ExoPlanet News
An Electronic Newsletter

No. 144, 15 June 2021

Editors: J. Venturini, L. Mishra, D. Angerhausen & H. L. Capelo
NCCR PlanetS, Gesellschaftsstrasse 6, CH-3012 Bern, Switzerland

exoplanetnews@nccr-planets.ch http://nccr-planets.ch/exoplanetnews

Contents

1 Editorial

Welcome to Edition 144 of the ExoPlanet News!

In this June issue you will find abstracts of scientific papers, Exoplanet Archive updates, a job posting, announcements for two workshops, the latest exoplanet talks, 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 July 13, 2021.

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

2 Abstracts of refereed papers

Multi-band transit follow up observations of five hot-Jupiters with critical noise treatments: Improved physical properties

Suman Saha[1,2], *Aritra Chakrabarty*[1,3], *Sujan Sengupta*[1]
[1] Indian Institute of Astrophysics, II Block, Koramangala, Bengaluru, India
[2] Pondicherry University, R.V. Nagar, Kalapet, Puducherry, India
[3] University of Calcutta, Salt Lake City, JD-2, Kolkata, India

The Astronomical Journal, in press (arXiv:2105.09668)

The most challenging limitation in transit photometry arises from the noises in the photometric signal. In particular, the ground-based telescopes are heavily affected by the noise due to perturbation in the Earth's atmosphere. Use of telescopes with large apertures can improve the photometric signal-to-noise ratio (S/N) to a great extent. However, detecting a transit signal out of a noisy light curve of the host star and precisely estimating the transit parameters call for various noise reduction techniques. Here, we present multi-band transit photometric follow-up observations of five hot-Jupiters e.g., HAT-P-30 b, HAT-P-54 b, WASP-43 b, TrES-3 b and XO-2 N b, using the 2m Himalayan Chandra Telescope (HCT) at the Indian Astronomical Observatory, Hanle and the 1.3m J. C. Bhattacharya Telescope (JCBT) at the Vainu Bappu Observatory, Kavalur. Our critical noise treatment approach includes techniques such as Wavelet Denoising and Gaussian Process regression, which effectively reduce both time-correlated and time-uncorrelated noise components from our transit light curves. In addition to these techniques, use of our state-of-the-art model algorithms have allowed us to estimate the physical properties of the target exoplanets with a better accuracy and precision compared to the previous studies.

Download/Website: `https://arxiv.org/abs/2105.09668`

Contact: `suman.saha@iiap.res.in`

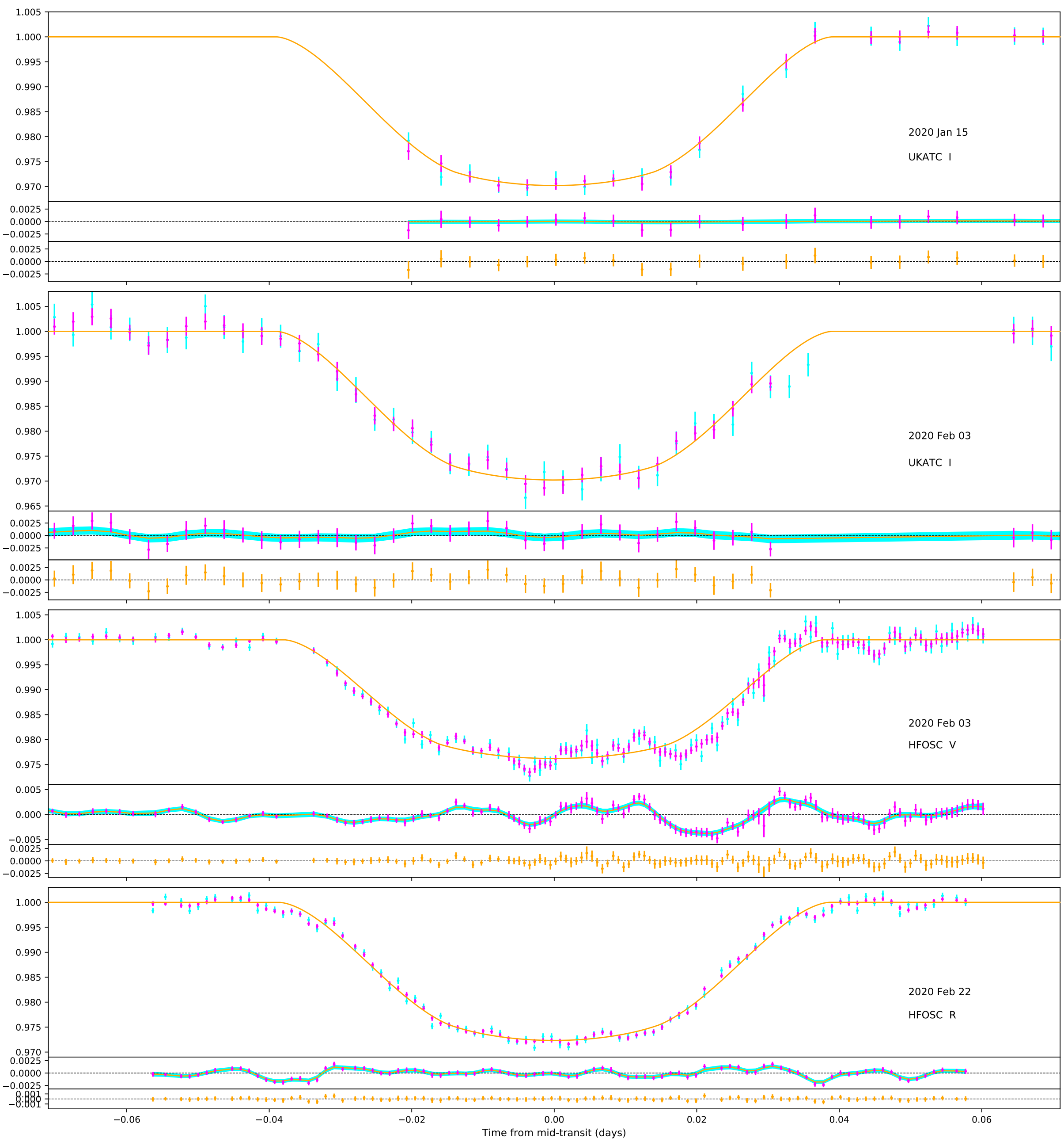

Figure 1: Observational and modelled light curves for HAT-P-54 b. For each observed transit event (see Table **??**), the observation date, the instrument, and the photometric filter used are mentioned. Top: the unprocessed light curve (cyan), light curve after Wavelet Denoising (magenta), the best-fit transit model (orange). Middle: the residual after modelling without GP regression (magenta), the mean (orange) and 1-σ interval (cyan) of the best-fit GP regression model. Bottom: mean residual flux (orange).

Exploring terrestrial lightning parameterisations for exoplanets and brown dwarfs

G. Hodosán[1,2,3,5], *Ch. Helling*[1,2,4], *I. Vorgul*[1]

[1] Centre for Exoplanet Science, University of St Andrews, St Andrews KY16 9SS, UK
[2] SUPA, School of Physics and Astronomy, University of St Andrews, St Andrews KY16 9SS, UK
[3] Instituto de Astrofísica de Andalucía, (IAA-CSIC), Glorieta de la Astronomía s/n, 18008, Granada, Spain
[4] SRON Netherlands Institute for Space Research, Sorbonnelaan 2, 3584 CA Utrecht, NL
[5] RAL Space, STFC Rutherford Appleton Laboratory, Didcot, Oxfordshire OX11 0QX, UK

Planetary & Space Science, accepted for publication (2021arXiv210310155H)

Observations and models suggest that the conditions to develop lightning may be present in cloud-forming extrasolar planetary and brown dwarf atmospheres. Whether lightning on these objects is similar to or very different from what is known from the Solar System awaits answering as lightning from extrasolar objects has not been detected yet. We explore terrestrial lightning parameterisations to compare the energy radiated and the total radio power emitted from lightning discharges for Earth, Jupiter, Saturn, extrasolar giant gas planets and brown dwarfs. We find that lightning on hot, giant gas planets and brown dwarfs may have energies of the order of 10^{11}–10^{17} J, which is two to eight orders of magnitude larger than the average total energy of Earth lightning (10^9 J), and up to five orders of magnitude more energetic than lightning on Jupiter or Saturn (10^{12} J), affirming the stark difference between these atmospheres. Lightning on exoplanets and brown dwarfs may be more energetic and release more radio power than what has been observed from the Solar System. Such energies would increase the probability of detecting lightning-related radio emission from an extrasolar body.

Download/Website: `https://arxiv.org/pdf/2103.10155.pdf`

Contact: `hodosan.gabriella@gmail.com`

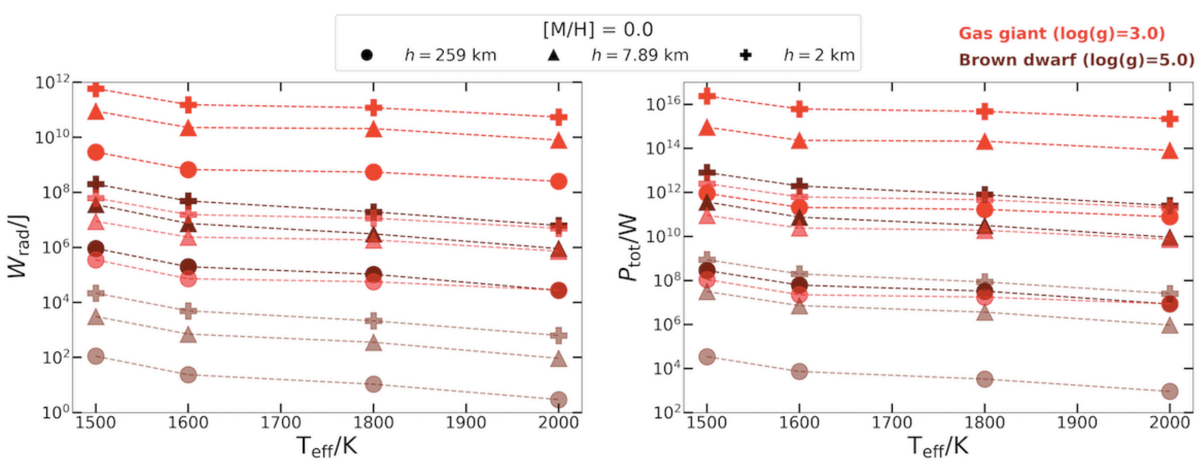

Figure 2: Exo-Case (iii): Total radiated energy (left) and total radio power (right) released from extrasolar lightning in gas giant (dark red) and brown dwarf (dark brown) solar metallicity atmospheres ([M/H]=0.0), The discharge extensions $h = 2$km, 7.89km, 259 km (cross, triangle, circle symbols; resulting in $\tau = 2.5\times10^{-5}, 9.9\times10^{-5}, 3.2\times10^{-3}$ s with $v = 0.3$c) and the minimum charges necessary to initiate a discharge, $Q_{\rm min}$, are prescribed, with $Q_{\rm min}$ linking to the global parameters $T_{\rm eff}$, log(g) and [M/H]. The light red and brown colours show results for 1% of $Q_{\rm min}$.

Ultra Short Period Planets in K2 III: Neighbors are Common with 13 New Multi-Planet Systems and 10 Newly Validated Planets in Campaigns 0-8, 10

Elisabeth R. Adams[1], *Brian Jackson*[2], *Samantha Johnson*[3], *David R. Ciardi*[4], *William D. Cochran*[5], *Michael Endl*[6], *Mark E. Everett*[7], *Elise Furlan*[4], *Steve B. Howell*[8], *Prasanna Jayanthi*[2], *Phillip J. MacQueen*[6], *Rachel A. Matson*[9], *Ciera Partyka-Worley*[2], *Joshua Schlieder*[10], *Nicholas J. Scott*[8], *Sevio M. Stanton*[2], *& Carl Ziegler*[11]

[1] Planetary Science Institute, 1700 E. Ft. Lowell, Suite 106, Tucson, AZ 85719, USA
[2] Department of Physics, Boise State University, 1910 University Drive, Boise ID 83725, USA
[3] Department of Physics, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina 27599, USA; Triangle Universities Nuclear Laboratory, Duke University, Durham, North Carolina 27708, USA
[4] NASA Exoplanet Science Institute, 770 South Wilson Avenue, Pasadena, CA 91125, USA
[5] Center for Planetary Systems Habitability and McDonald Observatory, The University of Texas at Austin, Austin, TX 78712, USA
[6] McDonald Observatory, The University of Texas at Austin, Austin, TX 78712, USA
[7] NSF's Optical Infrared Astronomy Research Laboratory, 950 North Cherry Avenue Tucson, AZ 85719, USA
[8] NASA Ames Research Center, Moffett Field, CA 94035, USA
[9] U.S. Naval Observatory, 3450 Massachusetts Avenue NW, Washington, D.C. 20392, USA
[10] NASA Goddard Space Flight Center, Greenbelt, MD, USA
[11] Dunlap Institute for Astronomy and Astrophysics, University of Toronto, 50 St. George Street, Toronto, Ontario M5S 3H4, Canada

Planetary Science Journal, in press (arXiv:2011.11698)

Using the EVEREST photometry pipeline, we have identified 74 candidate ultra-short-period planets (orbital period $P < 1$ d) in the first half of the K2 data (Campaigns 0-8 and 10). Of these, 33 candidates have not previously been reported. A systematic search for additional transiting planets found 13 new multi-planet systems, doubling the number known and representing a third (32%) of USPs. We also identified 30 companions, which have periods from 1.4 to 31 days (median 5.5 d). A third (36 of 104) of the candidate USPs and companions have been statistically validated or confirmed, 10 for the first time, including 7 USPs. Almost all candidates, and all validated planets, are small (radii $Rp \leq 3R_{\oplus}$) with a median radius of $R_p = 1.1R_{\oplus}$; the validated and confirmed candidates have radii between $0.4R_{\oplus}$ and $2.4R_{\oplus}$ and periods from P=0.18 to 0.96 d. The lack of candidate (a) ultra-hot-Jupiters ($R_p > 10R_{\oplus}$) and (b) short-period desert ($3 \leq Rp \leq 10R_{\oplus}$) planets suggests that both populations are rare, although our survey may have missed some of the very deepest transits. These results also provide strong evidence that we have not reached a lower limit on the distribution of planetary radius values for planets at close proximity to a star, and suggest that additional improvements in photometry techniques would yield yet more ultra-short-period planets. The large fraction of USPs in known multi-planet systems supports origins models that involve dynamical interactions with exterior planets coupled to tidal decay of the USP orbits.

