ExoPlanet News
An Electronic Newsletter

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Editors: H. L. Capelo, J. Venturini, L. Mishra, & D. Angerhausen
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Contents

1 Editorial

We bring you the short, sweet, edition 146 of the Exoplanet News.

In this August issue you will find abstracts of scientific papers, a workshop announcement, Exoplanet Archive updates, an open PhD position, the latest from exoplanet-talks.org, and an overview of exoplanet-related articles on astro-ph.

We remind you of some guidelines for using our templates. If you follow these guidelines, you will make our job easier:

- Please rename the *.tex* file you send from *abstract_template* to something with your last name, like *jobs_smith* or *announcement_miller*
- Avoid using hyperlinks, the newsletter template cannot yet handle the package *hyperref*.
- Do not use any defined command or additional packages
- Abstract: should occupy maximum one page of the pdf without figure. If the list of authors is too large for this, please cut the list of authors, add "et al." followed by "(a complete list of authors can be found on the publication)".
- Figure: attach it to the e-mail without large white margins. It should be one single pdf file per abstract.
- Prior to submission, please remember to comment the three lines which start the tex document and the last line which ends the document.
- Please remember to fill the brackets {} after the title with author names.

For the next month we look forward to your paper abstracts, job ads or meeting announcements. Also special announcements are welcome. As always, we would also be happy to receive feedback concerning the newsletter. The Latex template for submitting contributions, as well as all previous editions of ExoPlanet News, can be found on the ExoPlanet News webpage (http://nccr-planets.ch/exoplanetnews/).

The next issue will appear on September 14 2021.

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

2 Abstracts of refereed papers

How planets grow by pebble accretion IV: Envelope opacity trends from sedimenting dust and pebbles

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Astronomy & Astrophysics, in press

The amount of nebular gas that a planet can bind is limited by its cooling rate, which is set by the opacity of its envelope. Accreting dust and pebbles contribute to the envelope opacity and, thus, influence the outcome of planet formation. Our aim is to model the size evolution and opacity contribution of solids inside planetary envelopes. We then use the resultant opacity relations to study emergent trends in planet formation. We design a model for the opacity of solids in planetary envelopes that accounts for the growth, fragmentation and erosion of pebbles during their sedimentation. We formulate analytical expressions for the opacity of pebbles and dust and map out their trends as a function of depth, planet mass, distance and accretion rate. We find that the accretion of pebbles rather than planetesimals can produce fully convective envelopes, but only in lower-mass planets that reside in the outer disk or in those that are accreting pebbles at a high rate. In these conditions, pebble sizes are limited by fragmentation and erosion, allowing them to pile up in the envelope. At higher planetary masses or reduced accretion rates, a different regime applies where the sizes of sedimenting pebbles are only limited by their rate of growth. The opacity in this growth-limited regime is much lower, steeply declines with depth and planet mass but is invariant with the pebble mass flux. Our results imply that the opacity of a forming planetary envelope can not be approximated by a value that is constant with either depth or planet mass. When applied to the Solar System, we argue that Uranus and Neptune could not have maintained a sufficiently high opacity to avoid runaway gas accretion unless they both experienced sufficiently rapid accretion of solids and formed late.

Download/Website: `https://arxiv.org/abs/2106.03848`

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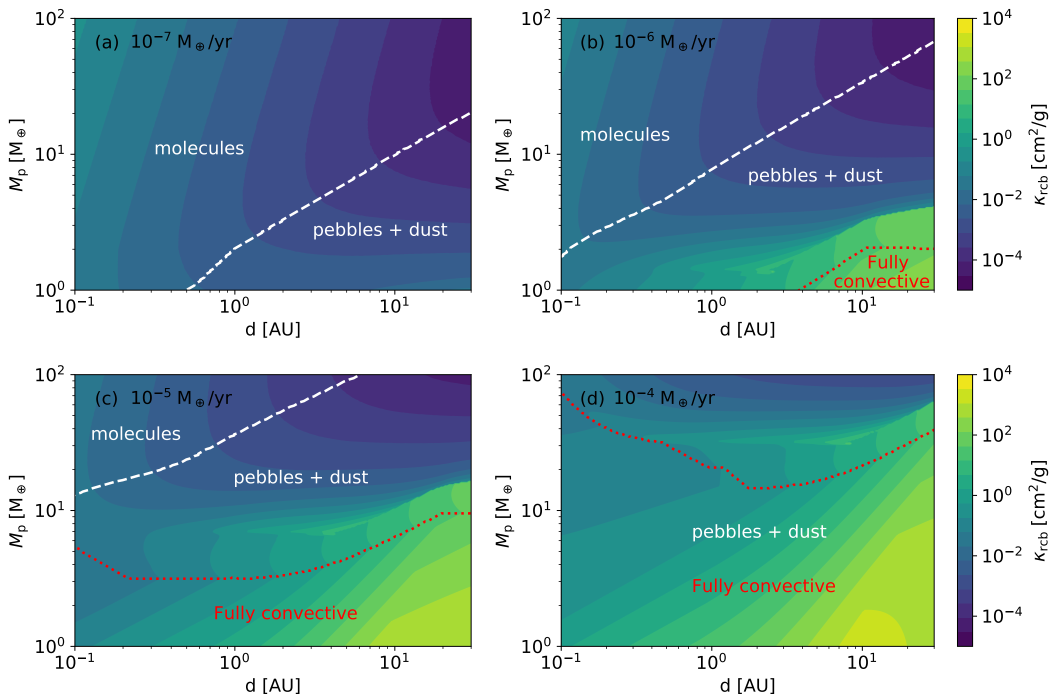

