ExoPlanet News
An Electronic Newsletter

No. 100, October 2nd, 2017

Editor: Andrew J. Norton
Department of Physical Sciences, The Open University, Milton Keynes MK7 6AA, UK
exoplanet@open.ac.uk, http://exoplanet.open.ac.uk/

Contents

1 Editorial

Welcome to the one hundredth edition of ExoPlanet News – and my last as Editor. I am very pleased to say that I had a few expressions of interest to take over as editor following my announcement in the last edition. I am therefore delighted to announce that Sascha P. Quanz and the Swiss PlanetS team will take over the production and hosting of the ExoPlanet News from the next issue onwards.

I have had great fun producing this newsletter since Glenn White and I launched it back in 2007. Over the years I've seen the amount of activity in this research area increase dramatically. To take an example, in the first few issues there were fewer than 30 exoplanet papers per month listed on the arXiv, whereas now that number has almost tripled. And of course the discoveries in the exoplanet field have continued to mount up. It's invidious to pick out any specific discoveries, but I particularly note the success of *SuperWASP* for ground-based discoveries and *Kepler* for space-based discoveries, over this time period. In recent years and months, the discoveries of Proxima b and the remarkable Trappist 1 system are highlights, and surely a sign of things to come with *TESS* and *PLATO* in future years. I therefore wish the new editorial team every success in taking the newsletter forward.

Best wishes and thanks for everyone's support with the newsletter over the last 10 years,
Andrew Norton
The Open University

When we heard that Andrew Norton would step down as editor for the Exoplanet Newsletter and it was unclear whether or not the Newsletter would survive at all it became quickly clear to us that we need to find a solution that secures its continuation for the foreseeable future. With more than 1350 subscribers the Exoplanet Newsletter is a popular and practical communication channel for astrophysicists and astrobiologists working on exoplanet science, and no longer receiving regular compact updates about recent publications, upcoming events and job opportunities would have meant a significant loss.

Hence, we were very happy when we got the green light to continue this service for the community, and from issue number 101 onward the Newsletter will be edited and distributed from within the swiss-wide PlanetS network (http://nccr-planets.ch). Over the coming months, the role of editor-in-chief will rotate between the various partner institutions and this person will always be supported by a small team of colleagues. At the beginning, the people in charge will be Christoph Mordasini, Yann Alibert and myself.

At the moment we do not foresee any significant changes for the Newsletter - maybe the webpage will get a slight update and new look - but we are open for suggestions and comments from the community. We will inform each subscriber when the migration of the services and the webpage is complete. Until then please keep submitting your abstracts or other contributions to the current email address.

Finally, we would like to take this opportunity to warmly thank Andrew for his service and dedication for more than 10 years growing and establishing the Exoplanet Newsletter as a key source of information for the community. We are very much looking forward to continuing what Andrew has created!
Sascha Quanz
ETH Zurich

2 Abstracts of refereed papers

The Very Low Albedo of WASP-12b from Spectral Eclipse Observations with Hubble

T. J. Bell[1,], N. Nikolov[2], N. B. Cowan[1,3,*], J. K. Barstow[4], T. S. Barman[5], I. J. M. Crossfield[6], N. P. Gibson[7], T. M. Evans[2], D. K. Sing[2], H. A. Knutson[8], T. Kataria[9], J. D. Lothringer[5], B. Benneke[10], and J. C. Schwartz[1,3,*]*

[1] Department of Physics, McGill University, 3600 rue University, Montréal, QC H3A 2T8, Canada
[2] Department of Physics and Astronomy, University of Exeter, Exeter EX4 4QL, UK
[3] Department of Earth & Planetary Sciences, McGill University, 3450 rue University, Montréal, QC H3A 0E8, Canada
[4] Department of Physics and Astronomy, University College London, Gower Street, London WC1E 6BT, UK
[5] Lunar and Planetary Laboratory, University of Arizona, 1629 E. University Boulevard, Tucson, AZ 85721, USA
[6] Department of Physics, Massachusetts Institute of Technology, Cambridge, MA, USA
[7] Astrophysics Research Centre, School of Mathematics and Physics, Queens University Belfast, Belfast BT7 1NN, UK
[8] Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA 91125, USA
[9] Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109, USA
[10] Department of Physics, Université de Montréal, 2900 boul. Édouard-Montpetit, Montréal, QC H3T 1J4, Canada
[*] McGill Space Institute; Institute for Research on Exoplanets

Astrophysical Journal Letters, published (2017ApJ...847L...2B)

We present an optical eclipse observation of the hot Jupiter WASP-12b using the Space Telescope Imaging Spectrograph on board the Hubble Space Telescope. These spectra allow us to place an upper limit of $A_g < 0.064$ (97.5% confidence level) on the planet's white light geometric albedo across 290–570 nm. Using six wavelength bins across the same wavelength range also produces stringent limits on the geometric albedo for all bins. However, our uncertainties in eclipse depth are ∼40% greater than the Poisson limit and may be limited by the intrinsic variability of the Sun-like host star — the solar luminosity is known to vary at the 10^{-4} level on a timescale of minutes. We use our eclipse depth limits to test two previously suggested atmospheric models for this planet: Mie scattering from an aluminum-oxide haze or cloud-free Rayleigh scattering. Our stringent nondetection rules out both models and is consistent with thermal emission plus weak Rayleigh scattering from atomic hydrogen and helium. Our results are in stark contrast with those for the much cooler HD 189733b, the only other hot Jupiter with spectrally resolved reflected light observations; those data showed an increase in albedo with decreasing wavelength (Evans et al. 2013). The fact that the first two exoplanets with optical albedo spectra exhibit significant differences demonstrates the importance of spectrally resolved reflected light observations and highlights the great diversity among hot Jupiters.

Download/Website: `https://arxiv.org/abs/1709.04461`

Contact: `taylor.bell@mail.mcgill.ca`

Temporal evolution of the high-energy irradiation and water content of TRAPPIST-1 exoplanets

V. Bourrier[1], J. de Wit[2], E. Bolmont[3], V. Stamenković[4,5], P.J. Wheatley[6], A.J Burgasser[7], L. Delrez[8], B.-O. Demory[9], D. Ehrenreich[1], M. Gillon[10], E. Jehin[10], J. Leconte[11], S.M. Lederer[12], N. Lewis[13], A.H.M.J. Triaud[14], V. Van Grootel[10]

[1] Observatoire de l'Université de Genève, 51 chemin des Maillettes, 1290 Sauverny, Switzerland
[2] Department of Earth, Atmospheric and Planetary Sciences, MIT, 77 Massachusetts Avenue, Cambridge, MA 02139, USA
[3] Lab. AIM Paris-Saclay, CEA/DRF - CNRS - Univ. Paris Diderot - IRFU/SAp, Centre de Saclay, F- 91191 Gif-sur-Yvette Cedex, France
[4] Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA 91125 USA
[5] Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109 USA
[6] Department of Physics, University of Warwick, Coventry CV4 7AL, UK
[7] Center for Astrophysics and Space Science, University of California San Diego, La Jolla, CA 92093, USA
[8] Cavendish Laboratory, J J Thomson Avenue, Cambridge, CB3 0HE, UK
[9] University of Bern, Center for Space and Habitability, Sidlerstrasse 5, CH-3012, Bern, Switzerland
[10] Institut dAstrophysique et de Géophysique, Université de Liège, Allée du 6 Aout 19C, 4000 Liège, Belgium
[11] Laboratoire dAstrophysique de Bordeaux, Univ. Bordeaux, CNRS, B18N, allée Geoffroy Saint-Hilaire, 33615 Pessac, France
[12] NASA Johnson Space Center, 2101 NASA Parkway, Houston, Texas, 77058, USA
[13] Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, Maryland 21218, USA
[14] Institute of Astronomy, Madingley Road, Cambridge CB3 0HA, UK

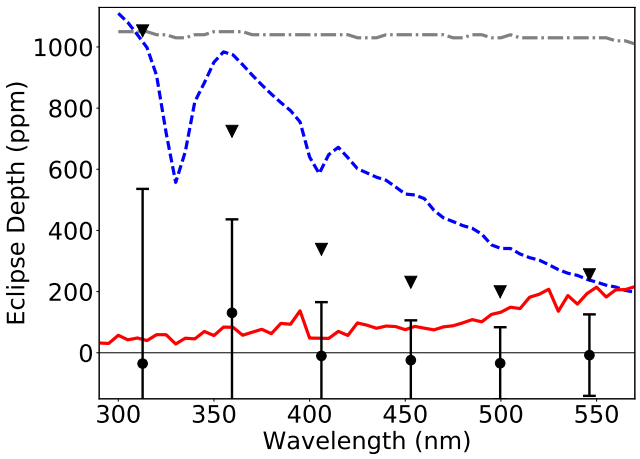

Figure 1: (Bell et al.) Best-fit eclipse depths and 1σ uncertainties are shown with black points and error bars, with black triangles denoting 97.5% confidence upper limits. Previously proposed models for WASP-12b made with `NEMESIS` (Irwin et al. 2008; Barstow et al. 2014) are shown with a grey, dashed-dotted line (aluminum-oxide haze) and a blue, dashed line (cloud-free). The *HST*/STIS data firmly reject both models and are instead consistent with the thermally dominated `PHOENIX` model shown with a red solid line (Barman et al. 2001, 2005; Crossfield et al. 2012).

The Astronomical Journal, published (2017AJ....154..121B)

The ultracool dwarf star TRAPPIST-1 hosts seven Earth-size transiting planets, some of which could harbour liquid water on their surfaces. UV observations are essential to measure their high-energy irradiation, and to search for photodissociated water escaping from their putative atmospheres. Our new observations of TRAPPIST-1 Ly-α line during the transit of TRAPPIST-1c show an evolution of the star emission over three months, preventing us from assessing the presence of an extended hydrogen exosphere. Based on the current knowledge of the stellar irradiation, we investigated the likely history of water loss in the system. Planets b to d might still be in a runaway phase, and planets within the orbit of TRAPPIST-1g could have lost more than 20 Earth oceans after 8 Gyr of hydrodynamic escape. However, TRAPPIST-1e to h might have lost less than 3 Earth oceans if hydrodynamic escape stopped once they entered the habitable zone. We caution that these estimates remain limited by the large uncertainty on the planet masses. They likely represent upper limits on the actual water loss because our assumptions maximize the XUV-driven escape, while photodissociation in the upper atmospheres should be the limiting process. Late-stage outgassing could also have contributed significant amounts of water for the outer, more massive planets after they entered the habitable zone. While our results suggest that the outer planets are the best candidates to search for water with the JWST, they also highlight the need for theoretical studies and complementary observations in all wavelength domains to determine the nature of the TRAPPIST-1 planets, and their potential habitability.

