ExoPlanet News
An Electronic Newsletter

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Contents

1 Editorial

Welcome to the 93rd edition of Exoplanet News. Apologies for its late arrival, but I other things justt seemed to get in the way this month.

There will not be a newsletter in January, but please keep contributions coming in, and I will aim to send out a new edition in February 2017. Meanwhile I hope you enjoy the festive season and the New Year.

best wishes
Andrew Norton

2 Abstracts of refereed papers

Refined architecture of the WASP-8 system: A cautionary tale for traditional Rossiter-McLaughlin analysis

V. Bourrier, H. M. Cegla, C. Lovis, A. Wyttenbach
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Astronomy & Astrophysics, in press (arXiv:1611.07985)

Probing the trajectory of a transiting planet across the disk of its star through the analysis of its Rossiter-McLaughlin effect can be used to measure the differential rotation of the host star and true obliquity of the system. Highly misaligned systems could be particularly conducive to these measurements, which is why we reanalyzed the HARPS transit spectra of WASP-8b using the Rossiter-McLaughlin effect reloaded (reloaded RM) technique. This approach allows us to isolate the local stellar CCF emitted by the planet-occulted regions. As a result we identified a ∼35% variation in the local CCF contrast along the transit chord, which might trace a deepening of the stellar lines from the equator to the poles. Whatever its origin, such an effect cannot be detected when analyzing the RV centroids of the disk-integrated CCFs through a traditional velocimetric analysis of the RM effect. Consequently this effect injected a significant bias into the results obtained by Queloz et al. (2010) for the projected rotational velocity $v_{eq} \sin i_{\star}$ ($1.59^{+0.08}_{-0.09}$ km s^{-1}) and the sky-projected obliquity λ ($-123.0^{+3.4}_{-4.4}{}^{\circ}$). Using our technique, we measured these values to be $v_{eq} \sin i_{\star}$ = 1.90±0.05 km s^{-1} and λ = $-143.0^{+1.6}_{-1.5}{}^{\circ}$. We found no compelling evidence for differential rotation of the star, although there are hints that WASP-8 is pointing away from us with the stellar poles rotating about 25% slower than the equator. Measurements at higher accuracy during ingress and egress will be required to confirm this result. In contrast to the traditional analysis of the RM effect, the reloaded RM technique directly extracts the local stellar CCFs, allowing us to analyze their shape and to measure their RV centroids, unbiased by variations in their contrast or FWHM.

Download/Website: `https://arxiv.org/abs/1611.07985`

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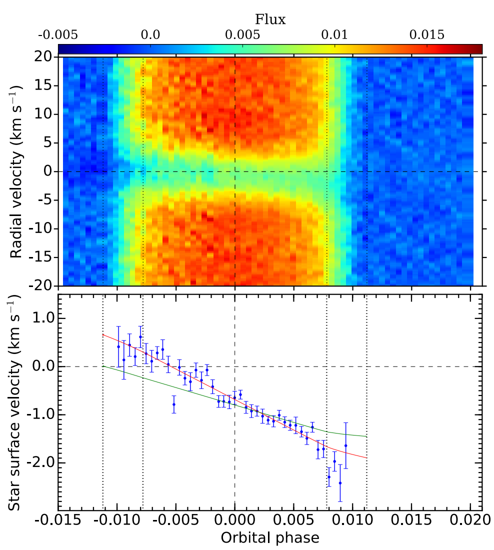

Figure 1: (Bourrier et al.) *Upper panel:* Local stellar CCFs emitted by the photospheric regions occulted by WASP-8b along its transit chord. They are plotted as a function of orbital phase (in abscissa) and radial velocity in the stellar rest frame (in ordinate). Colors indicate flux values. The four vertical dashed black lines show the times of the contacts. *Lower panel:* RVs centroids of the local stellar CCFs, which correspond to the RVs of the regions occulted by the planet (blue points). The green curve is the RV model derived by Queloz et al. (2010) from a traditional analysis of the RM effect. The red curve corresponds to our best fit using the reloaded RM approach.

Near-IR Emission Spectrum of WASP-103b using Hubble Space Telescope/Wide Field Camera 3

K. M. S. Cartier[1,2], *T. G. Beatty*[1,2], *M. Zhao*[1,2], *M. Line*[3,4], *H. Ngo*[3], *D. Mawet*[9,10], *K. G. Stassun*[5,6], *J. T. Wright*[1,2], *L. Kreidberg*[7], *J. Fortney*[8] *H. Knutson*[3],

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The Astronomical Journal, in press (arXiv:1611.09272)

We present here our observations and analysis of the dayside emission spectrum of the hot Jupiter WASP-103b. We observed WASP-103b during secondary eclipse using two visits of the *Hubble Space Telescope* with the G141 grism on Wide Field Camera 3 in spatial scan mode. We generated secondary eclipse light curves of the planet in both blended white-light and spectrally binned wavechannels from $1.1 - 1.7\mu m$ and corrected the light curves for flux contamination from a nearby companion star. We modeled the detector systematics and secondary eclipse spectrum using Gaussian process regression and found that the near-IR emission spectrum of WASP-103b is featureless across the observed near-IR region to down to a sensitivity of 175 ppm, and shows a shallow slope towards the red. The atmosphere has a single brightness temperature of $\mathrm{T_B} = 2890$ K across this wavelength range. This region of the spectrum is indistinguishable from isothermal, but may not manifest from a physically isothermal system, i.e. pseudo-isothermal. A Solar-metallicity profile with a thermal inversion layer at 10^{-2} bar fits WASP-103b's spectrum with high confidence, as do an isothermal profile with Solar metallicity and a monotonically decreasing atmosphere with C/O$>$1. The data rule out a monotonically decreasing atmospheric profile with Solar composition, and we rule out a low-metallicity decreasing profile as non-physical for this system. The pseudo-isothermal profile could be explained by a thermal inversion layer just above the layer probed by our observations, or by clouds or haze in the upper atmosphere. Transmission spectra at optical wavelengths would allow us to better differentiate between potential atmospheric models.

Download/Website: `https://arxiv.org/abs/1611.09272`

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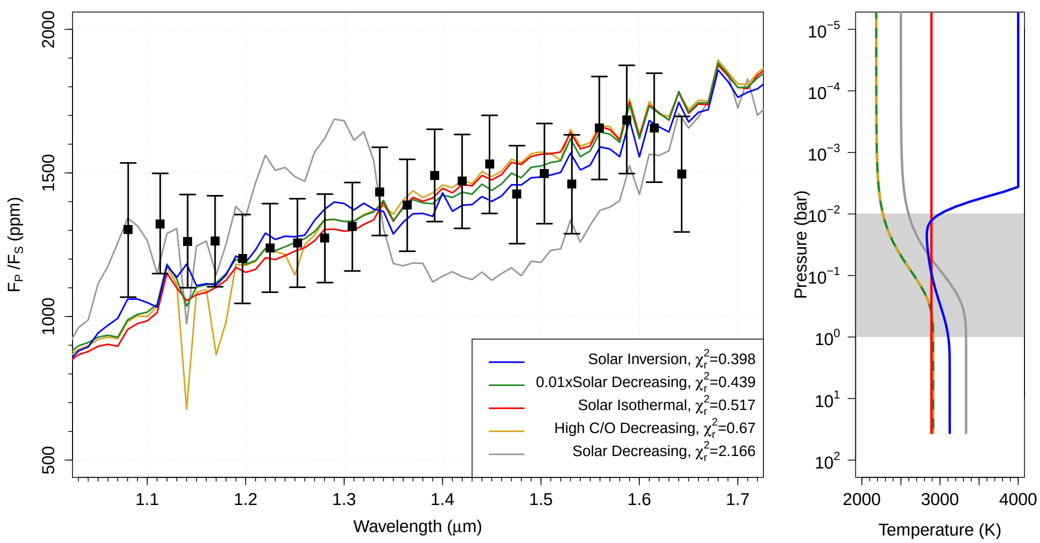