Figure 1: Compilation grid of 10^6 runs, where the colors indicate the opacity at the radiative-convective boundary (RCB) as a function of the planet's semi-major axis and mass at four different pebble accretion rates. The white dashed lines divide the zones where different opacity contributions dominate. The red dotted lines mark the parameter space where the entire envelope is convective due to high opacities in the velocity-limited regime.

Bridging the gap between protoplanetary and debris disks: separate evolution of millimeter and micrometer-sized dust

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The Astrophysical Journal, in press (arXiv:2104.05894)

The connection between the nature of a protoplanetary disk and that of a debris disk is not well understood. Dust evolution, planet formation, and disk dissipation likely play a role in the processes involved. We aim to reconcile both manifestations of dusty circumstellar disks through a study of optically thin Class III disks and how they correlate to younger and older disks. In this work, we collect literature and ALMA archival millimeter fluxes for 85 disks (8%) of all Class III disks across nearby star-forming regions. We derive millimeter-dust masses $M_{\rm dust}$ and compare these with Class II and debris disk samples in the context of excess infrared luminosity, accretion rate, and age. The mean $M_{\rm dust}$ of Class III disks is $0.29 \pm 0.19\ M_{\oplus}$. We propose a new evolutionary scenario wherein radial drift is very efficient for non-structured disks during the Class II phase resulting in a rapid $M_{\rm dust}$ decrease. In addition, we find possible evidence for long infrared protoplanetary disk timescales, $\sim$8 Myr, consistent with overall slow disk evolution. In structured disks, the presence of dust traps allows for the formation of planetesimal belts at large radii, such as those observed in debris disks. We propose therefore that the planetesimal belts in debris disks are the result of dust traps in structured disks, whereas protoplanetary disks without dust traps decrease in dust mass through radial drift and are therefore undetectable as debris disks after the gas dissipation. These results provide a hypothesis for a novel view of disk evolution.
The disk fraction of the eleven star-forming regions used as a function of age based on Gaia-constrained and updated star-forming region stellar membership. The left panel shows the disk fraction according to the IRAC classification, based on $\alpha_{\rm IRAC}$; the right panel is according to the Lada classification, based on $\alpha_{\rm Lada}$. The black solid line represents the free parameter best-fit exponential line for the timescales in each plot. The red dashed line represents the fixed parameter ($A = 80\%$) best-fit exponential line. The transparent lines are random draws from the posterior distribution that resulted from the MCMC fitting. The blue dashed line shows the best fit according to Mamajek 2009 using a wider range of star-forming regions and older disk fraction values. We present updated characteristic timescales of $\sim$8 Myr for the disk fraction evolution in time, which is 2-3 times larger than previous estimates. The longer lifetime is consistent with slow dissipation and low viscosities as explored by Sellek et al. 2020.

