ExoPlanet News
An Electronic Newsletter

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Contents

1 Editorial

Welcome to the 95th edition of Exoplanet News. This month sees a very full newsletter, with plenty of interesting abstracts. As ever, please continue to encourage your colleagues to submit their abstracts to future editions. Since I will be away in early April, the next edition of the newsletter is planned for the beginning of May 2017.

best wishes
Andrew Norton

2 Abstracts of refereed papers

Probabilistic Constraints on the Mass and Composition of Proxima b

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Astrophysical Journal Letters, published (2017ApJ...836L..31B)

Recent studies regarding the habitability, observability, and possible orbital evolution of the indirectly detected exoplanet Proxima b have mostly assumed a planet with $M \sim 1.3\ M_\oplus$, a rocky composition, and an Earth-like atmosphere or none at all. In order to assess these assumptions, we use previous studies of the radii, masses, and compositions of super-Earth exoplanets to probabilistically constrain the mass and radius of Proxima b, assuming an isotropic inclination probability distribution. We find it is $\sim 90\%$ likely that the planet's density is consistent with a rocky composition; conversely, it is at least 10% likely that the planet has a significant amount of ice or an H/He envelope. If the planet does have a rocky composition, then we find expectation values and 95% confidence intervals of $\langle M \rangle_{\text{rocky}} = 1.63^{+1.66}_{-0.72}\ M_\oplus$ for its mass and $\langle R \rangle_{\text{rocky}} = 1.07^{+0.38}_{-0.31}\ R_\oplus$ for its radius.

Download/Website: `https://doi.org/10.3847/2041-8213/aa5f51`

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Reconnaissance of the TRAPPIST-1 exoplanet system in the Lyman-α line

V. Bourrier[1], *D. Ehrenreich*[1], *P.J. Wheatley*[2], *E. Bolmont*[3], *M. Gillon*[4], *J. de Wit*[5], *A.J Burgasser*[6], *E. Jehin*[4], *D. Queloz*[7,1], *A.H.M.J. Triaud*[8]

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Astronomy & Astrophysics, published (2017A&A...599L..3B)

The TRAPPIST-1 system offers the opportunity to characterize terrestrial, potentially habitable planets orbiting a nearby ultracool dwarf star. We performed a four-orbit reconnaissance with the Space Telescope Imaging Spectrograph onboard the Hubble Space Telescope to study the stellar emission at Lyman-α, to assess the presence of hydrogen exospheres around the two inner planets, and to determine their UV irradiation. We detect the Lyman-α line of TRAPPIST-1, making it the coldest exoplanet host star for which this line has been measured. We reconstruct the intrinsic line profile, showing that it lacks broad wings and is much fainter than expected from the stellar X-ray emission. TRAPPIST-1 has a similar X-ray emission as Proxima Cen but a much lower Ly-α emission. This suggests that TRAPPIST-1 chromosphere is only moderately active compared to its transition region and corona. We estimated the atmospheric mass loss rates for all planets, and found that despite a moderate extreme UV emission the total XUV irradiation could be strong enough to strip the atmospheres of the inner planets in a few billions years. We detect marginal flux decreases at the times of TRAPPIST-1b and c transits, which might originate from stellar activity, but could also hint at the presence of extended hydrogen exospheres. Understanding the origin of these Lyman-α variations will be crucial in assessing the atmospheric stability and potential habitability of the TRAPPIST-1 planets.

Download/Website: `https://arxiv.org/abs/1702.07004`

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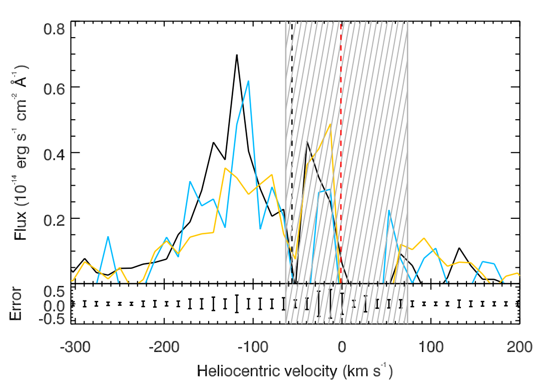

Figure 1: (Bourrier et al.) Ly-α line spectrum of TRAPPIST-1, measured with the HST/STIS spectrograph, and plotted as a function of Doppler velocity in the heliocentric rest frame. The black spectrum was measured outside of the planets transits, while the blue and orange spectra were obtained during the transit of TRAPPIST-1b and shortly after the transit of TRAPPIST-1c, respectively. The dashed black line indicates the velocity of the star, and the dashed red line the velocity of the Interstellar Medium LIC cloud. Most of the red wing of the Ly-α line cannot be observed from Earth because of ISM absorption along the line of sight, and contamination from geocoronal emission (hatched region).

Deposition of steeply infalling debris around white dwarf stars

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1702.05109)

High-metallicity pollution is common in white dwarf (WD) stars hosting remnant planetary systems. However, they rarely have detectable debris accretion discs, possibly because much of the influx is fast steeply-infalling debris in star-grazing orbits, producing a more tenuous signature than a slowly accreting disk. Processes governing such deposition between the Roche radius and photosphere have so far received little attention and we model them here analytically by extending recent work on sun-grazing comets to WD systems. We find that the evolution of cm-to-km size (a_0) infallers most strongly depends on two combinations of parameters, which effectively measure sublimation rate and binding strength. We then provide an algorithm to determine the fate of infallers for any WD, and apply the algorithm to four limiting combinations of hot versus cool (young/old) WDs with snowy (weak, volatile) versus rocky (strong, refractory) infallers. We find: (i) Total sublimation above the photosphere befalls all small infallers across the entire WD temperature ($T_{\rm WD}$) range, the threshold size rising with $T_{\rm WD}$ and 100× larger for rock than snow. (ii) All very large objects fragment tidally regardless of $T_{\rm WD}$: for rock, $a_0 \succeq 10^5$ cm; for snow, $a_0 \succeq 10^3 - 3 \times 10^4$ cm across all WD cooling ages. (iii) A considerable range of a_0 avoids fragmentation and total sublimation, yielding impacts or grazes with cold WDs. This range narrows rapidly with increasing $T_{\rm WD}$, especially for snowy bodies. Finally, we discuss briefly how the various forms of deposited debris may finally reach the photosphere surface itself.

Download/Website: `http://arxiv.org/abs/1702.05109`

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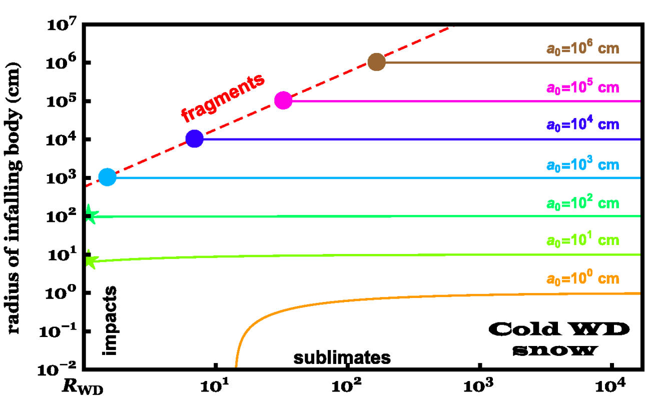

Figure 2: (Brown, Veras & Gänsicke) Size evolutions and fates for snowy bodies falling in toward a cool white dwarf with an effective temperature of 5000 K. The x-axis refers to the distance from the white dwarf in white dwarf radii. The initial sizes of the infallers (a_0) range from 1 cm to 10^6 cm. The three possible outcomes are (i) total sublimation (bottom axis), (ii) fragmentation (dashed red line), or (iii) impact with the WD photosphere (left axis).

Mid-infrared characterization of the planetary-mass companion ROXs 42B b

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Astronomy & Astrophysics, in press (arXiv:1702.06549)

We present new Keck/NIRC2 3–5 μm infrared photometry of the planetary-mass companion to ROXS 42B in L', and for the first time in Brackett-α (Brα) and in M_s-band. We combine our data with existing near-infrared photometry and K-band (2–2.4 μm) spectroscopy and compare these with models and other directly imaged planetary-mass objects using forward modeling and retrieval methods in order to characterize the atmosphere of ROXS 42B b. ROXS 42B b's 1.25–5 μm spectral energy distribution most closely resembles that of GSC 06214 B and κ And b, although it has a slightly bluer $K_\mathrm{s}-M_\mathrm{s}$ color than GSC 06214 B and thus so far lacks evidence for a circumplanetary disk. We cannot formally exclude the possibility that any of the tested dust-free/dusty/cloudy forward models describe atmosphere of ROXS 42B b well. However, models with substantial atmospheric dust/clouds yield temperatures and gravities that are consistent when fit to photometry and spectra separately, whereas dust-free model fits to photometry predict temperatures/gravities inconsistent with ROXS 42B b's K-band spectrum and vice-versa. Atmospheric retrieval on the 1–5 μm photometry places a limit on the fractional number density of CO_2 of $\log(n_{\mathrm{CO}_2}) < -2.7$ but provides no other constraints so far. We conclude that ROXS 42B b has mid-IR photometric features that are systematically different from other previously observed planetary-mass and field objects of similar temperature. It remains unclear whether this is in the range of the natural diversity of targets at the very young ($\sim$2 Myr) age of ROXS 42B b, or unique to its early evolution and environment.

