ExoPlanet News
An Electronic Newsletter

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1 Editorial

Welcome to edition 102 of the ExoPlanet News!

Thanks to all of you who contributed to this last edition in 2017 by sending abstracts and other contributions. Please be reminded that at the moment we can only work with submission in .tex format; already compiled .pdf files require extra efforts on our side and we cannot guarantee that your abstract or job ad looks exactly as you would like, in particular if you use different style files. The correct templates, as well as all previous editions of ExoPlanet News, can be found at http://nccr-planets.ch/exoplanetnews/.

Please send new abstracts, but also suggestions and feedback, to exoplanetnews@nccr-planets.ch. Depending on the number of new submissions we will receive in the coming 3-4 weeks the next issue of the newsletter will either appear early January or early February 2018.

Thanks for all your support so far and we wish all of you a very Merry Christmas and Happy New Year 2018!
With best regards from Switzerland

Sascha P. Quanz
Yann Alibert
Adrien Leleu
Christoph Mordasini

2 Abstracts of refereed papers

Evidence for the formation of comet 67P/Churyumov-Gerasimenko through gravitational collapse of a bound clump of pebbles

Jürgen Blum[1], Bastian Gundlach[1], Maya Krause[1], Marco Fulle[2], Anders Johansen[3], Jessica Agarwal[4], Ingo von Borstel[1], Xian Shi[4], Xuanyu Hu[4,1], Mark S. Bentley[5], Fabrizio Capaccioni[6], Luigi Colangeli[7], Vincenzo Della Corte[6], Nicolas Fougere[8], Simon F. Green[9], Stavro Ivanovski[6], Thurid Mannel[5,10], Sihane Merouane[4], Alessandra Migliorini[6], Alessandra Rotundi[11,6], Roland Schmied[5] & Colin Snodgrass[9]

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1710.07846)

The processes that led to the formation of the planetary bodies in the Solar System are still not fully understood. Using the results obtained with the comprehensive suite of instruments on-board ESA's Rosetta mission, we present evidence that comet 67P/Churyumov-Gerasimenko likely formed through the gentle gravitational collapse of a bound clump of mm-sized dust aggregates ("pebbles"), intermixed with microscopic ice particles. This formation scenario leads to a cometary make-up that is simultaneously compatible with the global porosity, homogeneity, tensile strength, thermal inertia, vertical temperature profiles, sizes and porosities of emitted dust, and the steep increase in water-vapour production rate with decreasing heliocentric distance, measured by the instruments on-board the Rosetta spacecraft and the Philae lander. Our findings suggest that the pebbles observed to be abundant in protoplanetary discs around young stars provide the building material for comets and other minor bodies.

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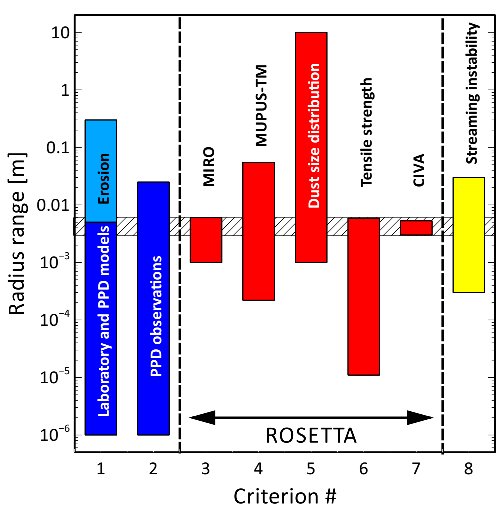

Figure 1: Blum et al.: Size ranges of dust aggregates. From left to right: protoplanetary-disc models and observations (blue, criteria 1-2), Rosetta observations (red, criteria 3-7), and streaming instability criterion (yellow, criterion 8). The hatched region is the minimum width for pebble radii consistent with all Rosetta observations.

The signatures of the parental cluster on field planetary systems

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1711.01274)

Due to the high stellar densities in young clusters, planetary systems formed in these environments are likely to have experienced perturbations from encounters with other stars. We carry out direct N-body simulations of multi-planet systems in star clusters to study the combined effects of stellar encounters and internal planetary dynamics. These planetary systems eventually become part of the Galactic field population the parental cluster dissolves, which is where most presently-known exoplanets are observed. We show that perturbations induced by stellar encounters lead to distinct signatures in the field planetary systems, most prominently, the excited orbital inclinations and eccentricities. Planetary systems that form within the cluster's half-mass radius are more prone to such perturbations. The orbital elements are most strongly excited in the outermost orbit, but the effect propagates to the entire planetary system through secular evolution. Planet ejections may occur long after a stellar encounter. The surviving planets in these reduced systems tend to have, on average, higher inclinations and larger eccentricities compared to systems that were perturbed less strongly. As soon as the parental star cluster dissolves, external perturbations stop affecting the escaped planetary systems, and further evolution proceeds on a relaxation time scale. The outer regions of these ejected planetary systems tend to relax so slowly that their state carries the memory of their last strong encounter in the star cluster. Regardless of the stellar density, we observe a robust anticorrelation between multiplicity and mean inclination/eccentricity. We speculate that the "Kepler dichotomy" observed in field planetary systems is a natural consequence of their early evolution in the parental cluster.

Download/Website: `https://arxiv.org/abs/1711.01274`

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K2-136: A Binary System in the Hyades Cluster Hosting a Neptune-Sized Planet

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AAS Journals, in press/published (arXiv:1709.10398)

We report the discovery of a Neptune-size planet ($R_p = 3.0R_\oplus$) in the Hyades Cluster. The host star is in a binary system, comprising a K5V star and M7/8V star with a projected separation of 40 AU. The planet orbits the primary star with an orbital period of 17.3 days and a transit duration of 3 hours. The host star is bright ($V = 11.2$, $J = 9.1$) and so may be a good target for precise radial velocity measurements. K2-136A c is the first Neptune-sized planet to be found orbiting in a binary system within an open cluster. The Hyades is the nearest star cluster to the Sun, has an age of 625-750 Myr, and forms one of the fundamental rungs in the distance ladder; understanding the planet

population in such a well-studied cluster can help us understand and set constraints on the formation and evolution of planetary systems.

Download/Website: `http://adsabs.harvard.edu/abs/2017arXiv170910398C`

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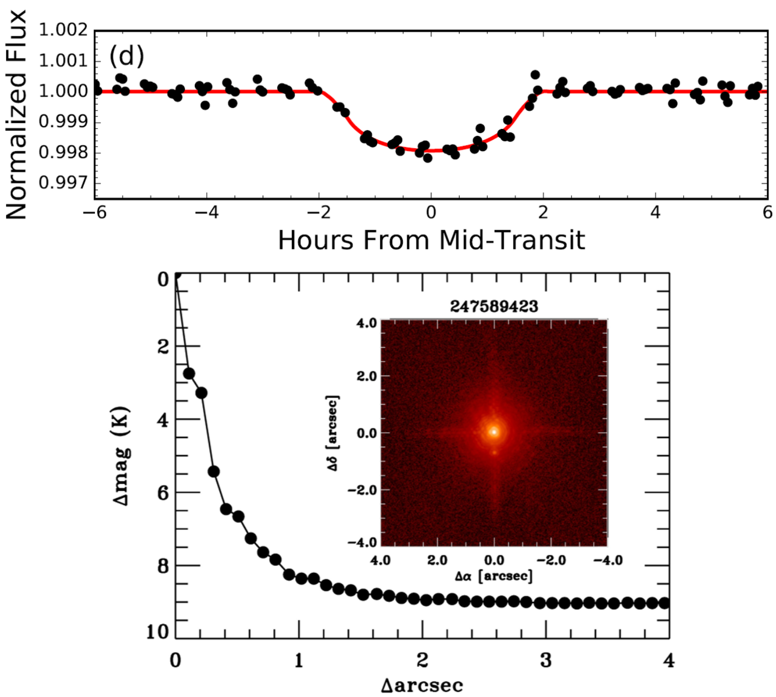

Figure 2: Ciardi et al.: The top figure shows the K2 discovery transit light curve of K2-136A c folded on the orbital period; the bottom figure shows the adaptive optics image discovery of the stellar companion.