Download/Website: `https://arxiv.org/abs/2104.05894`

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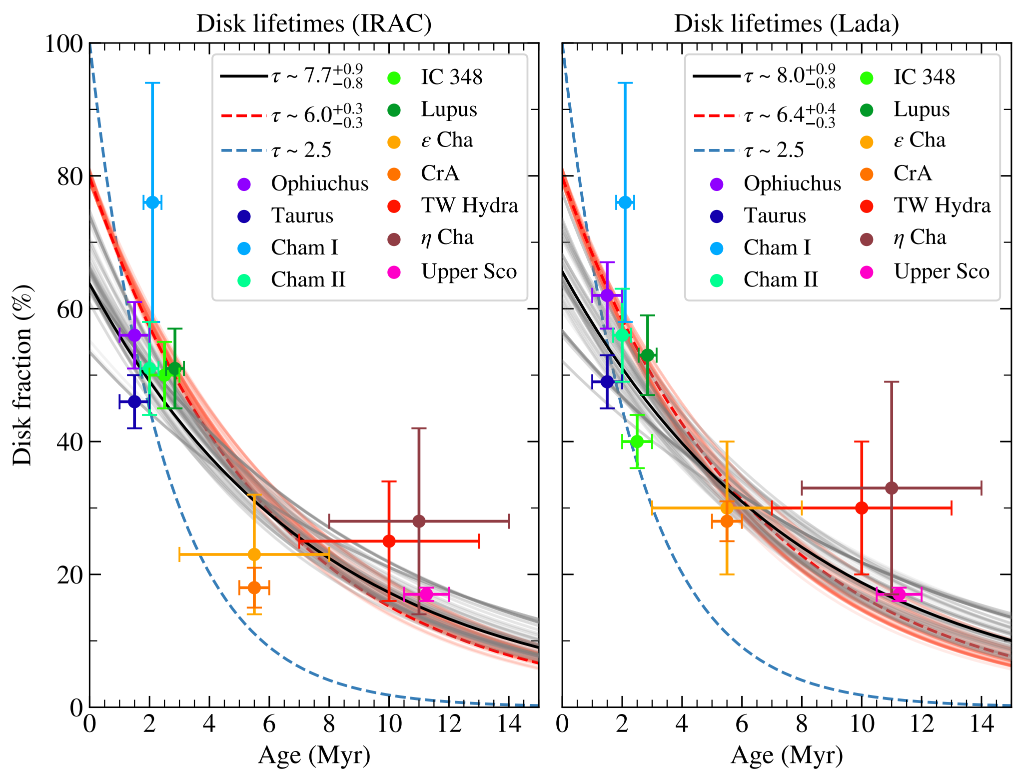

Figure 2: The disk fraction of the eleven star-forming regions used as a function of age based on Gaia-constrained and updated star-forming region stellar membership. The left panel shows the disk fraction according to the IRAC classification, based on α_{IRAC}; the right panel is according to the Lada classification, based on α_{Lada}. The black solid line represents the free parameter best-fit exponential line for the timescales in each plot. The red dashed line represents the fixed parameter ($A = 80\%$) best-fit exponential line. The transparent lines are random draws from the posterior distribution that resulted from the MCMC fitting. The blue dashed line shows the best fit according to Mamajek 2009 using a wider range of star-forming regions and older disk fraction values. We present updated characteristic timescales of ∼8 Myr for the disk fraction evolution in time, which is 2-3 times larger than previous estimates. The longer lifetime is consistent with slow dissipation and low viscosities as explored by Sellek et al. 2020.

The Mass Budgets and Spatial Scales of Exoplanet Systems and Protoplanetary Disks

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The Astrophysical Journal, in press (arXiv:2107.12520)

Planets are born from disks of gas and dust, and observations of protoplanetary disks are used to constrain the initial conditions of planet formation. However, dust mass measurements of Class II disks with ALMA have called into question whether they contain enough solids to build the exoplanets that have been detected to date. In this paper, we calculate the mass and spatial scale of solid material around Sun-like stars probed by transit and radial velocity exoplanet surveys, and compare those to the observed dust masses and sizes of Class II disks in the same stellar mass regime. We show that the apparent mass discrepancy disappears when accounting for observational selection and detection biases. We find a discrepancy only when the planet formation efficiency is below 100%, or if there is a population of undetected exoplanets that significantly contributes to the mass in solids. We identify a positive correlation between the masses of planetary systems and their respective orbital periods, which is consistent with the trend between the masses and the outer radii of Class II dust disks. This implies that, despite a factor 100 difference in spatial scale, the properties of protoplanetary disks seem to be imprinted on the exoplanet population. Estimated solid system mass vs. spatial scale for exoplanets systems and protoplanetary disks around solar-mass stars. The symbol size is proportional to the inverse survey completeness for each exoplanet to better reflect the true occurrence. The sizes of protoplanetary disks are the radii that enclose 68% of the flux (circles), or an upper limit to that value (triangle).