Download/Website: `https://arxiv.org/abs/1702.06549`

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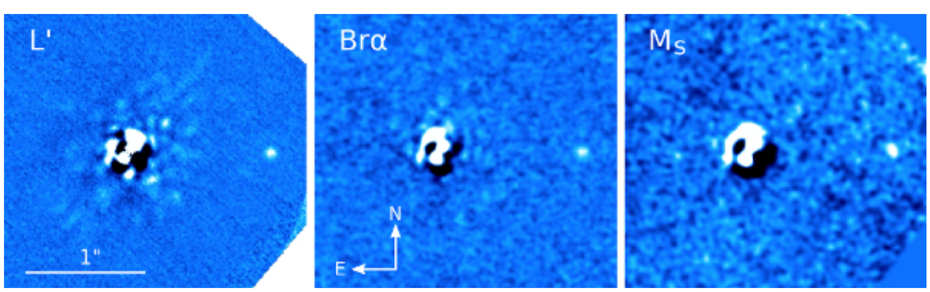

Figure 3: (Daemgen et al) New imaging observations of ROXS 42B and its companion in L', Brα, and M_s filters. For illustration, a radially averaged profile was subtracted from the primary to reduce the seeing halo and the Brα and M_s images were smoothed with a 3 pix-wide Gaussian. The color stretch is linear and cuts were adjusted to best display ROXS 42B b.

The GAPS Programme with HARPS-N at TNG. XIII. The orbital obliquity of three close-in massive planets hosted by dwarf K-type stars: WASP-43, HAT-P-20 and Qatar-2.

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Astronomy & Astrophysics, accepted, (arXiv:1702.03136)

The orbital obliquity of planets with respect to the rotational axis of their host stars is a relevant parameter for the characterization of the global architecture of planetary systems and a key observational constraint to discriminate between different scenarios proposed to explain the existence of close-in giant planets.
In the framework of the GAPS project, we conduct an observational programme aimed at determinating the orbital obliquity of known transiting exoplanets. The targets are selected to probe the obliquity against a wide range of stellar and planetary physical parameters.
We exploit high-precision radial velocity (RV) measurements, delivered by the HARPS-N spectrograph at the 3.6m Telescopio Nazionale Galileo, to measure the Rossiter-McLaughlin (RM) effect in RV time-series bracketing planet transits, and to refine the orbital parameters determinations with out-of-transit RV data. We also analyse new transit light curves obtained with several 1-2m class telescopes to better constrain the physical fundamental parameters of the planets and parent stars.
We report here on new transit spectroscopic observations for three very massive close-in giant planets: WASP-43 b, HAT-P-20 b and Qatar-2 b ($M_{\rm p}$ = 2.00, 7.22, 2.62 $\rm M_J$; a = 0.015, 0.036, 0.022 AU, respectively) orbiting dwarf K-type stars with effective temperature well below 5000 K ($T_{\rm eff}$ = 4500±100, 4595±45, 4640±65 K respectively). These are the coolest stars (except for WASP-80) for which the RM effect has been observed so far. We find λ = 3.5±6.8 deg for WASP-43 b and λ = -8.0±6.9 deg for HAT-P-20 b, while for Qatar-2, our faintest target, the RM effect is only marginally detected, though our best-fit value λ = 15±20 deg is in agreement with a previous determination. In combination with stellar rotational periods derived photometrically, we estimate the true spin-orbit angle, finding that WASP-43 b is aligned while the orbit of HAT-P-20 b presents a small but significant obliquity (Ψ=36 $^{+10}_{-12}$ deg). By analyzing the CaII H&K chromospheric emission lines for HAT-P-20 and WASP-43, we find evidence for an enhanced level of stellar activity that is possibly induced by star-planet interactions.

Download/Website: `https://arxiv.org/abs/1702.03136`

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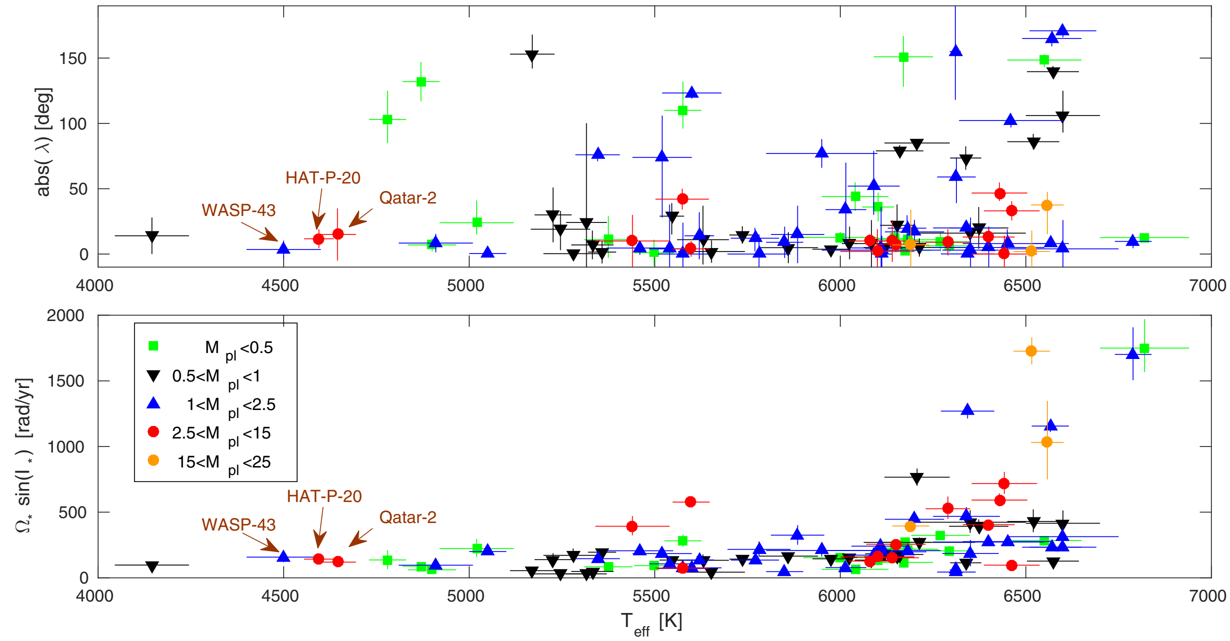

Figure 4: (Esposito et al.) Top panel: λ-$T_{\rm eff}$ diagram for all the transiting planets with published determinations of λ. Only two systems with $T_{\rm eff}$¿7000 K were not included. Bottom panel: Projected stellar angular rotational velocity $\Omega_{*}\sin(I_{*})$ as a function of the stellar $T_{\rm eff}$. We referred to the http://www.astro.keele.ac.uk/jkt/tepcat/ website for the values of λ, $T_{\rm eff}$, R_{*} and $M_{\rm pl}$; the values of $V \sin I_{\star}$ were compiled by exploring the literature. Size evolutions and fates for snowy bodies falling in toward a cool white dwarf with an effective temperature of 5000 K. The x-axis refers to the distance from the white dwarf in white dwarf radii. The initial sizes of the infallers (a_0) range from 1 cm to 10^6 cm. The three possible outcomes are (i) total sublimation (bottom axis), (ii) fragmentation (dashed red line), or (iii) impact with the WD photosphere (left axis).

The effect of ISM absorption on stellar activity measurements and its relevance for exoplanet studies

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Astronomy & Astrophysics, in press (arXiv:1702.02883)

Past ultraviolet and optical observations of stars hosting close-in Jupiter-mass planets have shown that some of these stars present an anomalously low chromospheric activity, significantly below the basal level. For the hot Jupiter planet host WASP-13, observations have shown that the apparent lack of activity is possibly caused by absorption from the intervening interstellar medium (ISM). Inspired by this result, we study the effect of ISM absorption on activity measurements (S and $\log R'_{\rm HK}$ indices) for main-sequence late-type stars. To this end, we employ synthetic stellar photospheric spectra combined with varying amounts of chromospheric emission and ISM absorption. We present the effect of ISM absorption on activity measurements by varying several instrumental (spectral resolution), stellar (projected rotational velocity, effective temperature, and chromospheric emission flux), and ISM parameters (relative velocity between stellar and ISM CaII lines, broadening b-parameter, and CaII column density). We find that for relative velocities between the stellar and ISM lines smaller than 30–40 $\mathrm{km\,s^{-1}}$ and for ISM CaII column densities $\log N_{\mathrm{CaII}} > 12$, the ISM absorption has a significant influence on activity measurements. Direct measurements and three dimensional maps of the Galactic ISM absorption indicate that an ISM CaII column density of $\log N_{\mathrm{CaII}} = 12$ is typically reached by a distance of about 100 pc along most sight lines. In particular, for a Sun-like star lying at a distance greater than 100 pc, we expect a depression (bias) in the $\log R'_{\mathrm{HK}}$ value larger than 0.05–0.1 dex, about the same size as the typical measurement and calibration uncertainties on this parameter. This work shows that the bias introduced by ISM absorption must always be considered when measuring activity for stars lying beyond 100 pc. We also consider the effect of multiple ISM absorption components. We discuss the relevance of this result for exoplanet studies and revise the latest results on stellar activity versus planet surface gravity correlation. We finally describe methods with which it would be possible to account for ISM absorption in activity measurements and provide a code to roughly estimate the magnitude of the bias (`http://www.iwf.oeaw.ac.at/forschung/exo-planetenphysik/exoplaneten/software/`). Correcting for the ISM absorption bias may allow one to identify the origin of the anomaly in the activity measured for some planet-hosting stars.

Download/Website: `http://arxiv.org/abs/1702.02883`

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Sulfur Hazes in Giant Exoplanet Atmospheres: Impacts on Reflected Light Spectra

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The Astronomical Journal, in press (arXiv:1701.00318)

Recent work has shown that sulfur hazes may arise in the atmospheres of some giant exoplanets, due to the photolysis of H_2S. We investigate the impact such a haze would have on an exoplanet's geometric albedo spectrum and how it may affect the direct imaging results of the *Wide Field Infrared Survey Telescope (WFIRST)*, a planned NASA space telescope. For temperate (250 K $<$ T_{eq} $<$ 700 K) Jupiter–mass planets, photochemical destruction of H_2S results in the production of $\sim$1 ppmv of S_8 between 100 and 0.1 mbar, which, if cool enough, will condense to form a haze. Nominal haze masses are found to drastically alter a planet's geometric albedo spectrum: whereas a clear atmosphere is dark at wavelengths between 0.5 and 1 μm due to molecular absorption, the addition of a sulfur haze boosts the albedo there to $\sim$0.7 due to scattering. Strong absorption by the haze shortward of 0.4 μm results in albedos $<$0.1, in contrast to the high albedos produced by Rayleigh scattering in a clear atmosphere. As a result, the color of the planet shifts from blue to orange. The existence of a sulfur haze masks the molecular signatures of methane and water, thereby complicating the characterization of atmospheric composition. Detection of such a haze by *WFIRST* is possible, though discriminating between a sulfur haze and any other highly reflective, high–altitude scatterer will require observations shortward of 0.4 μm, which is currently beyond *WFIRST*'s design.