Download/Website: `https://arxiv.org/abs/2011.11698`

Contact: `adams@psi.edu`

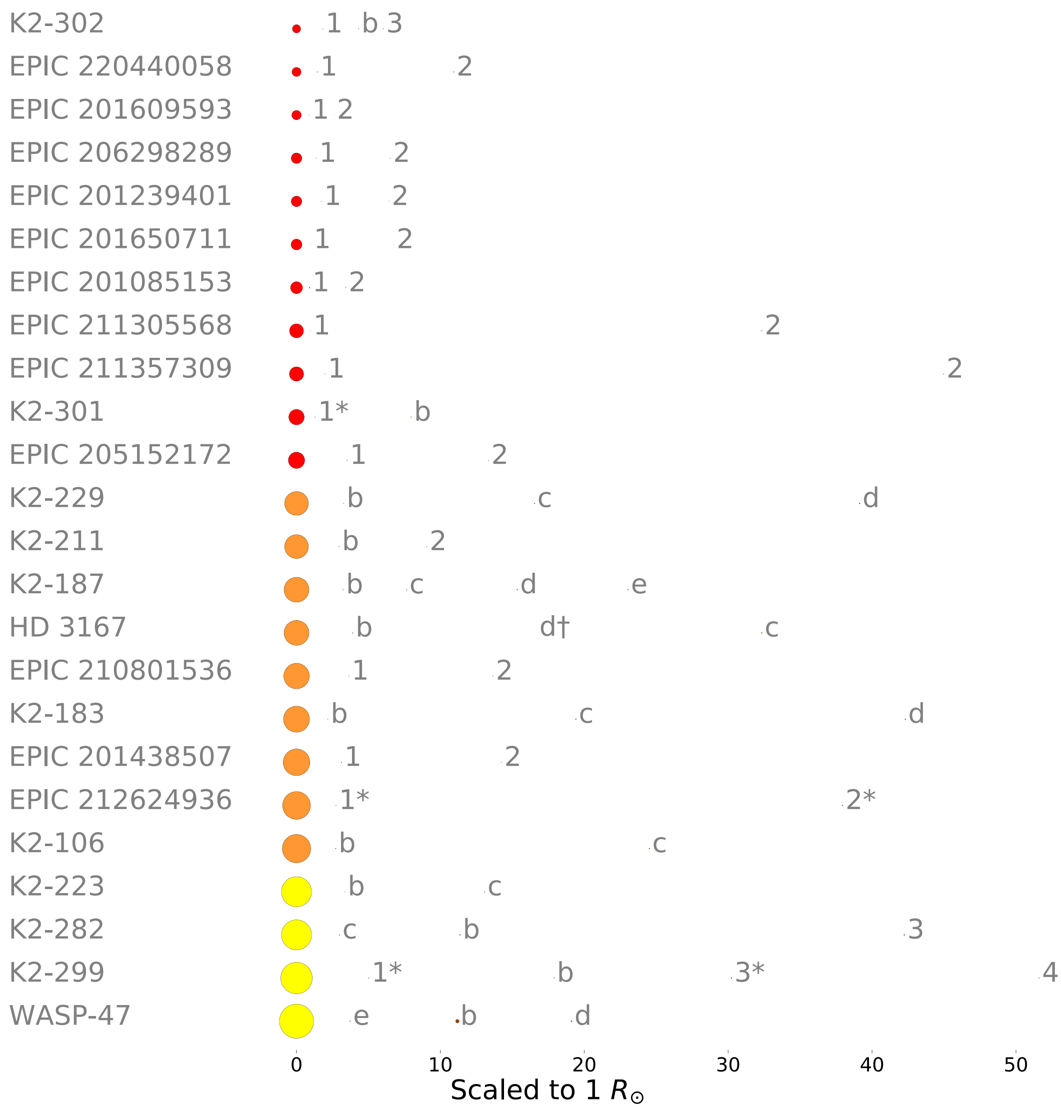

Figure 3: All known USP multi-planet systems for Campaigns 0-8 and 10, plotted entirely to scale. All sizes and distances are in solar radii ($R_\odot$). Stars are color coded by spectral type using stellar radius as a proxy: red=M ($R_\star \leq 0.7\ R_\odot$), orange=K ($0.7 < R_\star \leq 0.96\ R_\odot$), and yellow=G ($0.96 < R_\star \leq 1.15\ R_\odot$). No USPs were found around F stars. Numbers denote candidates and letters denote confirmed or validated worlds. Planets with an asterisk (*) have been newly validated in this work but are pending an official letter designation. One non-transiting planet is marked with a dagger (†) and plotted with zero radius at the correct separation from the star.

First detection of a disk free of volatile elements around a young A-type star: A sign of collisions between rocky planets?

M. E. van den Ancker[1], *N. P. Gentile Fusillo*[1], *T. J. Haworth*[2], *C. F. Manara*[1], *P. A. Miles-Páez*[1], *R. D. Oudmaijer*[3], *O. Panić*[3], *D. J. M. Petit dit de la Roche*[1], *M. G. Petr-Gotzens*[1] *and M. Vioque*[4,5]

[1] European Southern Observatory, Karl-Schwarzschild-Str. 2, D–85748 Garching bei München, Germany
[2] Astronomy Unit, School of Physics and Astronomy, Queen Mary University of London, London E1 4NS, UK
[3] School of Physics and Astronomy, University of Leeds, Woodhouse Lane, Leeds, LS2 9JT, UK
[4] Joint ALMA Observatory, Alonso de Córdova 3107, Vitacura 763-0355, Santiago, Chile
[5] National Radio Astronomy Observatory, 520 Edgemont Road, Charlottesville, VA 22903, USA

Astronomy & Astrophysics Letters, in press (arXiv:2105.08327)

Aims. We present the first detailed analysis of the astrophysical parameters of the poorly studied Sco-Cen member HD 152384 and its circumstellar environment.
Methods. We analyze newly obtained optical-near-IR XSHOOTER spectra, as well as archival TESS data, of HD 152384. In addition, we use literature photometric data to construct a detailed spectral energy distribution (SED) of the star.
Results. The photospheric absorption lines in the spectrum of HD 152384 are characteristic of a A0 V star, for which we derive a stellar mass of 2.1 ± 0.1 $M_\odot$ and a stellar age > 4.5 Myr. Superimposed on the photospheric absorption, the optical spectrum also displays double-peaked emission lines of Ca II, Fe I, Mg I and Si I, typical of circumstellar disks. Notably, all Hydrogen and Helium lines appear strictly in absorption. A toy model shows that the observed emission line profiles can be reproduced by emission from a compact (radius < 0.3 au) disk seen at an inclination of $\sim 24°$. Further evidence for the presence of circumstellar material comes from the detection of a moderate infrared excess in the SED, similar to those found in extreme debris disk systems.
Conclusions. We conclude that HD 152384 is surrounded by a tenuous circumstellar disk which, although rich in refractory elements, is highly depleted of volatile elements. To the best of our knowledge such a disk is unique within the group of young stars. However, it is reminiscent of the disks seen in some white dwarfs, which have been attributed to the disruption of rocky planets. We suggest that the disk around HD 152384 may have a similar origin and may be due to collisions in a newly formed planetary system.

Download/Website: `http://arxiv.org/abs/2105.08327`

Contact: `mvandena@eso.org`

Constraints on the nearby exoplanet ϵ Ind Ab from deep near/mid-infrared imaging limits

G. Viswanath[1], M. Janson[1], C.-H. Dahlqvist[2], D. Petit dit de la Roche[3], M. Samland[1], J. Girard[4], P. Pathak[3], M. Kasper[3], F. Feng[5], M. Meyer[6], A. Boehle[7], S. P. Quanz[7], H.R.A. Jones[8], O. Absil[2], W. Brandner[9], A.-L. Maire[2], R. Siebenmorgen[3], M. Sterzik[3] & E. Pantin[10]

[1] Department of Astronomy, Stockholm University, AlbaNova University Center, 10691 Stockholm, Sweden
[2] STAR Institute, Université de Liège, Allée du Six Aout 19c, 4000 Liège, Belgium
[3] European Southern Observatory, Karl-Schwartzschild-Strasse 2, 85748 Garching, Germany
[4] Space Telescope Science Institute, 3700 San Martin Dr, 21218 Baltimore, MD, USA
[5] Department of Terrestrial Magnetism, Carnegie Institution of Washington, 5241 Broad Branch Road, NW, 20015 Washington, DC, USA
[6] Department of Astronomy, University of Michigan, 311 West Hall,1085 S. University Avenue, 48109 Ann Arbor, MI, USA
[7] ETH Zurich, Institute for Particle Physics and Astrophysics, Wolfgang-Pauli-Strasse 27, 8093 Zurich, Switzerland
[8] Centre for Astrophysics Research, University of Hertfordshire, College Lane, AL10 9AB, Hatfield, UK
[9] Max Planck Institute for Astronomy, Königstuhl 17, 69117 Heidelberg, Germany
[10] AIM, CEA, CNRS, Université Paris-Saclay, Université Paris Diderot, Sorbonne Paris Cité, Gif-sur-Yvette, France

Astronomy & Astrophysics, in press (arXive-Code 2105.09773)

The past decade has seen increasing efforts in detecting and characterising exoplanets by high contrast imaging in the near/mid-infrared, which is the optimal wavelength domain for studying old, cold planets. In this work, we present deep AO imaging observations of the nearby Sun-like star ϵ Ind A with NaCo (L') and NEAR (10-12.5 microns) instruments at VLT, in an attempt to directly detect its planetary companion whose presence has been indicated from radial velocity (RV) and astrometric trends. We derive brightness limits from the non-detection of the companion with both instruments, and interpret the corresponding sensitivity in mass based on both cloudy and cloud-free atmospheric and evolutionary models. For an assumed age of 5 Gyr for the system, we get detectable mass limits as low as 4.4 $M_{\rm J}$ in NaCo L' and 8.2 $M_{\rm J}$ in NEAR bands at 1.5$''$ from the central star. If the age assumed is 1 Gyr, we reach even lower mass limits of 1.7 $M_{\rm J}$ in NaCo L' and 3.5 $M_{\rm J}$ in NEAR bands, at the same separation. However, based on the dynamical mass estimate (3.25 $M_{\rm J}$) and ephemerides from astrometry and RV, we find that the non-detection of the planet in these observations puts a constraint of 2 Gyr on the lower age limit of the system. NaCo offers the highest sensitivity to the planetary companion in these observations, but the combination with the NEAR wavelength range adds a considerable degree of robustness against uncertainties in the atmospheric models. This underlines the benefits of including a broad set of wavelengths for detection and characterisation of exoplanets in direct imaging studies.

Download/Website: `http://arxiv.org/abs/2105.09773`

Contact: `gayathri.viswanath@astro.su.se`

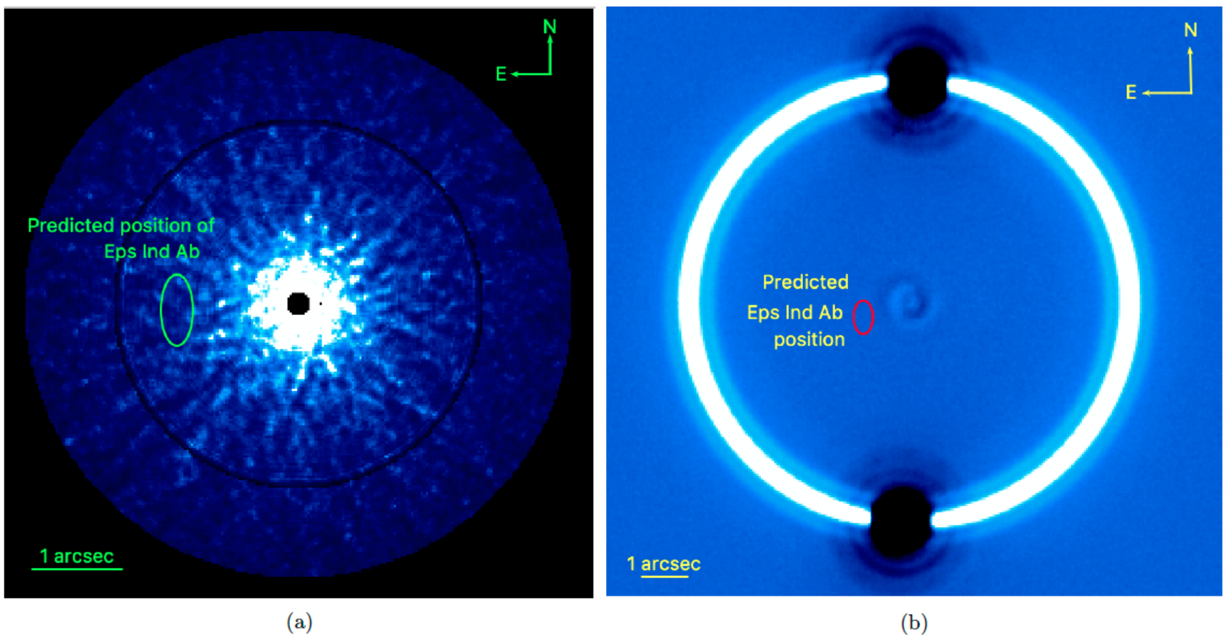

Figure 4: The final detection probability map from NaCo (panel a) and the final reduced image from NEAR observations (panel b) of ϵ Ind A. The predicted position of the companion at the time of observation, along with the 1σ uncertainty in position, as inferred from the best-fit ephemerides, based on radial velocity and astrometry data (Feng et al. 2019), is shown as an ellipse. The NaCo image was reduced using a combination of RSM (Dahlqvist et al. 2021) and modified LOCI subtraction applied at suitable separations while the NEAR image was reduced using the circular profile subtraction technique (Lafreniére et al. 2007). No companions were detected in both images.