Download/Website: `https://arxiv.org/abs/2107.12520/`

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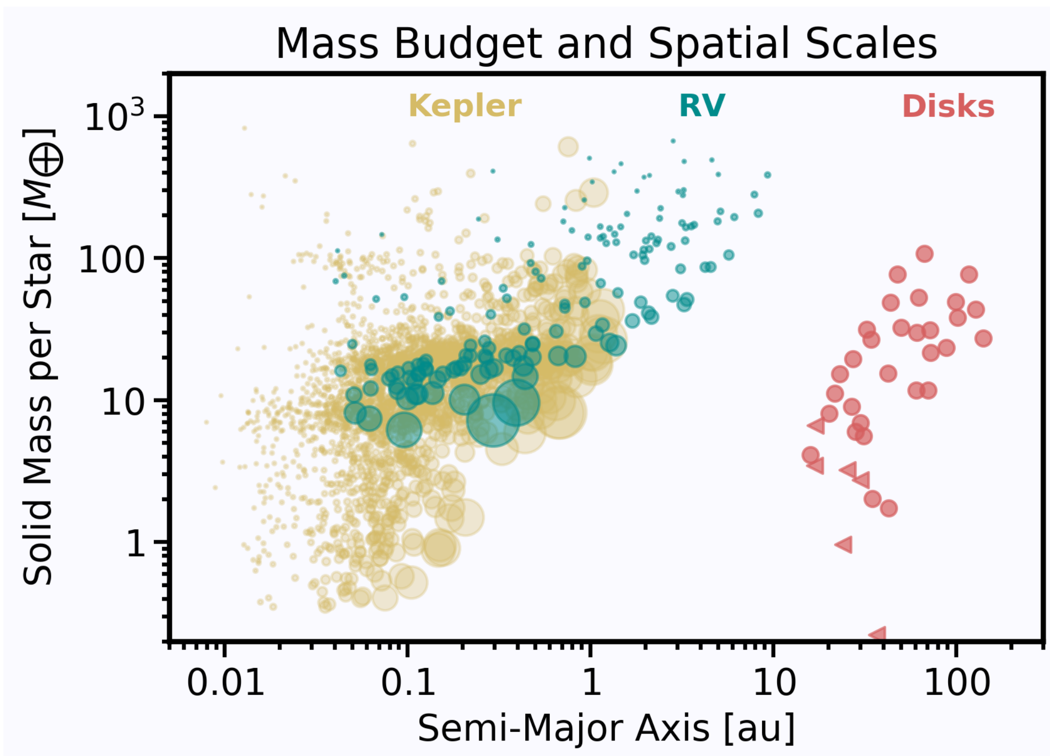

Figure 3: Estimated solid system mass vs. spatial scale for exoplanets systems and protoplanetary disks around solar-mass stars. The symbol size is proportional to the inverse survey completeness for each exoplanet to better reflect the true occurrence. The sizes of protoplanetary disks are the radii that enclose 68% of the flux (circles), or an upper limit to that value (triangle).

The Second Discovery from the COol Companions ON Ultrawide orbiTS (COCONUTS) Program: A Cold Wide-Orbit Exoplanet around a Young Field M Dwarf at 10.9 pc

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The Astrophysical Journal Letters, published (2021ApJ...916L..11Z)