Figure 2: (Cartier et al.) *Left:* Atmospheric models (binned to low resolution) tested against the visit-averaged thermal emission spectrum of WASP-103b in the near-IR (black points). Blue corresponds to a Solar metallicity atmosphere with a thermal inversion, yellow corresponds to a decreasing atmosphere with C/O$>$1, red corresponds to an isothermal atmosphere at Solar metallicity, and green and gray correspond to a decreasing atmosphere at low-metallicity and Solar metallicity, respectively. Reduced χ_r^2 values are listed for each model. *Right:* The vertical pressure-temperature profiles associated with the tested atmospheric models. Model colors are the same as in the left panel, and the gray shaded region indicates the atmospheric pressures probed by our observations. The low-metallicity Solar and high C/O profiles are identical, and overplotted with alternating dashed colors.

On the radial velocity detection of additional planets in transiting, slowly rotating M-dwarf systems: the case of GJ 1132

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The Astronomical Journal, accepted: arXiv:1610.09667

M-dwarfs are known to commonly host high-multiplicity planetary systems. Therefore M-dwarf planetary systems with a known transiting planet are expected to contain additional small planets ($r_p \leq 4$ R$_\oplus$, $m_p \lesssim 20$ M$_\oplus$) that are not seen in transit. In this study we investigate the effort required to detect such planets using precision velocimetry around the sizable subset of M-dwarfs which are slowly rotating ($P_{\rm rot} \gtrsim 40$ days) and hence more likely to be inactive. We focus on the test case of GJ 1132. Specifically, we perform a suite of Monte-Carlo simulations of the star's radial velocity signal featuring astrophysical contributions from stellar jitter due to rotationally modulated active regions and keplerian signals from the known transiting planet and hypothetical additional planets not seen in transit. We then compute the detection completeness of non-transiting planets around GJ 1132 and consequently estimate the number of RV measurements required to detect those planets. We show that with 1 m s^{-1} precision per measurement, only ~ 50 measurements are required to achieve a 50% detection completeness to all non-transiting planets in the system and to planets which are potentially habitable. Throughout we advocate the use of Gaussian process regression as an effective tool for mitigating the effects of stellar jitter including stars with high activity. Given that GJ 1132 is representative of a large population of slowly rotating M-dwarfs, we conclude with a discussion of how our results may be extended to other systems with known transiting planets such as those which will be discovered with *TESS*.

Download/Website: `https://arxiv.org/abs/1610.09667`

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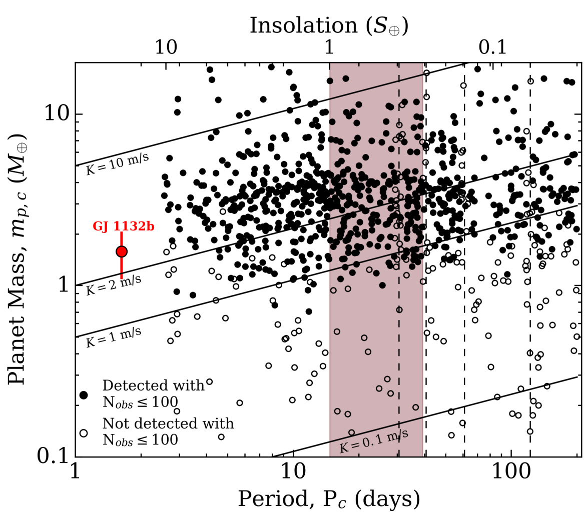

Figure 3: (Cloutier et al.) The planetary mass-period/insolation plane of our full Monte-Carlo sample of additional hypothetical planets around GJ 1132. Planets which are detected with $\leq$ 100 RV measurements ($\sigma_{\rm RV} = 1$ m s^{-1}) are shown in black whereas planets which remain undetected are shown in white. Contours of constant RV semiamplitude are over-plotted as solid black lines. The vertical dashed lines indicate the rotation period of GJ 1132 and its low-order harmonics where we do not detect planetary signals. The habitable zone is depicted in the shaded red region. GJ 1132b is highlighted as the red circle on the far left.

WASP-20 is a close visual binary with a transiting hot Jupiter

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Astrophysical Journal Letters, in press (arXiv:1611.08735)

We announce the discovery that WASP-20 is a binary stellar system, consisting of two components separated by $0.2578 \pm 0.0007''$ on the sky, with a flux ratio of 0.4639 ± 0.0015 in the K-band. It has previously been assumed that the system consists of a single F9 V star, with photometric and radial velocity signals consistent with a low-density transiting giant planet. With a projected separation of approximately 60 au between the two components, the detected planetary signals almost certainly originate from the brighter of the two stars. We reanalyse previous observations allowing for two scenarios, 'planet transits A' and 'planet transits B', finding that both cases remain consistent with a transiting gas giant. However, we rule out the 'planet transits B' scenario because the observed transit duration requires star B to be significantly evolved, and therefore have an age much greater than star A. We outline further observations which can be used to confirm this finding. Our preferred 'planet transits A' scenario results in the measured mass and radius of the planet increasing by 4σ and 1σ, respectively.

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Inner mean-motion resonances with eccentric planets: A possible origin for exozodiacal dust clouds

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1611.02196)

High levels of dust have been detected in the immediate vicinity of many stars, both young and old. A promising scenario to explain the presence of this short-lived dust is that these analogues to the Zodiacal cloud (or exozodis) are refilled in situ through cometary activity and sublimation. As the reservoir of comets is not expected to be replenished, the presence of these exozodis in old systems has yet to be adequately explained. It was recently suggested that mean-motion resonances (MMR) with exterior planets on moderately eccentric ($e_p \gtrsim 0.1$) orbits could scatter planetesimals on to cometary orbits with delays of the order of several 100 Myr. Theoretically, this mechanism is also expected to sustain continuous production of active comets once it has started, potentially over Gyr-timescales.
We aim here to investigate the ability of this mechanism to generate scattering on to cometary orbits compatible with the production of an exozodi on long timescales. We combine analytical predictions and complementary numerical N-body simulations to study its characteristics.
We show, using order of magnitude estimates, that via this mechanism, low mass discs comparable to the Kuiper Belt could sustain comet scattering at rates compatible with the presence of the exozodis which are detected around Solar-type stars, and on Gyr timescales. We also find that the levels of dust detected around Vega could be sustained via our proposed mechanism if an eccentric Jupiter-like planet were present exterior to the system's cold debris disc.