Download/Website: `https://doi.org/10.3847/1538-3881/aa859c`

Download/Website: `https://arxiv.org/abs/1708.09484`

Contact: `vincent.bourrier@unige.ch`

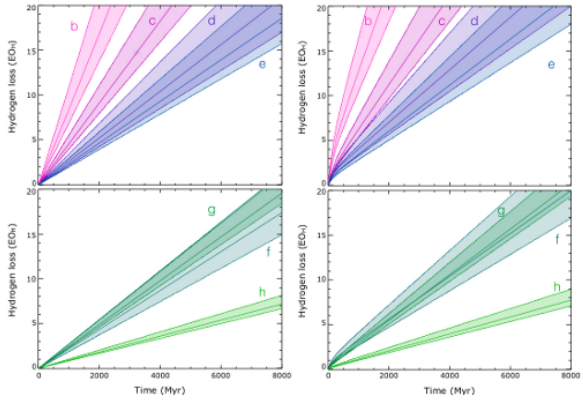

Figure 2: (Bourrier et al.) Theoretical estimates of the cumulative hydrogen loss for the TRAPPIST-1 planets, assuming their XUV irradiation remained constant *(left column)* or evolved *(right column)* over time. The present XUV irradiation is derived from direct measurements of the stellar X-ray and Ly-α emission. Because of our assumptions, these estimates likely represent upper limits on the actual loss.

PeX 1. Multi-spectral expansion of residual speckles for planet detection

N. Devaney[1], *É.Thiébaut*[2]

[1] School of Physics, National University of Ireland, Galway, Ireland
[2] Univ Lyon, Univ Lyon1, Ens de Lyon, CNRS, Centre de Recherche Astrophysique de Lyon UMR5574, F-69230, Saint-Genis-Laval, France

Monthly Notices of the Royal Astronomical Society, in press (arXiv:1708.08223)

The detection of exoplanets in coronographic images is severely limited by residual starlight speckles. Dedicated post-processing can drastically reduce this "stellar leakage" and thereby increase the faintness of detectable exoplanets. Based on a multi-spectral series expansion of the diffraction pattern, we derive a multi-mode model of the residuals which can be exploited to estimate and thus remove the residual speckles in multi-spectral coronographic images. Compared to other multi-spectral processing methods, our model is physically grounded and is suitable for use in an (optimal) inverse approach. We demonstrate the ability of our model to correctly estimate the speckles in simulated data and demonstrate that very high contrasts can be achieved.We further apply our method to removing speckle from a real data cube obtained with the SPHERE IFS instrument.

Download/Website: `http://arxiv.org/abs/1708.08223`

Contact: `nicholas.devaney@nuigalway.ie`

High-resolution Imaging of Transiting Extrasolar Planetary systems (HITEP). II. Lucky Imaging results from 2015 and 2016

D.F. Evans[1], *J. Southworth*[1], *B. Smalley* [1], *U.G. Jørgensen* [2], *M. Dominik* [3], *M.I. Andersen* [4], *V. Bozza*[5,6], *D.M. Bramich* [7], *M.J. Burgdorf* [8], *S. Ciceri* [9], *G. D'Ago* [10], *R. Figuera Jaimes* [3,11], *S.-H.Gu* [12,13], *T.C. Hinse* [14], *Th. Henning* [9], *M. Hundertmark* [15], *N. Kains* [16], *E. Kerins* [17], *H. Korhonen*[4,18], *R. Kokotanekova* [19,20], *M. Kuffmeier* [2], *P. Longa-Peña* [21], *L. Mancini* [22,9,23], *J.MacKenzie* [2], *A. Popovas* [2], *M. Rabus* [24,9], *S. Rahvar* [25], *S. Sajadian* [26], *C. Snodgrass* [20], *J. Skottfelt*[20] , *J. Surdej* [27], *R. Tronsgaard* [28], *E. Unda-Sanzana* [21], *C. von Essen* [28], *Yi-Bo Wang* [12,13], *O. Wertz* [29]

[1] Astrophysics Group, Keele University, Staffordshire, ST5 5BG, UK
[2] Niels Bohr Institute & Centre for Star and Planet Formation, University of Copenhagen Øster Voldgade 5, 1350 - Copenhagen, Denmark
[3] Centre for Exoplanet Science, SUPA School of Physics & Astronomy, University of St Andrews, North Haugh, St Andrews, KY16 9SS
[4] Dark Cosmology Centre, Niels Bohr Institute, University of Copenhagen, Juliane Maries Vej 30, DK-2100 Copenhagen
[5] Dipartimento di Fisica "E.R. Caianiello", Università di Salerno, Via Giovanni Paolo II 132, 84084, Fisciano, Italy
[6] Istituto Nazionale di Fisica Nucleare, Sezione di Napoli, Napoli, Italy
[7] No affiliation
[8] Universitat Hamburg, Department of Earth Sciences, Meteorological Institute, Bundesstrasse 55, 20146 Hamburg, Germany
[9] Max Planck Institute for Astronomy, Königstuhl 17, 69117 Heidelberg, Germany
[10] INAF-Osservatorio Astronomico di Capodimonte, Salita Moiariello 16, 80131, Napoli, Italy
[11] European Southern Observatory, Karl-Schwarzschild Straße 2, 85748 Garching bei München, Germany
[12] Yunnan Observatories, Chinese Academy of Sciences, Kunming 650011, China
[13] Key Laboratory for the Structure and Evolution of Celestial Objects, Chinese Academy of Sciences, Kunming 650011, China
[14] Korea Astronomy & Space Science Institute, 776 Daedukdae-ro, Yuseong-gu, 305-348 Daejeon, Republic of Korea
[15] Astronomisches Rechen-Institut, Zentrum für Astronomie der Universität Heidelberg, Mönchhofstr. 12-14, 69120 Heidelberg, Germany
[16] Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD 21218, United States of America
[17] Jodrell Bank Centre for Astrophysics, School of Physics and Astronomy, Univ. of Manchester, Oxford Road, Manchester M13 9PL, UK
[18] Finnish Centre for Astronomy with ESO (FINCA), Väisäläntie 20, FI-21500 Piikkiö, Finland
[19] Max Planck Institute for Solar System Research, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany
[20] School of Physical Sciences, Faculty of STEM, The Open University, Walton Hall, Milton Keynes, MK7 6AA, UK
[21] Unidad de Astronomía, Fac. de Ciencias Básicas, Universidad de Antofagasta, Avda. U. de Antofagasta 02800, Antofagasta, Chile
[22] Department of Physics, University of Rome Tor Vergata, Via della Ricerca Scientifica 1, 00133 – Roma, Italy
[23] INAF – Astrophysical Observatory of Turin, Via Osservatorio 20, 10025 – Pino Torinese, Italy
[24] Instituto de Astrofísica, Facultad de Física, Pontificia Univ. Católica de Chile, Av. Vicuña Mackenna 4860, 7820436 Macul, Santiago, Chile
[25] Department of Physics, Sharif University of Technology, PO Box 11155-9161 Tehran, Iran
[26] Department of Physics, Isfahan University of Technology, Isfahan 84156-83111, Iran
[27] Institut d'Astrophysique et de Géophysique, Allée du 6 Août 19c, Sart Tilman, Bât. B5c, 4000 Liège, Belgium
[28] Stellar Astrophysics Centre, Department of Physics and Astronomy, Aarhus University, Ny Munkegade 120, DK-8000 Aarhus C, Denmark
[29] Argelander-Institut für Astronomie, Auf dem Hgel, 71, 53121 Bonn, Germany

Astronomy & Astrophysics, in press (arXiv:1709.07476)

The formation and dynamical history of hot Jupiters is currently debated, with wide stellar binaries having been suggested as a potential formation pathway. Additionally, contaminating light from both binary companions and unassociated stars can significantly bias the results of planet characterisation studies, but can be corrected for if the properties of the contaminating star are known. We search for binary companions to known transiting exoplanet host stars, in order to determine the multiplicity properties of hot Jupiter host stars. We also search for and characterise unassociated stars along the line of sight, allowing photometric and spectroscopic observations of the planetary system to be corrected for contaminating light. We analyse lucky imaging observations of 97 Southern hemisphere exoplanet host stars, using the Two Colour Instrument on the Danish 1.54m telescope. For each detected companion star, we determine flux ratios relative to the planet host star in two passbands, and measure the relative position of the companion. The probability of each companion being physically associated was determined using our two-colour photometry. A catalogue of close companion stars is presented, including flux ratios, position measurements, and estimated companion star temperature. For companions that are potential binary companions, we review archival and catalogue data for further evidence. For WASP-77AB and WASP-85AB, we combine our data with historical measurements to determine the binary orbits, showing them to be moderately eccentric and inclined to the line of sight (and hence planetary orbital axis). Combining our survey with the similar Friends of Hot Jupiters survey, we conclude that known hot Jupiter host stars show a deficit of high mass stellar companions compared to the field star population; however, this may be a result of the biases in detection and target selection by ground-based surveys.

Download/Website: `https://arxiv.org/abs/1709.07476`

Contact: `d.f.evans@keele.ac.uk`

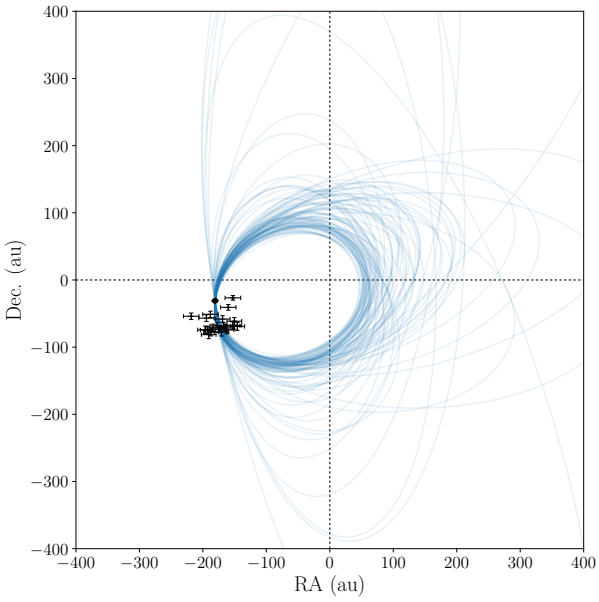

Figure 3: (Evans et al.) A selection of 100 orbits generated to fit astrometry for the WASP-85AB system, centred on the primary star. The orbital motion of the system clearly shows that the binary and planetary orbits are not coplanar, with the binary orbit being inclined by approximately 50 degrees from the line of sight.