Characterization of the K2-18 multi-planetary system with HARPS: A habitable zone super-Earth and discovery of a second, warm super-Earth on a non-coplanar orbit

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Astronomy & Astrophysics, in press

The bright M2.5 dwarf K2-18 (M_s = 0.36 $M_\odot$, R_s = 0.41 $R_\odot$) at 34 pc is known to host a transiting super-Earth-sized planet orbiting within the star's habitable zone; K2-18b. Given the superlative nature of this system for studying an exoplanetary atmosphere receiving similar levels of insolation as the Earth, we aim to characterize the planet's mass which is required to interpret atmospheric properties and infer the planet's bulk composition. We have obtained precision radial velocity measurements with the HARPS spectrograph. We then coupled those measurements with the K2 photometry to jointly model the observed radial velocity variation with planetary signals and a correlated stellar activity model based on Gaussian process regression. We measured the mass of K2-18b to be 8.0 ± 1.9 $M_\oplus$ with a bulk density of 3.3 ± 1.2 g/cm^3 which may correspond to a predominantly rocky planet with a significant gaseous envelope or an ocean planet with a water mass fraction $\gtrsim$ 50%. We also find strong evidence for a second, warm super-Earth K2-18c ($m_{p,c} \sin i_c = 7.5 \pm 1.3$ $M_\oplus$) at approximately nine days with a semi-major axis ~ 2.4 times smaller than the transiting K2-18b. After re-analyzing the available light curves of K2-18 we conclude that K2-18c is not detected in transit and therefore likely has an orbit that is non-coplanar with the orbit of K2-18b although only a small mutual inclination is required for K2-18c to miss a transiting configuration; $|\Delta i| \sim 1 - 2°$. A suite of dynamical integrations are performed to numerically confirm the system's dynamical stability. By varying the simulated orbital eccentricities of the two planets, dynamical stability constraints are used as an additional prior on each planet's eccentricity posterior from which we constrain $e_b < 0.43$ and $e_c < 0.47$ at the level of 99% confidence. The discovery of the inner planet K2-18c further emphasizes the prevalence of multi-planet systems around M dwarfs. The characterization of the density of K2-18b reveals that the planet likely has a thick gaseous envelope which, along with its proximity to the solar system, makes the K2-18 planetary system an interesting target for the atmospheric study of an exoplanet receiving Earth-like insolation.

Download/Website: `https://arxiv.org/abs/1707.04292`

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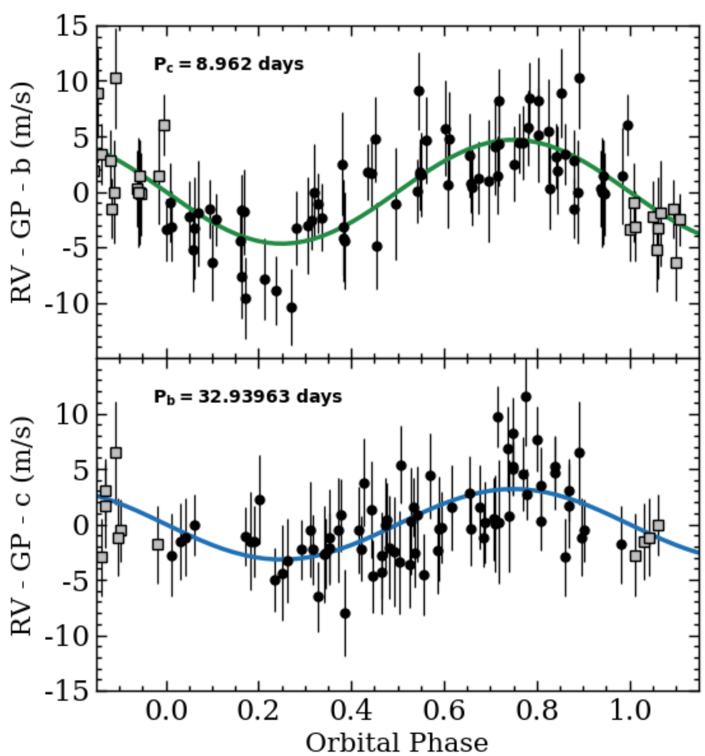

Figure 3: Cloutier et al.: Phase-folded radial velocities for each planet in the K2-18 planetary system (top: K2-18c and bottom: K2-18b). The radial velocities have been corrected for stellar activity with a quasi-periodic GP model trained on the star's K2 photometry. The solid curves depict the maximum a-posteriori Keplerian orbital solutions for each planet with fixed circular orbits.

A PCA-based approach for subtracting thermal background emission in high-contrast imaging data

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Astronomy & Astrophysics, in press (arXiv:1706.10069)

Ground-based observations at thermal infrared wavelengths suffer from large background radiation due to the sky, telescope and warm surfaces in the instrument. This significantly limits the sensitivity of ground-based observations at wavelengths longer than $\sim 3\,\mu$m. The main purpose of this work is to analyze this background emission in infrared high–contrast imaging data as illustrative of the problem, show how it can be modelled and subtracted and demonstrate that it can improve the detection of faint sources, such as exoplanets. We applied principal component analysis (PCA) to model and subtract the thermal background emission in three archival high–contrast angular differential imaging (ADI) datasets in the M' and L' filter. We use an M' dataset of β Pic to describe in detail how the algorithm works and explain how it can be applied. The results of the background subtraction are compared to the results from a conventional mean background subtraction scheme applied to the same dataset. Finally, both methods for background subtraction are compared by performing complete data reductions. We analyze the results from the M' dataset of HD100546 only qualitatively. For the M' band dataset of β Pic and the L' band dataset of HD169142, which was obtained with an angular groove phase mask (AGPM) vortex vector coronagraph, we also calculate and analyze the achieved signal-to-noise (S/N). We show that applying PCA is an effective way to remove spatially and temporarily varying thermal background emission down to close to the background limit. The procedure also proves to be very successful at reconstructing the background that is hidden behind the PSF. In the complete data reductions, we find at least qualitative improvements for HD100546 and HD169142, however, we fail to find a significant increase in S/N of β Pic b. We discuss these findings and argue that in particular datasets with strongly varying observing conditions or infrequently sampled sky background will benefit from the new approach.