Download/Website: `https://arxiv.org/abs/1611.02196`

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A New Yield Simulator for Transiting Planets and False Positives: Application to the Next Generation Transit Survey

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Monthly Notices of the Royal Astronomical Society, in press (doi:10.1093/mnras/stw2908 or arxiv:1611.02526)

We present a yield simulator to predict the number and characteristics of planets, false positives and false alarms in transit surveys. The simulator is based on a galactic model and the planet occurrence rates measured by the Kepler mission. It takes into account the observation window function and measured noise levels of the investigated survey. Additionally, it includes vetting criteria to identify false positives. We apply this simulator to the Next Generation Transit Survey (NGTS), a wide-field survey designed to detect transiting Neptune-sized exoplanets. We find that red noise is the main limitation of NGTS up to 14th magnitude, and that its obtained level determines the expected yield. Assuming a red noise level of 1 mmag, the simulation predicts the following for a four-year survey: 4 ± 3 Super-Earths, 19 ± 5 Small Neptunes, 16 ± 4 Large Neptunes, 55 ± 8 Saturn-sized planets and 150 ± 10 Jupiter-sized planets, along with 4688 ± 45 eclipsing binaries and 843 ± 75 background eclipsing binaries. We characterize the properties of these objects to enhance the early identification of false positives and discuss follow-up strategies for transiting candidates.

Download/Website: `http://mnras.oxfordjournals.org/content/early/2016/11/10/mnras.stw2908` or `https://arxiv.org/abs/1611.02526`

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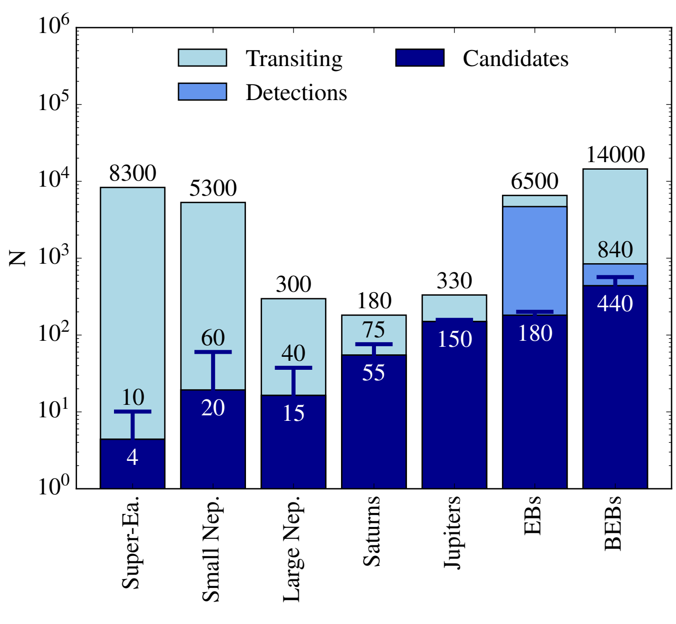

Figure 4: (Günther et al.) Expected Yield for NGTS' planets and false positives, i.e. eclipsing binaries (EBs) and background eclipsing binaries (BEBs). Light blue: objects undergoing a transit in the line of sight with orbital periods shorter than 20 d. Blue: Objects that can be detected with a detection threshold $\mathrm{DT} = 5$ for a red noise level of 1 mmag. Dark blue: planetary candidates that remain from the former group after applying the rule-out criteria for false positives described in the paper. These remaining false positives in the NGTS planet candidate list need follow-up with additional instruments before they can be identified. Blue lines indicate the possible yield if a red noise level of 0.5 mmag can be reached. All values are averaged over ten simulation runs.

Jupiter's Phase Variations from Cassini: A Testbed for Future Direct-Imaging Missions

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The Astronomical Journal, published (2016AJ....152..209M)

We present empirical phase curves of Jupiter from 0° to 140° as measured in multiple optical bandpasses by Cassini/Imaging Science Subsystem (ISS) during the Millennium flyby of Jupiter in late 2000 to early 2001. Phase curves are of interest for studying the energy balance of Jupiter and understanding the scattering behavior of the planet as an exoplanet analog. We find that Jupiter is significantly darker at partial phases than an idealized Lambertian planet by roughly 25% and is not well fit by Jupiter-like exoplanet atmospheric models across all wavelengths. We provide analytic fits to Jupiter's phase function in several Cassini/ISS imaging filter bandpasses. In addition, these observations show that Jupiter's color is more variable with phase angle than predicted by models. Therefore, the color of even a near Jupiter-twin planet observed at a partial phase cannot be assumed to be comparable to that of Jupiter at full phase. We discuss how the Wide-Field Infrared Survey Telescope and other future direct-imaging missions can enhance the study of cool giants.

Download/Website: `http://iopscience.iop.org/article/10.3847/0004-6256/152/6/209/meta`

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Atmospheric Retrieval for Direct Imaging Spectroscopy of Gas Giants In Reflected Light II: Orbital Phase and Planetary Radius

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Publications of the Astronomical Society of the Pacific, in press (arXiv:1612.00342)

Future space-based telescopes, such as the Wide-Field Infrared Survey Telescope (WFIRST), will observe the reflected-light spectra of directly imaged extrasolar planets. Interpretation of such data presents a number of novel challenges, including accounting for unknown planet radius and uncertain stellar illumination phase angle. Here we report on our continued development of Markov Chain Monte Carlo retrieval methods for addressing these issues in the interpretation of such data. Specifically we explore how the unknown planet radius and potentially poorly known observer-planet-star phase angle impacts retrievals of parameters of interest such as atmospheric methane abundance, cloud properties and surface gravity. As expected, the uncertainty in retrieved values is a strong function of signal-to-noise ratio (SNR) of the observed spectra, particularly for low metallicity atmospheres, which lack deep absorption signatures. Meaningful results may only be possible above certain SNR thresholds; for cases across a metallicity range of 1-50 times solar, we find that only an SNR of 20 systematically reproduces close to the correct methane abundance at all phase angles. However, even in cases where the phase angle is poorly known we find that the planet radius can be constrained to within a factor of two. We find that uncertainty in planet radius decreases at phase angles past quadrature, as the highly forward scattering nature of the atmosphere at these geometries limits the

possible volume of phase space that relevant parameters can occupy. Finally, we present an estimation of possible improvement that can result from combining retrievals against observations at multiple phase angles.

Download/Website: `https://arxiv.org/abs/1612.00342`

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Supernova enrichment of planetary systems in low-mass star clusters

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Monthly Notices of the Royal Astronomical Society, published (2017MNRAS.464.4318N)

The presence and abundance of short lived radioisotopes (SLRs) ^{26}Al and ^{60}Fe in chondritic meteorites implies that the Sun formed in the vicinity of one or more massive stars that exploded as supernovae (SNe). Massive stars are more likely to form in massive star clusters (>1000 $M_\odot$) than lower mass clusters. However, photoevaporation of protoplanetary discs from massive stars and dynamical interactions with passing stars can inhibit planet formation in clusters with radii of ∼1 pc. We investigate whether low-mass (50 – 200 $M_\odot$) star clusters containing one or two massive stars are a more likely avenue for early Solar system enrichment as they are more dynamically quiescent.
We analyse N-body simulations of the evolution of these low-mass clusters and find that a similar fraction of stars experience supernova enrichment than in high mass clusters, despite their lower densities. This is due to two-body relaxation, which causes a significant expansion before the first supernova even in clusters with relatively low (100 stars pc^{-3}) initial densities. However, because of the high number of low mass clusters containing one or two massive stars, the absolute number of enriched stars is the same, if not higher than for more populous clusters. Our results show that direct enrichment of protoplanetary discs from supernovae occurs as frequently in low mass clusters containing one or two massive stars (¿20 $M_\odot$) as in more populous star clusters (1000 $M_\odot$). This relaxes the constraints on the direct enrichment scenario and therefore the birth environment of the Solar System.