The First Dynamical Mass Measurement in the HR 8799 System

G.M. Brandt[1], *T.D. Brandt*[1], *T. Dupuy*[2], *D. Michalik*[3], *G.-D. Marleau*[4,5,6]

[1] Department of Physics, University of California, Santa Barbara, Santa Barbara, CA 93106, USA
[2] Institute for Astronomy, University of Edinburgh, Royal Observatory, Blackford Hill, Edinburgh, EH9 3HJ, UK
[3] European Space Agency (ESA), European Space Research and Technology Centre (ESTEC), Keplerlaan 1, 2201 AZ Noordwijk, The Netherlands
[4] Institut für Astronomie und Astrophysik, Universität Tübingen, Auf der Morgenstelle 10, 72076 Tübingen, Germany
[5] Physikalisches Institut, Universität Bern, Gesellschaftsstr. 6, 3012 Bern, Switzerland
[6] Max-Planck-Institut für Astronomie, Königstuhl 17, 69117 Heidelberg, Germany

ApJ Letters, Accepted: arXiv:2105.12820

HR 8799 hosts four directly imaged giant planets, but none has a mass measured from first principles. We present the first dynamical mass measurement in this planetary system, finding that the innermost planet HR 8799 e has a mass of $9.6^{+1.9}_{-1.8}$. This mass results from combining the well-characterized orbits of all four planets with a new astrometric acceleration detection (5σ) from the *Gaia* EDR3 version of the *Hipparcos-Gaia* Catalog of Accelerations. We find with 95% confidence that HR 8799 e is below $13\,M_{\rm Jup}$, the deuterium-fusing mass limit. We derive a hot-start cooling age of 42^{+24}_{-16} Myr for HR 8799 e that agrees well with its hypothesized membership in the Columba association but is also consistent with an alternative suggested membership in the β Pictoris moving group. We exclude the presence of any additional $>5\ M_{\rm Jup}$ planets interior to HR 8799 e with semi-major axes between ≈3–16 au. We provide proper motion anomalies and a matrix equation to solve for the mass of any of the planets of HR 8799 using only mass ratios between the planets.

Download/Website: `https://arxiv.org/pdf/2105.12820.pdf`

Contact: `gmbrandt@physics.ucsb.edu`

Magma ocean evolution of the TRAPPIST-1 planets

P. Barth[1,2,3], *L. Carone*[3], *R. Barnes*[4,5], *L. Noack*[6], *P. Mollière*[3], *Th. Henning*[3]

[1] Centre for Exoplanet Science, University of St Andrews, North Haugh, St Andrews, KY169SS, UK
[2] SUPA, School of Physics & Astronomy, University of St Andrews, North Haugh, St Andrews, KY169SS, UK
[3] Max Planck Institute for Astronomy, Königstuhl 17, 69117 Heidelberg, Germany
[4] Astronomy Department, University of Washington, Box 3515580, Seattle, WA 98195, USA
[5] NASA Virtual Planetary Laboratory Lead Team, USA
[6] Freie Universität Berlin, Institute of Geological Sciences, Malteserstr. 74-100, 12249 Berlin, Germany

Astrobiology, in press (arXiv:2008.09599)

Recent observations of the potentially habitable planets TRAPPIST-1 e, f, and g suggest that they possess large water mass fractions of possibly several tens of wt% of water, even though the host star's activity should drive rapid atmospheric escape. These processes can photolyze water, generating free oxygen and possibly desiccating the planet. After the planets formed, their mantles were likely completely molten with volatiles dissolving and exsolving from the melt In order to understand these planets and prepare for future observations, the magma ocean phase of these worlds must be understood. To simulate these planets, we have combined existing models of stellar evolution, atmospheric escape, tidal heating, radiogenic heating, magma ocean cooling, planetary radiation, and water-oxygen-iron geochemistry. We present `MagmOc`, a versatile magma ocean evolution model, validated against the rocky Super-Earth GJ 1132b and early Earth. We simulate the coupled magma ocean-atmospheric evolution of TRAPPIST-1 e, f, and g for a range of tidal and radiogenic heating rates, as well as initial water contents between 1 and 100 Earth oceans. We also reanalyze the structures of these planets and find they have water mass fractions of 0–0.23, 0.01–0.21, and 0.11–0.24 for planets e, f, and g, respectively. Our model does not make a strong prediction about the water and oxygen content of the atmosphere of TRAPPIST-1 e at the time of mantle solidification. In contrast, the model predicts that TRAPPIST-1 f and g would have a thick steam atmosphere with a small amount of oxygen at that stage. For all planets that we investigated, we find that only $3-5\%$ of the initial water will be locked in the mantle after the magma ocean solidified.

Download/Website: `https://arxiv.org/abs/2008.09599`

Contact: `pb94@st-andrews.ac.uk`

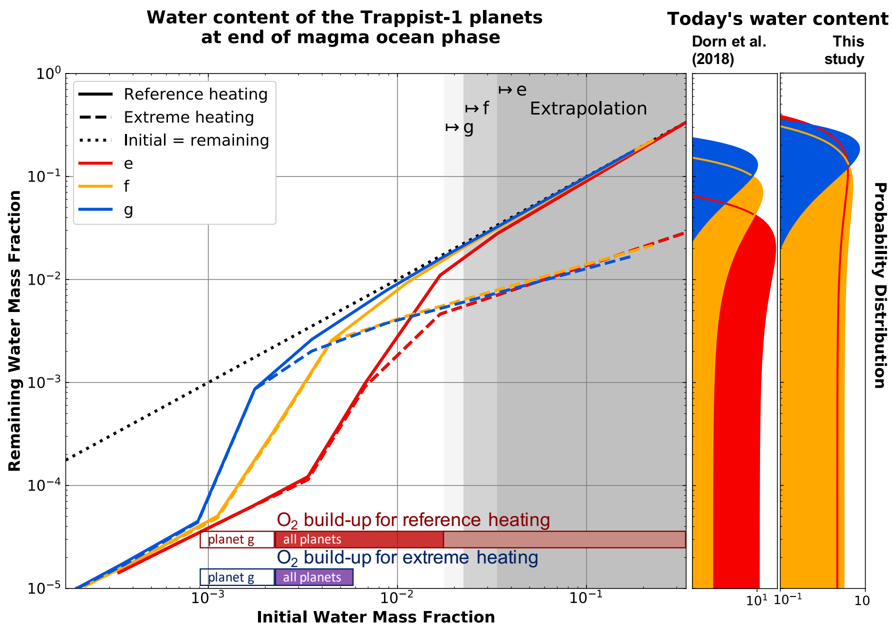

Figure 5: Final water content of the planets TRAPPIST-1 e, f, g with a pure steam atmosphere for different initial water mass fractions and two different heating scenarios: Reference (solid): Earth abundances of radioactive isotopes and low eccentricities; and extreme (dashed): 1000 times Earth abundance of ^{40}K and fixed eccentricities ($e = 0.1$). Simulations for all planets with 100% steam atmospheres (red, yellow, blue). Red and purple bars indicate range of initial water fractions that lead to abiotic O_2 build-up. Values for initial water fractions $> 20 - 30$ wt% (grey area) are extrapolations on the assumption that solidification times do not increase with more water. Probability distributions show the current estimates for water content of the TRAPPIST-1 planets by Dorn et al. (2018) and those calculated with the interior structure model by Noack et al. (2016) with 1σ error range for mass and radius.

HADES RV programme with HARPS-N at TNG XIV. A candidate super-Earth orbiting the M-dwarf GJ 9689 with a period close to half the stellar rotation period

J. Maldonado[1], A. Petralia[1], M. Damasso [2], M. Pinamonti [2], G. Scandariato [3], E. González-Álvarez [4], L. Affer [1], G. Micela [1], A. F. Lanza [3], G. Leto [3], E. Poretti [5,6], A. Sozzetti [2], M. Perger [7,8], P. Giacobbe [2], R. Zanmar Sánchez [3], A. Maggio [1], J. I. González Hernández [9,10], R. Rebolo [9,10], I. Ribas [7,8], A. Suárez-Mascareño [9,10], B. Toledo-Padrón [9,10], A. Bignamini [11], E. Molinari [12], E. Covino [13], R. Claudi [14], S. Desidera [14], E. Herrero [7,8], J. C. Morales [7,8], I. Pagano [3], G. Piotto [15]

[1] INAF - Osservatorio Astronomico di Palermo, Piazza del Parlamento 1, 90134 Palermo, Italy
[2] INAF - Osservatorio Astrofisico di Torino, Via Osservatorio 20, 10025 Pino Torinese, Italy
[3] INAF - Osservatorio Astrofisico di Catania, Via S. Sofia 78, 95123, Catania, Italy
[4] Centro de Astrobiología (CSIC-INTA), Carretera de Ajalvir km 4, 28850 Torrejón de Ardoz, Madrid, Spain
[5] Fundación Galileo Galilei-INAF, Rambla José Ana Fernández Pérez 7, 38712 Breña Baja, TF, Spain
[6] INAF - Osservatorio Astronomico di Brera, Via E. Bianchi 46, 23807 Merate, Italy
[7] Institut de Ciéncies de l'Espai (ICE, CSIC), Campus UAB, Carrer de Can Magrans s/n, 08193 Bellaterra, Spain
[8] Institut d'Estudis Espacials de Catalunya (IEEC), 08034 Barcelona, Spain
[9] Instituto de Astrofísica de Canarias, 38205 La Laguna, Tenerife, Spain
[10] Universidad de La Laguna, Departamento Astrofísica, 38206 La Laguna, Tenerife, Spain
[11] INAF - Osservatorio Astronomico di Trieste, Via Tiepolo 11, 34143 Trieste, Italy
[12] INAF - Osservatorio Astronomico di Cagliari & REM, Via della Scienza, 5, 09047 Selargius CA, Italy
[13] INAF - Osservatorio Astronomico di Capodimonte, Salita Moiariello 16, 80131 Napoli, Italy
[14] INAF - Osservatorio Astronomico di Padova, vicolo dell'Osservatorio 5, 35122 Padova, Italy
[15] Dipartimento di Fisica e Astronomia Galileo Galilei, Vicolo Osservatorio 3, 35122 Padova, Italy

Astronomy & Astrophysics, in press, arXiv:2105.06155

Context. It is now well-established that small, rocky planets are common around low-mass stars. However, the detection of such planets is challenged by the short-term activity of the host stars.
Aims. The HArps-N red Dwarf Exoplanet Survey (HADES) program is a long-term project at the Telescopio Nazionale Galileo aimed at the monitoring of nearby, early-type, M dwarfs, using the HARPS-N spectrograph to search for small, rocky planets.
Methods. A total of 174 HARPS-N spectroscopic observations of the M0.5V-type star GJ 9689 taken over the past seven years have been analysed. We combined these data with photometric measurements to disentangle signals related to the stellar activity of the star from possible Keplerian signals in the radial velocity data. We run an MCMC analysis, applying Gaussian Process regression techniques to model the signals present in the data.
Results. We identify two periodic signals in the radial velocity time series, with periods of 18.27 d, and 39.31 d. The analysis of the activity indexes, photometric data, and wavelength dependency of the signals reveals that the 39.31 d signal corresponds to the stellar rotation period. On the other hand, the 18.27 d signal shows no relation to any activity proxy or the first harmonic of the rotation period. We, therefore, identify it as a genuine Keplerian signal. The best-fit model describing the newly found planet, GJ 9689 b, corresponds to an orbital period $P_b = 18.27 \pm 0.01$ d, and a minimum mass $M_P \sin i = 9.65 \pm 1.41\ M_\oplus$.