Combining angular differential imaging and accurate polarimetry with SPHERE/IRDIS to characterize young giant exoplanets

R.G. van Holstein[1], F. Snik[1], J.H. Girard[2], J. de Boer[1], C. Ginski[1], C.U. Keller[1], D.M. Stam[3], J-L. Beuzit[4], D. Mouillet[4], M. Kasper[5], M. Langlois[6], A. Zurlo[7,8], R.J. de Kok[1], A. Vigan[9]

[1] Leiden Observatory, Leiden University, P.O. Box 9513, 2300 RA Leiden, The Netherlands
[2] Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD 21218, USA
[3] Faculty of Aerospace Engineering, Delft University of Technology, Kluyverweg 1, 2629 HS Delft, The Netherlands
[4] CNRS, IPAG, F-38000 Grenoble, France
[5] European Southern Observatory, Karl-Schwarzschild-Str. 2, 85748 Garching, Germany
[6] Centre de Recherche Astrophysique de Lyon, CNRS/ENS-L/Universit Lyon 1, 9 av. Ch. Andr, 69561 Saint-Genis-Laval, France
[7] Núcleo de Astronomía, Facultad de Ingeniería, Universidad Diego Portales, Av. Ejercito 441, Santiago, Chile
[8] Millennium Nucleus 'Protoplanetary Disk', Departamento de Astronomía, Universidad de Chile, Casilla 36-D, Santiago, Chile
[9] Aix Marseille Univ, CNRS, LAM, Laboratoire d'Astrophysique de Marseille, Marseille, France

Proceedings of SPIE, published online (doi: 10.1117/12.2272554)

Young giant exoplanets emit infrared radiation that can be linearly polarized up to several percent. This linear polarization can trace: 1) the presence of atmospheric cloud and haze layers, 2) spatial structure, e.g. cloud bands and rotational flattening, 3) the spin axis orientation and 4) particle sizes and cloud top pressure. We introduce a novel high-contrast imaging scheme that combines angular differential imaging (ADI) and accurate near-infrared polarimetry to characterize self-luminous giant exoplanets. We implemented this technique at VLT/SPHERE-IRDIS and developed the corresponding observing strategies, the polarization calibration and the data-reduction approaches. The combination of ADI and polarimetry is challenging, because the field rotation required for ADI negatively affects the polarimetric performance. By combining ADI and polarimetry we can characterize planets that can be directly imaged with a very high signal-to-noise ratio. We use the IRDIS pupil-tracking mode and combine ADI and principal component analysis to reduce speckle noise. We take advantage of IRDIS' dual-beam polarimetric mode to eliminate differential effects that severely limit the polarimetric sensitivity (flat-fielding errors, differential aberrations and seeing), and thus further suppress speckle noise. To correct for instrumental polarization effects, we apply a detailed Mueller matrix model that describes the telescope and instrument and that has an absolute polarimetric accuracy $\leq 0.1\%$. Using this technique we have observed the planets of HR 8799 and the (sub-stellar) companion PZ Tel B. Unfortunately, we do not detect a polarization signal in a first analysis. We estimate preliminary 1σ

upper limits on the degree of linear polarization of $\sim 1\%$ and $\sim 0.1\%$ for the planets of HR 8799 and PZ Tel B, respectively. The achieved sub-percent sensitivity and accuracy show that our technique has great promise for characterizing exoplanets through direct-imaging polarimetry.

Download/Website: https://arxiv.org/abs/1709.07519; https://spie.org/Publications/Proceedings/Paper/10.1117/12.2272554

Contact: vanholstein@strw.leidenuniv.nl

Gemini/GMOS Transmission Spectral Survey: Complete Optical Transmission Spectrum of the hot Jupiter WASP-4b

C.M. Huitson[1], *J-.M Désert*[1,2], *J.L. Bean*[3], *J.J. Fortney*[4], *K.B. Stevenson*[5], *M. Bergmann*[6]

[1] CASA, University of Colorado, 389 UCB, Boulder, CO, 80309-0389, USA
[2] University of Amsterdam, P.O. Box 94249, 1090 GE Amsterdam, The Netherlands
[3] Department of Astronomy and Astrophysics, University of Chicago, Chicago, IL 60637, USA
[4] Department of Astronomy and Astrophysics, University of California, Santa Cruz, CA 95064, USA
[5] Space Telescope Science Institute, 3700 San Martin Dr, Baltimore, MD 21218, USA
[6] NOAO & Gemini Observatory, present address Palo Alto, CA

The Astronomical Journal, published (2017AJ....154...95H)

We present the complete optical transmission spectrum of the hot Jupiter WASP-4b from 440-940 nm at $R \sim 400$-1500 obtained with the Gemini Multi-Object Spectrometers (GMOS); this is the first result from a comparative exoplanetology survey program of close-in gas giants conducted with GMOS. WASP-4b has an equilibrium temperature of 1700 K and is favorable to study in transmission due to a large scale height (370 km). We derive the transmission spectrum of WASP-4b using 4 transits observed with the MOS technique. We demonstrate repeatable results across multiple epochs with GMOS, and derive a combined transmission spectrum at a precision about twice above photon noise, which is roughly equal to to one atmospheric scale height. The transmission spectrum is well fitted with a uniform opacity as a function of wavelength. The uniform opacity and absence of a Rayleigh slope from molecular hydrogen suggest that the atmosphere is dominated by clouds with condensate grain size of ~ 1 μm. This result is consistent with previous observations of hot Jupiters since clouds have been seen in planets with similar equilibrium temperatures to WASP-4b. We describe a custom pipeline that we have written to reduce GMOS time-series data of exoplanet transits, and present a thorough analysis of the dominant noise sources in GMOS, which primarily consist of wavelength- and time- dependent displacements of the spectra on the detector, mainly due to a lack of atmospheric dispersion correction.

Download/Website: http://adsabs.harvard.edu/abs/2017AJ....154...95H

Contact: catherine.huitson@colorado.edu

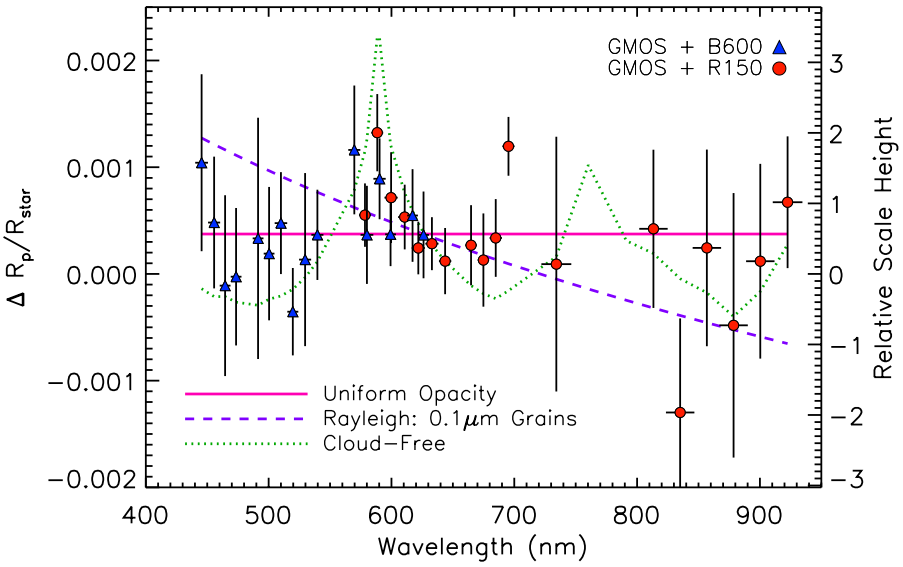

Figure 4: (Huitson et al.) Transmission spectrum of WASP-4b from GMOS data taken with the B600 grating (blue triangles) and the R150 grating (red circles). We measure the change in $R_P/R_\star$ as a function of wavelength only, $\Delta R_P/R_\star$. The absolute level of the B600 radii with respect to the R150 radii is a free parameter in our model fits and the radii are plotted using the best-fitting value of this parameter. The uncertainties on the data points are the uncertainties on the wavelength-dependent $R_P/R_\star$ only, and do not include the uncertainty on the absolute transit depth. Also shown are a cloud-free forward atmospheric model from Fortney et al. (2010), an atmosphere dominated by scattering from small-particle grains and an atmosphere dominated by scattering from large-particle grains. Models are binned to the resolution of the data. Note that the lower precision redward of 700 nm is due to fringing and also because we could only use one out of three R150 transits in this range. Blueward of 700 nm, the red points are the combined results of three R150 transits.