Download/Website: `http://adsabs.harvard.edu/abs/2017MNRAS.464.4318N`

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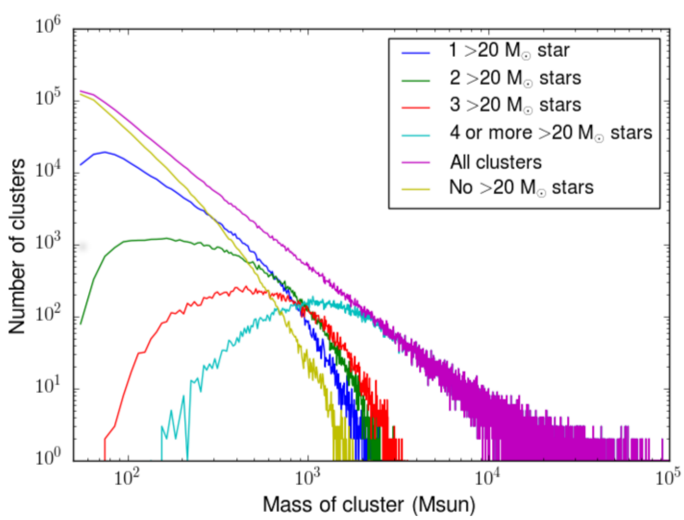

Figure 5: (Nicholson & Parker) Star cluster mass functions for clusters containing different numbers of massive (> 20 $M_\odot$) stars

ACCESS I: An Optical Transmission Spectrum of GJ 1214b Reveals a Heterogeneous Stellar Photosphere

B. Rackham[1,2], *N. Espinoza*[3,4], *D. Apai*[1,2,5], *Mercedes López-Morales*[2,6], *Andrés Jordán*[2,3,4], *David J. Osip*[7], *Nikole K. Lewis*[8], *Florian Rodler*[9,10], *Jonathan D. Fraine*[1], *Caroline V. Morley*[11], *Jonathan J. Fortney*[11]

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The Astrophysical Journal, in press (arXiv:1612.00228)

GJ 1214b is the most studied sub-Neptune exoplanet to date. Recent measurements have shown its near-infrared transmission spectrum to be flat, pointing to a high-altitude opacity source in the exoplanet's atmosphere, either equilibrium condensate clouds or photochemical hazes. Many photometric observations have been reported in the optical by different groups, though simultaneous measurements spanning the entire optical regime are lacking. We present an optical transmission spectrum (4,500–9,260 Å) of GJ 1214b in 14 bins measured with Magellan/IMACS repeatedly over three transits. We measure a mean planet-to-star radius ratio of $R_p/R_s = 0.1146 \pm 2 \times 10^{-4}$ and mean uncertainty of $\sigma(R_p/R_s) = 8.7 \times 10^{-4}$ in the spectral bins. The optical transit depths are shallower on average than observed in the near-infrared. We present a model for jointly incorporating the effects of a composite photosphere and atmospheric transmission (CPAT) through the exoplanet's limb, and use it to examine the cases of absorber and temperature heterogeneities in the stellar photosphere. We find the optical and near-infrared measurements are best explained by the combination of (1) photochemical haze in the exoplanetary atmosphere with a mode particle size $r = 0.1$ μm and haze-forming efficiency $f_{haze} = 10\%$ and (2) faculae in the unocculted stellar disk with a temperature contrast $\Delta T = 354^{+46}_{-46}$ K, assuming 3.2% surface coverage. The CPAT model can be used to assess potential contributions of heterogeneous stellar photospheres to observations of exoplanet transmission spectra, which will be important for searches for spectral features in the optical.

Download/Website: `https://arxiv.org/abs/1612.00228/`

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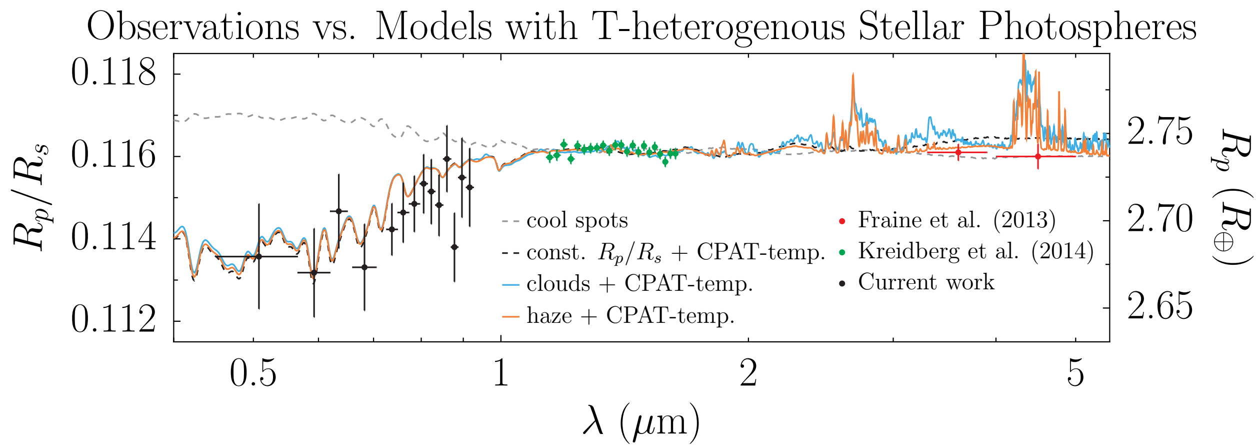

Figure 6: (Rackham et al.) Transmission spectra models that include contributions from both the exoplanetary atmosphere and a temperature heterogeneity in the stellar photosphere (the CPAT-temperature model) provide the best fits to the near-infrared and optical measurements for GJ 1214b. We fit the optical transmission spectrum from Magellan (current work) simultaneously with the most constraining HST (Kreidberg et al. 2014) and Spitzer (Fraine et al. 2013) measurements. Bright regions covering 3.2% of the unocculted stellar disk with a temperature contrast of $\sim$ 350 K can effectively decrease a completely flat R_p/R_s (*black*) transmission spectrum as well as models for cloudy (*blue*), and hazy (*orange*) atmospheres to the observed optical values, while only minimally altering the near-infrared spectrum. The effect of cool, unocculted starspots, however, does not match the optical data.

The unstable fate of the planet orbiting the A-star in the HD 131399 triple stellar system

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1611.00007)

Validated planet candidates need not lie on long-term stable orbits, and instability triggered by post-main-sequence stellar evolution can generate architectures which transport rocky material to white dwarfs, polluting them. The giant planet HD 131399Ab orbits its parent A star at a projected separation of about 50-100 au. The host star, HD 131399A, is part of a hierarchical triple with HD 131399BC being a close binary separated by a few hundred au from the A star. Here, we determine the fate of this system, and find that (i) stability along the main sequence is achieved only for a favourable choice of parameters within the errors, and (ii) even for this choice, in almost every instance the planet is ejected during the transition between the giant branch and white dwarf phases of HD 131399A. This result provides an example of both how the free-floating planet population may be enhanced by similar systems, and how instability can manifest in the polluted white dwarf progenitor population.