Download/Website: `https://arxiv.org/abs/2105.06155`

Contact: `jesus.maldonado@inaf.it`

Constraints on the nearby exoplanet ϵ Ind Ab from deep near/mid-infrared imaging limits

G. Viswanath[1], M. Janson[1], C.-H. Dahlqvist[2], D. Petit dit de la Roche[3], M. Samland[1], J. Girard[4], P. Pathak[3], M. Kasper[3], F. Feng[5], M. Meyer[6], A. Boehle[7], S. P. Quanz[7], H.R.A. Jones[8], O. Absil[2], W. Brandner[9], A.-L. Maire[2], R. Siebenmorgen[3], M. Sterzik[3] & E. Pantin[10]

[1] Department of Astronomy, Stockholm University, AlbaNova University Center, 10691 Stockholm, Sweden
[2] STAR Institute, Université de Liège, Allée du Six Aout 19c, 4000 Liège, Belgium
[3] European Southern Observatory, Karl-Schwartzschild-Strasse 2, 85748 Garching, Germany
[4] Space Telescope Science Institute, 3700 San Martin Dr, 21218 Baltimore, MD, USA
[5] Department of Terrestrial Magnetism, Carnegie Institution of Washington, 5241 Broad Branch Road, NW, 20015 Washington, DC, USA
[6] Department of Astronomy, University of Michigan, 311 West Hall,1085 S. University Avenue, 48109 Ann Arbor, MI, USA
[7] ETH Zurich, Institute for Particle Physics and Astrophysics, Wolfgang-Pauli-Strasse 27, 8093 Zurich, Switzerland
[8] Centre for Astrophysics Research, University of Hertfordshire, College Lane, AL10 9AB, Hatfield, UK
[9] Max Planck Institute for Astronomy, Königstuhl 17, 69117 Heidelberg, Germany
[10] AIM, CEA, CNRS, Université Paris-Saclay, Université Paris Diderot, Sorbonne Paris Cité, Gif-sur-Yvette, France

Astronomy & Astrophysics, in press (arXive-Code 2105.09773)

The past decade has seen increasing efforts in detecting and characterising exoplanets by high contrast imaging in the near/mid-infrared, which is the optimal wavelength domain for studying old, cold planets. In this work, we present deep AO imaging observations of the nearby Sun-like star ϵ Ind A with NaCo (L') and NEAR (10-12.5 microns) instruments at VLT, in an attempt to directly detect its planetary companion whose presence has been indicated from radial velocity (RV) and astrometric trends. We derive brightness limits from the non-detection of the companion with both instruments, and interpret the corresponding sensitivity in mass based on both cloudy and cloud-free atmospheric and evolutionary models. For an assumed age of 5 Gyr for the system, we get detectable mass limits as low as 4.4 $M_{\rm J}$ in NaCo L' and 8.2 $M_{\rm J}$ in NEAR bands at 1.5$''$ from the central star. If the age assumed is 1 Gyr, we reach even lower mass limits of 1.7 $M_{\rm J}$ in NaCo L' and 3.5 $M_{\rm J}$ in NEAR bands, at the same separation. However, based on the dynamical mass estimate (3.25 $M_{\rm J}$) and ephemerides from astrometry and RV, we find that the non-detection of the planet in these observations puts a constraint of 2 Gyr on the lower age limit of the system. NaCo offers the highest sensitivity to the planetary companion in these observations, but the combination with the NEAR wavelength range adds a considerable degree of robustness against uncertainties in the atmospheric models. This underlines the benefits of including a broad set of wavelengths for detection and characterisation of exoplanets in direct imaging studies.

Download/Website: `http://arxiv.org/abs/2105.09773`

Contact: `gayathri.viswanath@astro.su.se`

Ionization and transport in partially ionized multicomponent plasmas: Application to atmospheres of hot Jupiters

S. Kumar[1], *A.J. Poser*[1], *M. Schöttler*[1], *U. Kleinschmidt*[1], *W. Dietrich*[2], *J. Wicht*[2], *M. French*[1], *R. Redmer*[1]

[1] Universität Rostock, Institut für Physik, D-18051 Rostock, Germany
[2] Max-Planck-Institut für Sonnensystemforschung, D-37077 Göttingen, Germany

Physical Review E, published (DOI:10.1103/PhysRevE.103.063203)

We study ionization and transport processes in partially ionized multicomponent plasmas. The plasma composition is calculated via a system of coupled mass action laws. The electronic transport properties are determined by the electron-ion and electron-neutral transport cross sections. The influence of electron-electron scattering is considered via a correction factor to the electron-ion contribution. Based on this data, the electrical and thermal conductivity as well as the Lorenz number are calculated. For the thermal conductivity, we consider also the contributions of the translational motion of neutral particles and of the dissociation, ionization, and recombination reactions. We apply our approach to a partially ionized plasma composed of hydrogen, helium, and a small fraction of metals (Li, Na, Ca, Fe, K, Rb, Cs) as typical for hot Jupiter atmospheres. We present results for the plasma composition and the transport properties as function of density and temperature and then along typical P-T profiles for the outer part of the hot Jupiter HD 209458b. The electrical conductivity profile allows revising the Ohmic heating power related to the fierce winds in the planet's atmosphere. We show that the higher temperatures suggested by recent interior models could boost the conductivity and thus the Ohmic heating power to values large enough to explain the observed inflation of HD 209458b.

Download/Website: `https://arxiv.org/abs/2106.03092`

Contact: `sandeep.kumar@uni-rostock.de`

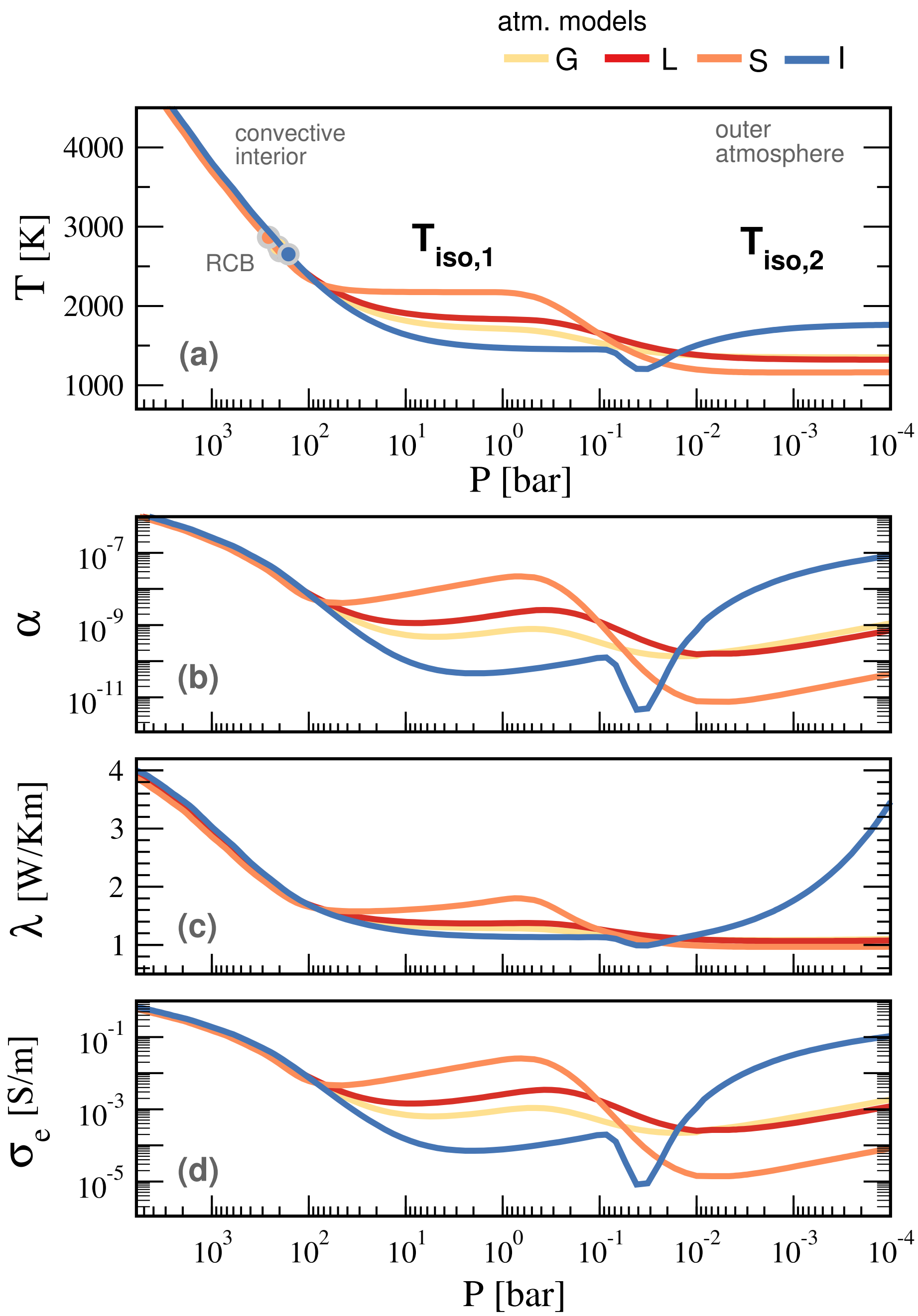

Figure 6: Temperature T, ionization degree α, thermal conductivity λ, and electrical conductivity σ_e for different planetary interior models along the pressure axis of HD 209458b, specifically, for the four atmospheric models used in this work: G (yellow), L (red), and S (orange) as well as one with an inversion, I (blue). Circles in the temperature profile represent the location of the radiative-convective boundary (RCB).

Survival of exomoons around exoplanets

V. Dobos[1,2,3], *S. Charnoz*[4], *A. Pál*[2], *A. Roque-Bernard*[4], *Gy. M. Szabó*[3,5]

[1] Kapteyn Astronomical Institute, University of Groningen, 9747 AD, Landleven 12, Groningen, The Netherlands
[2] Konkoly Thege Miklós Astronomical Institute, Research Centre for Astronomy and Earth Sciences, Eötvös Loránd Research Network (ELKH), 1121, Konkoly Thege Miklós út 15-17, Budapest, Hungary
[3] MTA-ELTE Exoplanet Research Group, 9700, Szent Imre h. u. 112, Szombathely, Hungary
[4] Université de Paris, Institut de Physique du Globe de Paris, CNRS, F-75005 Paris, France
[5] ELTE Eötvös Loránd University, Gothard Astrophysical Observatory, Szombathely, Szent Imre h. u. 112, Hungary

Publications of the Astronomical Society of the Pacific, in press (arXiv:2105.12040)

Despite numerous attempts, no exomoon has firmly been confirmed to date. New missions like CHEOPS aim to characterize previously detected exoplanets, and potentially to discover exomoons. In order to optimize search strategies, we need to determine those planets which are the most likely to host moons.
We investigate the tidal evolution of hypothetical moon orbits in systems consisting of a star, one planet and one test moon. We study a few specific cases with ten billion years integration time where the evolution of moon orbits follows one of these three scenarios: (1) “locking”, in which the moon has a stable orbit on a long time scale ($\gtrsim 10^9$ years); (2) “escape scenario” where the moon leaves the planet’s gravitational domain; and (3) “disruption scenario”, in which the moon migrates inwards until it reaches the Roche lobe and becomes disrupted by strong tidal forces.
Applying the model to real cases from an exoplanet catalogue, we study the long-term stability of moon orbits around known exoplanets. We calculate the survival rate which is the fraction of the investigated cases when the moon survived around the planet for the full integration time (which is the age of the star, or if not known, then the age of the Sun).The most important factor determining the long term survival of an exomoon is the orbital period of the planet. For the majority of the close-in planets (< 10 days orbital periods) there is no stable orbit for moons. Between 10 and 300 days we find a transition in survival rate from about zero to 70%.
Our results give a possible explanation to the lack of successful exomoon discoveries for close-in planets. Tidal instability causes moons to escape or being tidally disrupted around close-in planets which are mostly favoured by current detection techniques.

Download/Website: `https://ui.adsabs.harvard.edu/abs/2021arXiv210512040D/abstract`

Contact: `vera.dobos@rug.nl`

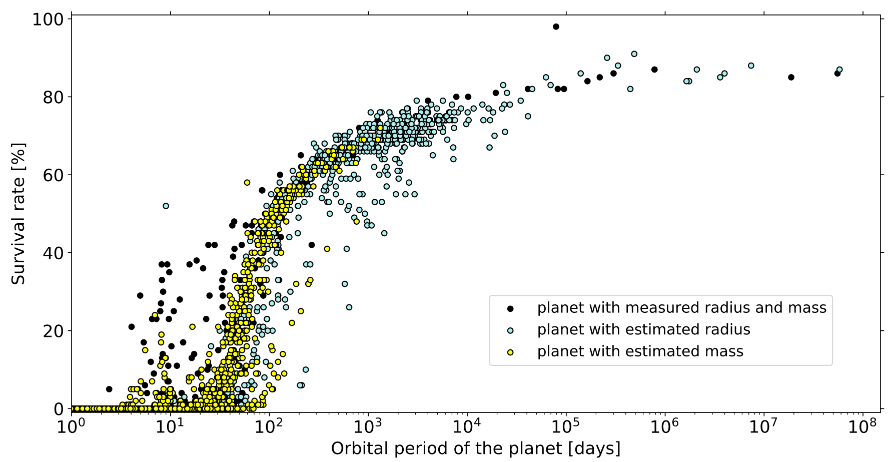

Figure 7: Survival rate of moons around known exoplanets as function of the planet orbital period. Black coloured dots: planets with known radius and mass data. Teal coloured dots: planets without known radius data, for these, their radius was estimated based on their measured mass (or $M_{\mathrm{p}} \sin i$). Yellow coloured dots: Planets without known mass data, for these the masses were estimated from their measured radius.