We present the identification of the COCONUTS-2 system, composed of the M3 dwarf L 34-26 and the T9 dwarf WISEPA J075108.79−763449.6. Given their common proper motions and parallaxes, these two field objects constitute a physically bound pair with a projected separation of $594''$ (6471 au). The primary star COCONUTS-2A has strong stellar activity (Hα, X-ray, and UV emission) and is rapidly rotating ($P_{\rm rot} = 2.83$ days), from which we estimate an age of $150 - 800$ Myr. Comparing equatorial rotational velocity derived from the TESS light curve to spectroscopic $v \sin i$, we find COCONUTS-2A has a nearly edge-on inclination. The wide exoplanet COCONUTS-2b has an effective temperature of $T_{\rm eff} = 434 \pm 9$ K, a surface gravity of $\log g = 4.11^{+0.11}_{-0.18}$ dex, and a mass of $M = 6.3^{+1.5}_{-1.9}\ M_{\rm Jup}$ based on hot-start evolutionary models, leading to a mass ratio of $0.016^{+0.004}_{-0.005}$ for the COCONUTS-2 system. COCONUTS-2b is the second coldest (after WD 0806−661B) and the second widest (after TYC 9486-927-1 b) exoplanet imaged to date. Comparison of COCONUTS-2b's infrared photometry with ultracool model atmospheres suggests the presence of both condensate clouds and non-equilibrium chemistry in its photosphere. Similar to 51 Eri b, COCONUTS-2b has a sufficiently low luminosity ($\log{(L_{\rm bol}/L_{\odot})} = -6.384 \pm 0.028$ dex) to be consistent with the cold-start process that may form gas-giant (exo)planets, though its large separation means such formation would not have occurred in situ. Finally, at a distance of 10.9 pc, COCONUTS-2b is the nearest imaged exoplanet to Earth known to date.
Bolometric luminosity and age of COCONUTS-2b (red star) and those of L6−Y1 benchmarks from Zhang et al. (2020a) and Zhang et al. (2021a). We also plot β Pic c (Nowak et al. 2020) and YSES-1c (Bohn et al. 2020), which have no spectral types but have bolometric luminosities consistent with late-L dwarfs. We overlay the hot-start cloudless, solar-metallicity Sonora-Bobcat evolutionary models (purple solid; Marley et al. 2021) and the cold-start variation of these models (teal solid). We also show the coldest-start cloud-free, solar-metallicity Spiegel & Burrows (2012) evolutionary models (grey dotted), which are significantly fainter than the cold-start Sonora models. Similar to 51 Eri b (Macintosh et al. 2015), COCONUTS-2b has a sufficiently low luminosity to be consistent with the cold-start process that may form gas-giant (exo)planets, though its large separation means such formation would not have occurred in situ.

Download/Website: `https://ui.adsabs.harvard.edu/abs/2021ApJ...916L..11Z/abstract`

Contact: `zhangdirac@gmail.com`

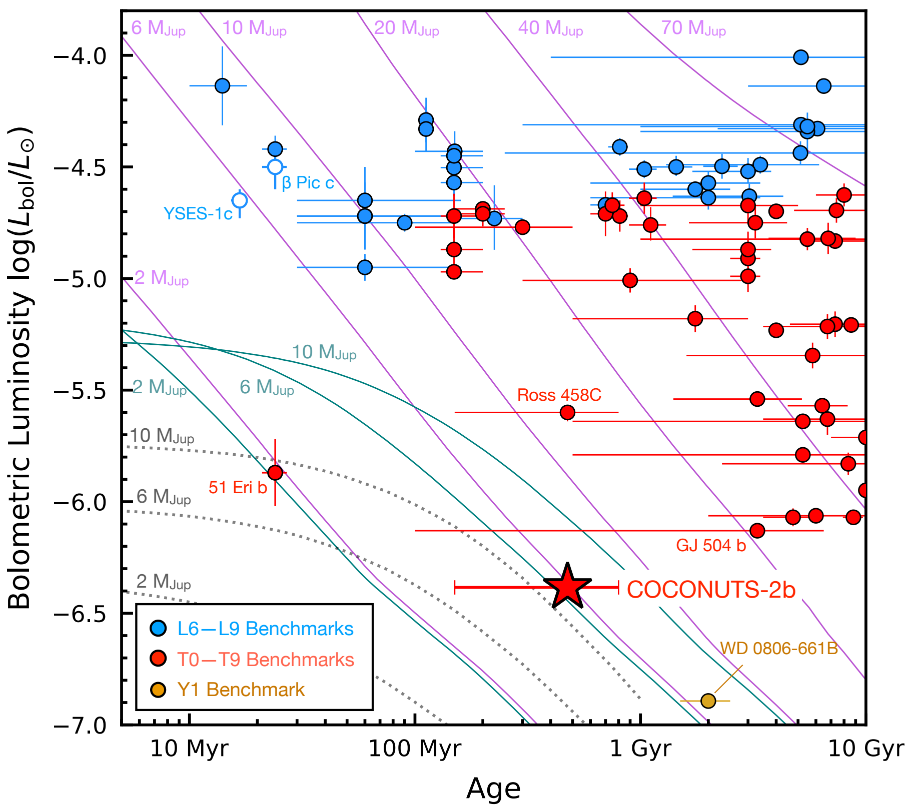

Figure 4: Bolometric luminosity and age of COCONUTS-2b (red star) and those of L6−Y1 benchmarks from Zhang et al. (2020a) and Zhang et al. (2021a). We also plot β Pic c (Nowak et al. 2020) and YSES-1c (Bohn et al. 2020), which have no spectral types but have bolometric luminosities consistent with late-L dwarfs. We overlay the hot-start cloudless, solar-metallicity Sonora-Bobcat evolutionary models (purple solid; Marley et al. 2021) and the cold-start variation of these models (teal solid). We also show the coldest-start cloud-free, solar-metallicity Spiegel & Burrows (2012) evolutionary models (grey dotted), which are significantly fainter than the cold-start Sonora models. Similar to 51 Eri b (Macintosh et al. 2015), COCONUTS-2b has a sufficiently low luminosity to be consistent with the cold-start process that may form gas-giant (exo)planets, though its large separation means such formation would not have occurred in situ.