Simulating the Exoplanet Yield of a Space-based MIR Interferometer Based on *Kepler* Statistics

J. Kammerer, S. P. Quanz

ETH Zurich, Institute for Particle Physics and Astrophysics, Wolfgang-Pauli-Strasse 27, 8093 Zurich, Switzerland

Astronomy & Astrophysics, in press (arXiv:1707.06820)

Aims: We predict the exoplanet yield of a space-based mid-infrared nulling interferometer using Monte-Carlo simulations. We quantify the number and properties of detectable exoplanets and identify those target stars that have the highest or most complete detection rate. We investigate how changes in the underlying technical assumptions and uncertainties in the underlying planet population impact the scientific return. **Methods:** We simulate $2'000$ exoplanetary systems, based on planet occurrence statistics from *Kepler*, with randomly orientated orbits and uniformly distributed albedos around each of 326 nearby ($d < 20$ pc) stars. Assuming thermal equilibrium and blackbody emission, together with the limiting spatial resolution and sensitivity of our simulated instrument in three specific bands (5.6, 10.0, and 15.0 μm), we quantify the number of detectable exoplanets as a function of their radii and equilibrium temperatures. **Results:** $\sim 315^{+113}_{-77}$ exoplanets (with radii $0.5\ R_{\mathrm{Earth}} \leq R_{\mathrm{p}} \leq 6\ R_{\mathrm{Earth}}$) could be detected in at least one and half of them in all three bands during ~ 0.52 years of mission time assuming throughputs 3.5 times worse than those for the *JWST* and $\sim 40\%$ overheads. Accounting for stellar leakage and (unknown) exozodiacal light, the discovery phase of the mission very likely requires 2 – 3 years in total. The uncertainties in planet yield are dominated by uncertainties in the underlying planet population, but the distribution of the Bond

albedos also has a significant impact. Roughly 50% of the detected planets orbit M stars, which also have the highest planet yield per star; the other 50% FGK stars, which show a higher completeness in the detectability. ~ 85 planets could be habitable ($0.5\ R_{\rm Earth} \leq R_{\rm p} \leq 1.75\ R_{\rm Earth}$ and 200 K $\leq T_{\rm eq} \leq$ 450 K) and are prime targets for spectroscopic observations in a second mission phase. Comparing these results to those for a large optical/NIR telescope we find that a MIR interferometer would detect more planets and the number of planets depends less strongly on the wavelength. **Conclusions:** An optimized space-based nulling interferometer operating in the mid-infrared would deliver an unprecedented dataset for the characterization of (small) nearby exoplanets including dozens of potentially habitable worlds.

Download/Website: `https://arxiv.org/abs/1707.06820`

Contact: `sascha.quanz@phys.ethz.ch`

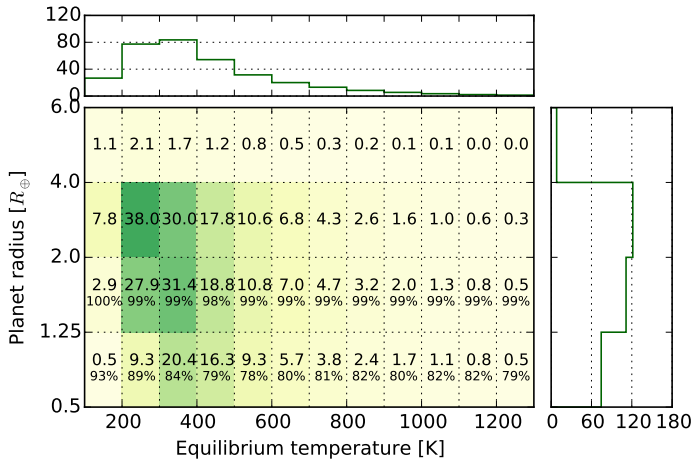

Figure 5: (Kammerer & Quanz) Expected number of detectable exoplanets binned in the radius-equilibrium temperature plane for our baseline scenario. The two histograms show the projected equilibrium temperature distribution (top) and the projected radius distribution (right) of the detectable exoplanets. The numbers in percent state the fraction of planets which is also detectable with radial velocity observations assuming a detection threshold of $K_* \geq 10$ cm s^{-1} and a planet density of $\rho_{\rm p} = 5'000$ kg m^{-3}.

PSYM-WIDE: A survey for large-separation planetary-mass companions to late spectral type members of young moving groups

Marie-Eve Naud[1]*, *Étienne Artigau*[1], *René Doyon*[1], *Lison Malo*[2,1], *Jonathan Gagné*[3,4], *David Lafrenière*[1], *Christian Wolf*[5] *and Eugene A. Magnier*[6]

[1] Institut de recherche sur les exoplanètes, Département de physique, Université de Montréal, Montréal, QC H3C 3J7, Canada.
[2] CanadaFranceHawaii Telescope (CFHT) Corporation, 65-1238 Mamalahoa Highway, Kamuela, Hawaii 96743, USA.
[3] Carnegie Institution of Washington DTM, 5241 Broad Branch Road NW, Washington, DC 20015, USA.
[4] NASA Sagan Fellow.
[5] Research School of Astronomy and Astrophysics, Australian National University, Canberra, ACT 2611, Australia
[6] Institute for Astronomy, University of Hawaii, 2680 Woodlawn Drive Honolulu, HI 96822, USA.

The Astronomical Journal, published (2017AJ....154..129)

We present the results of a direct-imaging survey for very large separation (>100 AU) late spectral type companions around 95 nearby young K5–L5 stars and brown dwarfs. They are high-likelihood candidates or confirmed members of the young ($\lesssim$ 150 Myr) β Pictoris and AB Doradus moving groups (ABDMG) and the TW Hya, Tucana-Horologium, Columba, Carina, and Argus associations. Images in i' and z' filters were obtained with GMOS on Gemini South to search for companions down to an apparent magnitude of $z' \sim$ 22–24 at separations $\gtrsim$ 20″ from the targets and in the remainder of the wide 5″5 × 5″5 GMOS field of view. This allowed probing the most distant region where planetary-mass companions could be gravitationally bound to the targets. This region was left largely unstudied by past high-contrast imaging surveys, that probed much closer-in separations. This survey led to the discovery of a planetary-mass (9–13 $M_{\rm Jup}$) companion at 2000 AU from the M3V star GU Psc, a highly probable member of ABDMG. No other substellar companions were identified. These results allowed constraining the frequency of distant planetary-mass companions (5–13 $M_{\rm Jup}$) to $0.84^{+6.73}_{-0.66}$% (95% confidence) at semi-major axes between 500 and 5000 AU around young K5–L5 stars and brown dwarfs. This is consistent with other studies suggesting that gravitationally bound planetary-mass companions at wide separations from low-mass stars are relatively rare.

Download/Website: `http://adsabs.harvard.edu/abs/2017AJ....154..129N`

Download/Website: `http://www.exoplanetes.umontreal.ca/?lang=en`

Contact: `naud@astro.umontreal.ca`

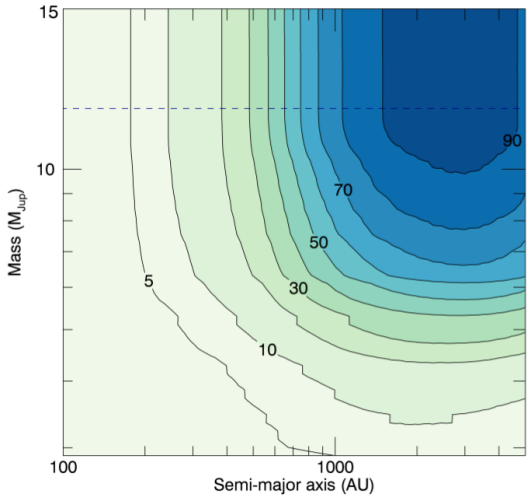

Figure 6: (Naud et al.) Completeness map for the PSYM-Wide survey, giving the mean detection probability in percentage with respect to mass and semi-major axis. The horizontal dash line is the $13\,M_{\rm Jup}$ separation between planetary-mass objects and brown dwarfs.

Three Super-Earths Transiting the nearby star GJ 9827

Prajwal Niraula[1], *Seth Redfield*[1], *Fei Dai*[2,3], *Oscar Barragán*[4], *Davide Gandolfi*[4], *P. Wilson Cauley*[1], *Teruyuki Hirano*[5], *Judith Korth*[6], *Alexis M. S. Smith*[7], *Jorge Prieto-Arranz*[8,9], *Sascha Grziwa*[6], *Malcolm Fridlund*[10,11], *Carina M. Persson*[11], *Anders Bo Justesen*[12], *Joshua N. Winn*[2], *Simon Albrecht*[12], *William D. Cochran*[13], *Szilard Csizmadia*[7], *Girish M. Duvvuri*[1], *Michael Endl*[13], *Artie P. Hatzes*[14], *John H. Livingston*[15], *Norio Narita*[15,16,17], *David Nespral*[8,9], *Grzegorz Nowak*[8,9], *Martin Pätzold*[6], *Enric Palle*[8,9], *and Vincent Van Eylen*[10]

[1] Astronomy Department and Van Vleck Observatory, Wesleyan University, Middletown, CT 06459, USA
[2] Department of Astrophysical Sciences, Princeton University, 4 Ivy Lane, Princeton, NJ 08544, USA
[3] Department of Physics and Kavli Institute for Astrophysics and Space Research, MIT, Cambridge, MA 02139, USA
[4] Dipartimento di Fisica, Universitá di Torino, via P. Giuria 1, 10125 Torino, Italy
[5] Department of Earth and Planetary Sciences, Tokyo Inst of Technology, 2-12-1 Ookayama, Meguro-ku, Tokyo 152-8551, Japan
[6] Rheinisches Institut für Umweltforschung an der Universität zu Köln, Aachener Strasse 209, 50931 Köln, Germany
[7] Institute of Planetary Research, German Aerospace Center, Rutherfordstrasse 2, 12489 Berlin, Germany
[8] Instituto de Astrofísica de Canarias, C/ Vía Láctea s/n, 38205 La Laguna, Spain
[9] Departamento de Astrofísica, Universidad de La Laguna, 38206 La Laguna, Spain
[10] Leiden Observatory, University of Leiden, PO Box 9513, 2300 RA, Leiden, The Netherlands
[11] Department of Space, Earth and Environment, Chalmers University of Technology, Onsala Space Observatory, 439 92 Onsala, Sweden
[12] Stellar Astrophysics Centre (SAC), Department of Physics and Astronomy, Aarhus University, Ny Munkegade 120, DK-8000
[13] Department of Astronomy and McDonald Observatory, University of Texas at Austin, 2515 Speedway, Stop C1400, Austin, TX 78712, USA
[14] Thüringer Landessternwarte Tautenburg, Sternwarte 5, D-07778 Tautenberg, Germany
[15] Department of Astronomy, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan
[16] Astrobiology Center, NINS, 2-21-1 Osawa, Mitaka, Tokyo 181-8588, Japan
[17] National Astronomical Observatory of Japan, NINS, 2-21-1 Osawa, Mitaka, Tokyo 181-8588, Japan

Submitted: AAS Journal, arXiv:1709.01527

We report on the discovery of three transiting planets around GJ 9827. The planets have radii of 1.75±0.18, 1.36±0.14, and $2.11^{+0.22}_{-0.21}$ $R_\oplus$, and periods of 1.20896 , 3.6480, and 6.2014 days, respectively. The detection was made in Campaign 12 observations as part of our *K2* survey of nearby stars. GJ 9827 is a $V = 10.39$ mag K6V star at distance of 30.3 ± 1.6 parsecs and the nearest star to be found hosting planets by *Kepler* and *K2*. The radial velocity follow-up, high resolution imaging, and detection of multiple transiting objects near commensurability drastically reduce the false positive probability. The orbital periods of GJ 9827 b, c and d planets are very close to the 1:3:5 mean motion resonance. Our preliminary analysis shows that GJ 9827 planets are excellent candidates for atmospheric observations. Besides, the planetary radii span both sides of the rocky and gaseous divide, hence the system will be an asset in expanding our understanding of the threshold.