Download/Website: `https://arxiv.org/abs/1701.00318`

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Does warm debris dust stem from asteroid belts?

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Monthly Notices of the Royal Astronomical Society, published (arXiv:1702.05966)

Many debris discs reveal a two-component structure, with a cold outer and a warm inner component. While the former are likely massive analogues of the Kuiper belt, the origin of the latter is still a matter of debate. In this work we investigate whether the warm dust may be a signature of asteroid belt analogues. In the scenario tested here the current two-belt architecture stems from an originally extended protoplanetary disc, in which planets have opened a gap separating it into the outer and inner discs which, after the gas dispersal, experience a steady-state collisional decay. This idea is explored with an analytic collisional evolution model for a sample of 225 debris discs from a Spitzer/IRS catalogue that are likely to possess a two-component structure. We find that the vast majority of systems (220 out of 225, or 98%) are compatible with this scenario. For their progenitors, original protoplanetary discs, we find an average surface density slope of -0.93 ± 0.06 and an average initial mass of $\left(3.3^{+0.4}_{-0.3}\right) \times 10^{-3}$ solar masses, both of which are in agreement with the values inferred from submillimetre surveys. However, dust production by short-period comets and — more rarely — inward transport from the outer belts may be viable, and not mutually excluding, alternatives to the asteroid belt scenario. The remaining five discs (2% of the sample) harbour inner components that appear inconsistent with dust production in an “asteroid belt.” Warm dust in these systems must either be replenished from cometary sources or represent an aftermath of a recent rare event, such as a major collision or planetary system instability.

Download/Website: `https://arxiv.org/abs/1702.05966`

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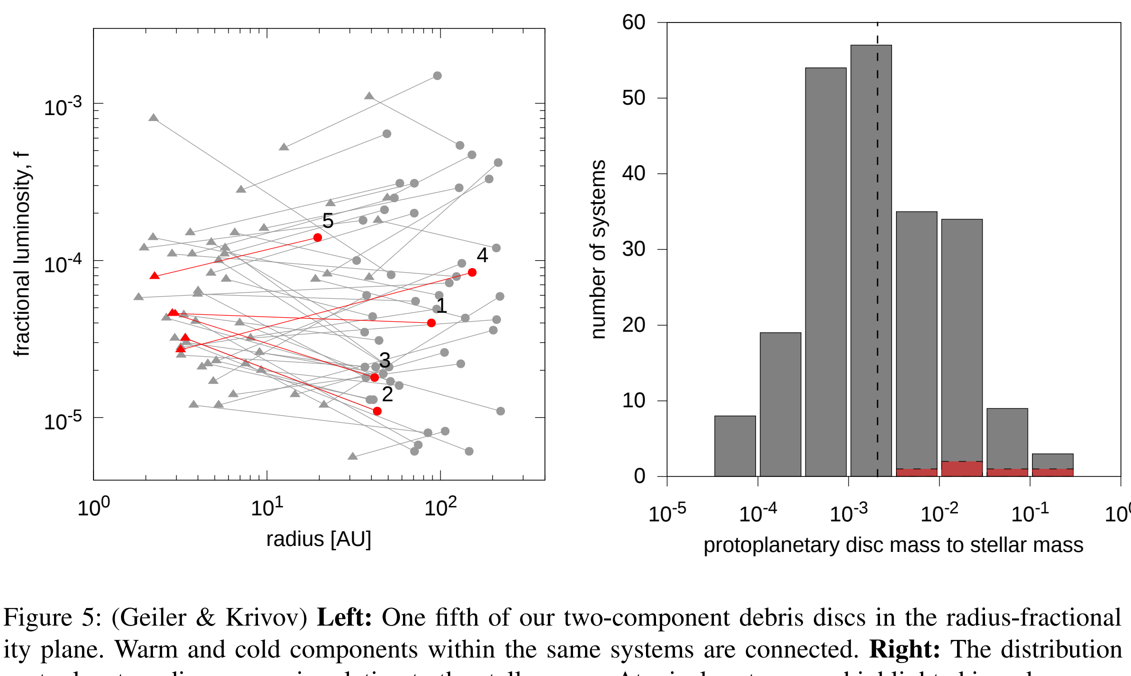

Figure 5: (Geiler & Krivov) **Left:** One fifth of our two-component debris discs in the radius-fractional luminosity plane. Warm and cold components within the same systems are connected. **Right:** The distribution of initial protoplanetary disc masses in relation to the stellar mass. Atypical systems are highlighted in red.

VLT/FORS2 comparative transmission spectroscopy II: Confirmation of a cloud-deck and Rayleigh scattering in WASP-31b, but no potassium?

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Monthly Notices of the Royal Astronomical Society, in press, 2017arXiv170202150G

We present transmission spectroscopy of the hot-Jupiter WASP-31b using FORS2 on the VLT during two primary transits. The observations cover a wavelength range of ≈400–840 nm. The light curves are corrupted by significant systematics, but these were to first order invariant with wavelength and could be removed using a common-mode correction derived from the white light curves. We reach a precision in the transit depth of ≈140 ppm in 15 nm bins, although the precision varies significantly over the wavelength range. Our FORS2 observations confirm the cloud-deck previously inferred using *HST*/STIS. We also re-analyse the *HST*/STIS data using a Gaussian process model, finding excellent agreement with earlier measurements. We reproduce the Rayleigh scattering signature at short wavelengths (< 5300 Å) and the cloud-deck at longer wavelengths. However, our FORS2 observations appear to rule out the large potassium feature previously detected using STIS, yet it is recovered from the *HST*/STIS data, although with reduced amplitude and significance ($\approx 2.5\sigma$). The discrepancy between our results and the earlier STIS detection of potassium ($\approx 4.3\sigma$) is either a result of telluric contamination of the ground-based observations, or an underestimate of the uncertainties for narrow-band features in *HST*/STIS when using linear basis models to account for the systematics. Our results further demonstrate the use of ground-based multi-object spectrographs for the study of exoplanet atmospheres, and highlight the need for caution in our interpretation of narrow-band features in low-resolution spectra of hot-Jupiters.

Download/Website: `http://adsabs.harvard.edu/abs/2017arXiv170202150G`

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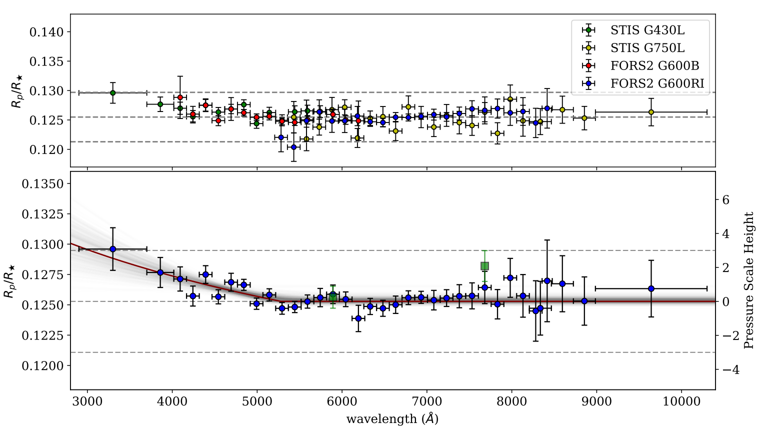

Figure 6: (Gibson et al.) Combined optical transmission spectrum of WASP-31b from FORS2 and STIS. The upper panel shows the data for the individual observations, and the lower panel is the combined dataset. The red line is the best-fitting two-component model, containing Rayleigh scattering and a cloud deck. The grey lines show samples drawn from the model fit, illustrating the uncertainty in the model. The strong detection of potassium previously reported from the STIS data is not reproduced.

Secondary Eclipses of HAT-P-13 b

R.A. Hardy[1,2], *J. Harrington*[1,3], *M.R. Hardin*[1], *N. Madhusudhan*[4], *T.J. Loredo*[5], *R.C. Challener*[1], *A.S.D. Foster*[1], *P.E. Cubillos*[1,6], *J. Blecic*[1]

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The Astrophysical Journal, published (2017ApJ...836..143H)

We present *Spitzer* secondary-eclipse observations of the hot Jupiter HAT-P-13 b in the 3.6 μm and 4.5 μm bands. HAT-P-13 b inhabits a two-planet system with a configuration that enables constraints on the planet's second Love number, k_2, from precise eccentricity measurements, which in turn constrains models of the planet's interior structure. We exploit the direct measurements of $e\cos\omega$ from our secondary-eclipse data and combine them with previously published radial velocity data to generate a refined model of the planet's orbit and thus an improved estimate on the possible interval for k_2. We report eclipse phases of 0.49154 $\pm$ 0.00080 and 0.49711 $\pm$ 0.00083 and corresponding $e\cos\omega$ estimates of -0.0136 $\pm$ 0.0013 and -0.0048 $\pm$ 0.0013. Under the assumptions of previous work, our estimate of k_2 of 0.81 $\pm$ 0.10 is consistent with the lower extremes of possible core masses found by previous models, including models with no solid core. This anomalous result challenges both interior models and the dynamical assumptions that enable them, including the essential assumption of apsidal alignment. We also report eclipse depths of 0.081% $\pm$ 0.008% in the 3.6 μm channel and 0.088 % $\pm$ 0.028 % in the 4.5 μm channel. These photometric results are non-uniquely consistent with solar-abundance composition without any thermal inversion.