The CARMENES search for exoplanets around M dwarfs. Mapping stellar activity indicators across the M dwarf domain

M. Lafarga[1,2,3], I. Ribas[1,2], A. Reiners[4], A. Quirrenbach[5], P. J. Amado[6], J. A. Caballero[7], M. Azzaro[8], V. J. S. Béjar[9,10], M. Cortés-Contreras[7], S. Dreizler[4], A. P. Hatzes[11], Th. Henning[12], S. V. Jeffers[13], A. Kaminski[5], M. Kürster[12], D. Montes[14], J. C. Morales[1,2], M. Oshagh[9,10], C. Rodríguez-López[6], P. Schöfer[4], A. Schweitzer[15], M. Zechmeister[4]

[1] Institut de Ciències de l'Espai (ICE, CSIC), Campus UAB, C/ de Can Magrans s/n, 08193 Cerdanyola del Vallès, Spain
[2] Institut d'Estudis Espacials de Catalunya (IEEC), C/ Gran Capità 2-4, 08034 Barcelona, Spain
[3] Department of Physics, University of Warwick, Gibbet Hill Road, Coventry CV4 7AL, United Kingdom
[4] Institut für Astrophysik, Georg-August-Universität, Friedrich-Hund-Platz 1, 37077 Göttingen, Germany
[5] Landessternwarte, Zentrum für Astronomie der Universität Heidelberg, Königstuhl 12, 69117 Heidelberg, Germany
[6] Instituto de Astrofísica de Andalucía (IAA-CSIC), Glorieta de la Astronomía s/n, 18008 Granada, Spain
[7] Centro de Astrobiología (CSIC-INTA), ESAC, Camino Bajo del Castillo s/n, 28692 Villanueva de la Cañada, Madrid, Spain
[8] Centro Astronónomico Hispano Alemán, Observatorio de Calar Alto, Sierra de los Filabres, E-04550 Gérgal, Spain
[9] Instituto de Astrofísica de Canarias, Vía Láctea s/n, 38205 La Laguna, Tenerife, Spain
[10] Departamento de Astrofísica, Universidad de La Laguna, 38026 La Laguna, Tenerife, Spain
[11] Thüringer Landessternwarte Tautenburg, Sternwarte 5, 07778 Tautenburg, Germany
[12] Max-Planck-Institut für Astronomie, Königstuhl 17, 69117 Heidelberg, Germany
[13] Max-Planck-Institut für Sonnensystemforschung, D-37077, Göttingen, Germany
[14] Departamento de Física de la Tierra y Astrofísica & IPARCOS-UCM (Instituto de Física de Partículas y del Cosmos de la UCM),
[15] Facultad de Ciencias Físicas, Universidad Complutense de Madrid, 28040 Madrid, Spain
[16] Hamburger Sternwarte, Gojenbergsweg 112, 21029 Hamburg, Germany

Astronomy & Astrophysics, in press (arXiv:2105.13467)

Stellar activity poses one of the main obstacles for the detection and characterisation of small exoplanets around cool stars, as it can induce radial velocity (RV) signals that can hide or mimic the presence of planetary companions. Several indicators of stellar activity are routinely used to identify activity-related signals in RVs, but not all indicators trace exactly the same activity effects, nor are any of them always effective in all stars.

We evaluate the performance of a set of spectroscopic activity indicators for M dwarf stars with different masses and activity levels with the aim of finding a relation between the indicators and stellar properties.

In a sample of 98 M dwarfs observed with CARMENES, we analyse the temporal behaviour of RVs and nine spectroscopic activity indicators: cross-correlation function (CCF) full-width-at-half-maximum (FWHM), CCF contrast, CCF bisector inverse slope (BIS), RV chromatic index (CRX), differential line width (dLW), and indices of the chromospheric lines Hα and calcium infrared triplet.

A total of 56 stars of the initial sample show periodic signals related to activity in at least one of these ten parameters. RV is the parameter for which most of the targets show an activity-related signal. CRX and BIS are effective activity tracers for the most active stars in the sample, especially stars with a relatively high mass, while for less active stars, chromospheric lines perform best. FWHM and dLW show a similar behaviour in all mass and activity regimes, with the highest number of activity detections in the low-mass, high-activity regime. Most of the targets for which we cannot identify any activity-related signals are stars at the low-mass end of the sample (i.e. with the latest spectral types). These low-mass stars also show the lowest RV scatter, which indicates that ultracool M dwarfs could be better candidates for planet searches than earlier types, which show larger RV jitter.

Our results show that the spectroscopic activity indicators analysed behave differently, depending on the mass and activity level of the target star. This underlines the importance of considering different indicators of stellar activity when studying the variability of RV measurements. Therefore, when assessing the origin of an RV signal, it is critical to take into account a large set of indicators, or at least the most effective ones considering the characteristics of the star, as failing to do so may lead to false planet claims.

Download/Website: `https://arxiv.org/abs/2105.13467`

Contact: `marina.lafarga-magro@warwick.ac.uk`

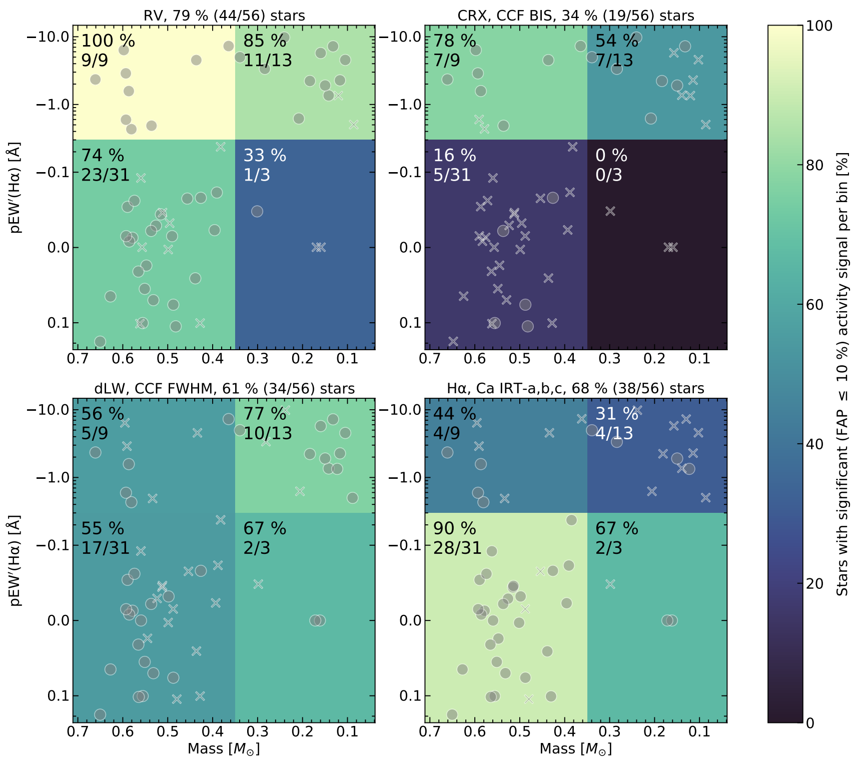

Figure 8: Number of stars with activity detections in RV (*top left*), CRX and BIS (*top right*), dLW and FWHM (*bottom left*), and chromospheric lines Hα and Ca IRT-a,b,c (*bottom right*). Each panel shows the average activity level of the stars (measured from their pEW'(Hα), y-axis, from less to more active) as a function of their mass (x-axis, from high to low mass). The stars are divided into four bins, depending on their average activity level and mass. The colours of each bin indicate the number of stars (in percentage) for which we found an activity-related signal with FAP $\leq 10\,\%$. The text in each bin also shows that percentage, together with the absolute number of stars that have such a detection. The title of each panel shows the same numbers, but for all the stars (i.e. for the four bins together). Grey data points indicate the position of the 56 stars considered in the activity-mass space, with large circles representing the stars with a detection in the specific indicator, and crosses, stars with no detection.

The New Generation Planetary Population Synthesis (NGPPS). VI. Introducing KOBE: Kepler Observes Bern Exoplanets. Theoretical perspectives on the architecture of planetary systems: Peas in a pod

Lokesh Mishra[1,2]*, Yann Alibert*[1]*, Adrien Leleu*[2]*, Alexandre Emsenhuber*[1,3] *, Christoph Mordasini*[1]*, Remo Burn*[1]*, Stéphane Udry*[2] *, Willy Benz* [1]

[1] Institute of Physics, University of Bern, Gesellschaftsstrasse 6, 3012 Bern, Switzerland
[2] Geneva Observatory, University of Geneva, Chemin Pegasi 51b, 1290 Versoix, Switzerland
[3] Lunar and Planetary Laboratory, University of Arizona, 1629 E. University Blvd., Tucson, AZ 85721, USA

submitted to A&A, arXiv:2105.12745

Context. Observations of exoplanets indicate the existence of several correlations in the architecture of planetary systems. Exoplanets within a system tend to be of similar size and mass, evenly spaced and often ordered in size and mass. Small planets are frequently packed in tight configurations, while large planets often have wider orbital spacing. Together, these correlations are called the peas in a pod trends in the architecture of planetary systems.
Aims. In this paper, these trends are investigated in theoretically simulated planetary systems and compared with observations. Whether these correlations emerge from astrophysical processes or the detection biases of the transit method is examined.
Methods. Using the Generation III Bern Model, synthetic planetary systems are simulated. KOBE, a new computer code, simulates the geometrical limitations of the transit method and applies the detection biases and completeness of the Kepler survey. This allows simulated planetary systems to be confronted with observations.
Results. The architecture of synthetic planetary systems, observed via KOBE, show the peas in a pod trends in good agreement with observations. These correlations are also present in the theoretical underlying population, from the Bern Model, indicating that these trends are probably of astrophysical origin.
Conclusions. Physical processes, involved in planet formation, are responsible for the emergence of evenly spaced planets with similar sizes and masses. The size/mass similarity trends are primordial and originate from the oligarchic growth of protoplanetary embryos and the uniform growth of planets at early times. Later stages in planet formation allows planets, within a system, to grow at different rates thereby decreasing these correlations. The spacing and packing correlations are absent at early times and arise from dynamical interactions.

Download/Website: `https://ui.adsabs.harvard.edu/abs/2021arXiv210512745M/abstract`

Contact: `exomishra@gmail.com`

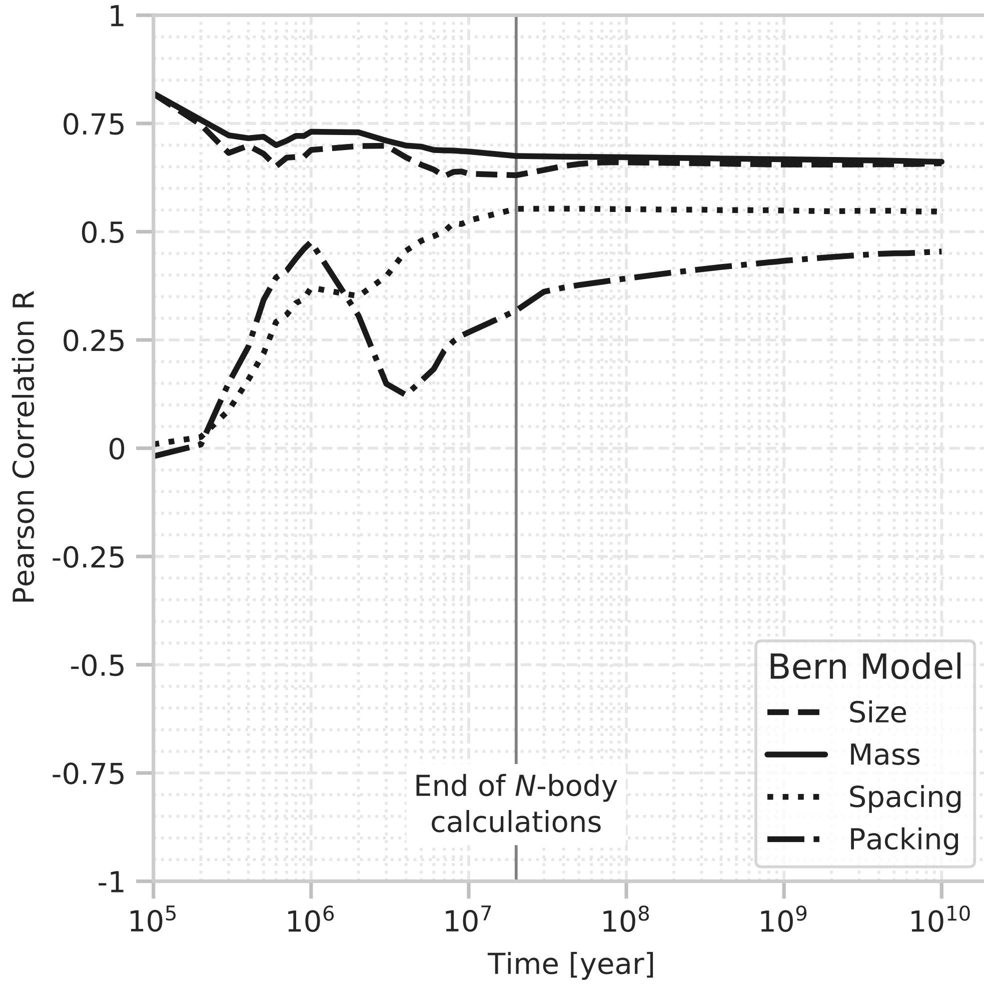

Figure 9: The evolution of the peas in a pod trends. The vertical solid line represents the end of N-body calculations. The plot shows that dynamical interactions during the formation stage play a vital role in shaping the architecture of planetary systems. While the size/mass trends are present at very early times, the spacing and packing trends are almost absent at early times.

3 Jobs and Positions

Postdoctoral position in adaptive optics for the RISTRETTO project

Thierry Fusco[1] *& Christophe Lovis*[2]
[1] Laboratoire d'Astrophysique de Marseille, 38 rue Frédéric Joliot-Curie, 13388 Marseille Cedex 13, France
[2] Department of Astronomy, University of Geneva, Chemin Pegasi 51b, 1290 Versoix, Switzerland

Marseille & Geneva, Fall 2021

The Laboratoire d'Astrophysique de Marseille (LAM, France) and the Geneva Observatory (Switzerland) are opening a joint postdoctoral position in the context of the RISTRETTO project (http://ristretto.astro.unige.ch). RISTRETTO is a novel instrument that will combine high spectral resolution and high-contrast coronagraphy to directly characterize nearby exoplanets in reflected light for the first time. It will be proposed as a visitor instrument for ESO VLT and will serve as a pathfinder for similar instrumentation at the ELT (HIRES, PCS).