Download/Website: `http://arxiv.org/abs/1611.00007`

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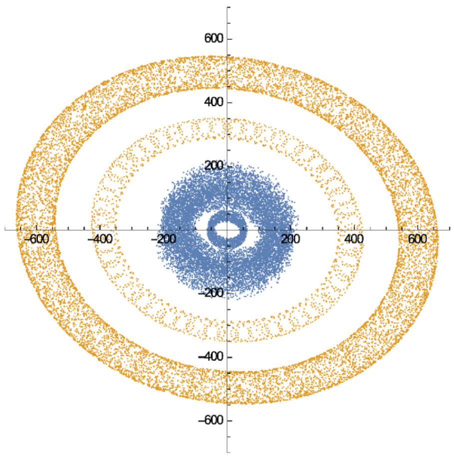

Figure 7: (Veras, Mustill & Gänsicke) y-z plane schematic in au of one of the only three simulations out of 400 total which remained stable for 12.8 Gyr. The blue dots represent the planet (HD 131399Ab) and the orange dots the approximated star which emulates the combination of HD 131399B and HD 131399C at their barycentre. The inner and outer rings for each set of dots indicates evolution along the main sequence and white dwarf phases, respectively. Note the extended dynamic range of the outer ring of blue dots, which is due to a more delicate stability on the white dwarf phase of HD 131399A.

Planetesimal clearing and size-dependent asteroid retention by secular resonance sweeping during the depletion of the solar nebula

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The Astrophysical Journal, in press (arXiv:1610.09670)

The distribution of heavy elements is anomalously low in the asteroid main belt region compared with elsewhere in the solar system. Observational surveys also indicate a deficit in the number of small ($\leq$ 50 km size) asteroids that is two orders of magnitude lower than what is expected from the single power-law distribution that results from a collisional coagulation and fragmentation equilibrium. Here, we consider the possibility that a major fraction of the original asteroid population may have been cleared out by Jupiter's secular resonance, as it swept through the main asteroid belt during the depletion of the solar nebula. This effect leads to the excitation of the asteroids' orbital eccentricities. Concurrently, hydrodynamic drag and planet-disk tidal interaction effectively damp the eccentricities of sub-100 km-size and of super-lunar-size planetesimals, respectively. These combined effects lead to the asteroids' orbital decay and clearing from the present-day main belt region ($\sim 2.1 - 3.3$ AU). The intermediate-size (50 to several hundreds of kilometers) planetesimals therefore preferentially remain as main belt asteroids near their birthplaces, with modest asymptotic eccentricities. The smaller asteroids are the fragments of subsequent disruptive collisions at later times as suggested by the present-day asteroid families. This scenario provides a natural explanation for both the observed low surface density and the size distribution of asteroids in the main belt. It also offers an explanation for the confined spatial extent of the terrestrial planet building blocks without the requirement of extensive migration of Jupiter.

Download/Website: `https://arxiv.org/abs/1610.09670`

Contact: `x.c.zheng1989@gmail.com`

3 Conference announcements

4th UK Exoplanet Community Meeting

SOC: Christiane Helling (Chair), Isabelle Baraffe, Beth Biller, Andrew Cameron, Don Pollaco, Didier Queloz and Peter Woitke

University of St Andrews, 15th – 17th March 2017

The fourth UK Exoplanet Community Meeting will take place at the St Andrews Centre for Exoplanet Science at the University of St Andrews, 15th – 17th March 2017. This event aims to gather and consolidate the UK community working in the field of exoplanets. This is the fourth of such events, with the first meeting held in Cambridge in 2014; the second in Warwick in 2015, and the third in Exeter in 2016

Registration for the UK Exoplanet Community meeting 2017 in St Andrews is now open, and the deadline is 15th January 2017. We ask you to submit your abstract when registering. Three kinds of abstracts can be submitted: contributed talks, posters and discussion meetings.

Participants are particularly invited to submit abstracts to lead discussion sessions, each lasting for about 1.5 hours. The discussion format is free and part of the discussion proposal. Any ideas for the format of your session are welcome, ranging from a regular arrangement of short talks (splinter meeting); open discussions; collaborative 'hack' sessions to hands-on workshops. The topics can be focused on a specific science area; discussions of future directions for the community; modelling software or data reduction; particular grant applications or observing proposals, or another topic relevant to a considerable fraction of the community. The SOC will select about 4-6 topics, and participants will split into 4-6 subgroups. Participants will also be given opportunities to pre-select their choice of attendance, and to interact with the discussion leaders before the meeting.

Please register here: https://ukexo2017.sciencesconf.org/ You can also find more information on registration, payment, travel, accommodation and discussion meetings on the website.

Download/Website: `http://ukexo2017.sciencesconf.org/`

Contact: `am352@st-andrews.ac.uk (LOC), ch80@st-andrews.ac.uk (SOC)`

Diversity of planetary circulation regimes, in our solar system and beyond

D. Apai[1], F. Forget[2], N. Iro[3], V. Lucarini[3,4], R. Pierrehumbert[5]

[1] Department of Astronomy, University of Arizona, Tucson, USA
[2] LMD, CNRS, Paris, France
[3] CEN - Institute of Meteorology, University of Hamburg, Germany
[4] Department of Mathematics and Statistics, University of Reading, Reading, UK
[5] Department of Physics, University of Oxford, Oxford, UK

Les Houches Physics Center France, 6–10 March 2017

We would like to advertise a Winter School entitled "Diversity of planetary circulation regimes, in our solar system and beyond", taking place March 6-10, 2017 at the Les Houches Physics center (http://houches.ujf-grenoble.fr/) based in Les Houches, France.

We will present the recent observational data and modelling studies pertaining to the variety of planetary atmospheres circulation regimes, including giant and terrestrial planets. We will also discuss the theory of planetary physical processes (e.g. circulation, dynamics, thermodynamics, radiative transfer, cloud microphysics) and review the current status of the modelling of planetary atmospheres in order to calculate observables such as light curves. This interdisciplinary school wishes to contribute to bridging the gap between Earth science, planetary science, and astrophysics.

The Physics school of Les Houches is located in the French Alps (Savoy) and has been hosting worldwide renowned training and scientific events since 1951. Lodging and food are provided on site. Ample time will be reserved for individual and joint social activities. Arrival of participants is possible after 3 pm on Sunday March 5th.

All practical information concerning reaching the location of the school and the available facilities can be found at: https://houches.univ-grenoble-alpes.fr/en/
Topics that will be addressed are the following:

- What are the various circulation regimes of Earth, Solar system planets and exoplanets (theory/observation)?
- What have we learned from Earth climate dynamics that can be applied to exoplanets?
- Which properties are relevant for habitability?
- How can we use knowledge of planetary physics to better understand the Earth climate system and its response to forcings?
- How do the very diverse radiation regimes affect the circulation? What are the main feedbacks?
- How to deal with complex processes such as clouds, shocks, lightenings, hydrological cycle, weathering?
- How to construct flexible modeling tools?

Lectures will be delivered by about 20 speakers. The number of additional participants is limited to 50. The deadline to apply is January, 15th 2017, and early applicants will be given priority. The participants will be encouraged to bring over a poster for presenting their research activities. Full or partial financial support will be provided to selected participants. Details for registration are given in the school website: http://leshouchesplanets2017.zmaw.de/
For questions, please contact Nicolas Iro.