Download/Website: `https://doi.org/10.3847/1538-4357/836/1/143`

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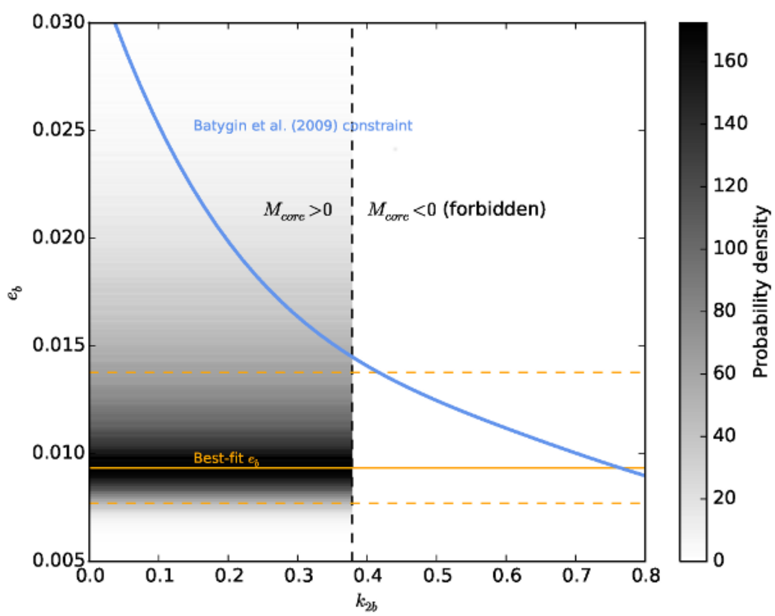

Figure 7: (Hardy et al.) Our best-fit eccentricity, with a 1σ confidence interval (solid and dashed orange lines, respectively), and its MCMC-generated posterior probability density distribution (black shading). The blue line is the model relating k_{2b} to the eccentricity of Batygin et al. (2009) and the upper limit of k_{2b} corresponding to models of HAT-P-13 b with zero core mass derived by Kramm et al. (2009), vertical dashed line, $k_{2b} < 0.379$.

Atmospheric Circulation of Hot Jupiters: Dayside-Nightside Temperature Differences. II. Comparison with Observations

Thaddeus D. Komacek, Adam P. Showman, & Xianyu Tan
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The Astrophysical Journal, published (2016arXiv161003893K)

The full-phase infrared light curves of low-eccentricity hot Jupiters show a trend of increasing fractional dayside-nightside brightness temperature difference with increasing incident stellar flux, both averaged across the infrared and in each individual wavelength band. The analytic theory of Komacek & Showman (2016) shows that this trend is due to the decreasing ability with increasing incident stellar flux of waves to propagate from day to night and erase temperature differences. Here, we compare the predictions of this theory to observations, showing that it explains well the shape of the trend of increasing dayside-nightside temperature difference with increasing equilibrium temperature. Applied to individual planets, the theory matches well with observations at high equilibrium temperatures but, for a fixed photosphere pressure of $100\ \mathrm{mbar}$, systematically under-predicts the dayside-nightside brightness temperature differences at equilibrium temperatures less than $2000\ \mathrm{K}$. We interpret this as due to as the effects of a process that moves the infrared photospheres of these cooler hot Jupiters to lower pressures. We also utilize general circulation modeling with double-grey radiative transfer to explore how the circulation changes with equilibrium temperature and drag strengths. As expected from our theory, the dayside-nightside temperature differences from our numerical simulations increase with increasing incident stellar flux and drag strengths. We calculate model phase curves using our general circulation models, from which we compare the broadband infrared offset from the substellar point and dayside-nightside brightness temperature differences against observations, finding that strong drag or additional effects (e.g. clouds and/or supersolar metallicities) are necessary to explain many observed phase curves.

Download/Website: `http://iopscience.iop.org/article/10.3847/1538-4357/835/2/198`

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Dynamical rearrangement of super-Earths during disk dispersal I. Outline of the magnetospheric rebound model

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Astronomy & Astrophysics, in press (arXiv:1702.02059)

The Kepler mission has discovered that close-in super-Earth planets are common around solar type stars. They are often seen together in multiplanetary systems, but their period ratios do not show strong pile-ups near mean motion resonances (MMRs). One scenario is that super-Earths form early, in the presence of a gas-rich disk. Such planets interact gravitationally with the disk gas, inducing their orbital migration. Disk migration theory predicts, however, that planets would end up at resonant orbits due to their differential migration speed.

Motivated by the discrepancy between observation and theory, we seek for a mechanism that moves planets out of resonances. We examine the orbital evolution of planet pairs near the magnetospheric cavity during the gas disk dispersal phase. Our study determines the conditions under which planets can escape resonances. We extend Type I migration theory by calculating the torque a planet experiences at the interface of the empty magnetospheric cavity and the disk: the one-sided torque. We perform two-planet N-body simulations with the new Type I expressions, varying the planet masses, stellar magnetic field strengths, disk accretion rates and gas disk depletion timescales.

As planets migrate outward with the expanding magnetospheric cavity, their dynamical configurations can be rearranged.
Migration of planets is substantial (minor) in a massive (light) disk. When the outer planet is more massive than the inner planet, the period ratio of two planets increases through outward migration. On the other hand, when the inner planet is more massive, the final period ratio tends to remain similar to the initial one. Larger stellar magnetic field strengths result in planets stopping their migration at longer periods. We apply this model to two systems, Kepler-170 and Kepler-180. By fitting their present dynamical architectures, the disk and stellar B-field parameters at the time of disk dispersal can be retrieved. *Magnetospheric rebound* is a promising mechanism **to play a role on reconciling** disk migration theory with observations. Even when planets are trapped into MMR during the early gas-rich stage, subsequent cavity expansion would induce substantial changes to their orbits, moving them out of resonance.

Download/Website: `https://arxiv.org/abs/1702.02059`

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Searching for chemical signatures of brown dwarf formation

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Astronomy & Astrophysics, in press, arXiv:1702.02904

Context. Recent studies have shown that close-in brown dwarfs in the mass range 35-55 M_{Jup} are almost depleted as companions to stars, suggesting that objects with masses above and below this gap might have different formation mechanisms.
Aims. We aim to test whether stars harbouring "massive" brown dwarfs and stars with "low-mass" brown dwarfs show any chemical peculiarity that could be related to different formation processes.
Methods. Our methodology is based on the analysis of high-resolution échelle spectra (R $\sim$ 57000) from 2-3 m class telescopes. We determine the fundamental stellar parameters, as well as individual abundances of C, O, Na, Mg, Al, Si, S, Ca, Sc, Ti, V, Cr, Mn, Co, Ni, and Zn for a large sample of stars known to have a substellar companion in the brown dwarf regime. The sample is divided into stars hosting massive and low-mass brown dwarfs. Following previous works a threshold of 42.5 M_{Jup} was considered. The metallicity and abundance trends of both subsamples are compared and set in the context of current models of planetary and brown dwarf formation.
Results. Our results confirm that stars with brown dwarf companions do not follow the well-established gas-giant planet metallicity correlation seen in main-sequence planet hosts. Stars harbouring "massive" brown dwarfs show similar metallicity and abundance distribution as stars without known planets or with low-mass planets. We find a tendency of stars harbouring "less-massive" brown dwarfs of having slightly larger metallicity, $[X_{Fe}/Fe]$ values, and abundances of Sc II, Mn I, and Ni I in comparison with the stars having the massive brown dwarfs. The data suggest, as previously reported, that massive and low-mass brown dwarfs might present differences in period and eccentricity.
Conclusions. We find evidence of a non-metallicity dependent mechanism for the formation of massive brown dwarfs. Our results agree with a scenario in which massive brown dwarfs are formed as stars. At high-metallicities, the core-accretion mechanism might become efficient in the formation of low-mass brown dwarfs while at lower metallicities low-mass brown dwarfs could form by gravitational instability in turbulent protostellar discs.

Download/Website: `https://arxiv.org/abs/1702.02904`

Contact: `jmaldonado@astropa.inaf.it`

Stacked Bayesian general Lomb-Scargle periodogram: Identifying stellar activity signals

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Astronomy & Astrophysics, in press (arXiv:1702.03885)

Context. Distinguishing between a signal induced by either stellar activity or a planet is currently the main challenge in radial velocity searches for low-mass exoplanets. Even when the presence of a transiting planet and hence its period are known, stellar activity can be the main barrier to measuring the correct amplitude of the radial velocity signal. Several tools are being used to help understand which signals come from stellar activity in the data.
Aims. We aim to present a new tool that can be used for the purpose of identifying periodicities caused by stellar activity, and show how it can be used to track the signal-to-noise ratio (S/N) of the detection over time. The tool is based on the principle that stellar activity signals are variable and incoherent.
Methods. We calculate the Bayesian general Lomb-Scargle periodogram for subsets of data and by adding one extra data point we track what happens to the presence and significance of periodicities in the data. Publicly available datasets from HARPS and HARPS-N were used for this purpose. Additionally, we analysed a synthetic dataset that we created with SOAP2.0 to simulate pure stellar activity and a mixture of stellar activity and a planet.
Results. We find that this tool can easily be used to identify unstable and incoherent signals, such as those introduced by stellar activity. The S/N of the detection grows approximately as the square root of the number of data points, in the case of a stable signal. This can then be used to make decisions on whether it is useful to keep observing a specific object. The tool is relatively fast and easy to use, and thus lends itself perfectly to a quick analysis of the data.

Download/Website: `https://arxiv.org/pdf/1702.03885.pdf`

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Predictions for the Detection and Characterization of a Population of Free-Floating Planets with $K2$ Campaign 9

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The Astronomical Journal, in press

K2 Campaign 9 (*K2*C9) offers the first chance to measure parallaxes and masses of members of the large population of free-floating planets (FFPs) that has previously been inferred from measurements of the rate of short-timescale microlensing events. Using detailed simulations of the nominal campaign (ignoring the loss of events due to *Kepler*'s emergency mode) and ground-based microlensing surveys, we predict the number of events that can be detected if there is a population of 1-$M_{\rm Jup}$ FFPs matching current observational constraints. Using a Fisher matrix analysis we also estimate the number of detections for which it will be possible to measure the microlensing parallax, angular Einstein radius and FFP mass. We predict that between 1.4 and 7.9 events will be detected in the *K2* data, depending on the noise floor that can be reached, but with the optimistic scenario being more likely. For nearly all of these it will be possible to either measure the parallax or constrain it to be probabilistically consistent with only planetary-mass lenses. We expect that for between 0.42 and 0.98 events it will be possible to gain a complete solution and measure the FFP mass. For the emergency-mode truncated campaign, these numbers are reduced by 20 percent. We argue that when combined with prompt high-resolution imaging of a larger sample of short-timescale events, *K2*C9 will conclusively determine if the putative FFP population is indeed both planetary and free-floating.