Download/Website: `http://arXiv.org/abs/1709.01527`

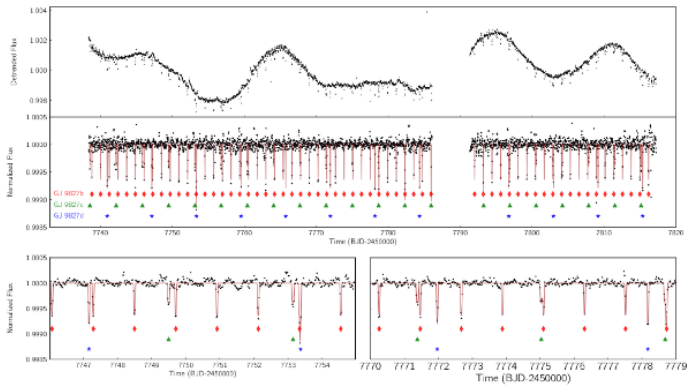

Figure 7: (Niraula et al.) Detrended and normalized *K2* light curve of EPIC 246389858. Transits of each planet are marked, and the combined fit (brown line) at a finer sampling rate for all transit based on MCMC fits is shown. The bottom left and bottom right figure zooms into two different sections of the data.

On Signatures of Clouds in Exoplanetary Transit Spectra

A. Pinhas & N. Madhusudhan
Institute of Astronomy, University of Cambridge, Madingley Rise, CB3 0HA

Monthly Notices of the Royal Astronomical Society, published (2017MNRAS.471.4355P)

Transmission spectra of exoplanetary atmospheres have been used to infer the presence of clouds/hazes. Such inferences are typically based on spectral slopes in the optical deviant from gaseous Rayleigh scattering or low-amplitude spectral features in the infrared. We investigate three observable metrics that could allow constraints on cloud properties from transmission spectra, namely, the optical slope, the uniformity of this slope, and condensate features in the infrared. We derive these metrics using model transmission spectra considering Mie extinction from a wide range of condensate species, particle sizes, and scale heights. Firstly, we investigate possible degeneracies among the cloud properties for an observed slope. We find, for example, that spectra with very steep optical slopes suggest sulphide clouds (*e.g.* MnS, ZnS, Na_2S) in the atmospheres. Secondly, (non)uniformities in optical slopes provide additional constraints on cloud properties, e.g., MnS, ZnS, TiO_2, and Fe_2O_3 have significantly non-uniform slopes. Thirdly, infrared spectra provide an additional powerful probe into cloud properties, with SiO_2, Fe_2O_3, Mg_2SiO_4, and $MgSiO_3$ bearing strong infrared features observable with the *James Webb Space Telescope*. We investigate observed spectra of eight hot Jupiters and discuss their implications. In particular, no single or composite condensate species considered here conforms to the steep and non-uniform optical slope observed for HD 189733b. Our work highlights the importance of the three above metrics to investigate cloud properties in exoplanetary atmospheres using high-precision transmission spectra and detailed cloud models. We make our Mie data for condensates publicly available to the community.

Download/Website: `http://adsabs.harvard.edu/abs/2017MNRAS.471.4355P`

Contact: `ap817@ast.cam.ac.uk`

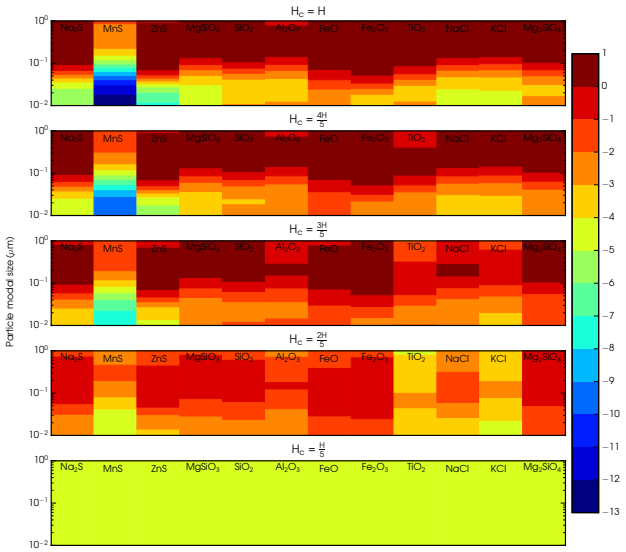

Figure 8: (Pinhas & Madhusudhan) Optical slopes of transmission spectra for cloudy H_2-rich atmospheres. Various cloud species are considered as a function of cloud modal particle size and cloud scale height H_c. The optical slope is one of three proposed metrics that can be used to constrain cloud properties of exoplanets using transmission spectrum observations.

The EBLM Project IV. Spectroscopic orbits of over 100 eclipsing M dwarfs masquerading as transiting hot-Jupiters

Amaury H.M.J. Triaud[1,2]*, David V. Martin*[3]*, Damien Ségransan*[3]*, Barry Smalley*[4]*, Pierre F.L. Maxted*[4]*, David R. Anderson*[4]*, François Bouchy*[3]*, Andrew Collier Cameron*[5]*, Francesca Faedi*[6]*, Yilen Gómez Maqueo Chew*[7]*, Leslie Hebb*[8]*, Coel Hellier*[4]*, Maxime Marmier*[3]*, Francesco Pepe*[3]*, Don Pollacco*[6]*, Didier Queloz*[9]*, Stéphane Udry* [3]*, Richard West*[6]

[1] Institute of Astronomy, Madingley Road, Cambridge CB3 0HA, UK
[2] School of Physics & Astronomy, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK
[3] Observatoire Astronomique de l'Université de Genève, Chemin des Maillettes 51, CH-1290 Sauverny, Switzerland
[4] Astrophysics Group, Keele University, Staffordshire, ST5 5BG, UK
[5] SUPA, School of Physics & Astronomy, University of St Andrews, North Haugh, KY16 9SS, St Andrews, Fife, Scotland, UK
[6] Department of Physics, University of Warwick, Coventry CV4 7AL, UK
[7] Instituto de Astronomía, Universidad Nacional Autónoma de México, Ciudad Universitaria, Ciudad de México, 04510, México
[8] Hobart and William Smith Colleges, Department of Physics, Geneva, NY 14456, USA
[9] Cavendish Laboratory, J J Thomson Avenue, Cambridge, CB3 0HE, UK

Astronomy & Astrophysics, in press (arXiv:arXiv:1707.07521)

We present 2271 radial velocity measurements taken on 118 single-line binary stars, taken over eight years with the CORALIE spectrograph. The binaries consist of F/G/K primaries and M-dwarf secondaries. They were initially discovered photometrically by the WASP planet survey, as their shallow eclipses mimic a hot-Jupiter transit. The observations we present permit a precise characterisation of the binary orbital elements and mass function. With modelling of the primary star this mass function is converted to a mass of the secondary star. In the future, this spectroscopic work will be combined with precise photometric eclipses to draw an empirical mass/radius relation for the bottom of the mass sequence. This has applications in both stellar astrophysics and the growing number of exoplanet surveys around M-dwarfs. In particular, we have discovered 34 systems with a secondary mass below $0.2M_{\odot}$, and so we will ultimately double the known number of very low-mass stars with well characterised masses and radii.

The quality of our data combined with the amplitude of the Doppler variations mean that we are able to detect eccentricities as small as 0.001 and orbital periods to sub-second precision. Our sample can revisit some earlier work on the tidal evolution of close binaries, extending it to low mass ratios. We find some exceptional binary systems that are eccentric at orbital periods below three days, while our longest circular orbit has a period of 10.4 days. Amongst our systems, we note one remarkable architecture in J1146-42, that boasts three stars within one astronomical unit.

By collating the EBLM binaries with published WASP planets and brown dwarfs, we derive a mass spectrum with twice the resolution of previous work. We compare the WASP/EBLM sample of tightly-bound orbits with work in the literature on more distant companions up to 10 AU. We note that the brown dwarf desert appears wider, as it carves into the planetary domain for our short-period orbits. This would mean that a significantly reduced abundance of planets begins at $\sim 3M_{\rm Jup}$, well before the Deuterium-burning limit. This may shed light on the formation and migration history of massive gas giants.

Download/Website: `https://arxiv.org/abs/1707.07521`

Contact: `A.Triaud@bham.ac.uk`

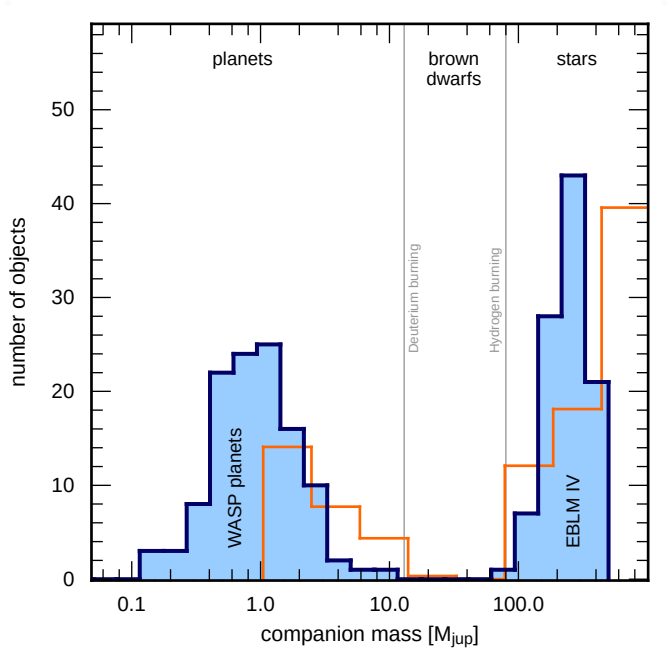

Figure 9: (Triaud et al.) This is our mass spectrum, ranging from $\sim$ $0.1M_{\rm Jup}$ to $\sim$ $0.3M_{\odot}$. We measure the mass of all WASP candidates showing periodic eclipses with depth consistent with $< 2.1R_{\rm Jup}$, planets, brown dwarfs and low-mass stellar companions alike. Our survey shows a clear, preliminary, confirmation for the brown dwarf desert. Several non-published planets, and many non-published low mass eclipsing binaries remain to be added to this diagram. The orange histogram is from Grether & Lineweaver (2006).