Download/Website: `http://leshouchesplanets2017.zmaw.de`

Contact: `nicolas.iro@uni-hamburg.de`

Molecules in Astrophysics and Astrobiology, Interdisciplinary Winter School

Svetlana Berdyugina
Kiepenheuer Institute for Solar Physics, Freiburg, Germany

Zurich, Switzerland, February 13-17, 2017

This interdisciplinary school offers advanced lectures in molecular physics and chemistry relevant to stellar and planetary atmospheres and introductory level lectures in biophysics and biochemistry on life molecules and biosignatures. Lectures are supplemented by extended questionnaires and tutoring in numerical tools allowing for computing molecular flux and polarized spectra for stars and planets (including magnetic and scattering effects). Complementary professional development workshops are offered for students wishing to improve their learning, communication, and presentation skills. A number of travel grants are available – application deadline Dec 20, 2016. Registration deadline Jan 15, 2017.

Download/Website: `http://hotmol.eu/ws2017`

Contact: `hotmolschool@gmail.com`

2017 Sagan Summer Workshop: Microlensing in the Era of WFIRST?

D. Gelino, R. Paladini
NASA Exoplanet Science Institute, California Institute of Technology, Pasadena, CA, USA

Pasadena, CA, August 7-11, 2017

The 2017 Sagan Summer Workshop will focus on searching for planets with WFIRST microlensing. Leaders in the field will discuss the importance of microlensing to understanding planetary populations and demographics, especially beyond the snow line. They will review the microlensing method, both in the context of current capabilities and the future WFIRST microlensing survey. In addition, speakers will address the broad potential of the WFIRST's Wide Field Imaging microlensing survey for (non-microlensing) science in the galactic bulge. Attendees will participate in hands-on group projects related to the WFIRST microlensing planet survey and will have the opportunity to present their own work through short presentations (research POPs) and posters.

Please check the website in early 2017 for registration and financial aid information.

Topics to be covered include:

- Microlensing Science: Current and Future
- An Introduction to the Theory of Microlensing
- Fitting Microlensing Light Curves
- The K2/C9 and Spitzer Microlens Parallax Campaigns
- The WFIRST Microlensing Survey
- Planet Populations Beyond the Snow Line: Formation and Demographics
- Galactic Science with Wide Field imaging Data in the Galactic Bulge, including microlensing and Galactic Structure
- Finding Exotic Massive Objects with Microlensing

Download/Website: `http://nexsci.caltech.edu/workshop/2017`
Contact: `sagan_workshop@ipac.caltech.edu`

The 2nd Advanced School on Exoplanetary Science: Astrophysics of Exoplanetary Atmospheres

A. Sozzetti
INAF - Osservatorio Astrofisico di Torino Strada Osservatorio, 20 I-10025 Pino Torinese (TO), Italy

International Institute for Advanced Scientific Studies, Vietri sul Mare, Italy, 22th - 26th May 2017

This is the First Announcement of the 2nd Advanced School on Exoplanetary Science (ASES2), to be held at the International Institute for Advanced Scientific Studies (Vietri sul Mare, Italy) from May 22 to May 26, 2017.
Rationale
The Advanced School on Exoplanetary Science - taking place in the enchanting Amalfi Coast - is aimed at providing a comprehensive, state-of-the-art picture of the rich variety of relevant aspects of the fast-developing, highly interdisciplinary field of extoplanet research (both from an observational and theoretical viewpoint). The School is addressed to graduate students and young post-doctoral researchers, and offers the fascinating possibility to interact

with world-class experts engaged in different areas of the astrophysics of planetary systems. The 2nd edition of the School will be focused on the Astrophysics of Exoplanetary Atmospheres, covering both the theoretical and observational perspective.

Organizing Committee

V. Bozza (University of Salerno), L. Mancini (Max Planck Institute for Astronomy, Heidelberg), A. Sozzetti (INAF - Astrophysical Observatory of Turin)

Confirmed School Lecturers

Theoretical models: Prof. J. J. Fortney, Dept. of Astron. and Astroph., University of California, USA
Observational techniques: Prof. D. Sing, Astrophysics Group, School of Physics, University of Exeter, UK
Molecular spectroscopy: Prof. J. Tennyson, Dept. of Phys. and Astron., University College London, UK
Solar system atmospheres: Dr. D. Grassi, Inst. for Space Astrophysics and Planetology, INAF, Italy

Lecture Notes

The Lecture Notes of the 2nd Advanced School on Exoplanetary Science will be published by Springer in its Astrophysics and Space Science Library series. A copy of the book will be given to each participant. The first book of the series is available on http://www.springer.com/gp/book/9783319274560.

Fees

The registration fee is 320 Euro, and includes a copy of the Lecture Notes, conference kit, coffee breaks and social dinner. Lodging and meals (full-board accommodation at Hotel La Lucertola adjoint to the School venue), for the entire duration of the course (arrival on Sunday May 21, departure in the morning of Saturday May 27, 2017), will be in the order of 540-660 Euro. A limited number of grants, partially covering accommodation expenses, will be available for selected participants. Justified requests for economic support (addressed via email to the Organizing Committee) will have to be accompanied by the submission of a Curriculum Vitae.

Registration and abstract submission

Registration is now open! There is a limited number of time slots for brief seminars of participants to present their own research. Title/Abstract submission is possible at any later moment after registration by sending an email to the Organizing Committee. All participants are allowed and encouraged to bring a poster.

Important Dates

8th November 2016: First Announcement, Registration Opens
15th January 2017: Second and Final Announcement
1st February 2017: Accommodation Subsidy Deadline
1st March 2017: Registration Deadline
1th May 2017: Final School programme
22th-26th May 2017: The School
For further information please refer to the Conference website or send an email to the Organizing Committee:
V. Bozza: valboz@physics.unisa.it, L. Mancini: mancini@mpia.de, A. Sozzetti: sozzetti@oato.inaf.it
Contact: ases2@mpia.de - facebook.com/ases2017 - twitter.com/ases2017

Download/Website: `http://www.mpia.de/ases2`

Contact: `ases2@mpia.de`

Exoplanets II

Didier Queloz, Kevin Heng, Thomas Henning

The Guildhall, Cambridge, UK , 2 - 6 July 2018

Uniquely Focussed on Exoplanet Science, Exoplanets II is part of a series of conferences following Exoplanets I, organised in Davos in 2016.

Download/Website: `http://exoplanets.phy.cam.ac.uk/Meetings/exoplanets2`

Contact: `exoplanets2@mrao.cam.ac.uk`

4 Jobs and positions

2 CHEOPS Fellows (postdoctoral positions) in Swiss-wide exoplanet network

Universities of Bern, Geneva, Zürich, ETH-Zürich or Lausanne, June 2017 or later

The Swiss National Science Foundation has awarded funding to establish a National Centre of Competences in Research (NCCR) in the area of planetary sciences. This NCCR, named PlanetS, regroups about sixty researchers from a number of research institutions across Switzerland (University of Bern, Geneva, Zürich and ETH Zürich and Lausanne). The scope of the framework is broad (www.nccr-planets.ch) and includes planet origin, evolution and characterisation, considering both the Solar System and exoplanets, in theory, observation and instrumentation. In addition, one explicit goal is to support the scientific exploitation of the CHEOPS satellite.

The CHaracterising ExOPlanets Satellite (CHEOPS) is a joint mission between ESA and Switzerland to be launched in 2018. ESA's Science Programme has selected CHEOPS in 2012 as the first small mission (S-mission). The goal of the CHEOPS mission is to characterise the structure of exoplanets with typical sizes ranging from Neptune down to Earth diameters orbiting bright star. This will be achieved by measuring high precision photometric sequences to detect variation in the stellar brightness induced by a transiting planet. For details about the mission's science goals and technical implementation, see the CHEOPS website at http://cheops.unibe.ch.