Download/Website: `http://adsabs.harvard.edu/abs/2016arXiv160501059P`

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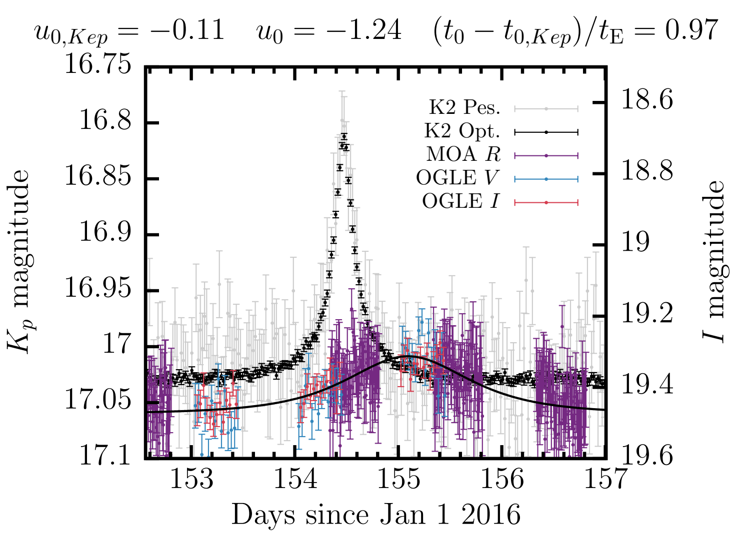

Figure 8: (Penny, et al.) Example of a simulated lightcurve. Grey and black points, plotted against the left axis, show pessimistic and optimistic *K2* photometry, respectively. Purple, blue and red points, plotted against the right axis, show MOA and OGLE V and I photometry, respectively. Note that the y-scales and the baseline magnitudes are very different for the *K2* and ground-based photometry, and that the event as seen from *K2* is highly magnified but severely blended.

The Multi-site All-Sky CAmeRA (MASCARA): Finding transiting exoplanets around bright ($m_V < 8$) stars.

G.J.J. Talens [1], *J.F.P. Spronck* [1], *A.-L. Lesage* [1], *G.P.P.L. Otten* [1], *R. Stuik* [1], *D. Pollacco* [2], *I.A.G Snellen* [1]

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Astronomy & Astrophysics, in press (arXiv:1702.03931)

This paper describes the design, operations, and performance of the Multi-site All-Sky CAmeRA (MASCARA). Its primary goal is to find new exoplanets transiting bright stars, $4 < m_V < 8$, by monitoring the full sky. MASCARA consists of one northern station on La Palma, Canary Islands (fully operational since February 2015), one southern station at La Silla Observatory, Chile (operational from early 2017), and a data centre at Leiden Observatory in the Netherlands. Both MASCARA stations are equipped with five interline CCD cameras using wide field lenses (24 mm focal length) with fixed pointings, which together provide coverage down to airmass 3 of the local sky. The interline CCD cameras allow for back-to-back exposures, taken at fixed sidereal times with exposure times of 6.4 sidereal seconds. The exposures are short enough that the motion of stars across the CCD does not exceed one pixel during an integration. Astrometry and photometry are performed on-site, after which the resulting light curves are transferred to Leiden for further analysis. The final MASCARA archive will contain light curves for $\sim$70,000 stars down to $m_V = 8.4$, with a precision of 1.5% per 5 minutes at $m_V = 8$.

Download/Website: `http://mascara1.strw.leidenuniv.nl/`

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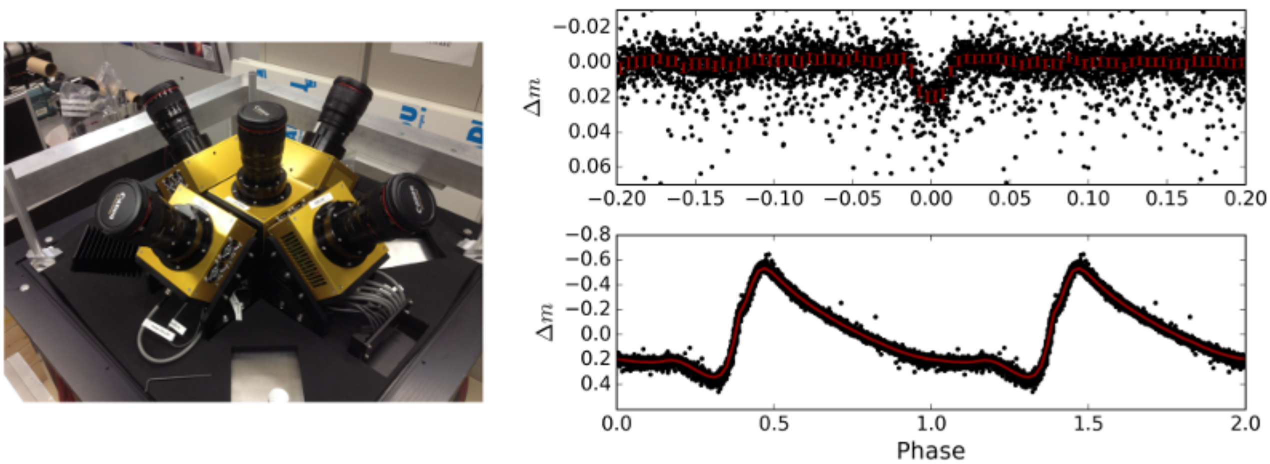

Figure 9: (Talens, et al.) *Left*: Atik cameras and 24 mm lenses of the northern station mounted on the base of the camera box during testing at Leiden Observatory. *Right*: RMS achieved for the west camera of the northern station during the second quarter of 2015. Shown are the RMS on the five-minute binned lightcurves of individual stars with >500 data points (black points) and the median relation in bins of $\Delta m_V = 0.2$ (blue line). We achieve an RMS of $\sim$0.5% at the bright end of our magnitude range and $\sim$2% at the faint end. Similar RMS is achieved by the other cameras.

The Changing Face of α Centauri B: Probing plage and stellar activity in K-dwarfs.

A.P.G. Thompson[1], *C.A. Watson*[1], *E.J.W. de Mooij*[1,2], *D.B. Jess*[1]

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1702.01647)

A detailed knowledge of stellar activity is crucial for understanding stellar dynamos, as well as pushing exoplanet radial-velocity detection limits towards Earth analogue confirmation. We directly compare archival HARPS spectra taken at the minimum in α Cen B's activity cycle to a high-activity state when clear rotational modulation of $\log R'_{HK}$ is visible. Relative to the inactive spectra, we find a large number of narrow pseudo-emission features in the active spectra with strengths that are rotationally modulated. These features most likely originate from plage, spots, or a combination of both. They also display radial velocity variations of $\sim$300 m s^{-1} – consistent with an active region rotating across the stellar surface. Furthermore, we see evidence that some of the lines originating from the 'active immaculate' photosphere appear broader relative to the 'inactive immaculate' case. This may be due to enhanced contributions of e.g. magnetic bright points to these lines, which then causes additional line broadening. More detailed analysis may enable measurements of plage and spot coverage using single spectra in the future.

Download/Website: `https://arxiv.org/abs/1702.01647/`

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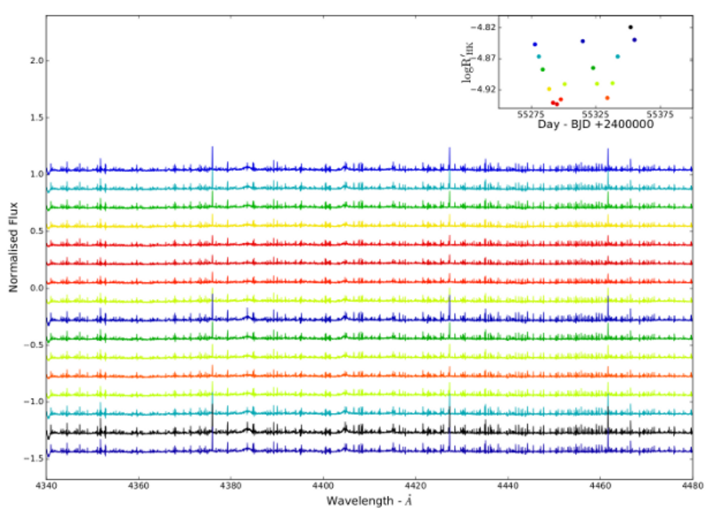

Figure 10: (Thompson, et al.) A selection of relative spectra from the high activity March-June 2010 period – generated by dividing high-activity spectra by the master low-activity template – for ease of viewing only 16 of the 48 weighted spectra available for this period are shown. The broad features seen at 4383 Å and 4404 Å correspond to temperature sensitive Fe I lines. A large number of narrow 'pseudo-emission' peaks can also be seen with the feature at 4375 Å showing an excursion of $\sim 20\%$. The colour of the residuals corresponds to the activity as seen in the $\log R'_{HK}$ (see insert at the top right). Note the change in the strength of all these features clearly correlates with the rotation cycle of the star.