Download/Website: `https://arxiv.org/pdf/1706.10069`

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Compositional imprints in density-distance-time: a rocky composition for close-in low-mass exoplanets from the location of the valley of evaporation

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The Astrophysical Journal, accepted (arXiv:1706.00251)

We use an end-to-end model of planet formation, thermodynamic evolution, and atmospheric escape to investigate how the statistical imprints of evaporation depend on the bulk composition of planetary cores (rocky vs. icy). We find that the population-wide imprints like the location of the "evaporation valley" in the distance–radius plane and the corresponding bimodal radius distribution clearly differ depending on the bulk composition of the cores. Comparison with the observed position of the valley (Fulton et al. 2017) suggests that close-in low-mass Kepler planets have a predominately Earth-like rocky composition. Combined with the excess of period ratios outside of MMR, this suggests that low-mass Kepler planets formed inside of the water iceline, but still undergoing orbital migration. The core radius becomes visible for planets losing all primordial H/He. For planets in this "triangle of evaporation" in the distance–radius plane, the degeneracy in compositions is reduced. In the observed diagram, we identify a trend to more volatile-rich compositions with increasing radius ($R/R_{\rm Earth} \lesssim 1.6$ rocky; 1.6-3.0 ices and/or H/He; $\gtrsim$ 3: H/He). The mass–density diagram contains important information about formation and evolution. Its characteristic broken V-shape reveals the transitions from solid planets to low-mass core-dominated planets with

H/He and finally to gas-dominated giants. Evaporation causes density and orbital distance to be anti-correlated for low-mass planets, in contrast to giants, where closer-in planets are less dense, likely due to inflation. The temporal evolution of the statistical properties reported here will be of interest for the PLATO 2.0 mission which will observe the temporal dimension.

Download/Website: `https://arxiv.org/abs/1706.00251`

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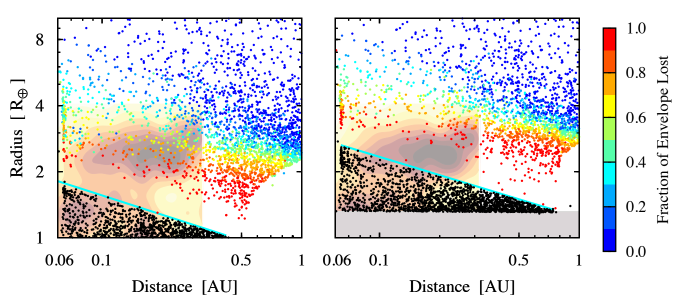

Figure 4: Jin & Mordasini: *a*–*R* of synthetic planetary populations and comparison with observations. Left: rocky core population (Earth-like cores). Right: icy core population (75% ice in mass). Colored points: fraction of initial H/He envelope evaporated. Black points: planets in the "triangle of evaporation" that have lost all their H/He. Contours: completeness-corrected occurrence rate of Kepler planets with brown (yellow) indicating high (low) occurrences (Fulton et al. 2017). The observed location of the valley is compatible with predominantly rocky cores, but inconsistent with a mainly icy ones.

Debris Disc Constraints on Planetesimal Formation

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Monthly Notices of the Royal Astronomical Society, in press (2017arXiv171103490K)

Two basic routes for planetesimal formation have been proposed over the last few decades. One is a classical "slow-growth" scenario. Another one is particle concentration models, in which small pebbles are concentrated locally and then collapse gravitationally to form planetesimals. Both types of models make certain predictions for the size spectrum and internal structure of newly-born planetesimals. We use these predictions as input to simulate collisional evolution of debris discs left after the gas dispersal. The debris disc emission as a function of a system's age computed in these simulations is compared with several Spitzer and Herschel debris disc surveys around A-type stars. We confirm that the observed brightness evolution for the majority of discs can be reproduced by classical models. Further, we find that it is equally consistent with the size distribution of planetesimals predicted by particle concentration models — provided the objects are loosely bound "pebble piles" as these models also predict. Regardless of the assumed planetesimal formation mechanism, explaining the brightest debris discs in the samples uncovers a "disc mass problem." To reproduce such discs by collisional simulations, a total mass of planetesimals of up to $\sim$ 1000 Earth masses is required, which exceeds the total mass of solids available in the protoplanetary progenitors of debris discs. This may indicate that stirring was delayed in some of the bright discs, that giant impacts occurred recently in some of them, that some systems may be younger than previously thought, or that non-collisional processes contribute significantly to the dust production.

Download/Website: `https://doi.org/10.1093/mnras/stx2932`

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Close-by planets and flares in their host stars

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Astronomy & Astrophysics, in press (arXiv:1710.09140)

The interaction between the magnetic fields of late-type stars and their close-by planets may produce stellar flares as observed in active binary systems. However, in spite of several claims, conclusive evidence is still lacking. We estimate the magnetic energy available in the interaction using analytical models to provide an upper bound to the expected flare energy.We investigate three different mechanisms leading to magnetic energy release. The first two can release an energy up to $(0.2 - 1.2)\, B_0^2 R^3/\mu$, where B_0 is the surface field of the star, R its radius, and μ the magnetic permeability of the plasma. They operate in young active stars whose coronae have closed magnetic field lines up to the distance of their close-by planets that can trigger the energy release. The third mechanism operates in weakly or moderately active stars having a coronal field with predominantly open field lines at the distance of their planets. The released energy is of the order of $(0.002 - 0.1)\, B_0^2 R^3/\mu$ and depends on the ratio of the planetary to the stellar fields thus allowing an indirect measurement of the former when the latter is known.We compute the released energy for different separations of the planet and different stellar parameters finding the conditions for the operation of the proposed mechanisms. An application to eight selected systems is presented.The computed energies and dissipation timescales are in agreement with flare observations in the eccentric system HD 17156 and in the circular systems HD 189733 and HD 179949. This kind of star-planet interaction can be unambiguously identified by the higher flaring frequency expected close to periastron in eccentric systems.

Download/Website: `https://arxiv.org/abs/1710.09140`

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Impact splash chondrule formation during planetesimal recycling

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Icarus 302 (2018), 27–43, http://adsabs.harvard.edu/abs/2018Icar..302...27L

Chondrules, mm-sized igneous-textured spherules, are the dominant bulk silicate constituent of chondritic meteorites and originate from highly energetic, local processes during the first million years after the birth of the Sun. So far, an astrophysically consistent chondrule formation scenario explaining major chemical, isotopic and textural features, in particular Fe,Ni metal abundances, bulk Fe/Mg ratios and intra-chondrite chemical and isotopic diversity, remains elusive. Here, we examine the prospect of forming chondrules from impact splashes among planetesimals heated by radioactive decay of short-lived radionuclides using thermomechanical models of their interior evolution. We show that intensely melted planetesimals with interior magma oceans became rapidly chemically equilibrated and physically differentiated. Therefore, collisional interactions among such bodies would have resulted in chondrule-like but basaltic spherules, which are not observed in the meteoritic record. This inconsistency with the expected dynamical interactions hints at an incomplete understanding of the planetary growth regime during the lifetime of the solar protoplanetary disk. To resolve this conundrum, we examine how the observed chemical and isotopic features of chondrules constrain the dynamical environment of accreting chondrite parent bodies by interpreting the meteoritic record as an impact-generated proxy of early solar system planetesimals that underwent repeated collision and reaccretion cycles. Using a coupled evolution-collision model we demonstrate that the vast

majority of collisional debris feeding the asteroid main belt must be derived from planetesimals which were partially molten at maximum. Therefore, the precursors of chondrite parent bodies either formed primarily small, from sub-canonical aluminum-26 reservoirs, or collisional destruction mechanisms were efficient enough to shatter planetesimals before they reached the magma ocean phase. Finally, we outline the window in parameter space for which chondrule formation from planetesimal collisions can be reconciled with the meteoritic record and how our results can be used to further constrain early solar system dynamics.