In order to support the scientific exploitation of CHEOPS, the NCCR PlanetS has established a CHEOPS Fellowship programme. These Fellowships target bright young scientists interested to work on any aspect of CHEOPS science at any institution member of PlanetS. Two CHEOPS Fellowships are currently available.

Each Fellow can choose its home institution among those participating in PlanetS and will be encouraged to work in collaboration with the others. A research budget of 10'000 CHF per year will be available to each Fellow to support expenses related to their project.

The interested applicants should present, in a 3 pages maximum document, their research project and the home institution of their choice. The proposal, as well as a document summarising their past and present research interests, a CV (2 pages maximum), a publication list, and a cover letter should be sent to the email address indicated below. In addition, the recommendation letters of three referees should be sent to the same email address. The deadline for receiving all the application material (including recommendation letters) is 15 January 2017.

The length of a postdoc contract is of 3 years, with possible extension for one additional year. In addition, the Swiss National Science Foundation requires that applicants are less than 6 years after PhD at the end of the position. Swiss postdoc salaries are defined by the home institution and are extremely competitive even considering local costs of living.

The starting date of the position is negotiable, and could start as early as June 2017.

The application documents should be sent to: Janine Jungo, Sidlerstrasse 5, CH-3012 Bern
Tel: +41 (0)31 631 3239
mailto: janine.jungo@space.unibe.ch

Download/Website: `www.nccr-planets.ch, cheops.unibe.ch`

Contact: `janine.jungo@space.unibe.ch`

Postdoctoral position in star/planet formation and exoplanets

Manuel Güdel
University of Vienna, Department of Astrophysics, Vienna, Austria

University of Vienna, Department of Astrophysics, Vienna, Austria, Spring-Summer 2017

The University of Vienna announces availability of a 4-year postdoctoral position in the field of star and planet formation and/or exoplanetary research. We seek an excellent candidate developing research in any of the areas of planet formation, protoplanetary disks, or exoplanetary atmospheres, focusing on theoretical/numerical modeling or observations also aiming at JWST in the future. The position is part of the Star and Planet Formation group of Prof. Manuel Güdel that hosts a large national research program on planet formation and exoplanetary habitability (http://path.univie.ac.at) offering many opportunities for participation and collaboration. The candidate will be expected to carry out his/her independent research programs, but is strongly encouraged to also engage in collaborations within the group.

The candidate will have access to observatories of ESO and ESA; for numerical work, the Vienna Scientific Cluster will be accessible. There are many opportunities to interact within ongoing or planned instrument projects (PLATO, CHEOPS, Athena, ESO E-ELT, etc). Funds are made available to support travel expenses and conference participation. A modest level of teaching is expected. The position should be filled at the earliest possible date but no earlier than 1 March 2017. Duration of employment: 4 years.

Applications include a motivation letter addressed to Prof. M. Güdel, a CV, a publication list, a summary of past research (max. 2 pages), and an outline of the proposed research program for the duration of the employment (max. 4 pages). These documents must be submitted electronically as a PDF file to university's Job Center, http://jobcenter.univie.ac.at/en/applications/, referring to Job code 7143. Review starts 1 February 2017. Applicants should arrange for three letters of reference sent by the referees directly to manuel.guedel@univie.ac.at.

Contact: `manuel.guedel@univie.ac.at`

5 Announcements

What can LSST:UK do for us?

E. Kerins[1], *A.J. Norton*[2]
[1] Jodrell Bank Centre for Astrophysics, Alan Turing Building, University of Manchester, Oxford Road, Manchester M13 9PL, UK
[2] School of Physical Sciences, The Open University, Walton Hall, Milton Keynes MK7 6AA, UK

LSST:UK, 23rd December 2016

The Large Synoptic Survey Telescope (LSST) will provide an unparalleled dataset for deep multi-filter optical time-domain studies over much of the sky. The UK's STFC has invested £15M in joining LSST to allow UK scientists access to LSST data. The UK astronomy community is currently shaping its LSST science priorities though the LSST:UK Consortium, on which all UK astronomy departments have representation. We are calling on the UK exoplanet community to help shape LSST science strategy to maximise science returns from current and future exoplanet surveys over the timeline of LSST operations (2020-2033).

We invite members of the UK exoplanet community to form an LSST:UK exoplanet working group which will define a Roadmap for exoplanet science priorities from LSST. During 2017 LSST:UK Consortium members will be developing a science case for submission to STFC for LSST:UK Phase B (which covers LSST commissioning). This is a critical phase and it is vital that the science priorities of our community are included within the UK LSST science strategy.

We envisage holding a workshop within the first quarter of 2017 to help finalise the Roadmap and to establish a Working Group. The Roadmap will be used as the basis for a draft science case (to be prepared by September 2017) to be put forward for inclusion in the LSST:UK Phase B submission in February 2018. Members of the exoplanet community who would like to engage in helping to draft the Roadmap, to participate in the Working Group, and to help work on the draft Phase B science case, should send an Expression of Interest to Eamonn Kerins (Eamonn.Kerins@manchester.ac.uk) preferably by Friday December 23rd 2016. We welcome participation from early career researchers and we will strive towards ensuring gender balance within the Working Group.

Eamonn Kerins (Manchester) LSST:UK Associate PI (Exoplanets)
Andrew Norton (Open University).

Download/Website: `http://www.lsst.ac.uk/`

Contact: `Eamonn.Kerins@manchester.ac.uk`

6 As seen on astro-ph

The following list contains all the entries relating to exoplanets that we spotted on astro-ph during November 2016. If you see any that we missed, please let us know and we'll include them in the next issue.

astro-ph/1611.00007 : **The unstable fate of the planet orbiting the A-star in the HD 131399 triple stellar system** by *Dimitri Veras, Alexander J. Mustill, Boris T. Gaensicke*

astro-ph/1611.00153 : **Discovery of the secondary eclipse of HAT-P-11 b** by *K. F. Huber, S. Czesla, J. H. M. M. Schmitt*

astro-ph/1611.00364 : **Planets Around Low-Mass Stars (PALMS). VI. Discovery of a Remarkably Red Planetary-Mass Companion to the AB Dor Moving Group Candidate 2MASS J22362452+4751425** by *Brendan Bowler, et al.*

astro-ph/1611.00397 : **Ultra Short Period Planets in K2 with companions: a double transiting system for EPIC 220674823** by *Elisabeth R. Adams, et al.*

astro-ph/1611.00526 : **Circumbinary planets II - when transits come and go** by *David V. Martin*

astro-ph/1611.00691 : **The Next Generation Transit Survey - Prototyping Phase** by *James McCormac, et al.*

astro-ph/1611.00766 : **Discovering new worlds: a review of signal processing methods for detecting exoplanets from astronomical radial velocity data** by *Muhammad Salman Khan, James Stewart Jenkins, Nestor Becerra Yoma*

astro-ph/1611.00775 : **Binary Source Event Masquerading as Planet: A New Manifestation of the Binary-Source Degeneracy** by *Y. K. Jung, et al.*

astro-ph/1611.01070 : **The accretion of migrating giant planets** by *Christoph Drmann, Wilhelm Kley*

astro-ph/1611.01168 : **ALMA observations of the η Corvi debris disc: inward scattering of CO-rich exocomets by a chain of 3-30 M? planets?** by *S. Marino, et al.*

astro-ph/1611.01538 : **FU Orionis outbursts, preferential recondensation of water ice, and the formation of giant planets** by *Alexander Hubbard*