Into the storm: Diving into the winds of the ultra-hot Jupiter WASP-76 b with HARPS and ESPRESSO

J. V. Seidel[1] , *D. Ehrenreich*[1] , *R. Allart*[2,1] , *H. J. Hoeijmakers*[3] , *C. Lovis*[1] , *V. Bourrier*[1] , *L. Pino*[4] , *A. Wyttenbach*[5] , *V. Adibekyan*[6,7] , *Y. Alibert*[8] , *F. Borsa*[9] , *N. Casasayas-Barris*[13,19,20] , *S. Cristiani*[11] , *O. D. S. Demangeon*[6,7] , *P. Di Marcantonio*[10] , *P. Figueira*[12,6] , *J. I. González Hernández*[13] , *J. Lillo-Box*[10] , *C. J. A. P. Martins*[6,14] , *A. Mehner* [12] , *P. Molaro* [11,18] , *N. J. Nunes*[15] , *E. Palle*[13,19] , *F. Pepe*[1] , *N. C. Santos*[6,7] , *S. G. Sousa*[6] , *A. Sozzetti*[16] , *H. M. Tabernero*[6,17] , *M. R. Zapatero Osorio*[17]

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Astronomy & Astrophysics, in press (arXiv:2107.09530)

Context. Despite swift progress in the characterisation of exoplanet atmospheres in composition and structure, the study of atmospheric dynamics has not progressed at the same speed. While theoretical models have been developed to describe the lower layers of the atmosphere, and independently, the exosphere, little is known about the intermediate layers up to the thermosphere.
Aims. We aim to provide a clearer picture of atmospheric dynamics for the class of ultra-hot Jupiters, which are highly irradiated gas giants, based on the example of WASP-76 b.
Methods. We jointly analysed two datasets that were obtained with the HARPS and ESPRESSO spectrographs to interpret the resolved planetary sodium doublet. We then applied the MERC code, which retrieves wind patterns, speeds, and temperature profiles on the line shape of the sodium doublet. An updated version of MERC, with added planetary rotation, also provides the possibility of modelling the latitude dependence of the wind patterns.
Results. We retrieve the highest Bayesian evidence for an isothermal atmosphere, interpreted as a mean temperature of 3389 ± 227 K, a uniform day- to nightside wind of $5.5^{+1.4}_{-2.0}$ km/s in the lower atmosphere with a vertical wind in the upper atmosphere of $22.7^{+4.9}_{-4.1}$ km/s, switching atmospheric wind patterns at 10^{-3} bar above the reference surface pressure (10 bar).
Conclusions. Our results for WASP-76 b are compatible with previous studies of the lower atmospheric dynamics of WASP-76 b and other ultra-hot Jupiters. They highlight the need for vertical winds in the intermediate atmosphere above the layers probed by global circulation model studies to explain the line broadening of the sodium doublet in this planet. This work demonstrates the capability of exploiting the resolved spectral line shapes to observationally constrain possible wind patterns in exoplanet atmospheres. This is an invaluable input to more sophisticated 3D atmospheric models in the future.

Download/Website: `https://arxiv.org/abs/2107.09530`

Contact: `julia.seidel@unige.ch`

3 Announcements

BUFFET: Building a Unified Framework For Exoplanet Treatments

Linda E. Sohl, Kostas Tsigaridis, Thomas Fauchez et. al.

Online everywhere, September 27-29, 2021

The NASA Nexus for Exoplanet System Science (NExSS) CUISINES Working Group is pleased to announce a workshop: **BUFFET: Building a Unified Framework For Exoplanet Treatments**.

This three-day workshop will bring together scientists who use a variety of models to explore the planets in the Solar System and beyond, and who are interested in participating in community-led efforts to compare results across models. These model intercomparisons will hopefully lead to a better understanding of modeled planetary environments, processes and spectral characteristics that are dramatically different from modern Earth, as well as lead to improvements for individual models.