The successful candidate will work on the design and construction of the RISTRETTO adaptive optics (AO) system, in particular the development of the wavefront sensor for the fast 2nd-stage AO loop.

More information can be found at: https://www.lam.fr/IMG/pdf/postdoc_innovativewfs_ristretto.pdf

The deadline for submitting applications is August 1st, 2021.
For any inquiries please contact Dr. Thierry Fusco or Prof. Christophe Lovis.

Download/Website: `https://www.lam.fr/IMG/pdf/postdoc_innovativewfs_ristretto.pdf`
Contact: `thierry.fusco@lam.fr, christophe.lovis@unige.ch`

4 Announcements

NASA ExoPAG 24 Meeting

Michael R. Meyer[1] *(for the ExoPAG Executive Committee)*
[1] Department of Astronomy, The University of Michigan, Ann Arbor, MI, USA

Virtual, June 24, from 12:00 to 17:00 EDT

NASA's Exoplanet Exploration Program Analysis Group (ExoPAG) will hold its twenty-fourth meeting on June 24th, 2021. This will be a fully virtual meeting. ExoPAG meetings offer an opportunity to participate in discussions of scientific and technical issues in exoplanet exploration, and a forum for community input on the prioritization of activities in NASA's Exoplanet Exploration Program (ExEP). All interested members of the space science community are invited to attend and participate. Suggestions for topics and/or speakers at the meeting along these lines are welcome. The agenda will include programmatic updates of relevance for the ExoPAG community, science updates and descriptions of exciting new capabilities, updates from ongoing ExoPAG activities including long-term Science Interest Groups (SIGs) and more focussed short-term activities carried out by Science Analysis Groups (SAGs), as well as our regular business meeting. Community Members can also propose ideas for future ExoPAG findings to be discussed by the group, as well as propose suggestions for the ExoPAG that will be discussed by the Executive Committee and can subsequently be discussed by the full ExoPAG. Please note that we also plan to hold a community forum later in the summer to review the exoplanet related recommendations of the Decadal Survey on Astronomy and Astrophysics (2020) after its release.

Download/Website: `https://exoplanets.nasa.gov/exep/events/347/exopag-24-virtual-meeting/`

Contact: `mrmeyer@umich.edu`

Cloud Nine Con

Jo Barstow, Laura Kreidberg, Caroline Morley, Diana Powell, Johanna Vos, Xinting Yu, Paul Mollière

Virtual event, 11 August 2021

We are excited to announce Cloud Nine Con (CNC), a half-day online event on all things clouds! CNC is an interdisciplinary event focussing on clouds in exoplanets and brown dwarfs. Topics include observations, spectral retrievals, atmospheric modeling, cloud microphysical modeling, and lab measurements. We have a line-up of excellent keynote speakers, with always two domain experts sharing a presentation.

CNC will take place on August 11, 2021, starting at 4 pm CEST (UTC+1: 3 pm, EDT: 10 am, PDT: 7 am). In addition to keynotes, we are also soliciting talk abstracts to give short 10-minute (including questions) presentations.

To register (and to submit an abstract if desired) please visit http://bit.ly/CloudNine2021
Abstract registration closes on July 2 at midnight (CEST).

Best,
the CNC SOC

Invited speakers:

- Hannah Wakeford
- Daniel Apai
- Peter Gao
- Sarah Moran
- Ryan MacDonald
- Ben Burningham
- Emily Rauscher
- Xianyu Tan

Download/Website: `http://bit.ly/CloudNine2021`
Contact: `molliere@mpia.de`

5 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

System-level fractionation of carbon from disk and planetesimal processing by *Tim Lichtenberg* – talk/358
Redox hysteresis of super-Earth exoplanets from magma ocean circulation by *Tim Lichtenberg* – talk/359

6 Exoplanet Archive

May 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, June 15, 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`).

May 27, 2021

New Contributed Data: MARGE-HOMER (D'oh!)

The archive has added a new synthetic spectra data set and machine learning model to help users model atmospheric observations and retrieve atmospheric properties. The release consists of two software packages: MARGE and HOMER (`https://bit.ly/3zrROyH`).

The **Machine learning Algorithm for Radiative transfer of Generated Exoplanets** (MARGE) is a Python package that trains a user-specified neural network architecture to approximate a deterministic process, based on some data generated by a forward model.

The **Helper Of My Eternal Retrievals** (HOMER) is a Python package that performs a Bayesian inverse inference using a MARGE-trained model.

The archive hosts the reproducible research compendium (RRC) of Himes et al. (2021) (`https://bit.ly/3vcFpLq`). The RRC includes 3.5 million emission spectra of synthetic hot Jupiters based on 12 free parameters, a trained neural network (NN) model that approximates the data set, the software and input files used to generate the data set and train the NN model, and more.

Read the documentation for further details and to access the data (`https://bit.ly/3zrROyH`).

May 20, 2021

Six Planets Added, Including CFHTWIR-Oph 98 b

Among the six planets added this week is CFHTWIR-Oph 98 b, a giant planet orbiting a very low-mass star/brown dwarf that was directly imaged by the Hubble Space Telescope. The central "star" is only 15 MJup and twice the mass of the planetary companion. Check out the host's cool (as in low temperature) graphic on its System Overview page! (`https://bit.ly/3vdW8xO`)

The other new planets are: HIP 56640 b, HIP 75092 b, HIP 90988 b, HIP 114933 b, and TOI-269 b. We've also added new data for 11 previously published planets. See the new data in the Planetary Systems Table and its companion table, Planetary Systems Composite Parameters, which offers a more complete table of planet parameters combined from multiple references and calculations.

As a reminder, the Confirmed Planets, Extended Planet Data, and Composite Parameters tables have been retired and are no longer updated. Please use the Planetary Systems tables for the most current published system data. To recap the recent the changes to the archive's tools and services, please see Developing a More Integrated Exoplanet Archive (`https://bit.ly/3jLgrhl`) and the Archive 2.0 Release Notes (`https://bit.ly/3rVQPTx`).

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

Contact: `mharbut@caltech.edu`

7 As seen on astro-ph

The following list contains exoplanet related entries appearing on astro-ph in May 2021.

May 2021

astro-ph/2105.00012: **ACCESS & LRG-BEASTS: a precise new optical transmission spectrum of the ultrahot Jupiter WASP-103b** by *James Kirk et al.*

astro-ph/2105.00034: **Exomoons in Systems with a Strong Perturber: Applications to α Cen AB** by *Billy Quarles et al.*

astro-ph/2105.00142: **The sub-Neptune desert and its dependence on stellar type: Controlled by lifetime X-ray irradiation** by *George D. McDonald, Laura Kreidberg, Eric Lopez*

astro-ph/2105.00346: **Shellspec39 – a tool for modelling the spectra, light curves, and images of interacting binaries and exoplanets** by *Jan Budaj*

astro-ph/2105.00456: **Forming pressure-traps at the snow-line to isolate isotopic reservoirs in the absence of a planet** by *Sébastien Charnoz et al.*

astro-ph/2105.00626: **Formation of eccentric gas discs from sublimating or partially disrupted asteroids orbiting white dwarfs** by *David Trevascus et al.*

astro-ph/2105.00753: **True Polar Wander on Dynamic Planets: Approximative Methods vs. Full Solution** by *Vojtěch Patočka*

astro-ph/2105.00800: **Revisiting high-order Taylor methods for astrodynamics and celestial mechanics** by *Francesco Biscani, Dario Izzo*

astro-ph/2105.00889: **The ultra-hot-Jupiter KELT-16 b: Dynamical Evolution and Atmospheric Properties** by *L. Mancini et al.*

astro-ph/2105.00917: **Tidal pull of the Earth strips the proto-Moon of its volatiles** by *S. Charnoz et al.*

astro-ph/2105.00961: **Superadiabaticity in Jupiter and giant planet interiors** by *F. Debras, G. Chabrier, D. Stevenson*

astro-ph/2105.00976: **High Spatial Resolution Observations of Molecular Lines towards the Protoplanetary Disk around TW Hya with ALMA** by *Hideko Nomura et al.*

astro-ph/2105.01065: **Stability of Neptune's distant resonances in the presence of Planet Nine** by *Matthew S. Clement, Scott S. Sheppard*

astro-ph/2105.01101: **The effect of a strong pressure bump in the Sun's natal disk: Terrestrial planet formation via planetesimal accretion rather than pebble accretion** by *André Izidoro, Bertram Bitsch, Rajdeep Dasgupta*

astro-ph/2105.01102: **Mass-radius relationships for irradiated ocean planets** by *Artyom Aguichine et al.*

astro-ph/2105.01164: **The science case for spacecraft exploration of the Uranian satellites: Candidate ocean worlds in an ice giant system** by *Richard J. Cartwright et al.*

astro-ph/2105.01359: **Thermal evolution of Uranus and Neptune II – Deep thermal boundary layer** by *Ludwig Scheibe, Nadine Nettelmann, Ronald Redmer*

astro-ph/2105.01474: **Ejecta distribution and momentum transfer from oblique impacts on asteroid surfaces** by *S.D. Raducan, T.M. Davison, G.S. Collins*

astro-ph/2105.01704: **Massive search of spot- and facula-crossing events in 1598 exoplanetary transit lightcurves** by *R. V. Baluev et al.*

astro-ph/2105.01789: **Characterization of Thermal Infrared Dust Emission and Refinements to the Nucleus Properties of Centaur 29P/Schwassmann-Wachmann 1** by *Charles A. Schambeau et al.*

astro-ph/2105.01911: **A 4565 Myr old andesite from an extinct chondritic protoplanet** by *Jean-Alix Barrat et al.*

astro-ph/2105.01944: **TOI-220 b: a warm sub-Neptune discovered by TESS** by *S. Hoyer et al.*

astro-ph/2105.01945: **TESS and HARPS reveal two sub-Neptunes around TOI 1062** by *J. F. Otegi et al.*

astro-ph/2105.02243: **The post-main-sequence fate of the HR 8799 planetary system** by *Dimitri Veras, Sasha Hinkley*

astro-ph/2105.02245: **Grid of Pseudo-2D Chemistry Models for Tidally-Locked Exoplanets. I. The Role of Vertical and Horizontal Mixing** by *Robin Baeyens et al.*

astro-ph/2105.02336: **Creep Tide Model for the 3-Body Problem. The rotational evolution of a circumbinary planet** by *F. A. Zoppetti et al.*

astro-ph/2105.02403: **Effects of Dust Evolution on the Vertical Shear Instability in the Outer Regions of Protoplanetary Disks** by *Yuya Fukuhara, Satoshi Okuzumi, Tomohiro Ono*

astro-ph/2105.02555: **Detecting General Relativistic Orbital Precession in Transiting Hot Jupiters** by *G. Antoniciello et al.*

astro-ph/2105.02680: **The Irradiation Instability of Protoplanetary Disks** by *Yanqin Wu , Yoram Lithwick*

astro-ph/2105.02701: **ALMA detection of sulfur dioxide and carbon monoxide in the atmosphere of Neptune** by *Arijit Manna, Sabyasachi Pal*

astro-ph/2105.02790: **Probing the icy shell structure of ocean worlds with gravity-topography admittance** by *Ryunosuke Akiba, Anton I. Ermakov, Burkhard Militzer*

astro-ph/2105.02890: **Evolution of Primordial Kuiper Belt Binaries Through a Giant Planet Instability** by *Lukas R Stone, Nathan A Kaib*

astro-ph/2105.02907: **An upper limit for the growth of inner planets?** by *Andrew J. Winter, Richard Alexander*

astro-ph/2105.02918: **The Architecture of the V892 Tau System: the Binary and its Circumbinary Disk** by *Feng Long et al.*

astro-ph/2105.03174: **Estimating Ion Escape from Unmagnetized Planets** by *M. Holmstrom*

astro-ph/2105.03244: **Looking for astrometric signals below 20 m/s: A candidate exo-Jupiter in δ Pav** by *Valeri V. Makarov, Norbert Zacharias, Charles T. Finch*

astro-ph/2105.03283: **Low-level jets and the convergence of Mars data assimilation algorithms** by *Todd A. Mooring et al.*

astro-ph/2105.03295: **Feasibility of Detecting Interstellar Panspermia in Astrophysical Environments** by *Claudio Grimaldi, Manasvi Lingam, Amedeo Balbi*

astro-ph/2105.03443: **Photoevaporation vs. core-powered mass-loss: model comparison with the 3D radius gap** by *James G. Rogers et al.*

astro-ph/2105.03446: **Long Period Jovian Tilts the Orbits of Two sub-Neptunes Relative to Stellar Spin Axis in Kepler-129** by *Jingwen Zhang et al.*

astro-ph/2105.03510: **Detection of OH 18-cm Emission from Comet C/2020 F3 NEOWISE using the Arecibo Telescope** by *Allison J. Smith et al.*

astro-ph/2105.03543: **A Statistical Review of Light Curves and the Prevalence of Contact Binaries in the Kuiper Belt** by *Mark R. Showalter et al.*

astro-ph/2105.03652: **The orbital evolution of resonant chains of exoplanets incorporating circularisation produced by tidal interaction with the central star with application to the HD 158259 and EPIC 245950175 systems** by *J.C.B. Papaloizou*

astro-ph/2105.04318: **Systematic search for long-term transit duration changes in Kepler transiting planets** by *Sahar Shahaf et al.*

astro-ph/2105.04424: **A generalization of the equinoctial orbital elements** by *Giulio Baù, Javier Hernando-Ayuso, Claudio Bombardelli*