3 Jobs and Positions

Postdoctoral Position(s) in Exo-Planetary Science

Professor Ray Jayawardhana
York University, Faculty of Science, 4700 Keele Street, Toronto ON M3J 1P3, Ontario (ON), Canada

Toronto, Canada, 2017-18

Applications are invited for one or more postdoctoral positions at York University in Toronto. The successful candidate(s) will work with Professor Ray Jayawardhana and his collaborators on observational and analytical studies of extra-solar planets and related topics such as planet formation and sub-stellar objects. Photometric and spectroscopic characterization of extra-solar planets is of particular interest. Group members use data from VLT, Subaru, Gemini, Keck, CFHT, Kepler, and other major observatories, and will also be involved in guaranteed-time observations with the NIRISS instrument on JWST and the SPIRou instrument on CFHT. The successful candidate(s) will also have the opportunity to collaborate with Professor John Moores at York, and with other members of the Technologies for Exo-Planetary Science (TEPS) program, funded by NSERC at 1.65 million, at institutions across Canada and abroad. The position is for two years, with extension to a third year possible, and comes with a competitive salary and funds for research expenses. Start date is flexible, though earlier is preferred. Applicants should send their curriculum vitae, a description of research interests and plans and a list of publications, and should arrange for three letters of recommendation to be sent directly to Marlene Caplan (marlene@yorku.ca). All materials should be submitted electronically. Applications are accepted until the position is filled, and those received before October 16, 2017 will receive full consideration. Early expressions of interest and inquiries are welcome, and should be made to rayjay@yorku.ca.

Download/Website: `http://teps.science.yorku.ca`

Contact: `rayjay@yorku.ca`

Three postdoctoral fellowship in astrophysics applied to the study of exoplanets

Marie-Eve Naud, Scientific and EPO Coordinator
Institute for research on exoplanets, Département de physique, Université de Montréal, Montréal, QC H3C 3J7, Canada

in Montréal, Canada, Starting date: Summer or Fall 2018

L'annonce en français : http://www.exoplanetes.umontreal.ca/trois-bourses-postdoctorales-de-lirex-en-astrophysique-appliquee-a-letude-des-exoplanetes/

The Institute for Research on Exoplanets (iREx), affiliated with the Department of Physics of the Université de Montréal (UdeM), invites applications for three (3) postdoctoral fellowships in astrophysics applied to the study of exoplanets.

The Institute for Research on Exoplanets (iREx) consists of a growing team of 40+ people (professors, postdocs, research assistants and students), mostly from UdeM and McGill all working on various research programs focused on the study of exoplanets and related fields of stellar astrophysics. Members of iREx have a leadership role in many large international facilities related to the detection and characterization of exoplanets, notably the James Webb Space Telescope (JWST), precision radial velocity instruments SPIRou and NIRPS, and the Gemini Planet Imager. iREx researchers have access to significant guaranteed time observations (GTO) with these facilities. More information on iREx research programs can be found on the institute website: http://www.exoplanetes.umontreal.ca/research/?lang=en.

- One (1) of the available positions is for the Trottier Postdoctoral Fellowship, which enables forefront independent research related to exoplanets. All areas of exoplanet research will be considered, but priority will be given to candidates with research programs and expertise well aligned with the science programs of SPIRou and NIRPS.
- The other two (2) positions, funded by the Canadian Space Agency, are to work with JWST NIRISS team on the data reduction, analysis and publication of their 200-hr GTO NIRISS program dedicated to transit and eclipse spectroscopy observations of a wide variety of exoplanets, from hot Jupiters to small rocky temperate planets orbiting nearby low-mass stars.

A PhD in physics, astronomy or related discipline is required at the start of the fellowship, which is expected to be between May and September 2018. The positions are for two years, renewable for a third one subject to performance and availability of funds. Preference will be given to applicants who received their PhD within the last 3 years.

Applicants should fill the on-line form that can be found at:
https://docs.google.com/forms/d/1E5UXchDzpmIOgxPNzDB8hZSQfznkTVzYLQuQKug-zxY/edit, and upload therein their application, including a cover letter, curriculum vitae, a list of publications, and a statement of research interests of maximum 2 pages, in one PDF file. They should also arrange to have three referees send a letter of reference to irex@astro.umontreal.ca. All application materials must be received by November 1st, 2017.

Université de Montréal promotes diversity in its workforce through its Equal access to employment program. It encourages members of visible and ethnic minorities as well as women, Aboriginal people, persons with disabilities and people of all sexual orientations and gender identities to apply.

Social Benefits: Postdoctoral researchers at iREx/UdeM enjoy a comprehensive benefits package, see the UdeM Faculté des études supérieures et postdoctorales webpage for more information: http://fesp.umontreal.ca/english/postdoctoral-fellow/presentation/

Download/Website: `http://www.exoplanetes.umontreal.ca/trottier-postdoctoral-fellowship-of-irex-2017-in-astrophysics-applied-to-the-study-of-exoplanets/?lang=en`

Contact: `irex@astro.umontreal.ca`

Postdoctoral Position in Exoplanetary Sciences

Jean-Michel Désert
Anton Pannekoek Instituut, Institute for Astronomy, PO Box 94249 1090 GE, 1090 GE Amsterdam, Netherlands

University of Amsterdam, Netherlands, Starting date: spring 2018 (negotiable)

Applications are invited for a postdoctoral position at the Anton Pannekoek Institute for Astronomy at the University of Amsterdam Netherlands to work with Jean-Michel Désert on the observational characterization of exoplanets. The primary responsibilities of the position are to lead research projects in the area of exoplanets. Researchers working in the areas of observation, theory, or instrumentation are invited to apply.
The successful applicant will contribute to several current research programs using space-and-ground based surveys dedicated to probing exoplanet atmospheres. The programs include Space and ground-based observations, which will be used to determine the atmospheric composition, structure and dynamics of exoplanets, and preparation to JWST observations. The Postdoctoral Scholar will have the opportunity to join existing projects and will also be encouraged to develop and pursue their own research program.
Previous experience with exoplanet observations is preferred but not required. Applicants should have a PhD in astronomy, physics, or planetary science on arrival. The appointment is intended for an initial period of two years,

with renewal for a third year contingent upon satisfactory progress. The starting date for the position is negotiable, but could start in early 2018.
To apply, email a single PDF containing a Cover Letter, a Current CV with a list of publications and a brief (up to 3 page) research statement of your scientific interests and how you would specifically contribute to the research program on exoplanets. Also please arrange for 3 letters of references (PDFs) to be emailed to desert@uva.nl. Complete applications received by November 1st, 2017 will receive full consideration.

Contact: `desert@uva.nl`

PhD Position #1 on Interior-Atmosphere Feedback Modelling

Nicola Tosi
Technische Universität Berlin, Centre of Astronomy and Astrophysics, Berlin, Germany

TU Berlin, Starting date: January 2018

Research will be carried out in the framework of the newly established DFG priority program 1992 Exploring the Diversity of Exoplanets (www-astro.physik.tu-berlin.de/exoplanet-diversity/) for the project Interior-atmosphere feedbacks and the nature of detected sub-Neptunian planets. The project will be conducted at the TU Berlin, Center of Astronomy and Astrophysics in close cooperation with the Institute of Planetary Research of the German Aerospace Center (DLR) in Berlin-Adlershof. It focuses on the modelling of the possible interior structures, interior evolution and outgassing of known sub-Neptunian extrasolar planets investigating the properties of the resulting atmospheres as well as the interactions between atmosphere and interior. The project is split into two sub-projects dealing with interior and atmosphere modelling.
The successful candidate will work with Dr. Nicola Tosi on the interior modelling sub-project. The main tasks include 1) the development of models of the possible interior structures of sub-Neptunian planets based on their measured mass and radius, and 2) the extension and application of a one-dimensional thermal evolution model to simu- late the thermal and outgassing history of such bodies over the lifetime of the central star. The work will be carried out in close collaboration with the successful candidate for the atmosphere-modelling sub-project supervised by Dr. Mareike Godolt. PhD thesis preparation is possible.
Requirements:
successfully completed university degree (Master, Diplom or equivalent) in physics, geophysics, astronomy, applied mathematics or related disciplines; solid programming experience in a high-level language (Python, Matlab, FORTRAN, C, or similar); basic knowledge of continuum mechanics and heat transfer; experience in numerical modelling will be beneficial.
How to apply:
Please send your written application with the reference number II-417/17 and the usual documents (letter of motivation including a description of your research interests, CV, copies of university degrees and contact details for at least two letters of reference) to Technische Universität Berlin - Der Präsident - Fakultät II, Zentrum für Astronomie und Astrophysik, Dr. Nicola Tosi, Sekr. EW 8-1, Hardenbergstr. 36, 10623 Berlin or by e-mail to nicola.tosi@tu-berlin.de.
Application deadline is the 15th of October 2017.
To ensure equal opportunities between women and men, applications by women with the required qualifications are explicitly desired. Qualified individuals with disabilities will be favored.