astro-ph/1611.01968 : **Transit Shapes and Self Organising Maps as a Tool for Ranking Planetary Candidates: Application to Kepler and K2** by *David J. Armstrong, Don Pollacco, Alexandre Santerne*

astro-ph/1611.02122 : **A super-Earth orbiting the nearby M-dwarf GJ 536** by *A. Surez Mascareno, et al.*

astro-ph/1611.02196 : **Inner mean-motion resonances with eccentric planets: A possible origin for exozodiacal dust clouds** by *Virginie Faramaz, et al.*

astro-ph/1611.02285 : **Initial mass function of planetesimals formed by the streaming instability** by *Urs Schfer, Chao-Chin Yang, Anders Johansen*
astro-ph/1611.02526 : **A New Yield Simulator for Transiting Planets and False Positives: Application to the Next Generation Transit Survey** by *Maximilian N. Gnther, et al.*
astro-ph/1611.02718 : **Radial Drift of Dust in Protoplanetary Disks: The Evolution of Ice lines and Dead zones** by *Alex J. Cridland, Ralph E. Pudritz, Tilman Birnstiel*
astro-ph/1611.02765 : **OGLE-2015-BLG-0196: Ground-based Gravitational Microlens Parallax Confirmed By Space-Based Observation** by *C. Han, et al.*
astro-ph/1611.03083 : **Atmospheric Signatures of Giant Exoplanet Formation by Pebble Accretion** by *Nikku Madhusudhan, et al.*
astro-ph/1611.03128 : **Disentangling Hot Jupiters formation location from their chemical composition** by *Mohamad Ali-Dib*
astro-ph/1611.03516 : **Kepler Planet Masses and Eccentricities from TTV Analysis** by *Sam Hadden, Yoram Lithwick*
astro-ph/1611.03704 : **K2-60b and epic 216468514b. A sub-jovian and a jovian planet from the k2 mission** by *Philipp Eigmüller, et al.*
astro-ph/1611.03859 : **Rocky Planetesimal Formation via Fluffy Aggregates of Nanograins** by *Sota Arakawa, Taishi Nakamoto*
astro-ph/1611.03871 : **Exo-Transmit: An Open-Source Code for Calculating Transmission Spectra for Exoplanet Atmospheres of Varied Composition** by *Eliza M.-R. Kempton, et al.*
astro-ph/1611.04064 : **Planet signatures in the chemical composition of Sun-like stars** by *Jorge Melendez, Ivan Ramirez*
astro-ph/1611.04610 : **Photophoretic Levitation and Trapping of Dust in the Inner Regions of Protoplanetary Disks** by *Colin P. McNally, Melissa K. McClure*
astro-ph/1611.04806 : **Atmospheric tides in Earth-like planets** by *Pierre Auclair-Desrotour, Jacques Laskar, Stéphane Mathis*
astro-ph/1611.05678 : **The rotation of planets hosting atmospheric tides: from Venus to habitable super-earths** by *Pierre Auclair-Desrotour, et al.*
astro-ph/1611.05925 : **Odd Harmonics in Exoplanet Photometry: Weather or Artifact?** by *Nicolas B. Cowan, et al.*
astro-ph/1611.06133 : **Effects of variable eccentricity on the climate of an Earth-like world** by *Michael. J. Way, Nikolaos Georgakarakos*
astro-ph/1611.06230 : **The depletion of water during dispersal of planet-forming disk regions** by *A. Banzatti, et al.*
astro-ph/1611.06239 : **Kepler-11 is a Solar Twin: Revising the Masses and Radii of Benchmark Planets Via Precise Stellar Characterization** by *Megan Bedell, et al.*
astro-ph/1611.06463 : **Migration of Planets Into and Out of Mean Motion Resonances in Protoplanetary Disks: Analytical Theory of Second-Order Resonances** by *Wenrui Xu, Dong Lai*
astro-ph/1611.06751 : **Review of gas and dust in debris discs** by *Quentin Kral*
astro-ph/1611.06916 : **Rayleigh scattering in the transmission spectrum of HAT-P-18b** by *J. Kirk, et al.*
astro-ph/1611.07014 : **Concentrating small particles in protoplanetary disks through the streaming instability** by *Chao-Chin Yang, Anders Johansen, Daniel Carrera*
astro-ph/1611.07339 : **On the possibility of habitable Trojan planets in binary star systems** by *Richard Schwarz, Barbara Funk, Ákos Bazsó*
astro-ph/1611.07614 : **EPIC 220504338b: A dense hot-Jupiter transiting a solar analogue** by *Néstor Espinoza, et al.*
astro-ph/1611.07648 : **The Pan-Pacific Planet Search VI: Giant planets orbiting HD 86950 and HD 222076** by *Robert A. Wittenmyer, et al.*
astro-ph/1611.07733 : **The DOHA algorithm: a new recipe for cotrending large-scale transiting exoplanet**

survey light curves by *D. Mislis, et al.*

astro-ph/1611.07985 : **Refined architecture of the WASP-8 system: a cautionary tale for traditional Rossiter-McLaughlin analysis** by *V. Bourrier, et al.*

astro-ph/1611.08243 : **Effect of the rotation, tidal dissipation history and metallicity of stars on the evolution of close-in planets** by *Emeline Bolmont, et al.*

astro-ph/1611.08608 : **Observing transiting planets with JWST – Prime targets and their synthetic spectral observations** by *Paul Mollière, et al.*

astro-ph/1611.08616 : **Metal enrichment leads to low atmospheric C/O ratios in transiting giant exoplanets** by *Néstor Espinoza, et al.*

astro-ph/1611.08708 : **Spitzer Secondary Eclipse Depths with Multiple Intrapixel Sensitivity Correction Methods: Observations of WASP-13b, WASP-15b, WASP-16b, WASP-62b, and HAT-P-22b** by *Brian M. Kilpatrick, et al.*

astro-ph/1611.08735 : **WASP-20 is a close visual binary with a transiting hot Jupiter** by *Daniel Evans, John Southworth, Barry Smalley*

astro-ph/1611.09074 : **Atmospheric Habitable Zones in Y Dwarf Atmospheres** by *Jack S. Yates, et al.*

astro-ph/1611.09236 : **An Overabundance of Low-density Neptune-like Planets** by *Patricio Cubillos, et al.*

astro-ph/1611.09272 : **Near-IR Emission Spectrum of WASP-103b using Hubble Space Telescope/Wide Field Camera 3** by *Kimberly M. S. Cartier, et al.*

astro-ph/1611.09319 : **Untangling the Near-IR Spectral Features in the Protoplanetary Environment of KH 15D** by *Nicole A. Arulanantham, et al.*

astro-ph/1611.09373 : **Hot-Jupiter Core Mass from Roche-lobe Overflow** by *Sivan Ginzburg, Re'em Sari*

astro-ph/1611.09504 : **A possible giant planet orbiting the cataclysmic variable LX Ser** by *K. Li, et al.*

astro-ph/1611.09848 : **A Search for Additional Bodies in the GJ 1132 Planetary System from 21 Ground-based Transits and a 100 Hour Spitzer Campaign** by *Jason A Dittmann, et al.*

astro-ph/1611.09873 : **The GAPS Programme with HARPS-N@TNG XII: Characterization of the planetary system around HD108874** by *S. Benatti, et al.*

astro-ph/1611.10362 : **Upper limits for Mass and Radius of objects around Proxima Cen from SPHERE/VLT** by *D. Mesa, et al.*