astro-ph/2105.04596: **The New Generation Planetary Population Synthesis (NGPPS). IV. Planetary systems around low-mass stars** by *Remo Burn et al.*

astro-ph/2105.04703: **Friends and Foes: Conditional Occurrence Rates of Exoplanet Companions and their Impact on Radial Velocity Follow-up Surveys** by *Matthias Y. He, Eric B. Ford, Darin Ragozzine*

astro-ph/2105.04931: **Characterising atmospheric gravity waves on the nightside lower clouds of Venus: a systematic analysis** by *J.E. Silva et al.*

astro-ph/2105.05277: **Super-Jupiters Migrate Outward** by *Adam M. Dempsey, Diego J. Muñoz, Yoram Lithwick* astro-ph/2105.05294: **Evidence that a novel type of satellite wake might exist in Saturn's E ring** by *M.M. Hedman, M. Young*

astro-ph/2105.05313: **Rates of protoplanetary accretion and differentiation set nitrogen budget of rocky planets** by *Damanveer S. Grewal et al.*

astro-ph/2105.05323: **A very early origin of isotopically distinct nitrogen in inner Solar System protoplanets** by *Damanveer S. Grewal, Rajdeep Dasgupta, Bernard Marty*

astro-ph/2105.05598: **The Pyrat Bay Framework for Exoplanet Atmospheric Modeling: A Population Study of Hubble/WFC3 Transmission Spectra** by *Patricio E. Cubillos, Jasmina Blecic*

astro-ph/2105.05826: **Six Outbursts of Comet 46P/Wirtanen** by *Michael S. P. Kelley et al.*

astro-ph/2105.05858: **A critical assessment of the applicability of the energy-limited approximation for estimating exoplanetary mass-loss rates** by *Andreas F. Krenn et al.*

astro-ph/2105.05898: **Minimal Differential Lateral Acceleration Configurations for Starshade Stationkeeping in Exoplanet Direct Imaging** by *Jackson Kulik, Gabriel J. Soto, Dmitry Savransky*

astro-ph/2105.05908: **The imprint of X-ray photoevaporation of planet-forming discs on the orbital distribution of giant planets – II. Theoretical predictions** by *Kristina Monsch et al.*

astro-ph/2105.05995: **A Deep Polarimetric Study of the Asymmetrical Debris Disk HD 106906** by *Katie A. Crotts et al.*

astro-ph/2105.05997: **The impact and recovery of asteroid 2018 LA** by *Peter Jenniskens et al.*

astro-ph/2105.06042: **Thresholds for Particle Clumping by the Streaming Instability** by *Rixin Li, Andrew Youdin*

astro-ph/2105.06051: **Formation of rims around chondrules via porous aggregate accretion** by *Yuji Matsumoto et al.*

astro-ph/2105.06087: **In Search of Subsurface Oceans within the Uranian Moons** by *C. J. Cochrane et al.*

astro-ph/2105.06159: **System-level fractionation of carbon from disk and planetesimal processing** by *Tim Lichtenberg, Sebastiaan Krijt*

astro-ph/2105.06338: **How Close are Compact Multi-Planet Systems to the Stability Limit?** by *Samuel W. Yee et al.*

astro-ph/2105.06353: **Longitudinally Resolved Spectral Retrieval (ReSpect) of WASP-43b** by *Patricio E. Cubillos et al.*

astro-ph/2105.06377: **The Atmosphere of Uranus** by *Leigh N. Fletcher*

astro-ph/2105.06475: **Orbital migration and circularization of tidal debris by Alfvén-wave drag: circumstellar debris and pollution around white dwarfs** by *Yun Zhang, Shang-Fei Liu, Douglas N.C. Lin*

astro-ph/2105.06522: **Ground-Based Transmission Spectroscopy with VLT FORS2: Evidence for faculae and clouds in the optical spectrum of the warm Saturn WASP-110b** by *Nikolay Nikolov et al.*

astro-ph/2105.06565: **Water Production Rates from SOHO/SWAN Observations of Six comets: 2017-2020** by *Michael R. Combi et al.*

astro-ph/2105.06995: **Improving exoplanet detection capabilities with the false inclusion probability. Comparison with other detection criteria in the context of radial velocities** by *Nathan C. Hara et al.*

astro-ph/2105.07000: **Impacts of Water Latent Heat on the Thermal Structure of Ultra-Cool Objects: Brown Dwarfs and Free-Floating Planets** by *Shih-Yun Tang et al.*

astro-ph/2105.07005: **Stellar Activity Manifesting at a One Year Alias Explains Barnard b as a False Positive** by *Jack Lubin et al.*

astro-ph/2105.07368: **A Tidal Origin for a 3-body Resonance in Kepler-221** by *Max Goldberg, Konstantin Batygin*

astro-ph/2105.07442: **The main asteroid belt: the primary source of debris on comet-like orbits** by *Patrick M. Shober et al.*

astro-ph/2105.07651: **Modelling of thermal stratification at the top of a planetary core: Application to the cores of Earth and Mercury and the thermal coupling with their mantles** by *Jurrien Sebastiaan Knibbe, Tim Van Hoolst*

astro-ph/2105.07987: **A CHEOPS White Dwarf Transit Search** by *Brett M. Morris et al.*
astro-ph/2105.08009: **Variable Irradiation on 1D Cloudless Eccentric Exoplanet Atmospheres** by *L. C. Mayorga et al.*
astro-ph/2105.08017: **Thermophysical Modeling of 20 Themis Family Asteroids with WISE/NEOWISE Observations** by *Haoxuan Jiang, Jianghui Ji*
astro-ph/2105.08077: **TOI-1231 b: A Temperate, Neptune-Sized Planet Transiting the Nearby M3 Dwarf NLTT 24399** by *Jennifer A. Burt et al.*
astro-ph/2105.08081: **Detectability of Artificial Lights from Proxima b** by *Elisa Tabor, Abraham Loeb*
astro-ph/2105.08223: **Joint Analysis of Multicolor Photometry: A New Approach to Constrain the Nature of Multiple-Star Systems Hosting Exoplanet Candidates** by *Kohei Miyakawa et al.*
astro-ph/2105.08375: **A fuzzy Multi-Criteria Decision Making approach for Exo-Planetary Habitability** by *Juan Miguel Sánchez-Lozano, Andrés Moya, José María Rodríguez-Mozos*
astro-ph/2105.08386: **MOA-2006-BLG-074: recognizing xallarap contaminants in planetary microlensing** by *P. Rota et al.*
astro-ph/2105.08498: **Study of Fischer-Tropsch Type reactions on chondritic meteorites** by *Victoria Cabedo et al.*
astro-ph/2105.08553: **In situ formation of hot Jupiters with companion super-Earths** by *Sanson T. S. Poon, Richard P. Nelson, Gavin A. L. Coleman*
astro-ph/2105.08574: **NGTS-19b : A high mass transiting brown dwarf in a 17-day eccentric orbit** by *Jack S. Acton et al.*
astro-ph/2105.08614: **TIC 172900988: A Transiting Circumbinary Planet Detected in One Sector of TESS Data** by *Veselin B. Kostov et al.*
astro-ph/2105.08768: **The Chicxulub Impactor: Comet or Asteroid?** by *Steve Desch et al.*
astro-ph/2105.08821: **Limits on Millimeter Continuum Emission from Circumplanetary Material in the DSHARP Disks** by *Sean M. Andrews et al.*
astro-ph/2105.08844: **TKS X: Confirmation of TOI-1444b and a Comparative Analysis of the Ultra-short-period Planets with Hot Neptunes** by *Fei Dai et al.*
astro-ph/2105.08852: **Asteroid Magnetization from the Early Solar Wind** by *Atma Anand et al.*
astro-ph/2105.08897: **Computational Infrared Spectroscopy of 958 Phosphorus-bearing Molecules** by *Juan C. Zapata Trujilo et al.*
astro-ph/2105.09134: **An advanced multipole model for (216) Kleopatra triple system** by *M. Brož et al.*
astro-ph/2105.09305: **Gaseous atomic nickel in the coma of interstellar comet 2I/Borisov** by *Piotr Guzik, Michał Drahus*
astro-ph/2105.09319: **Differentiating Modern and Prebiotic Earth Scenarios for TRAPPIST-1e: High-resolution Transmission Spectra and Predictions for JWST** by *Zifan Lin et al.*
astro-ph/2105.09327: **A Preponderance of Perpendicular Planets** by *Simon H. Albrecht et al.*
astro-ph/2105.09335: **Orbital Decay of Short-Period Exoplanets via Tidal Resonance Locking** by *Linhao Ma, Jim Fuller*
astro-ph/2105.09410: **Long live the disk: lifetimes of protoplanetary disks in hierarchical triple star systems and a possible explanation for HD 98800 B** by *María Paula Ronco et al.*
astro-ph/2105.09435: **'Oumuamua as a light sail – evidence against artificial origin** by *S. J. Curran*
astro-ph/2105.09498: **Sand Creep Motion in Slow Spin-up Experiment: An Analogue of Regolith Migration on Asteroids** by *Chenyang Huang et al.*
astro-ph/2105.09668: **Multi-band transit follow up observations of five hot-Jupiters with critical noise treatments: Improved physical properties** by *Suman Saha, Aritra Chakrabarty, Sujan Sengupta*
astro-ph/2105.09734: **Solar Radiation profiles for a 3U CubeSat in LEO** by *Gianmario Broccia*
astro-ph/2105.09741: **The SOPHIE search for northern extrasolar planets – XVII. A wealth of new objects: Six cool Jupiters, three brown dwarfs, and 16 low-mass binary stars** by *S. Dalal et al.*
astro-ph/2105.09763: **Photometry of selected outer main belt asteroids** by *V. Shevchenko et al.*

astro-ph/2105.09773: **Constraints on the nearby exoplanet ϵ Ind Ab from deep near/mid-infrared imaging limits** by *Gayathri Viswanath et al.*
astro-ph/2105.09789: **Non-thermal escaape of the Martian CO2 atmosphere over time: constrained by Ar isotopes** by *H. Lichtenegger et al.*
astro-ph/2105.09921: **Asteroid lightcurves and detection, shape, and size biases in large-scale surveys** by *Samuel Navarro-Meza, Erin Aadland, David Trilling*
astro-ph/2105.09940: **Reply to Desch et al. (2021) on "Breakup of a long-period comet as the origin of the dinosaur extinction"** by *Amir Siraj, Abraham Loeb*
astro-ph/2105.09949: **A Layered Debris Disk around M Star TWA 7 in Scattered Light** by *Bin Ren et al.*
astro-ph/2105.09952: **A PSF-based Approach to TESS High quality data Of Stellar clusters (PATHOS) – IV. Candidate exoplanets around stars in open clusters: frequency and age-planetary radius distribution** by *D. Nardiello et al.*
astro-ph/2105.09965: **Detection of volatiles undergoing sublimation from 67P/Churyumov-Gerasimenko coma particles using ROSINA/COPS. II. The nude gauge** by *Boris Pestoni et al.*
astro-ph/2105.09966: **On planetary systems as ordered sequences** by *Emily Sandford, David Kipping, Michael Collins*
astro-ph/2105.09990: **The Detectability of Nightside City Lights on Exoplanets** by *Thomas G. Beatty*
astro-ph/2105.10001: **Radius and mass distribution of ultra-short period planets** by *Ana Sofía M. Uzsoy, Leslie A. Rogers, Ellen M. Price*
astro-ph/2105.10105: **On the formation of terrestrial planets between two massive planets: The case of 55 Cancri** by *Lei Zhou, Rudolf Dvorak, Li-Yong Zhou*
astro-ph/2105.10230: **Detection of Fe and evidence for TiO in the dayside emission spectrum of WASP-33b** by *D. Cont et al.*
astro-ph/2105.10487: **The Featureless HST/WFC3 Transmission Spectrum of the Rocky Exoplanet GJ 1132b: No Evidence For A Cloud-Free Primordial Atmosphere and Constraints on Starspot Contamination** by *Jessica E. Libby-Roberts et al.*
astro-ph/2105.10513: **Where is the Water? Jupiter-like C/H ratio but strong H2O depletion found on τ Boötis b using SPIRou** by *Stefan Pelletier et al.*
astro-ph/2105.10814: **Origin of hydrogen isotopic variations in chondritic water and organics** by *Laurette Piani et al.*
astro-ph/2105.10985: **Born extra-eccentric: A broad spectrum of primordial configurations of the gas giants that match their present-day orbits** by *Matthew S. Clement et al.*
astro-ph/2105.10986: **Discovery of Carbon Monoxide in Distant Comet C/2017 K2 (PANSTARRS)** by *Bin Yang et al.*
astro-ph/2105.11034: **Decomposing the Iron Cross-Correlation Signal of the Ultra-Hot Jupiter WASP-76b in Transmission using 3D Monte-Carlo Radiative Transfer** by *Joost P. Wardenier et al.*
astro-ph/2105.11150: **Observable scattered light features from inclined and non-inclined planets embedded in protoplanetary discs** by *D. Kloster, M. Flock*
astro-ph/2105.11151: **On the Vertical Shear Instability in Magnetized Protoplanetary Disks** by *Can Cui*
astro-ph/2105.11208: **Redox hysteresis of super-Earth exoplanets from magma ocean circulation** by *Tim Lichtenberg*
astro-ph/2105.11243: **Stellar winds and planetary atmospheres** by *Colin P. Johnstone*
astro-ph/2105.11372: **The Surface of (16) Psyche from Thermal Emission and Polarization Mapping** by *Katherine de Kleer, Saverio Cambioni, Michael Shepard*
astro-ph/2105.11583: **The California Legacy Survey I. A Catalog of 177 Planets from Precision Radial Velocity Monitoring of 719 Nearby Stars over Three Decades** by *Lee J. Rosenthal et al.*
astro-ph/2105.11584: **The California Legacy Survey II. Occurrence of Giant Planets Beyond the Ice line** by *Benjamin J. Fulton et al.*
astro-ph/2105.11841: **The brittle boulders of dwarf planet Ceres** by *Stefan Schröder et al.*