Download/Website: `http://www-astro.physik.tu-berlin.de/exoplanet-diversity/jobs`

Contact: `nicola.tosi@tu-berlin.de`

PhD position #2 on Interior-atmosphere feedback modelling

Mareike Godolt
Technische Universität Berlin, Centre of Astronomy and Astrophysics, Berlin, Germany

TU Berlin, Starting date: January 2018

Research will be carried out in the framework of the newly established DFG priority program 1992 Exploring the Diversity of Exoplanets (www-astro.physik.tu-berlin.de/exoplanet-diversity/) for the project Interior-atmosphere feedbacks and the nature of detected sub-Neptunian planets. The project will be located at the TU Berlin, Center of Astronomy and Astrophysics, in the Planetary Physics group led by Prof. Dr. Heike Rauer. Work will be performed in close cooperation with the Department of Extrasolar Planets and Atmospheres at the Institute of Planetary Research of the German Aerospace Center (DLR) in Berlin-Adlershof. It focuses on the modelling of the possible interior structures, interior evolution and outgassing of known sub-Neptunian extrasolar planets investigating the properties of the resulting atmospheres as well as the interactions between atmosphere and interior. The project is split into two sub-projects dealing with interior and atmosphere modelling.
The successful candidate will work with Dr. Mareike Godolt on the atmosphere modelling sub-project, extending and applying one-dimensional atmosphere models for gas and rocky planets to the possible atmosphere scenarios of sub-Neptunes. The work will be carried out in close collaboration with the successful candidate for the interior-modelling sub-project supervised by Dr. Nicola Tosi. It further includes building and applying atmospheric escape parametrizations from detailed atmospheric escape studies in collaboration with the Institut fr Weltraumforschung, Graz. PhD thesis preparation is possible.
Requirements:
successfully completed university degree (Master, Diplom or equivalent) in physics, meteorology, geophysics, applied mathematics or related disciplines; solid programming experience in a high-level language (FORTRAN, C, Python, or similar); basic knowledge of astrophysics, radiative transfer or atmospheric physics; experience in numerical modelling (of planetary atmospheres in particular) will be beneficial.

How to apply:
Please send your written application with the reference number II-515/17 and the usual documents (letter of motivation including a description of your research interests, CV, copies of university degrees and contact details for at least two letters of reference) to Technische Universität Berlin - Der Präsident - Fakultät II, Zentrum für Astronomie und Astrophysik, Dr. Mareike Godolt, Sekr. EW 8-1, Hardenbergstr. 36, 10623 Berlin or by e-mail to kieschke@astro.physik.tu-berlin.de.
Application deadline is the 31st of October 2017.
To ensure equal opportunities between women and men, applications by women with the required qualifications are explicitly desired. Qualified individuals with disabilities will be favored.

Download/Website: `http://www-astro.physik.tu-berlin.de/exoplanet-diversity/jobs`

Contact: `godolt@tu-berlin.de`

Executive Officer of the PlanetS Technology Platform

Francesco Pepe (responsible for the Technology Platform)
Observatoire astronomique de l'Université de Genève, 51 ch. des Maillettes, CH-1290 Versoix, Switzerland

University of Geneva (Geneva Observatory) or University of Bern, as soon as possible

Work environment: PlanetS is a successful NCCR in Planetary Science (Solar System and Exoplanets) funded by the Swiss National Science Foundation (SNSF). Leading houses of the NCCR are the Universities of Bern and Geneva, but PlanetS involves also other leading research institutes across Switzerland and collaborates with renowned national and international partners. PlanetS is recognized as one of the leading organizations

worldwide in the exploration of our solar system and extra-solar planets research. As part of its infrastructural and strategic activities PlanetS intends, through its Technology Platform, to strengthen partnership with industry, foster knowledge and technology transfer, and education of young researches and engineers.

Job description: The Technology Platform of PlanetS (http://nccr-planets.ch/platforms/technology-transfer/) is opening a 40-60% position as Executive Officer. The successful candidate will, among other commitments, be responsible for the organisation of the platform and the implementation of its program through strategic activities defined by the Technology Platform leader and PlanetS Board. In particular, as as an example for these activities, we shall mention:

- Prepare the annual budget
- Prepare calls for seed-funding ideas and follow-up the selected projects
- Co-organize SwissCompanyMaker, in collaboration with other NCCRs
- Organize and coordinate a PlanetS-Industry exchange program for PhD-students and engineers
- Collaborate with other KTT (Knowledge and Technology Transfer) entities within Switzerland and coordinate activities
- Propose and organise KTT events and topical ”technology” workshops within PlanetS
- Foster the contact with industry

The Executive Officer shall work in close collaboration with the Technology Platform Leader (and member of the PlanetS Board), who will define the global strategy and report to the PlanetS Board and SNSF.

Skills and education: The candidates must have an University Degree in technical areas and at least 5 years of experience in industry and private sector. Additional experience in research and/or in ”technology education” is not mandatory but of great value. At least basic knowledge of KTT concepts are requested and experience with KTT activities strongly recommended.

Languages: Fluent in English, German and French

Work place: Geneva Observatory, Versoix (University of Geneva) or University of Bern

Starting date: As soon as possible

Duration: The yearly contract is extendable till end of May 2022, depending on funding and achievements.

Salary: Class 19 of the State of Geneva or equivalent

Academic title requested: University degree (Master) or equivalent

How to apply: Applications should be sent to Chantal.Tacoy@unige.ch and shall include:

- Cover letter
- Detailed CV together with a list of publications/experience/achievements
- Copy of highest degrees/diploma

- List of referees who can later be contacted directly by the search committee. Recommendation letters are not requested for now.

Complete applications received by 30 October 2017, will receive full considerations. Past this date, applications will be considered depending on availability.

PlanetS is committed to equal opportunities and diversity in its workplaces. Applications from women are strongly encouraged.

Download/Website: `http://nccr-planets.ch/platforms/technology-transfer/`

Contact: `chantal.tacoy@unige.ch`

4 Announcements

SPP1992 – Exploring the Diversity of Extrasolar Planets

H. Rauer[1,2] *& Ph. Eigmüller*[2]

[1] Center for Astronomy and Astrophysics, TU Berlin, Hardenbergstr. 36, D-10623 Berlin, Germany
[2] Institute of Planetary Research, German Aerospace Center, Rutherfordstrasse 2, D-12489 Berlin, Germany

DFG, 2017-2020

The German Research foundation (DFG) started a new priority program on "Exploring the Diversity of Extrasolar Planets" (SPP 1992). As part of this coordinated program nearly 40 projects have been funded by DFG for the coming 3 years. Topics of the different projects cover a wide range of exoplanet research:

- planet formation and the dynamical evolution of planetary systems
- atmosphere characterization of exoplanets
- star-planet interaction
- search for new extrasolar planets

A main goal of the priority program is it to strengthen the interaction between researchers on these different topics and to bring together modelers and observers in this rapidly evolving field.
The first job announcements for projects in this program are out and more will follow in the coming weeks. For more details visit our website:
http://www-astro.physik.tu-berlin.de/exoplanet-diversity
To stay updated you can subscribe to our rss-feed:
http://www-astro.physik.tu-berlin.de/exoplanet-diversity/rss.xml

Download/Website: `http://www-astro.physik.tu-berlin.de/exoplanet-diversity`

Contact: `spp1992@astro.physik.tu-berlin.de`

Fizeau exchange visitors program in optical interferometry - call for applications

Josef Hron
Vienna University, Department of Astrophysics, A-1180 Vienna, Tuerkenschanzstrasse 17 room 107.2

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

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

The deadline for applications is October 15. Fellowships can be awarded for missions to be carried out between December 2017 and May 2018!
Further informations and application forms can be found at: www.european-interferometry.eu
The program is funded by OPTICON/H2020.

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

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

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

Contact: `fizeau@european-interferometry.eu`

5 As seen on astro-ph

The following list contains all the entries relating to exoplanets that we spotted on astro-ph during September 2017.

September 2017

astro-ph/1709.00003 : **Anti-correlation between multiplicity and orbital properties in exoplanetary systems as a possible record of their dynamical histories** by *Angelo Zinzi, Diego Turrini*
astro-ph/1709.00246 : **Dust-driven viscous ring-instability in protoplanetary disks** by *C.P. Dullemond, A.B.T. Penzlin*
astro-ph/1709.00290 : **Astrometric exoplanet detectability and the Earth orbital motion** by *Alexey G. Butkevich*
astro-ph/1709.00338 : **Retrieval Analysis of the Emission Spectrum of WASP-12b: Sensitivity of Outcomes to Prior Assumptions and Implications for Formation History** by *Maria Oreshenko, et al.*
astro-ph/1709.00351 : **A modified CoRoT detrend algorithm and the discovery of a new planetary companion** by *Rodrigo C. Boufleur, et al.*
astro-ph/1709.00361 : **X-ray photoevaporation's limited success in the formation of planetesimals by the streaming instability** by *Barbara Ercolano et al.*
astro-ph/1709.00365 : **The fragmentation criteria in local vertically stratified self-gravitating disk simulations** by *Hans Baehr, Hubert Klahr, Kaitlin M. Kratter*
astro-ph/1709.00417 : **The HIP 79977 debris disk in polarized light** by *N. Engler, et al.*

astro-ph/1709.00428 : **Millimeter Spectral Indices and Dust Trapping By Planets in Brown Dwarf Disks** by *P. Pinilla, et al.*

astro-ph/1709.00645 : **Asteroseismology and Exoplanets: Proceedings of the IVth Azores International Advanced School in Space Sciences** by *Tiago L. Campante, Nuno C. Santos, Mario J.P.F.G. Monteiro*

astro-ph/1709.00680 : **Characterising exo-ringsystems around fast-rotating stars using the Rossiter-McLaughlin effect** by *E.J.W. de Mooij, C.A. Watson, M.A. Kenworthy*

astro-ph/1709.00806 : **Combining Spitzer parallax and Keck II adaptive optics imaging to measure the mass of a solar-like star orbited by a cold gaseous planet discovered by microlensing** by *J.-P. Beaulieu, et al.*

astro-ph/1709.00865 : **Precise masses for the transiting planetary system HD 106315 with HARPS** by *S. C. C. Barros, et al.*

astro-ph/1709.01025 : **Three small transiting planets around the M dwarf host star LP 358-499** by *R. Wells, K. Poppenhaeger, C. A. Watson*

astro-ph/1709.01027 : **The Influence of Coronal Mass Ejections on the Mass-loss Rates of Hot-Jupiters** by *A. A. Cherenkov, et al.*

astro-ph/1709.01219 : **The dehydration of water worlds via atmospheric losses** by *Chuanfei Dong, et al.*

astro-ph/1709.01463 : **CN rings in full protoplanetary disks around young stars as probe of disk structure** by *P. Cazzoletti, et al.*