Hot Exoplanet Atmospheres Resolved with Transit Spectroscopy (HEARTS) I. Detection of hot neutral sodium at high altitudes on WASP-49b

A. Wyttenbach[1], *C. Lovis*[1], *D. Ehrenreich*[1], *V. Bourrier*[1], *L. Pino*[1,2], *R. Allart*[1], *N. Astudillo-Defru*[1], *H. M. Cegla*[1,3], *K. Heng*[4], *B. Lavie*[1,4], *C. Melo*[5], *F. Murgas*[6,7], *A. Santerne*[8], *D. Ségransan*[1], *S. Udry*[1], *and F. Pepe*[1]

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Astronomy & Astrophysics, published (arXiv:1702.00448)

High-resolution optical spectroscopy during the transit of HD 189733b, a prototypical hot Jupiter, allowed the resolution of the Na I D sodium lines in the planet, giving access to the extreme conditions of the planet upper atmosphere. We have undertaken HEARTS, a spectroscopic survey of exoplanet upper atmospheres, to perform a comparative study of hot gas giants and determine how stellar irradiation affect them. Here, we report on the first HEARTS observations of the hot Saturn-mass planet WASP-49b. We observed the planet with the HARPS high-resolution spectrograph at ESO 3.6m telescope. We collected 126 spectra of WASP-49, covering three transits of WASP-49b. We analyzed and modeled the planet transit spectrum, while paying particular attention to the treatment of potentially spurious signals of stellar origin. We spectrally resolve the Na I D lines in the planet atmosphere and show that these signatures are unlikely to arise from stellar contamination. The large contrasts of $2.0 \pm 0.5\%$ (D_2) and $1.8 \pm 0.7\%$ (D_1) require the presence of hot neutral sodium ($2,950^{+400}_{-500}$ K) at high altitudes ($\sim$1.5 planet radius or $\sim$45,000 km). From estimating the cloudiness index of WASP-49b, we determine its atmosphere to be cloud free at the altitudes probed by the sodium lines. WASP-49b is close to the border of the evaporation desert and exhibits an enhanced thermospheric signature with respect to a farther-away planet such as HD 189733b.

Download/Website: `https://arxiv.org/abs/1702.00448`

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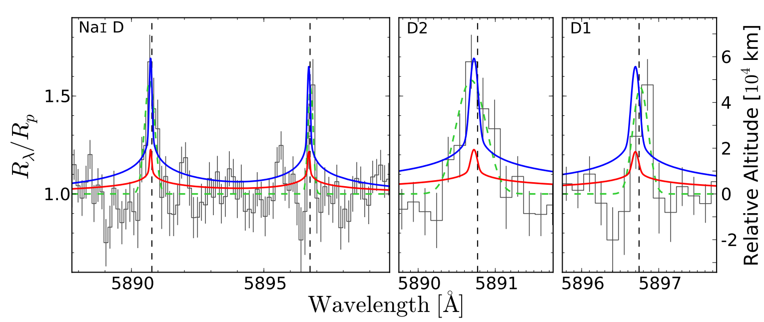

Figure 11: (Wyttenbach et al.) Fit of η models to the transmission spectrum of WASP-49b. The spectra are binned by $15\times$. The vertical scale are relative radii and altitudes assuming a white light radius of $1.198\,R_{\rm Jup}$. One η model, set at the equilibrium temperature ($\sim 1,400$ K, in red), is adjusted to the continuum. Another model is adjusted to the line cores and is shown in blue. The latter model temperature is found to be $2,950^{+400}_{-500}$ K. Gaussian fits are also shown in green for comparison.

3 Non-refereed papers

On the Detection of Extrasolar Moons and Rings

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Invited Review, arXiv:1701.04706

Since the discovery of a planet transiting its host star in the year 2000, thousands of additional exoplanets and exoplanet candidates have been detected, mostly by NASA's Kepler space telescope. Some of them are almost as small as the Earth's moon. As the solar system is teeming with moons, more than a hundred of which are in orbit around the eight local planets, and with all of the local giant planets showing complex ring systems, astronomers have naturally started to search for moons and rings around exoplanets in the past few years. We here discuss the principles of the observational methods that have been proposed to find moons and rings beyond the solar system and we review the first searches. Though no exomoon or exoring has been unequivocally validated so far, theoretical and technological requirements are now on the verge of being mature for such discoveries.

Download/Website: `https://arxiv.org/abs/1701.04706`

Contact: `heller@mps.mpg.de`

Figure 12: (Heller) Transit of Saturn and its ring system in front of the sun as seen by the Cassini spacecraft in September 2016. Note how the rings bend the sun light around the planet, an effect knows as diffraction. Image credit: NASA/JPL/Space Science Institute.

4 Conference announcements

EWASS 2017, Symposium S1. Exoplanet science in the coming decade: The bright and nearby future

SOC: Sz. Csizmadia[1]*, A. García Muñoz*[2]*, H. J. Deeg*[3]*, E. Guenther*[4]*, P. Kabath*[5]

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[2] TU Berlin, DE
[3] IAC Tenerife, ES
[4] TLS, DE
[5] AsU CAS, CZ

Prague, 26-27 June 2017

Aims and scope

This symposium will offer a forum for discussion on current and upcoming exoplanet science. Its 'bright and nearby' subtitle refers to the exciting possibilities that new instruments and missions are opening up, but it points also to the shift to brighter and more nearby planet samples that we expect, in particular from the TESS and PLATO missions. Such a brighter sample will lead to new developments and opportunities in their characterization, from which we can expect that data that currently exist only for very few systems will become available in quantities that permit much more advanced interpretations. We welcome presentations that report on any kind of exoplanet discovery and characterization, but in particular those that address any of these questions:

- What is the status of current and upcoming survey projects?
- Are we ready for the next decade of new discoveries in terms of theoretical modeling and instrumentation/projects?
- What are the priorities, methods and challenges of exoplanetary characterization?
- What is the implication of the current exo-characterization research for biomarkers and life?
- What shall be the future of the exoplanetary characterization?
- Which instrumentation to characterize exoplanets would the community need?

Programme

1. Overview on missions and projects to detect and characterize exoplanets operational projects
2. Characterization of exoplanets
3. Potential of the closest exoplanets (habitability, biomarkers)
4. Future missions
5. Architecture of planetary systems
6. General discussion about future heading of exoplanetary research

Invited speakers

- Dr. Beth Biller (Royal Observatory, Edinburgh (ROE))
- Dr. Piere Ferruit (ESA)

- Prof. Artie Hatzes (Thueringer Landessternwarte Tautenburg)
- Prof. Ravit Helled (Center for Theoretical Astrophysics & Cosmology, Institute for Computational Science, University of Zurich)
- Dr. Nikku Madhusudhan (Institute of Astronomy, University of Cambridge)
- Dr. Francesco Pepe (Observatoire de l'Université de Genève)

Download/Website: `http://eas.unige.ch/EWASS2017/session.jsp?id=S1`
Contact: `kabath@asu.cas.cz`

The Third Workshop on Extremely Precise Radial Velocities (ERPV III)

Jason T. Wright, Sharon X. Wang
The Pennsylvania State University, University Park, PA, USA

The Pennsylvania State University, during the week of August 14-17, 2017

The Penn State Center for Exoplanets and Habitable Worlds is proud to announce the Third Workshop on Extremely Precise Radial Velocities to be held in State College, Pennsylvania, USA, Aug 14-17, 2017. Following the tradition of previous workshops, participants will dig into the "nuts and bolts" of exoplanetary discovery and orbit characterization via Doppler velocimetry, and be a forum for practitioners to discuss challenges, lessons learned, and the details of their work, "warts and all".

This edition of the workshop will focus on:

- specific hardware challenges
- lessons learned from the newest generation of EPRV instruments
- statistical methods for signal extraction and analysis
- physical models and diagnostics of stellar granulation, activity, and other sources of jitter
- machine learning methods for Doppler extraction and jitter diagnostics

As with previous workshops, there will be a mix of plenary talks, breakout sessions, and posters.

We anticipate there will be travel support for some participants, especially junior participants, and we encourage strong international participation from all of the teams working on the EPRV problem. Overseas participants may wish to extend their stay in the US to experience the total solar eclipse the following Monday. The path of totality is not near the conference, but many scenic sites in the US will be, including the Carolina coast, the Smokey Mountains of Tennessee, and the Grand Tetons of Wyoming.

Pre-registration is available now at the conference website.

There will be a limited number of spaces for on-site childcare for children under 6, which we hope to subsidize – advance notice will be required, so interested participants should contact Jason Wright (astrowright@gmail.com) ASAP for more informaiton.

Download/Website: `http://bit.ly/EPRVIII`
Contact: `jtw13@psu.edu, sharonw@carnegiescience.edu`

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 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 visit the website to view the preliminary agenda.

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

Important Dates

- January 27, 2017: On-line Registration period open
- February 24, 2017: Financial Support applications due
- March 10, 2017: Financial Support decisions announced via email
- May 26, 2017: POP/Poster/Talk submission period open and on-line lunch and workshop dinner purchase periods open
- July 14, 2017: deadline for POP/Poster/Talk submission and deadline to purchase lunches and workshop dinner
- July 29, 2017: final agenda posted
- August 7-11, 2017: Sagan Exoplanet Summer Workshop

Download/Website: `http://nexsci.caltech.edu/workshop/2017`

Contact: `sagan_workshop@ipac.caltech.edu`

Transiting Exoplanets Conference

SOC: C. Hellier, N. Batalha, D. Charbonneau, H. Knutson, D. Pollacco, D. Queloz, H. Rauer;
LOC: C. Hellier, J. Southworth, D.R. Anderson, P.F.L. Maxted, B. Smalley
Keele University, UK

Keele University, UK, 17$^{\rm th}$–21$^{\rm st}$ July 2017

Talk abstract submission and registration are currently open.
Confirmed invited speakers include: Laura Kreidberg (*atmospheres, observations*), Nikku Madhusudhan (*atmospheres, theory*), Mercedes Lopez-Morales (*O2 in Earth-analogue atmospheres*), Michael Gillon (*M-dwarf planets*), Rebekah Dawson (*planetary architecture*), Simon Albrecht (*obliquities*), George Ricker (*TESS*).