The main objective of this workshop is the development of a framework for designing exoplanet model intercomparison projects (MIPs) that would promote best scientific practices and maximize scientific output, as well as enable broad and inclusive community participation.

This workshop is for you if:

- You use and/or develop computational models to study the past or current states of Earth, Solar System bodies, or exoplanets (ranging from icy moons and dwarf planets to hot Jupiters and brown dwarfs).
- You use and/or develop computational models to generate synthetic planetary spectra that may also be used with instrument simulators.
- You would like to contribute to the development of community standards that can help lead to new comparative planetology insights, and to more robust interpretations/predictions for observational missions.
- A significant part of the workshop will be devoted to brainstorming about both scientific targets and practical matters for completing MIPs that advance the scientific interests of the community.

We encourage all those interested to please indicate your interest to aid us in planning by filling out the following short form: https://forms.gle/yvQ1ka3qpfRtaAXi7

Download/Website: `http://nccr-planets.ch/`

Contact: `exoplanetnews@nccr-planets.ch`

4 Jobs and Positions

PhD Position to develop a CHON+PS chemical scheme validated at high temperatures with applications in planetology.

Olivia Venot[1], *Baptiste Sirjean*[2]
[1] Laboratoire Interuniversitaire des Systèmes Atmosphériques, Créteil, France
[2] Laboratoire Réactions et Génie des Procédés, Nancy, France

Location: Nancy/Créteil, Expected starting date: 1.11.2021

To learn more about the fascinating exoplanets, several space telescopes have been designed, such as the JWST and Ariel. The broad wavelength coverage and high-sensitivity of the instruments on-board these telescopes will allow us to extract much more information from their data than what has been possible so far, leading to numerous breakthroughs. However, these breakthroughs will be possible only if the models used to interpret the observations are robust and reliable, in particular, photo-thermochemical models. While models taking into account Carbon, Hydrogen, Oxygen, and Nitrogen species (CHON) already exist, Sulfur- and Phosphorous-bearing molecules can affect the observations of exoplanetsÕ atmospheres and thus need to be incorporated in models. The PhD candidate will develop a comprehensive CHON+PS scheme and will apply this scheme to the study of exoplanetary atmospheres, using a kinetic model.

We are looking for an extremely motivated student who will be fully involved in a challenging interdisciplinary project linking the fields of combustion and astrophysics. The PhD candidate will have a double expertise, both in chemical schemes development and in atmospheric modeling.

We are looking for an extremely motivated student who will be fully involved in a challenging interdisciplinary project linking the fields of combustion and astrophysics. The PhD candidate will have a double expertise, both in chemical schemes development and in atmospheric modeling. This unique formation will guarantee him/her an unprecedented interdisciplinary profile. Desired profile: i) Either a Master or Engineer degree in organic chemistry, chemical engineering, chemistry, physics or related fields with a great interest for astrophysics, in particular exoplanets, or a Master degree in Astrophysics, with a strong background on chemistry, chemical engineering; ii) Good English skills to work in an international environment; iii) Good programming skills.

Application should be sent to Dr Olivia Venot (olivia.venot@lisa.ipsl.fr) and Dr Baptiste Sirjean (baptiste.sirjean@univ-lorraine.fr) before 1st September 2021. Required documents should be sent in a single PDF file that includes a letter of motivation, a CV and academic transcripts of records in French or English.

Download/Website: `http://www.lisa.u-pec.fr/images/stories/EMPLOIS/PhD_EXACT_ANR2021_EN.pdf`

Contact: `olivia.venot@lisa.ipsl.fr`

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 10, 2021

Note: Unless otherwise noted, all planetary and stellar data mentioned in the news are in the Planetary Systems Table (`http://bit.ly/2Pt0tM1`), which provides a single location for all self-consistent planetary solutions, and its companion table the Planetary Systems Composite Parameters (`https://bit.ly/2Fer9NU`), which offers a more complete table of parameters combined from multiple references and calculations. Data can also be found in the Microlensing Planets Table (`https://bit.ly/3urUyZU`) or Direct Imaging Planets Table (`http://bit.ly/3ayD185`).

July 29, 2021

Seventeen New Planets!

This week's planetary profusion consists of 11 transiting planets—including a new Kepler planet— and six found with radial velocity. These bring the total confirmed planet count to **4,455**.

The new planets are: HAT-P-58 b, HAT-P-59 b, HAT-P-60 b, HAT-P-61 b, HAT-P-62 b, HAT-P-63 b, HAT-P-64 b, TOI-1749 b, c, d, Kepler-1704 b, HD 27969 b, HD 80869 b, HD 95544 b, HD 109286 b, HD 115954 b, and HD 211403 b.