Download/Website: `Plain text summary at http://goo.gl/5bDqGC`

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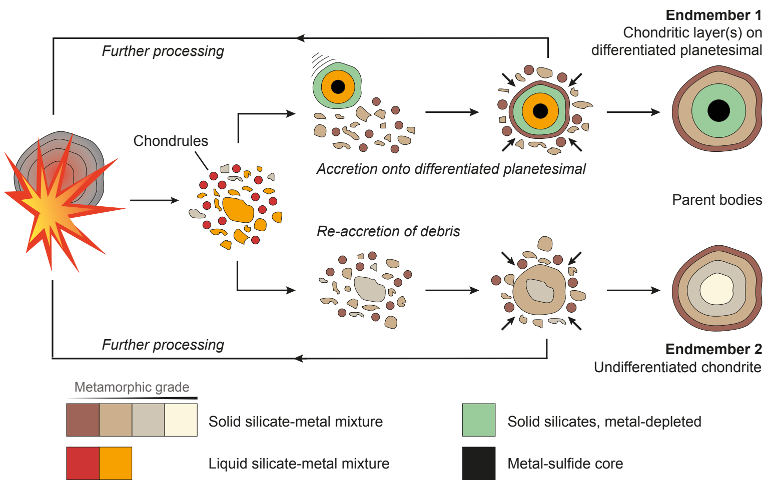

Figure 5: Lichtenberg et al.: How to form a chondrite parent body from collisions of pre-heated planetesimals. After planetesimal formation, the body collides with a similar-sized object and ejects a cloud of chondrules, that further reaccumulate or accrete onto a different object. Before the final parent bodies are formed, the material could go through multiple cycles of liberation and reaccumulation with varying degree of injected energy, accumulation times scales and chemistry.

The *TROY* project: Searching for co-orbital bodies to known planets. I. Project goals and first results from archival radial velocity

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Astronomy & Astrophysics, in press (arXiv:1710.01138)

The detection of Earth-like planets, exocomets or Kuiper belts shows that the different components found in the solar system should also be present in other planetary systems. Trojans are one of these components and can be considered fossils of the first stages in the life of planetary systems. Their detection in extrasolar systems would open a new scientific window to investigate formation and migration processes. In this context, the main goal of the TROY project is to detect exotrojans for the first time and to measure their occurrence rate (η-Trojan). In this first paper, we describe the goals and methodology of the project. Additionally, we used archival radial velocity data of 46 planetary systems to place upper limits on the mass of possible trojans and investigate the presence of co-orbital planets down to several tens of Earth masses. We used archival radial velocity data of 46 close-in ($P<5$ days) transiting planets (without detected companions) with information from high-precision radial velocity instruments. We took advantage of the time of mid-transit and secondary eclipses (when available) to constrain the possible presence of additional objects co-orbiting the star along with the planet. This, together with a good phase coverage, breaks the degeneracy between a trojan planet signature and signals coming from additional planets or underestimated eccentricity. We identify nine systems for which the archival data provide 1-sigma evidence for a mass imbalance between L_4 and L_5. Two of these systems provide 2-sigma detection, but no significant detection is found among our sample. We also report upper limits to the masses at L_4/L_5 in all studied systems and discuss the results in the context of previous findings.

Download/Website: `https://arxiv.org/abs/1710.01138`

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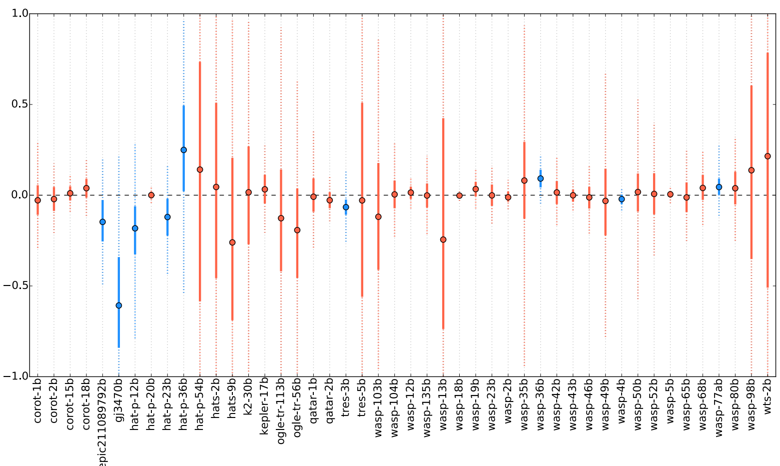

Figure 6: Lillo-Box et al.: Results for the α parameter from the radial velocity analysis. Color error bars indicate the 68.7% confidence intervals (i.e., 1σ) while the dotted error bars indicate the 99.7% confidence intervals (3σ). We show in blue symbols the 9 systems where the null value for α ($\alpha = 0$) lies outside of the 1σ limits.

A survey of eight hot Jupiters in secondary eclipse using WIRCam at CFHT

E. Martioli[1], *K. D. Colón*[2,3,17], *D. Angerhausen*[4,16], *K. G. Stassun*[5,6], *J. E. Rodriguez*[5,7], *G. Zhou*[7], *B. S. Gaudi*[8], *J. Pepper*[9], *T. G. Beatty*[10,11], *R. Tata*[12], *D. J. James*[13], *J. D. Eastman*[7], *P. A. Wilson*[14], *D. Bayliss*[15], *D. J. Stevens*[5]

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1711.07294)

We present near infrared high-precision photometry for eight transiting hot Jupiters observed during their predicted secondary eclipses. Our observations were carried out using the staring mode of the WIRCam instrument on the Canada-FranceHawaii Telescope (CFHT). We present the observing strategies and data reduction methods which

delivered time series photometry with statistical photometric precision as low as 0.11%. We performed a Bayesian analysis to model the eclipse parameters and systematics simultaneously. The measured planet-to-star flux ratios allowed us to constrain the thermal emission from the day side of these hot Jupiters, as we derived the planet brightness temperatures. Our results combined with previously observed eclipses reveal an excess in the brightness temperatures relative to the blackbody prediction for the equilibrium temperatures of the planets for a wide range of heat redistribution factors. We find a trend that this excess appears to be larger for planets with lower equilibrium temperatures. This may imply some additional sources of radiation, such as reflected light from the host star and/or thermal emission from residual internal heat from the formation of the planet.