astro-ph/2105.11960: **Analytic inversion of closed form solutions of the satellite's J2 problem** by *Alessio Bocci, Giovanni Mingari Scarpello*

astro-ph/2105.11994: **A comparative analysis of the outer-belt primitive families** by *M. N. De Prá et al.*

astro-ph/2105.12040: **Survival of exomoons around exoplanets** by *V. Dobos et al.*

astro-ph/2105.12138: **The GAPS Programme with HARPS-N at TNG. XXXI. The WASP-33 system revisited with HARPS-N** by *F. Borsa et al.*

astro-ph/2105.12160: **Primordial Obliquities of Brown Dwarfs and Super-Jupiters from Fragmenting Gravito-Turbulent Discs** by *R. Michael Jennings, Eugene Chiang*

astro-ph/2105.12169: **Simulating Observations of Ices in Protoplanetary Disks** by *Nicholas P. Ballering, L. Ilsedore Cleeves, Dana E. Anderson*

astro-ph/2105.12264: **Stumbling over planetary building blocks: AU Microscopii as an example of the challenge of retrieving debris-disk dust properties** by *Jessica A. Arnold et al.*

astro-ph/2105.12562: **Improved Constraints for the XUV Luminosity Evolution of Trappist-1** by *Jessica Birky, Rory Barnes, David P. Fleming*

astro-ph/2105.12712: **Constraining the Regolith Composition of Asteroid (16) Psyche via Laboratory Near-infrared Spectroscopy** by *David C. Cantillo et al.*

astro-ph/2105.12745: **The New Generation Planetary Population Synthesis (NGPPS). VI. Introducing KOBE: Kepler Observes Bern Exoplanets. Theoretical perspectives on the architecture of planetary systems: Peas in a pod** by *Lokesh Mishra et al.*

astro-ph/2105.12746: **Sculpting the sub-Saturn Occurrence Rate via Atmospheric Mass Loss** by *Tim Hallatt, Eve J. Lee*

astro-ph/2105.12759: **Storms, Variability, and Multiple Equilibria on Hot-Jupiters** by *J. Y-K. Cho, J. W. Skinner, H. Th. Thrastarson*

astro-ph/2105.12816: **Oort cloud Ecology II: The chronology of the formation of the Oort cloud** by *Simon Portegies Zwart , Santiago Torres , Maxwell X. Cai , Anthony Brown*

astro-ph/2105.12820: **The First Dynamical Mass Measurement in the HR 8799 System** by *G. Mirek Brandt et al.*

astro-ph/2105.12902: **The Aligned Orbit of the Eccentric Warm Jupiter K2-232b** by *Songhu Wang et al.*

astro-ph/2105.13031: **Geodesy of irregular small bodies via neural density fields: geodesyNets** by *Dario Izzo, Pablo Gómez*

astro-ph/2105.13101: **Evolution of the Water Snow Line in Magnetically Accreting Protoplanetary Disks** by *Shoji Mori et al.*

astro-ph/2105.13182: **An Update of the Correlation between Polarimetric and Thermal Properties of Cometary Dust** by *Yuna G. Kwon et al.*

astro-ph/2105.13267: **How drifting and evaporating pebbles shape giant planets I: Heavy element content and atmospheric C/O** by *Aaron David Schneider, Bertram Bitsch*

astro-ph/2105.13537: **Planets around young active Solar-type stars: Assessing detection capabilities from a non stabilised spectrograph** by *A. Heitzmann et al.*

astro-ph/2105.13663: **Did Uranus' regular moons form via a rocky giant impactor?** by *Jason Man Yin Woo et al.*

astro-ph/2105.13785: **The CARMENES search for exoplanets around M dwarfs. Two terrestrial planets orbiting G 264-012 and one terrestrial planet orbiting Gl 393** by *P.J. Amado et al.*

astro-ph/2105.13852: **Thermal Wave Instability as an Origin of Gap and Ring Structures in Protoplanetary Disks** by *Takahiro Ueda, Mario Flock, Tilman Birnstiel*

astro-ph/2105.14001: **Influence of Apophis' spin axis variations on a spacecraft during the 2029 close approach with Earth** by *S. Aljbaae et al.*

astro-ph/2105.14062: **On a possibility of transfer of asteroids from the 2:1 mean motion resonance with Jupiter to the Centaur zone** by *Anatolii Kazantsev, Lilia Kazantseva*

astro-ph/2105.14102: **Seeking echoes of circumstellar disks in Kepler light curves** by *Benjamin C. Bromley et* *al.*

astro-ph/2105.14140: **A Community Exoplanet Imaging Data Challenge for Roman CGI and Starshade Rendezvous** by *Margaret C. Turnbull et al.*

astro-ph/2105.14343: **Comparative Analysis of the Model for Exoplanet Atmosphere Outflow** by *P. B. Isakova et al.*

astro-ph/2105.14670: **Evidence Suggesting that 'Oumuamua is the 30 Myr-old product of a Molecular Cloud** by *Cheng-Han Hsieh, Gregory Laughlin, Hector G. Arce*

astro-ph/2105.14776: **Fragmentation model and strewn field estimation for meteoroids entry** by *Simone Limonta et al.*

astro-ph/2105.14782: **Auto-Differentiable Spectrum Model for High-Dispersion Characterization of Exoplanets and Brown Dwarfs** by *Hajime Kawahara et al.*

astro-ph/2105.14851: **Transiting Exoplanet Monitoring Project (TEMP). VI. The Homogeneous Refinement of System Parameters for 39 Transiting Hot Jupiters with 127 New Light Curves** by *Xian-Yu Wang et al.*

astro-ph/2105.14976: **Long-term dynamics of the solar system inner planets** by *Federico Mogavero, Jacques Laskar*

astro-ph/2105.15026: **Evolution of Earth-like extended exospheres orbiting solar-like stars** by *Ada Canet, Ana Inés Gómez de Castro*

astro-ph/2105.00107: **Cubesats in Low Earth Orbit: Perils and Countermeasures** by *Gianmario Broccia*

astro-ph/2105.00757: **On the interaction between fast tides and convection** by *Adrian J. Barker, Aurélie A. V. Astoul*

astro-ph/2105.01056: **THOR: An Algorithm for Cadence-Independent Asteroid Discovery** by *Joachim Moeyens et al.*

astro-ph/2105.01255: **The McDonald Accelerating Stars Survey (MASS): Discovery of a Long-Period Substellar Companion Orbiting the Old Solar Analog HD 47127** by *Brendan P. Bowler et al.*

astro-ph/2105.01661: **The chemical make-up of the Sun: A 2020 vision** by *M. Asplund, A. M. Amarsi, N. Grevesse*

astro-ph/2105.01915: **Long-term stellar activity variations and their effect on radial-velocity measurements** by *Jean C. Costes et al.*

astro-ph/2105.01994: **exoplanet: Gradient-based probabilistic inference for exoplanet data & other astronomical time series** by *Daniel Foreman-Mackey et al.*

astro-ph/2105.02034: **Dust changes in Sakurai's Object: new PAHs and SiC with coagulation of submicron-sized silicate dust into 10 micron-sized melilite grains** by *Janet E. Bowey*

astro-ph/2105.02226: **Infrared spectra of complex organic molecules in astronomically relevant ice matrices. III. Methyl formate and its tentative solid-state detection** by *Jeroen Terwisscha van Scheltinga et al.*

astro-ph/2105.02619: **Design-to-Robotic-Production of Underground Habitats on Mars** by *Henriette Bier et al.*

astro-ph/2105.03468: **zeus: A Python implementation of Ensemble Slice Sampling for efficient Bayesian parameter inference** by *Minas Karamanis, Florian Beutler, John A. Peacock*

astro-ph/2105.04000: **Persistent Plasma Waves in Interstellar Space Detected by Voyager 1** by *S.K. Ocker et al.*

astro-ph/2105.04268: **Cloud busting: enstatite and quartz clouds in the atmosphere of 2M2224-0158** by *Ben Burningham et al.*

astro-ph/2105.04625: **Gaia Search for stellar Companions of TESS Objects of Interest II** by *M. Mugrauer, K.-U. Michel*

astro-ph/2105.04681: **An ALMA Survey of Chemistry in Disks around M4-M5 Stars** by *Jamila Pegues et al.*

astro-ph/2105.04973: **Spectral unmixing for exoplanet direct detection in hyperspectral data** by *Julien Rameau et al.*

astro-ph/2105.05256: **Uniform Forward-Modeling Analysis of Ultracool Dwarfs. II. Atmospheric Properties of 55 Late-T Dwarfs** by *Zhoujian Zhang et al.*

astro-ph/2105.05281: **Mars Astrobiological Cave and Internal habitability Explorer (MACIE): A New Frontiers Mission Concept** by *Charity M. Phillips-Lander et al.*

astro-ph/2105.05798: **A Novel Survey for Young Substellar Objects with the W-band filter III: Searching for very low mass brown dwarfs in Serpens South and Serpens Core** by *Sophie Dubber et al.*

astro-ph/2105.06155: **HADES RV programme with HARPS-N at TNG XIV. A candidate super-Earth orbiting the M-dwarf GJ 9689 with a period close to half the stellar rotation period** by *J. Maldonado et al.*

astro-ph/2105.06482: **Spectral line polarization in protoplanetary disks** by *Boy Lankhaar, Wouter Vlemmings, Per Bjerkeli*

astro-ph/2105.06771: **SISPO: Space Imaging Simulator for Proximity Operations** by *Mihkel Pajusalu et al.*

astro-ph/2105.08327: **First detection of a disk free of volatile elements around a young A-type star: A sign of collisions between rocky planets?** by *M.E. van den Ancker et al.*

astro-ph/2105.09251: **The Earth-like Galactic cosmic ray intensity in the habitable zone of the M dwarf GJ 436** by *A. L. Mesquita, D. Rodgers-Lee, A. A. Vidotto*

astro-ph/2105.10670: **Estimation of lunar surface dielectric constant using MiniRF SAR data** by *Nidhi Verma, Pooja Mishra, Neetesh Purohit*

astro-ph/2105.11141: **Discovery in space of ethanolamine, the simplest phospholipid head group** by *Víctor M. Rivilla et al.*

astro-ph/2105.11662: **The Hipparcos-Gaia Catalog of Accelerations: Gaia EDR3 Edition** by *Timothy D. Brandt*

astro-ph/2105.11671: **orvara: An Efficient Code to Fit Orbits using Radial Velocity, Absolute, and/or Relative Astrometry** by *Timothy D. Brandt et al.*

astro-ph/2105.12465: **Nonlinear dynamics of hydrodynamic tori as a model of oscillations and bending waves in astrophysical discs** by *Callum W. Fairbairn, Gordon I. Ogilvie*

astro-ph/2105.13364: **Large Adaptive Optics Survey for Substellar Objects (LASSO) Around Young, Nearby, Low-mass Stars with Robo-AO** by *Maissa Salama et al.*

astro-ph/2105.13467: **The CARMENES search for exoplanets around M dwarfs. Mapping stellar activity indicators across the M dwarf domain** by *M. Lafarga et al.*

astro-ph/2105.13960: **TEM analyses of unusual presolar silicon carbide: Insights into the range of circumstellar dust condensation conditions** by *Sheryl A. Singerling et al.*

astro-ph/2105.14770: **The CARMENES search for exoplanets around M dwarfs: Spectroscopic orbits of nine M-dwarf multiple systems, including two triples, two brown dwarf candidates, and one close M-dwarf-white dwarf binary** by *D. Baroch et al.*

astro-ph/2105.03321: **A translation of L. Euler's "Simple determination of the orbit of a comet, when it is possible to observe its passage across the ecliptic twice"** by *Sylvio R Bistafa*

astro-ph/2105.03340: **A translation of L. Euler's "On the motion of comets in parabolic orbits, having the Sun in the focus"** by *Sylvio R Bistafa*

astro-ph/2105.03984: **The Drake Equation at 60: Reconsidered and Abandoned** by *John Gertz*

astro-ph/2105.06389: **Temporal changes of near-surface air temperature in Poland for 1781-2016 and in Tbilisi (Georgia) for 1881-2016** by *R. Modzelewska et al.*

astro-ph/2105.11100: **Rapid and Accurate Computation of Whiskered Tori and their Manifolds Near Resonances in Periodically Perturbed Planar Circular Restricted 3-Body Problems** by *Bhanu Kumar, Rodney L. Anderson, Rafael de la Llave*

astro-ph/2105.12559: **Cosmic Meteorology** by *Mike Lockwood, Mat Owens*

astro-ph/2105.13227: **What Sustained Multi-Disciplinary Research Can Achieve: The Space Weather Modeling Framework** by *Tamas I. Gombosi et al.*

astro-ph/2105.13311: **Restoring the top-of-atmosphere reflectance during solar eclipses: a proof of concept with the UV Absorbing Aerosol Index measured by TROPOMI** by *Victor Trees, Ping Wang, Piet Stammes*

astro-ph/2105.13917: **Full Spectroscopic Model and Trihybrid Experimental-Perturbative-Variational Line List for CN** by *Anna-Maree Syme, Laura K. McKemmish*

astro-ph/2105.14400: **Charge injection into the atmosphere by explosive volcanic eruptions** by *Joshua Méndez Harper et al.*

astro-ph/2105.15108: **Prediction of soft proton intensities in the near-Earth space using machine learning** by *Elena A. Kronberg et al.*