sandford, David Kipping, Michael Collins*

astro-ph/1907.08180: **Parametric study of polar configurations around binaries** by *Cristian Giuppone, Nicolás Cuello*

astro-ph/1907.08244: **Four Small Planets Buried in K2 Systems: What Can We Learn for TESS?** by *Christina Hedges et al.*

astro-ph/1907.08269: **Transit timing variations in the WASP-4 planetary system** by *John Southworth et al.*

astro-ph/1907.08471: **The effect of nucleation on icy pebble growth in protoplanetary discs** by *Katrin Ros et al.*

astro-ph/1907.09011: **Entrapment of CO in CO2 ice** by *Alexia Simon et al.*

astro-ph/1907.09068: **Magnetic field strengths of hot Jupiters from signals of star-planet interactions** by *P. Wilson Cauley et al.*

astro-ph/1907.09313: **Multiplanet systems in inviscid discs can avoid forming resonant chains** by *Colin P. McNally, Richard P. Nelson, Sijme-Jan Paardekooper*

astro-ph/1907.09480: **EXOFASTv2: A public, generalized, publication-quality exoplanet modeling code** by *Jason D. Eastman et al.*

astro-ph/1907.09541: **Dynamics of Dusty Vortices I: Extensions and limitations of the terminal velocity approximation** by *Francesco Lovascio, Sijme-Jan Paardekooper*

astro-ph/1907.09626: **On the nature of the resonant drag instability of dust streaming in protoplanetary disc** by *V.V. Zhuravlev*

astro-ph/1907.09776: **Multicolour photometry for exoplanet candidate validation** by *Hannu Parviainen et al.*

astro-ph/1907.09793: **Orbital Evolution of a Circumbinary Planet in a Gaseous Disk** by *Akihiro Yamanaka, Takanori Sasaki*

astro-ph/1907.09988: **Multiple Scales Asymptotic Solution For The Constant Radial Thrust Problem** by *Juan Luis Gonzalo, Claudio Bombardelli*

astro-ph/1907.10048: **Habitability and Spectroscopic Observability of Warm M-dwarf Exoplanets Evaluated with a 3D Chemistry-Climate Model** by *Howard Chen et al.*

astro-ph/1907.10078: **The GAPS Programme with HARPS-N at TNG XIX. Atmospheric Rossiter-McLaughlin effect and improved parameters of KELT-9b** by *F. Borsa et al.*

astro-ph/1907.10229: **An Observational Study for Grain Dynamics in the AS 209 Disk with Submillimeter Polarization** by *Tomohiro Mori et al.*

astro-ph/1907.10366: **The Fundamental Vibrational Frequencies and Spectroscopic Constants of the Dicyanoamine Anion, NCNCN- (C2N-3): Quantum Chemical Analysis for Astrophysical and Planetary Environments** by *David Dubois, Ella Sciamma-O'Brien, Ryan Fortenberry*

astro-ph/1907.10575: **Dynamical evolution of close-in super-earths tidally interacting with its host star near spin-orbit resonances. The case of Kepler-21 system** by *Santiago Luna, Mario Melita, Hugo Navone*

astro-ph/1907.10620: **K2-146: Discovery of Planet c, Precise Masses from Transit Timing, and Observed Precession** by *Aaron Hamann et al.*

astro-ph/1907.10640: **Sculpting eccentric debris disks with eccentric gas rings** by *Jonathan W. Lin, Eugene Chiang*

astro-ph/1907.10806: **Detection of Hundreds of New Planet Candidates and Eclipsing Binaries in K2 Campaigns 0-8** by *Ethan Kruse et al.*

astro-ph/1907.11081: **AMBITION – Comet Nucleus Cryogenic Sample Return (White paper for ESA's Voyage 2050 programme)** by *D. Bockelée-Morvan et al.*

astro-ph/1907.11098: **The Bio-habitable Zone and atmospheric properties for Planets of Red Dwarfs** by *Amri Wandel, Joseph Gale*

astro-ph/1907.11109: **Classifying Exoplanet Candidates with Convolutional Neural Networks: Application to the Next Generation Transit Survey** by *Alexander Chaushev et al.*

astro-ph/1907.11141: **It takes two planets in resonance to tango around K2-146** by *Kristine W. F. Lam et al.*

astro-ph/1907.11335: **High order symplectic integrators for planetary dynamics and their implementation in REBOUND** by *Hanno Rein, Daniel Tamayo, Garett Brown*

astro-ph/1907.11536: **OGLE-2015-BLG-1649Lb: A gas giant planet around a low-mass dwarf** by *Masayuki Nagakane et al.*

astro-ph/1907.11667: **WASP-South hot Jupiters: WASP-178b, WASP-184b, WASP-185b & WASP-192b** by *C. Hellier et al.*

astro-ph/1907.11820: **First ALMA Millimeter Wavelength Maps of Jupiter, with a Multi-Wavelength Study of Convection** by *Imke de Pater et al.*

astro-ph/1907.12563: **Embedding planetesimals into white dwarf discs from large distances** by *Evgeni Grishin, Dimitri Veras*

astro-ph/1907.12576: **Photosynthesis on Exoplanets and Exomoons from Reflected Light** by *Manasvi Lingam, Abraham Loeb*

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