Download/Website: `https://arxiv.org/abs/1711.07294`

Contact: `emartioli@lna.br`

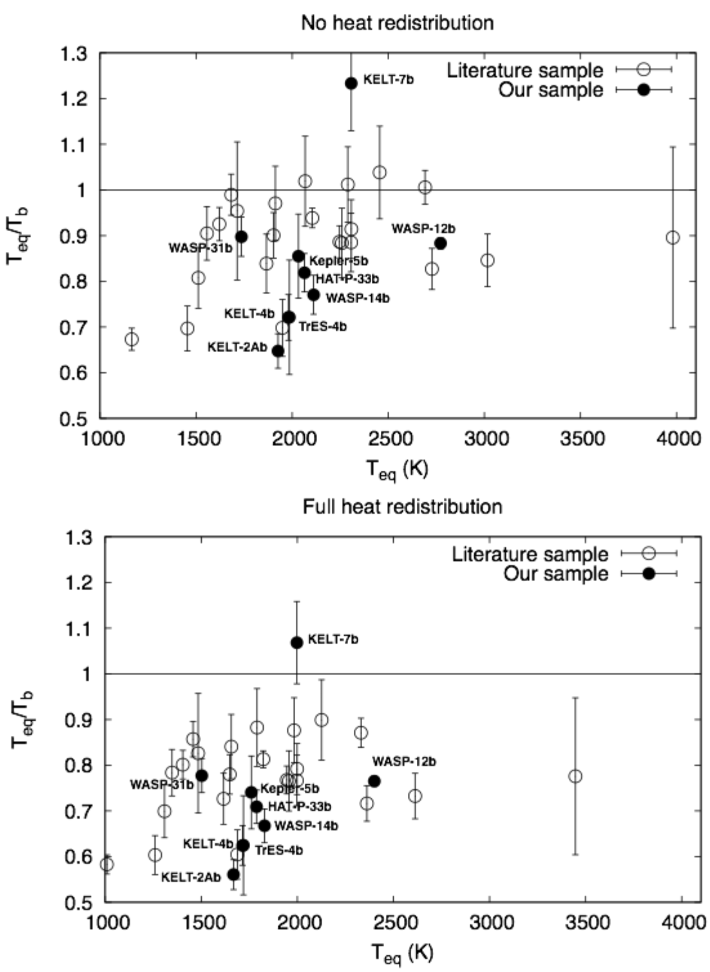

Figure 7: Martioli et al.: Equilibrium temperature (T_{eq}) versus the ratio between equilibrium temperature and the brightness temperature (T_{eq}/T_b), where T_b was obtained from the measured flux ratio in K-band assuming both the planet and the star emit as blackbodies, and T_{eq} was calculated assuming bond albedo of 0.1 and heat redistribution factor for both no heat redistribution $f = 2/3$ (top panel) and full heat redistribution $f = 1/2$ (bottom panel). Filled circles show our data and open circles show the data from the literature as presented in Table 6. The error bars were calculated considering only the error in the flux ratio.

Did a stellar fly-by shape the planetary system around Pr0211 in the cluster M44?

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A&A, in press (arXiv:1711.06043)

Out of the ~ 3000 exoplanets detected so far, only fourteen planets are members of open clusters: among them an exoplanet system around Pr 0211 in the cluster M44 which consists of at least two planets with the outer planet moving on a highly eccentric orbit at 5.5 AU. One hypothesis is that a close fly-by of a neighbouring star was responsible for the eccentric orbit. We test this hypothesis. First we determine the type of fly-by that would lead to the observed parameters and then use this result to determine the history of such fly-bys in simulations of the early dynamics in an M44-like environment. We find that although very close fly-bys are required to obtain the observed properties of Pr 0211c, such fly-bys are relatively common due to the high stellar density and longevity of the cluster. Such close fly-bys are most frequent during the first 1-2 Myr after cluster formation, corresponding to a cluster age ≤ 3 Myr. During the first 2 to 3 Myr about 6.5% of stars actually experience a fly-by that would lead to such a small system-size as observed for Pr0211 or even smaller. It is unclear whether planets generally form on such short timescales. However, afterwards the close fly-by rate is still 0.2-0.5 Myr^{-1}, which means extrapolating this to the age of M44 12%-20% of stars would experience such close fly-bys over this timespan. Our simulations show that the fly-by scenario is a realistic option for the formation of eccentricity orbits of the planets in M44. The occurrence of such events is relatively high leading to the expectation that similar systems are likely common in open clusters in general.

Download/Website: `https://arxiv.org/abs/1711.06043`

Contact: `spfalzner@mpifr.de`

Discovery of a point-like source and a third spiral arm in the transition disk around the Herbig Ae star MWC 758

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Astronomy & Astrophysics, in press

Transition disks offer the extraordinary opportunity to look for newly born planets and investigate the early stages of planet formation. In this context we observed the Herbig A5 star MWC 758 with the L-band vector vortex coronagraph installed in the near-infrared camera and spectrograph NIRC2 at the Keck II telescope, with the aim of unveiling the nature of the spiral structure by constraining the presence of planetary companions in the system. Our high-contrast imaging observations show a bright ($\Delta L' = 7.0 \pm 0.3$ mag) point-like emission, south of MWC 758 at a deprojected separation of ~20 au ($r = 0\farcs111 \pm 0\farcs004$) from the central star. We also recover the two spiral arms (south-east and north-west), already imaged by previous studies in polarized light, and discover a third one to the

south-west of the star. No additional companions were detected in the system down to 5 Jupiter masses beyond 0.″6 from the star. We propose that the bright L’-band emission could be caused by the presence of an embedded and accreting protoplanet, although the possibility of it being an asymmetric disk feature cannot be excluded. The spiral structure is probably not related to the protoplanet candidate, unless on an inclined and eccentric orbit, and it could be due to one (or more) yet undetected planetary companions at the edge of or outside the spiral pattern. Future observations and additional simulations will be needed to shed light on the true nature of the point-like source and its link with the spiral arms.

Download/Website: `http://arxiv.org/abs/1710.11393`

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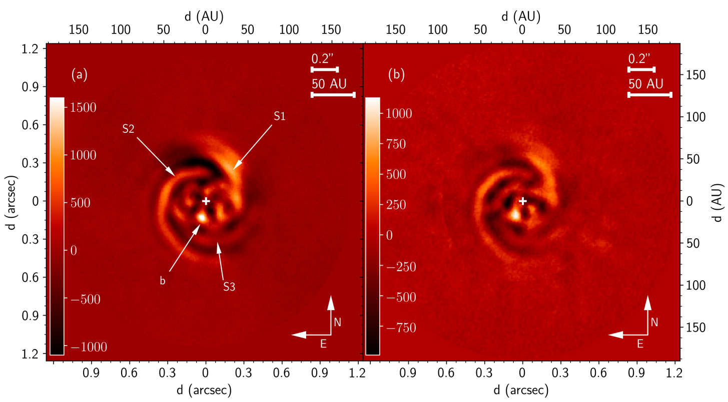

Figure 8: Zhao et al.: Final PCA-ADI images for the 2015 (a) and 2016 (b) data sets. Three spiral arms and a bright point-like feature are detected in the images. The three spiral arms and the point-like source are labeled with S1, S2, S3, and *b*, respectively.