Download/Website: `http://wasp-planets.net/conference/`

Contact: `c.hellier@keele.ac.uk`

5 Jobs and positions

Postdoctoral position in exoplanets: Golden targets for exoplanet atmospheres & exploitation of the CHEOPS space mission

David Ehrenreich

Geneva Observatory, University of Geneva, 1 June 2017 (flexible)

Applications are invited for a postdoctoral research position at the University of Geneva (Geneva Observatory) working with David Ehrenreich on his ERC Consolidator project about the upper atmospheric characterisation of exoplanets. The successful applicant is expected to carry out a research program to find the most amenable exoplanets for atmospheric follow-up using existing facilities (e.g. K2) and upcoming ones (e.g. TESS) and participate to the characterization follow-up. They will be involved into the scientific exploitation of CHEOPS, which will be used to cherry-pick the very best transiting targets for in-depth follow-up with spectroscopic instruments such as HST, JWST and the ground-based high-resolution spectrographs at large telescopes. CHEOPS (Characterizing Exoplanets Satellite) is an ESA mission that will be launched in 2018. The University of Geneva hosts the CHEOPS Science Operations Center and Project Science Office, providing the successful applicant plenty of opportunities to participate to the science data analysis and mission operations. The 3-year position could be extended upon satisfactory results for 2 additional years, hence covering the whole CHEOPS primary mission (3.5 years).

Setting—The Geneva Observatory offers one of the most vibrant environment worldwide for exoplanet research. Nearly 60 people contributes to the exoplanet team (www.exoplanets.ch), currently including 8 faculty members, 11 postdoctoral researchers, 19 PhD students, and 17 project staff. Research topics include exoplanet detection, exoplanet characterization (atmospheres, interiors), planetary system dynamics, and instrumentation. Team members are directly involved into a large number of projects, including photometric instruments (CHEOPS, TESS, PLATO, NGTS), high-resolution spectrographs (HARPS, HARPS-North, NIRPS and ESPRESSO) and direct imaging (SPHERE@VLT). The exoplanet team is also part of PlanetS (www.nccr-planets.ch), a Swiss research network focused on exoplanetary science, which includes $\sim$130 scientists from the Universities of Geneva, Bern, Zurich and the Institutes of Technology in Lausanne and Zurich. The successful applicant will be able to take advantage of this unique collaborative framework. The University of Geneva is an equal opportunity employer committed to diversity in its workplace.

Duration—This is a 3-year position, with possible extension to a fourth and fifth year pending on satisfactory results.

Salary—Starts at ∼81,000 CHF/year and commensurable with experience, according to rules of the University and Canton of Geneva.

Deadline—Candidates are encouraged to apply by April 1, 2017, but later applications will be reviewed until the position is filled.

Requirements—A Ph.D in astronomy, astrophysics or related fields. An expertise in time-series photometry of exoplanetary transits and/or analysis of data from space telescopes will be highly valued. Praised soft skills are scientific independence and good team playing abilities. The following application materials should be encapsulated within a single pdf and sent to david.ehrenreich@unige.ch: a curriculum vitae (up to 2 pages), a list of publications (no page limit), a cover letter (1 page) listing the names of 3 references/referees, up to three letters of recommendation should be sent directly to Dr Ehrenreich by the referees themselves.
Contact: `david.ehrenreich@unige.ch`

PhD position: Escape of exoplanet atmospheres

David Ehrenreich

Geneva Observatory, University of Geneva, 1 June 2017 (flexible)

Applications are invited for a research assistant (PhD student) position at the University of Geneva (Geneva Observatory) working with David Ehrenreich on his ERC Consolidator project about the upper atmospheric characterisation of exoplanets. The successful applicant is expected to work on ultraviolet spectroscopic data from the Hubble Space Telescope to search for signatures of escaping atmospheres on exoplanets. The data will come in part from the Hubble Panchromatic Exoplanet Treasury Program, of which Dr Ehrenreich is a Co-I, and from other programs obtained by the team. The work will involve data reduction and analysis as well as development of new insights about the star-planet interaction, in particular about the impact of stellar coronal and chromospheric activity on these observations.

Setting—The Geneva Observatory offers one of the most vibrant environment worldwide for exoplanet research. Nearly 60 people contributes to the exoplanet team (www.exoplanets.ch), currently including 8 faculty members, 11 postdoctoral researchers, 19 PhD students, and 17 project staff. Research topics include exoplanet detection, exoplanet characterization (atmospheres, interiors), planetary system dynamics, and instrumentation. Team members are directly involved into a large number of projects, including photometric instruments (CHEOPS, TESS, PLATO, NGTS), high-resolution spectrographs (HARPS, HARPS-North, NIRPS and ESPRESSO) and direct imaging (SPHERE@VLT). The exoplanet team is also part of PlanetS (www.nccr-planets.ch), a Swiss research network focused on exoplanetary science, which includes ∼130 scientists from the Universities of Geneva, Bern, Zurich and the Institutes of Technology in Lausanne and Zurich. The successful applicant will be able to take advantage of this unique collaborative framework. The University of Geneva is an equal opportunity employer committed to diversity in its workplace.

Duration—This is a 4-year position.

Salary—∼45,000 CHF/year, according to rules of the University and Canton of Geneva.

Deadline—Candidates are encouraged to apply by March 15, 2017, but later applications will be reviewed until the position is filled.

Requirements—A MSc degree in astronomy, astrophysics or related fields. The successful applicant will be immersed in a team work environment, therefore good team playing abilities and focus will be praised soft skills. The following application materials should be encapsulated within a single pdf and sent to david.ehrenreich@unige.ch: a curriculum vitae (2 pages), a cover letter (1 page) listing the names of 2 references/referees, up to two letters of recommendation should be sent directly to Dr Ehrenreich by the referees themselves.

Contact: `david.ehrenreich@unige.ch`

PhD position in Ensemble asteroseismology of solar-type stars with the NASA TESS mission

Dr. Tiago Campante
University of Birmingham, UK

IA-U.Porto/University of Göttingen/Aarhus University, starting Summer/Autumn 2017

A call is ongoing for a PhD project on “Ensemble asteroseismology of solar-type stars with the NASA TESS mission” (see abstract below). Details on the application procedure can be found at http://phd-space.iastro.pt/?page_id=1045. This PhD project has been made available in the context of the PhD::SPACE Programme, funded by the FCT PD Programme Initiative (Portugal). The deadline for applications is the **31st of March 2017**.

The student will be based at Instituto de Astrofísica e Ciências do Espaço – University of Porto (Portugal). It is nonetheless expected that the student will spend one-third of their time between the University of Göttingen (Germany) and Aarhus University (Denmark).

Abstract: The Transiting Exoplanet Survey Satellite (TESS) is a NASA space mission, with launch scheduled for March 2018, that will perform an all-sky survey for planets transiting bright nearby stars. Furthermore, TESS’s excellent photometric precision will enable asteroseismology, the detailed study of stars by the observation of their natural, resonant oscillations. Asteroseismology is proving to be particularly relevant for the study of solar-type stars (i.e., low-mass, main-sequence stars and cool subgiants), in great part due to the exquisite photometric data made available by NASA’s Kepler space telescope and, more recently, by the repurposed K2 mission. In extending the legacy of Kepler/K2, the main goal of this project will be to perform an ensemble asteroseismic study of bright solar-type stars that reside in the solar neighbourhood, making use of data collected by TESS during its 2-year primary mission. To that end, we propose an end-to-end PhD project that will provide the student with skills in photometric time-series preparation from pixel data, asteroseismic data analysis and stellar modelling techniques. The implications of this project are far-reaching. The proposed research will provide a well characterised sample of benchmark solar-type stars to be used in studies of exoplanetary systems and of the chemical evolution of the solar neighbourhood, the latter of which will impact on Galactic archaeology studies.

Download/Website: `http://phd-space.iastro.pt/?page_id=1045`

Contact: `campante@bison.ph.bham.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 February 2017. If you see any that we missed, please let us know and we'll include them in the next issue.

astro-ph/1702.00013 : **Four Sub-Saturns with Dissimilar Densities: Windows into Planetary Cores and Envelopes** by *Erik A. Petigura, et al.*

astro-ph/1702.00106 : **HAT-P-67b: An Extremely Low Density Saturn Transiting an F-Subgiant Confirmed via Doppler Tomography** by *G. Zhou, et al.*

astro-ph/1702.00251 : **Herschel survey and modelling of externally-illuminated photoevaporating protoplanetary disks** by *Jason Champion, et al.*

astro-ph/1702.00448 : **Hot Exoplanet Atmospheres Resolved with Transit Spectroscopy (HEARTS) I. Detection of hot neutral sodium at high altitudes on WASP-49b** by *A. Wyttenbach, et al.*

astro-ph/1702.00545 : **Polar alignment of a protoplanetary disk around an eccentric binary** by *Rebecca G. Martin, Stephen H. Lubow*

astro-ph/1702.00691 : **EPIC 218916923 b: a low-mass warm Jupiter on a 29-day orbit transiting an active K0 V star** by *O. Barragan, et al.*

astro-ph/1702.01123 : **Searching For Rapid Orbital Decay of WASP-18b** by *Ashlee N. Wilkins, et al.*

astro-ph/1702.01137 : **False negatives for remote life detection on ocean-bearing planets: Lessons from the early Earth** by *C.T. Reinhard, et al.*

astro-ph/1702.01647 : **The Changing Face of a Centauri B: Probing plage and stellar activity in K-dwarfs** by *A.P.G. Thompson, et al.*

astro-ph/1702.01657 : **KELT-18b: Puffy Planet, Hot Host, Probably Perturbed** by *Kim K. McLeod, et al.*

astro-ph/1702.01784 : **Exploring the Brown Dwarf Desert: New Substellar Companions from the SDSS-III MARVELS Survey** by *Nolan Grieves, et al.*

astro-ph/1702.01813 : **A common origin of magnetism from planets to white dwarfs** by *Jordi Isern, et al.*

astro-ph/1702.01820 : **PandExo: A Community Tool for Transiting Exoplanet Science with JWST & HST** by *Natasha E. Batalha, et al.*

astro-ph/1702.01826 : **A search for circularly polarised emission from young exoplanets** by *C. R. Lynch, et al.*