astro-ph/1709.01527 : **Three Small Super-Earths Transiting the nearby star GJ 9827** by *Prajwal Niraula, et al.*

astro-ph/1709.01642 : **Ohmic Dissipation in Mini-Neptunes** by *Bonan Pu, Diana Valencia*

astro-ph/1709.01732 : **Detection of a repeated transit signature in the light curve of the enigma star KIC 8462852: a 928-day period?** by *Flavien Kiefer, et al.*

astro-ph/1709.01734 : **Investigation of the inner structures around HD169142 with VLT/SPHERE** by *R. Ligi, et al.*

astro-ph/1709.01875 : **The GTC exoplanet transit spectroscopy survey VIII. Flat transmission spectrum for the warm gas giant WASP-80** by *Hannu Parviainen, et al.*

astro-ph/1709.01957 : **A System of Three Super Earths Transiting the Late K-Dwarf GJ 9827 at Thirty Parsecs** by *Joseph E. Rodriguez, et al.*

astro-ph/1709.02017 : **A Survey For Planetary-mass Brown Dwarfs in the Taurus and Perseus Star-forming Regions** by *Taran Esplin, Kevin Luhman*

astro-ph/1709.02051 : **Habitable Climate Scenarios for Proxima Centauri b With a Dynamic Ocean** by *Anthony D. Del Genio, et al.*

astro-ph/1709.02211 : **Transit Visibility Zones of the Solar System Planets** by *R. Wells, et al.*

astro-ph/1709.02391 : **Chemical enrichment of the planet forming region as probed by accretion** by *Richard A. Booth, Cathie J. Clarke*

astro-ph/1709.03491 : **The Breakthrough Listen Search for Intelligent Life: 1.1-1.9 GHz observations of 692 Nearby Stars** by *J. Emilio Enriquez, et al.*

astro-ph/1709.03502 : **Revisiting the Energy Budget of WASP-43b: Enhanced day-night heat transport** by *Dylan Keating, Nicolas B. Cowan*

astro-ph/1709.03530 : **Pebble Accretion in Turbulent Protoplanetary Disks** by *Ziyan Xu, Xue-Ning Bai, Ruth Murray-Clay*

astro-ph/1709.04118 : **Detection of titanium oxide in the atmosphere of a hot Jupiter** by *Elyar Sedaghati et al.*

astro-ph/1709.04433 : **The scattering outcomes of Kepler circumbinary planets: planet mass ratio** by *Yan-Xiang Gong, Jianghui Ji*

astro-ph/1709.04438 : **Observability of Forming Planets and their Circumplanetary Disks I. – Parameter Study for ALMA** by *J. Szulagyi, et al.*

astro-ph/1709.04461 : **The Very Low Albedo of WASP-12b From Spectral Eclipse Observations with Hubble** by *Taylor J. Bell, et al.*

astro-ph/1709.04539 : **Bayesian Analysis of Hot Jupiter Radius Anomalies: Evidence for Ohmic Dissipation?** by *Daniel P. Thorngren, Jonathan J. Fortney*
astro-ph/1709.04686 : **The long egress of GJ 436b's giant exosphere** by *B. Lavie, et al.*
astro-ph/1709.04736 : **The formation of mini-Neptunes** by *Julia Venturini, Ravit Helled*
astro-ph/1709.04950 : **On Shocks Driven by High-mass Planets in Radiatively Inefficient Disks. III. Observational Signatures in Thermal Emission and Scattered Light** by *Blake Hord, et al.*
astro-ph/1709.04987 : **Do planets remember how they formed?** by *David Kipping*
astro-ph/1709.05127 : **Search for possible exomoons with FAST telescope** by *Dragan Lukic*
astro-ph/1709.05315 : **Exclusion of Stellar Companions to Exoplanet Host Stars** by *Justin M. Wittrock, et al.*
astro-ph/1709.05676 : **Estimating the magnetic field strength in hot Jupiters** by *Rakesh K. Yadav, Daniel P. Thorngren*
astro-ph/1709.05784 : **The fate of close-in planets: tidal or magnetic migration?** by *A. Strugarek, et al.*
astro-ph/1709.05941 : **Exoplanet Atmosphere Measurements from Transmission Spectroscopy and other Planet-Star Combined Light Observations** by *Laura Kreidberg*
astro-ph/1709.06032 : **Asteroid impacts on terrestrial planets: The effects of super-Earths and the role of the ν_6 resonance** by *Jeremy L. Smallwood, et al.*
astro-ph/1709.06124 : **Transmission spectroscopy of the hot Jupiter TrES-3 b: Disproof of an overly large Rayleigh-like feature** by *F. Mackebrandt, et al.*
astro-ph/1709.06376 : **The Rossiter-McLaughlin effect in Exoplanet Research** by *Amaury H.M.J. Triaud*
astro-ph/1709.06443 : **Detecting transit signatures of exoplanetary rings using SOAP3.0** by *B. Akinsanmi, et al.*
astro-ph/1709.06851 : **HADES RV Programme with HARPS-N at TNG VI. GJ 3942 b behind dominant activity signals** by *M. Perger, et al.*
astro-ph/1709.06991 : **Out-of-Transit Refracted Light in the Atmospheres of Transiting and Non-Transiting Exoplanets** by *Paul A. Dalba*
astro-ph/1709.07006 : **Simulations of the Fomalhaut System Within Its Local Galactic Environment** by *Nathan A. Kaib, Ethan B. White, Andre Izidoro*
astro-ph/1709.07010 : **KELT-19Ab: A P $\sim$ 4.6 Day Hot Jupiter Transiting a Likely Am Star with a Distant Stellar Companion** by *Robert J. Siverd, et al.*
astro-ph/1709.07026 : **Electron Heating and Saturation of Self-regulating Magnetorotational Instability in Protoplanetary Disks** by *Shoji Mori, et al.*
astro-ph/1709.07070 : **Accretion of Planetary Material onto Host Stars** by *Brian Jackson, Joleen Carlberg*
astro-ph/1709.07382 : **Clearing residual planetesimals by sweeping secular resonances in transitional disks: a lone-planet scenario for the wide gaps in debris disks around Vega and Fomalhaut** by *Xiaochen Zheng, et al.*
astro-ph/1709.07385 : **Statistical Analysis of Hubble/WFC3 Transit Spectroscopy of Extrasolar Planets** by *Guangwei Fu, et al.*
astro-ph/1709.07459 : **Modeling the effects of inhomogeneous aerosols on the hot Jupiter Kepler-7b's atmospheric circulation** by *Michael Roman, Emily Rauscher*
astro-ph/1709.07476 : **High-resolution Imaging of Transiting Extrasolar Planetary systems (HITEP). II. Lucky Imaging results from 2015 and 2016** by *D. F. Evans, et al.*
astro-ph/1709.07519 : **Combining angular differential imaging and accurate polarimetry with SPHERE/IRDIS to characterize young giant exoplanets** by *Rob G. van Holstein, et al.*
astro-ph/1709.07800 : **Stellar Coronal and Wind Models: Impact on Exoplanets** by *A. A. Vidotto*
astro-ph/1709.07863 : **Molecular abundances and C/O ratios in chemically evolving planet-forming disk midplanes** by *Christian Eistrup, Catherine Walsh, Ewine F van Dishoeck*
astro-ph/1709.08369 : **Signatures of broken protoplanetary discs in scattered light and in sub-millimetre observations** by *Stefano Facchini, Attila Juhasz, Giuseppe Lodato*
astro-ph/1709.08415 : **VUV-absorption cross section of carbon dioxide from 150 to 800 K and applications to**

warm exoplanetary atmospheres by *Olivia Venot, et al.*

astro-ph/1709.08476 : **OGLE-2017-BLG-0173Lb: Low Mass-Ratio Planet in a "Hollywood" Microlensing Event** by *K.-H. Hwang, et al.*

astro-ph/1709.08514 : **Modelling of mid-infrared interferometric signature of hot exozodiacal dust emission** by *Florian Kirchschlager, et al.*

astro-ph/1709.08630 : **The Star-Planet Connection I: Using Stellar Composition to Observationally Constrain Planetary Mineralogy for the Ten Closest Stars** by *Natalie Hinkel, Cayman Unterborn*

astro-ph/1709.08635 : **Water, Methane Depletion, and High-Altitude Condensates in the Atmosphere of the Warm Super-Neptune WASP-107b** by *Laura Kreidberg, et al.*

astro-ph/1709.08704 : **pyLIMA : an open source package for microlensing modeling. I. presentation of the software and analysis on single lens models** by *E. Bachelet, et al.*

astro-ph/1709.09240 : **Obliquity and Eccentricity Constraints For Terrestrial Exoplanets** by *Stephen R. Kane, Stephanie M. Torres*

astro-ph/1709.09478 : **Atmospheric tides and their consequences on the rotational dynamics of terrestrial planets** by *Pierre Auclair-Desrotour, Jacques Laskar, Stephane Mathis*

astro-ph/1709.09664 : **Temporal and spatial variations of the absolute reflectivity of Jupiter and Saturn from 0.38 to 1.7 μm with PlanetCam-UPV/EHU** by *I. Mendikoa, et al.*

astro-ph/1709.09670 : **Zodiacal Exoplanet in Time (ZEIT) V: A Uniform Search for Transiting Planets in Young Clusters Observed by K2** by *Aaron C Rizzuto, et al.*

astro-ph/1709.09678 : **Combining low- to high-resolution transit spectroscopy of HD189733b** by *Lorenzo Pino, et al.*

astro-ph/1709.09978 : **Detection and Characterization of Extrasolar Planets through Mean-Motion Resonances. II. The Effect of the Planet's Orbital Eccentricity on Debris Disk Structures** by *Maryam Tabeshian, Paul A. Wiegert*

astro-ph/1709.10130 : **Inside-Out Planet Formation. IV. Pebble Evolution and Planet Formation Timescales** by *Xiao Hu, et al.*

astro-ph/1709.10328 : **Zodiacal Exoplanets in Time (ZEIT) VI: a three-planet system in the Hyades cluster including an Earth-sized planet** by *Andrew W. Mann, et al.*

astro-ph/1709.10398 : **K2-nnnA b: A Binary System in the Hyades Cluster Hosting a Neptune-Sized Planet** by *David R. Ciardi, et al.*