The CARMENES search for exoplanets around M dwarfs: High-resolution optical and near-infrared spectroscopy of 324 survey stars

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Astronomy & Astrophysics, in press (2017arXiv171106576R; DOI: 10.1051/0004-6361/201732054)

The CARMENES radial velocity (RV) survey is observing 324 M dwarfs to search for any orbiting planets. In this paper, we present the survey sample by publishing one CARMENES spectrum for each M dwarf. These spectra cover the wavelength range 520–1710 nm at a resolution of at least $R > 80,000$, and we measure its RV, Hα emission, and projected rotation velocity. We present an atlas of high-resolution M-dwarf spectra and compare the spectra to atmospheric models. To quantify the RV precision that can be achieved in low-mass stars over the CARMENES wavelength range, we analyze our empirical information on the RV precision from more than 6500 observations. We compare our high-resolution M-dwarf spectra to atmospheric models where we determine the spectroscopic RV information content, Q, and signal-to-noise ratio. We find that for all M-type dwarfs, the highest RV precision can be reached in the wavelength range 700–900 nm. Observations at longer wavelengths are equally precise only at the very latest spectral types (M8 and M9). We demonstrate that in this spectroscopic range, the large amount of absorption features compensates for the intrinsic faintness of an M7 star. To reach an RV precision of 1 m s^{-1} in very low mass M dwarfs at longer wavelengths likely requires the use of a 10 m class telescope. For

spectral types M6 and earlier, the combination of a red visual and a near-infrared spectrograph is ideal to search for low-mass planets and to distinguish between planets and stellar variability. At a 4 m class telescope, an instrument like CARMENES has the potential to push the RV precision well below the typical jitter level of 3–4 m s^{-1}.

Download/Website: `http://adsabs.harvard.edu/abs/2017arXiv171106576R` One CARMENES spectrum for each of the 324 stars is published in electronic format at http://carmenes.cab.inta-csic.es/

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K2-137 b: an Earth-sized planet in a 4.3-hour orbit around an M-dwarf

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1707.04549)

We report the discovery in *K2*'s Campaign 10 of a transiting terrestrial planet in an ultra-short-period orbit around an M3-dwarf. K2-137 b completes an orbit in only 4.3 hours, the second-shortest orbital period of any known planet, just 4 minutes longer than that of KOI 1843.03, which also orbits an M-dwarf. Using a combination of archival images, adaptive optics imaging, radial velocity measurements, and light curve modelling, we show that no plausible eclipsing binary scenario can explain the *K2* light curve, and thus confirm the planetary nature of the system. The planet, whose radius we determine to be 0.89 ± 0.09 $R_\oplus$, and which must have a iron mass fraction greater than 0.45, orbits a star of mass 0.463 ± 0.052 $M_\odot$ and radius 0.442 ± 0.044 $R_\odot$.

Download/Website: `https://arxiv.org/abs/1707.04549`

Contact: `Alexis.Smith@dlr.de`

Planet Detectability in the Alpha Centauri System

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The Astronomical Journal, Accepted. (arXiv:1711.06320)

We use more than a decade of radial velocity measurements for α Cen A, B, and Proxima Centauri from HARPS, CHIRON, and UVES to identify the $M \sin i$ and orbital periods of planets that could have been detected if they existed. At each point in a mass-period grid, we sample a simulated, Keplerian signal with the precision and cadence of existing data and assess the probability that the signal could have been produced by noise alone. Existing data places detection thresholds in the classically defined habitable zones at about $M \sin i$ of 53 $M_\oplus$ for α Cen A, 8.4 $M_\oplus$ for α Cen B, and 0.47 $M_\oplus$ for Proxima Centauri. Additionally, we examine the impact of systematic errors, or "red noise" in the data. A comparison of white- and red-noise simulations highlights quasi-periodic variability in the radial velocities that may be caused by systematic errors, photospheric velocity signals, or planetary signals. For example, the red-noise simulations show a peak above white-noise simulations at the period of Proxima Centauri b. We also carry out a spectroscopic analysis of the chemical composition of the α Centauri stars. The stars have super-solar metallicity with ratios of C/O and Mg/Si that are similar to the Sun, suggesting that any small planets in the α Cen system may be compositionally similar to our terrestrial planets. Although the small projected separation of α Cen A and B currently hampers extreme-precision radial velocity measurements, the angular separation is now increasing. By 2019, α Cen A and B will be ideal targets for renewed Doppler planet surveys.

Download/Website: `https://arxiv.org/abs/1711.06320`

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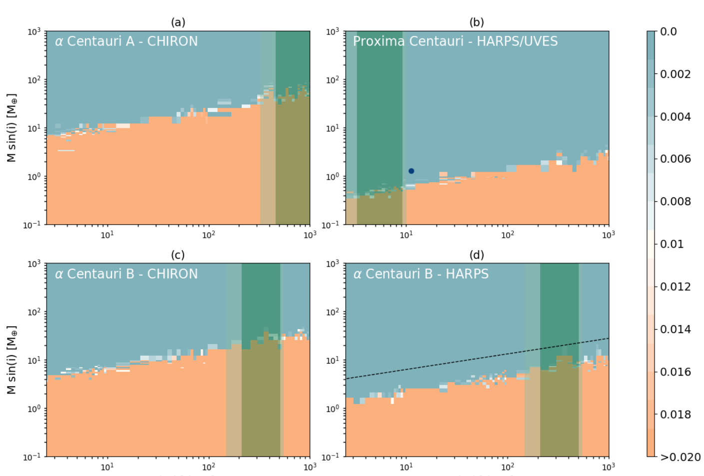

Figure 9: Zhao et al.: White-noise simulations. Mass vs. period grids showing the significance at which a planet of such a mass and period would have been detected assuming only the reported errors for observations of (a) α Centauri A from ES and CHIRON, (b) Proxima Centauri from HARPS and UVES, (c) α Centauri B from ES and CHIRON, and (d) α Centauri B from HARPS. A p-value of less than 0.01 (indicated by shades of blue) is considered significant. Green vertical bands mark the conservative habitable zone where liquid water could persist for most of the stellar lifetime with lighter green bands for the optimistic habitable zone (as defined by Kopparapu et al. (2013)). A power law was fit to the detectability border of the α Cen B ES and CHIRON data and is plotted on the α Cen B HARPS grid as a dashed line. The location of Proxima Cen b is indicated with a dot.

3 Jobs and Positions

Postdoctoral Research Fellow in Astrophysical Fluid Dynamics

Dr Adrian J. Barker
University of Leeds, UK

University of Leeds, Leeds, UK, April–October 2018

Applications are invited for a Postdoctoral Research Fellow to join a Science and Technology Facilities Council (STFC) funded project to investigate tidal flows in stars and giant planets. The project will involve performing hydrodynamical simulations to study tidal flows in spherical and ellipsoidal geometries using one or more existing codes (including Nek5000). The results from these simulations will be applied to interpret current observations of extrasolar planets and close binary stars, and to make predictions.

The successful candidate will work with Dr Adrian Barker in the Department of Applied Mathematics (`https://physicalsciences.leeds.ac.uk/staff/6/dr-adrian-j-barker`), and will join the Astrophysical and Geophysical Fluid Dynamics research group (`https://agfd.leeds.ac.uk`), which is one of the largest such groups in the world. This project will strongly complement and benefit from other STFC-funded projects at Leeds, such as those in planetary and stellar dynamos.

The post is available from 1st April 2018, but the start date is flexible and could be delayed up until 1st October 2018 at the latest. The funds are available for 2 years and the salary range is Grade 7 (£32,548–£38,833 p.a.).