astro-ph/1702.02049 : **A study of periodograms standardized using training data sets and application to exoplanet detection** by *Sophia Sulis, David Mary, Lionel Bigot*

astro-ph/1702.02051 : **The theory of transmission spectra revisited: a fast method for analyzing WFC3 data and an unresolved challenge** by *Kevin Heng, Daniel Kitzmann*

astro-ph/1702.02094 : **Constraining the giant planets' initial configuration from their evolution: implications for the timing of the planetary instability** by *Rogerio Deienno, et al.*

astro-ph/1702.02137 : **Mean motion resonances at high eccentricities: the 2:1 and the 3:2 interior resonances** by *Xianyu Wang, Renu Malhotra*

astro-ph/1702.02147 : **A Surface Density Perturbation in the TW Hydrae Disk at 95 au Traced by Molecular Emission** by *R Teague, et al.*

astro-ph/1702.02150 : **VLT/FORS2 comparative transmission spectroscopy II: confirmation of a cloud-deck and Rayleigh scattering in WASP-31b, but no potassium?** by *Neale P. Gibson, et al.*

astro-ph/1702.02151 : **Planetesimal formation near the snowline: in or out?** by *Djoeke Schoonenberg, Chris W. Ormel*

astro-ph/1702.02213 : **Activity and rotation of Kepler-17** by *A. Valio, et al.*

astro-ph/1702.02237 : **An Observational Upper Limit on the Interstellar Number Density of Asteroids and Comets** by *Toni Engelhardt, et al.*

astro-ph/1702.02494 : **Dynamics and evolution of planets in mean-motion resonances** by *Alexandre C. M. Correia, Jean-Baptiste Delisle, Jacques Laskar* astro-ph/1702.02542 : **Probabilistic Constraints on the Mass and Composition of Proxima b** by *Alex Bixel, Daniel Apai*

astro-ph/1702.02844 : **ALMA unveils rings and gaps in the protoplanetary system HD 169142: signatures of two giant protoplanets** by *D. Fedele et al.*

astro-ph/1702.02862 : **Observability of characteristic binary-induced structures in circumbinary disks** by *R. Avramenko, S. Wolf, T. F. Illenseer*

astro-ph/1702.02868 : **The Chemical Composition of an Extrasolar Kuiper-Belt-Object** by *S. Xu, et al.*

astro-ph/1702.02883 : **The effect of ISM absorption on stellar activity measurements and its relevance for exoplanet studies** by *L. Fossati, et al.*

astro-ph/1702.02994 : **Pale Orange Dots: The Impact of Organic Haze on the Habitability and Detectability of Earthlike Exoplanets** by *Giada N. Arney, et al.*

astro-ph/1702.03136 : **The GAPS Programme with HARPS-N at TNG. XIII. The orbital obliquity of three close-in massive planets hosted by dwarf K-type stars: WASP-43, HAT-P-20 and Qatar-2** by *M. Esposito, et al.*

astro-ph/1702.03170 : **Asteroseismology of the exoplanet-host F-type star 94 Ceti : impact of atomic diffusion on the stellar parameters** by *M. Deal, et al.*

astro-ph/1702.03301 : **A VLA Search for Radio Signals from M31 and M33** by *Robert H. Gray, Kunal P. Mooley*

astro-ph/1702.03315 : **Constraints on Climate and Habitability for Earth-like Exoplanets Determined from a General Circulation Model** by *Eric T. Wolf, et al.*

astro-ph/1702.03386 : **The cosmic shoreline: the evidence that escape determines which planets have atmospheres, and what this may mean for Proxima Centauri b** by *Kevin J. Zahnle, David C. Catling*

astro-ph/1702.03571 : **The LCES HIRES/Keck Precision Radial Velocity Exoplanet Survey** by *R. Paul Butler, et al.*

astro-ph/1702.03678 : **Quantitative indexing and Tardigrade analysis of exoplanets** by *J. M. Kashyap*

astro-ph/1702.03797 : **Planet-Induced Stellar Pulsations in HAT-P-2's Eccentric System** by *J. de Wit, et al.*

astro-ph/1702.03885 : **Stacked Bayesian general Lomb-Scargle periodogram: Identifying stellar activity signals** by *A. Mortier, A. Collier Cameron*

astro-ph/1702.03931 : **The Multi-site All-Sky CAmeRA: Finding transiting exoplanets around bright (mV¡8) stars** by *G.J.J. Talens, et al.*

astro-ph/1702.04089 : **Is Proxima Centauri b habitable? – A study of atmospheric loss** by *Chuanfei Dong, et al.*

astro-ph/1702.04383 : **Characterising face-on accretion onto and the subsequent contraction of protoplanetary discs** by *T.P.G. Wijnen, et al.*

astro-ph/1702.04543 : **Secular evolution of eccentricity in protoplanetary discs with gap-opening planets** by *Jean Teyssandier, Gordon I. Ogilvie*

astro-ph/1702.04734 : **The Oblique Orbit of WASP-107b from K2 Photometry** by *Fei Dai, Joshua N. Winn*

astro-ph/1702.04780 : **Polarized disk emission from Herbig Ae/Be stars observed using Gemini Planet Imager: HD 144432, HD 150193, HD 163296, and HD 169142** by *John D. Monnier et al.*

astro-ph/1702.05078 : **Starspots on WASP-107 and pulsations of WASP-118** by *T. Mocnik, et al.*

astro-ph/1702.05108 : **Testing giant planet formation in the transitional disk of SAO 206462 using deep VLT/SPHERE imaging** by *A.-L. Maire, et al.*

astro-ph/1702.05109 : **Deposition of steeply infalling debris around white dwarf stars** by *John C. Brown, Dimitri Veras, Boris T. Gaensicke*

astro-ph/1702.05123 : **Infrared observations of white dwarfs and the implications for the accretion of dusty planetary material** by *Amy Bonsor, et al.*

astro-ph/1702.05158 : **Search for exoplanets around pulsating stars of A–F type in Kepler Short Cadence data and the case of KIC 8197761** by *Paulina Sowicka, et al.*

astro-ph/1702.05483 : **Once in a blue moon: detection of 'bluing' during debris transits in the white dwarf**

WD1145+017 by *N. Hallakoun, et al.*
astro-ph/1702.05500 : **Natural and Artificial Spectral Edges in Exoplanets** by *Manasvi Lingam, Abraham Loeb*
astro-ph/1702.05966 : **Does warm debris dust stem from asteroid belts?** by *F. Geiler, A. Krivov*
astro-ph/1702.06393 : **The SOPHIE search for northern extrasolar planets - XII. Three giant planets suitable for astrometric mass determination with Gaia** by *Javiera Rey, et al.*
astro-ph/1702.06549 : **Mid-infrared characterization of the planetary-mass companion ROXs 42B b** by *Sebastian Daemgen, et al.*
astro-ph/1702.06578 : **HD 106906: A Case Study for External Perturbations of a Debris Disk** by *Erika R. Nesvold, Smadar Naoz, Michael Fitzgerald*
astro-ph/1702.06936 : **UV Surface Habitability of the TRAPPIST-1 System** by *J. T. O'Malley-James, L. Kaltenegger*
astro-ph/1702.07004 : **Reconnaissance of the TRAPPIST-1 exoplanet system in the Lyman-α line** by *V.Bourrier, et al.*
astro-ph/1702.07075 : **Occultations of astrophysical radio sources as probes of planetary environments: A case study of Jupiter and possible applications to exoplanets** by *Paul Withers, Marissa F. Vogt*
astro-ph/1702.07314 : **The Equilibrium Temperature of Planets in Elliptical Orbits** by *Abel Mendez, Edgard G. Rivera-Valentin*
astro-ph/1702.07327 : **Triaxial Deformation and Asynchronous Rotation of Rocky Planets in the Habitable Zone of Low-Mass Stars** by *J. J. Zanazzi, Dong Lai*
astro-ph/1702.07352 : **Temporary Capture of Asteroids by an Eccentric Planet** by *Arika Higuchi, Shigeru Ida*
astro-ph/1702.07522 : **Stellar energetic particle ionization in protoplanetary disks around T Tauri stars** by *Ch. Rab, et al.*
astro-ph/1702.07682 : **Polluting White Dwarfs with Perturbed Exo-Comets** by *Ilaria Caiazzo, Jeremy S. Heyl*
astro-ph/1702.07714 : **Effects of Unseen Additional Planetary Perturbers on Compact Extrasolar Planetary Systems** by *Juliette C. Becker, Fred C. Adams*
astro-ph/1702.07988 : **A Possible Mechanism for Driving Oscillations in Hot Giant Planets** by *Ethan Dederick, Jason Jackiewicz*
astro-ph/1702.07989 : **Chondrule Accretion with a Growing Protoplanet** by *Yuji Matsumoto, et al.*
astro-ph/1702.08126 : **A Flat Inner Disk Model as an Alternative to the Kepler Dichotomy in the Q1 to Q16 Planet Population** by *Timothy Bovaird, Charles H. Lineweaver*
astro-ph/1702.08252 : **Towards Detection of Exoplanetary Rings Via Transit Photometry: Methodology and a Possible Candidate** by *Masataka Aizawa, et al.*
astro-ph/1702.08461 : **Magnetospheric Truncation, Tidal Inspiral, and the Creation of Short and Ultra-Short Period Planets** by *Eve J. Lee, Eugene Chiang*
astro-ph/1702.08463 : **Exploring the climate of Proxima B with the Met Office Unified Model** by *Ian A. Boutle, et al.*
astro-ph/1702.08465 : **Collisions of Terrestrial Worlds: The Occurrence of Extreme Mid-Infrared Excesses around Low-Mass Field Stars** by *Christopher Theissen, Andrew West*
astro-ph/1702.08618 : **A Volcanic Hydrogen Habitable Zone** by *Ramses Ramirez, Lisa Kaltenegger*
astro-ph/1702.08775 : **Detection of co-orbital planets by combining transit and radial-velocity measurements** by *Adrien Leleu, et al.*
astro-ph/1702.08805 : **Tidal interactions in spin-orbit misaligned systems** by *Yufeng Lin, Gordon Ogilvie*