AstroQuery Supports New Archive Tables
If you use the astroquery.nasa_exoplanet_archive module, release v0.4.3 of the module now supports Table Access Protocol (TAP) queries to the new Planetary Systems (ps) and Planetary Systems Composite Parameters (pscomppars) tables.

No changes in syntax are required, but note that methods that previously queried the Confirmed Planets table (exoplanets), which returned one row per planet, now query the PS table, which can return multiple rows per planet. Support for querying the retired tables (exoplanets, exomultpars, and compositepars) has now been discontinued.

AstroQueryPy's module documentation (`https://bit.ly/3AfBOzb`) and examples have been updated to reflect these changes. Let us know if you find any issues (`http://bit.ly/38H6zjv`)!

July 22, 2021

Four New TESS Planets

This week we've added four planets orbiting a pair of related young stars observed by NASA's TESS. The new planets are: TOI-2076 b, c, & d (all described as mini-Neptunes) and TOI-1807 b, which is about twice the size of Earth. Read the discovery paper (`https://bit.ly/3lyOMDY`) and NASA's media release (`https://go.nasa.gov/3fzAI9M`), which includes a two-minute video illustrating these two interesting systems, and then check out the two systems' overview pages.

More TAP-supported Tables

As part of our continued migration to the IVOA's Table Access Protocol (TAP) standard, we've added five more tables to our TAP service:

- SuperWASP (superwasptimeseries)
- KELT (kelttimeseries)
- UKIRT (ukirttimeseries)
- Microlensing Planets (ml) (**Note:** This table name was changed from microlensing to ML and assigned new database column names in April 2021.)
- Object Aliases (object_aliases), which is is a table of all planetary system aliases recognized by the Exoplanet Archive.

The old API support for these tables is being discontinued, so please convert any existing old API queries to TAP queries, and use TAP for all new queries. Here are some resources:

- TAP User Guide (`https://bit.ly/2Tajkgk`)
- Column names mapping document between old microlensing and new ML tables (for queries created before April 2021): PDF (`https://bit.ly/33mS2Iw`) CSV (`https://bit.ly/2TX1roV`)
- A recap of the the recent and iterative changes to the archive's tools and services: Developing a More Integrated Exoplanet Archive (`https://bit.ly/3jLgrhl`) and the Archive 2.0 Release Notes (`https://bit.ly/3rVQPTx`).

Also, the API User Guide (`http://bit.ly/2JG8Xy0`) lists table-specific information on when the old API access will be discontinued.

July 15, 2021

A Cool Crop of Planet-hosting Stars

This week's 10 new planets have something in common: they all orbit cool stars—as in, M dwarfs and K dwarfs. The new planets are: TOI-674 b, TOI-1685 b, TOI-1260 b & c, TOI-1634 b, TOI-1259 A b, GJ 720 A b, G 264-012 b & c, and Gl 393 b.

July 1, 2021

Two New Planets, New Radial Velocity Parameters

This week's data include two new planets, Kepler-129 d and GJ 849 c, and radial velocity planet parameters for 163 known exoplanets.

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

6 As seen on Exoplanet-talks.org

Download/Website: `http://exoplanet-talks.org`
Contact: `info@exoplanet-talks.org`

Instruction video: http://exoplanet-talks.org/talk/164

The 13CO-rich atmosphere of a young accreting super-Jupiter by *Yapeng Zhang* – talk/377
Equitea: a monthly forum to discuss topics related to ED&I in Astronomy, Physics, and STEM (NAM2021) by *Ares Osborn* – talk/378
Beyond runaway: initiation of the post-runaway greenhouse state on rocky exoplanets by *Ryan Boukrouche* – talk/379

7 As seen on astro-ph

astro-ph/2107.00015: **Simulating Reflected Light Exoplanet Spectra of the Promising Direct Imaging Target, ups Andromedae d, with a New, Fast Sampling Method Using the Planetary Spectrum Generator** by *Prabal Saxena et al.*

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astro-ph/2107.00155: **KMT-2018-BLG-1743: Planetary Microlensing Event Occurring on Two Source Stars** by *Cheongho Han et al.*

astro-ph/2107.00240: **Long-term Dynamical Stability in the Outer Solar System I: The Regular and Chaotic Evolution of the 34 Largest Trans-Neptunian Objects** by *M. A. Munoz-Gutierrez et al.*

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