Applicants should have a PhD in a relevant discipline (e.g. Astrophysics, Applied Mathematics, Computational Fluid Dynamics or Planetary Sciences), together with computational experience, and they should be able to demonstrate the ability to conduct independent research and possess a developing track record of publications in international journals. In addition, the applicant must have excellent communication, planning and team working skills.

Applications must be made online (using the link below) before 23.59 (UK time) on the advertised closing date. Applicants must submit a CV and Publication List and provide the names and contact details of 3 people from whom references letters may be requested. Informal enquiries are welcome and should be directed to Adrian Barker (`A.J.Barker@leeds.ac.uk`). Interviews are expected to be held during the week of 15th January 2018.

Closing Date: 2nd January 2018

Download/Website: `https://jobs.leeds.ac.uk/Vacancy.aspx?ref=MAPMA1072`

Contact: `A.J.Barker@leeds.ac.uk`

Assistant Professor: Exoplanetary Atmospheric Theorist

Prof. Joseph Harrington
University of Central Florida

Department of Physics at the University of Central Florida, 2018

The Department of Physics (physics.ucf.edu) at the University of Central Florida (UCF) invites applications for a tenure-track Assistant Professorship, anticipated to start in August 2018. We seek candidates in exoplanet atmospheric theory who can add to or complement ongoing research in exoplanet characterization. Applicants must have a Ph.D. in Planetary Science or a closely related discipline from an accredited institution and a substantial record of independent, well regarded research. The successful applicant is expected to establish an independent, internationally competitive, externally funded research program and demonstrate excellence and innovation in graduate and undergraduate education The UCF Planetary Sciences Group (planets.ucf.edu), housed in both Physics and UCFs Florida Space Institute (fsi.ucf.edu), includes eight professors, two research-active lecturers, eight soft-money researchers, three postdoctoral associates, and 15 Ph.D. students, most in the Planetary Sciences Track of the Physics Ph.D. Research areas include exoplanet characterization; planetary surfaces, interiors, rings, dust, and formation; comets; asteroids; plasma-surface interactions; coastal geology; surface chemistry; laboratory spectroscopy; in- situ resource utilization; and space medicine. Another search is ongoing in the area of spacecraft instrumentation (Assistant/Associate Professor, Planetary Science Instrumentalist, https://www.jobswithucf.com/postings/51177). FSI provides a home for soft-money researchers in all areas of space exploration and seed money for new projects. We host a NASA Space Science Exploration Research Virtual Institute node, the Center for Lunar and Asteroid Surface Science (sciences.ucf.edu/class/). Up to 80,000 CPU hours/month are available free on campus to each faculty member. The Department of Physics has 46 faculty, offers B.S., B.A., M.S., and Ph.D. degrees, and is in a state-of-the-art research building. Research-active professors teach one course per semester. UCF is a leading, fast-growing, metropolitan university designated as a highest research activity institution, with a diverse student body of over 66,000 students. We offer a dual-career hiring program, paid parental leave for both parents, and professional development and leadership training for faculty at all career stages. UCF requires all applications and supporting documents to be submitted electronically through the Human Resources website at https://www.jobswithucf.com/postings/51176. In addition to the online application, interested candidates should upload: 1) a cover letter including the names, affiliations, and email addresses of at least three references; 2) a curriculum vitae; 3) a statement of research accomplishments, plans, and goals; 4) a statement of teaching philosophy, training, and experience; and 5) PDFs of 23 recent key publications. The system allows only one upload. Updates to complete applications may be emailed. Review of applications will begin November 15, 2017. New application review will continue until the position is filled. Send questions to Prof. Joseph Harrington, Chair, Atmospheric Theory Search Committee, at atmos-queries@planets.ucf.edu. As an equal opportunity/affirmative action employer, UCF encourages all qualified applicants to apply, including women, veterans, individuals with disabilities, and members of traditionally underrepresented populations. As a Florida public university, UCF makes all application materials and selection procedures available to the public upon request.

Contact: `atmos-queries@planets.ucf.edu`

Assistant or Associate Professor: Planetary Instrumentation

Prof. Joseph Harrington
University of Central Florida

Department of Physics at the University of Central Florida, 2018

The Department of Physics (physics.ucf.edu) at the University of Central Florida (UCF) invites applications for a 9-month, tenure-track Assistant Professor or tenured Associate Professor position, anticipated to start in August 2018. We seek candidates with expertise in space instrumentation for planetary missions that would complement the current planetary science group at UCF. Applicants must have a Ph.D. in Planetary Science or a closely related discipline from an accredited institution and a substantial record of independent, well regarded research. The successful applicant is expected to establish an independent, internationally competitive, externally funded research program and demonstrate excellence and innovation in graduate and undergraduate education The UCF Planetary Sciences Group (planets.ucf.edu), housed in both Physics and UCFs Florida Space Institute (fsi.ucf.edu), includes eight professors, two research-active lecturers, eight soft-money researchers, three postdoctoral associates, and 15 Ph.D. students, most in the Planetary Sciences Track of the Physics Ph.D. Research areas include exoplanet characterization; planetary surfaces, interiors, rings, dust, and formation; comets; asteroids; plasma-surface interactions; coastal geology; surface chemistry; laboratory spectroscopy; in- situ resource utilization; and space medicine. Another search is ongoing in the area of exoplanet atmospheric theory (Assistant Professor, Exoplanet Atmospheric

Theorist, https://www.jobswithucf.com/postings/51176). FSI provides a home for soft-money researchers in all areas of space exploration and seed money for new projects. We host a NASA Space Science Exploration Research Virtual Institute node, the Center for Lunar and Asteroid Surface Science (sciences.ucf.edu/class/). Up to 80,000 CPU hours/month are available free on campus to each faculty member. The Department of Physics has 46 faculty, offers B.S., B.A., M.S., and Ph.D. degrees, and is in a state-of-the-art research building. Research-active professors teach one course per semester. UCF is a leading, fast-growing, metropolitan university designated as a highest research activity institution, with a diverse student body of over 66,000 students. We offer a dual-career hiring program, paid parental leave for both parents, and professional development and leadership training for faculty at all career stages. UCF requires all applications and supporting documents to be submitted electronically through the Human Resources website at https://www.jobswithucf.com/postings/51177. In addition to the online application, interested candidates should upload: 1) a cover letter including the names, affiliations, and email addresses of at least three references; 2) a curriculum vitae; 3) a statement of research accomplishments, plans, and goals; 4) a statement of teaching philosophy, training, and experience; and 5) PDFs of 23 recent key publications. The system allows only one upload. Updates to complete applications may be emailed. Review of applications will begin November 15, 2017. New application review will continue until the position is filled. Send questions to Prof. Joshua Colwell, Chair, Planetary Instrumentalist Search Committee, at josh@ucf.edu. As an equal opportunity/affirmative action employer, UCF encourages all qualified applicants to apply, including women, veterans, individuals with disabilities, and members of traditionally underrepresented populations. As a Florida public university, UCF makes all application materials and selection procedures available to the public upon request.

Contact: `josh@ucf.edu`

Postdoctoral Associate: Exoplanet Characterization

Prof. Joseph Harrington
University of Central Florida

Planetary Sciences group at the University of Central Florida, 2018

The Exoplanet Measurement group (planets.ucf.edu/research/exoplanet-measurement/) in UCFs Planetary Sciences group (planets.ucf.edu) seeks a postdoctoral associate to work with Prof. Joseph Harrington on Spitzer Space Telescope exoplanet data analyses and the development of new observation modeling and analysis capabilities for the James Webb and other space telescopes. Applicants should have a Ph.D. in Planetary Science or a closely related discipline from an accredited institution. Desired experience/expertise is any of: exoplanet eclipse or transit data analysis, Bayesian methods, radiative transfer, atmospheric chemistry and dynamics, Linux, Python, C, parallel processing, cloud computing, deep learning, running community open-source projects, and skill in writing, public-speaking, and social media. Applicants should send, as a single PDF, in this order: 1) a cover letter including the names and contact information of three or more references; 2) CV; 3) a 2-4 page statement of research experience, accomplishments, and goals; and 4) PDFs of several lead-author publications to jh@physics.ucf.edu. Applications received by 15 November 2017 will receive full consideration. Review will continue until the position is filled, which must be by 31 December 2017. Those requiring longer to start should still apply. The UCF Planetary Sciences Group (planets.ucf.edu), housed in both the Department of Physics (physics.ucf.edu) and UCFs Florida Space Institute (fsi.ucf.edu), includes eight professors, two research-active lecturers, eight soft-money researchers, three postdoctoral associates, and 15 Ph.D. students, most in the Planetary Sciences Track of the Physics Ph.D. Research areas include exoplanet characterization; planetary surfaces, interiors, rings, dust, and formation; comets; asteroids; plasma-surface interactions; coastal geology; surface chemistry; laboratory spectroscopy; in-situ resource utilization; and space medicine. Another search is ongoing in the area of exoplanet atmospheric theory (Assistant Professor, Exoplanet Atmospheric Theorist, https://www.jobswithucf.com/postings/51176). FSI provides a home for soft-money researchers in all areas of space exploration and seed money for new projects. We host a NASA Space Science Exploration Research Virtual Institute node, the Center for Lunar and Asteroid Surface Science (sciences.ucf.edu/class/). Up to 80,000 CPU hours/month are available free on campus to each faculty member (including postdocs). We provide strong postdoc mentoring, to help establish productive and fundable research lines upon which to build a solid career. Teaching, outreach, and service opportunities are available, but not required. Toward the end of the postdoctoral period, establishing ones own grants as Principal Investigator with the goal of winning a professorship or a self-funded, long-term, soft-money position, at UCF or elsewhere, is encouraged. The Department of Physics has 46 faculty, offers B.S., B.A., M.S., and Ph.D. degrees, and is in a state-of-the-art research building. UCF is a leading, fast-growing, metropolitan university designated as a highest research activity institution, with a diverse student body of over 66,000 students. As an equal opportunity/affirmative action employer, UCF encourages all qualified applicants to apply, including women, veterans, individuals with disabilities, and members of traditionally underrepresented populations. As a Florida public university, UCF makes all application materials and selection procedures available to the public upon request.

Contact: `jh@physics.ucf.edu`

Job opening for postdoctoral researcher on exoplanet atmospheres

Michiel Min[1]
[1] SRON, Netherlands Institute for Space Research

Utrecht, The Netherlands, first half 2018

SRON invites applicants for a postdoctoral position in the field of exoplanet atmosphere observations, modelling and retrieval methods. The focus for this position is to prepare for, and analyze observations with the James Web Space Telescope (JWST), to be launched in spring 2019. The successful applicant will ensure SRON involvement in observing proposals using JWST, and prepare and apply state of the art analysis tools.
The position is located at SRON, Utrecht but will be in close collaboration with NOVA (the Netherlands research school of astronomy, located in Leiden). NOVA, in particular E.F. van Dishoeck and B. Brandl, leads the Dutch involvement in JWST/MIRI. Detailed insight into the MIRI instrument on board JWST is present through this collaboration, providing the successful applicant with a strong position to apply for JWST time.
We aim at researchers with some postdoctoral experience who want to perform research at the edge of theory and observation. The successful applicant ideally leads/contributes to the analysis of observations in a strong physical and chemical context and to JWST data reduction and observational strategies. Within this context there is significant freedom on the chosen focus.
For the full advertisement and additional information please visit the website.
Letter of application If you wish to apply you can send a motivation letter with CV, publication list, a short research statement (max. 3 pages) to jobs@sron.nl. Applicants should arrange for three letters of recommendation to be sent to the same address. Please state the vacancy number ”SRON 1330” in the subject of your mail. Applications that arrive on or before 8 January 2018 are given first priority.

Download/Website: `https://www.sron.nl/`

Contact: `M.Min@sron.nl`

Kavli Institute Fellow in Exoplanets (Fixed Term)

Didier Queloz, dq212@cam.ac.uk

Cambridge, UK, October 2018

Fixed-term: The funds for this post are available for 5 years in the first instance.

Three departments conducting research related to ’Exoplanets and life in the Universe’, the Cavendish Laboratory, the Institute of Astronomy (IoA) which is inclusive of the Kavli Institute for Cosmology (KICC), and the Department of Applied Mathematics and Theoretical Physics (DAMTP) are offering a senior Fellowship in Exoplanets.

The Kavli Institute Fellowship in Exoplanets is offered for five years, from October 2018. Applicants must have a PhD in Astronomy or a related field and will normally be expected to have several years of postdoctoral experience by the start date of the fellowship. A proven track record of independent research relevant to the research themes conducted on exoplanets in Cambridge is expected. The fellowship is targeted at researchers (observers, instrumentalists or theorists) who have the potential to become leaders in their fields. The successful applicant will be expected to conduct a programme of independent scientific research, prepare proposals to secure research resources (for example, experiment development, access to high performance computing, large telescopes, or other international facilities), write scientific articles for publication in peer reviewed journals and contribute to the supervision of graduate students, seminar organisation and outreach. Applicants must have excellent communication and computing skills.

Salary will be within the range £39,992 - £50,618 pa. A research allowance of £8,000 pa will be provided.

The post holder will have the choice to be located at any of the three departments as listed above (located in West Cambridge) but will be encouraged to interact with researchers in all three departments and to take an active part in Cambridge exoplanet research centre activity. Research programmes that complement the work undertaken in more than one department are particularly welcomed (see https://exoplanets.phy.cam.ac.uk/ for current activities).

Download/Website: `http://www.jobs.cam.ac.uk/job/15571/`

Contact: `Ms Joy McSharry (jpm@ast.cam.ac.uk)`

Postdoctoral Position in Exoplanets and/or Local ISM

Seth Redfield
Wesleyan University

Wesleyan University, Middletown, CT, USA, Fall 2018

Applications are invited for a postdoctoral position in exoplanets and/or the local interstellar medium in the Astronomy Department at Wesleyan University. The successful candidate will work in collaboration with Seth Redfield primarily on UV/optical/infrared spectra of transiting exoplanets and/or the interstellar medium. Projects can include characterizing the atmospheres and circumplanetary environments of exoplanets, and/or measuring and modeling the fundamental properties of the interstellar medium amongst the nearest stars. The data sources are rich, high-resolution spectra from a variety of ground-based and space-based facilities, spanning the UV, optical, and infrared. The precise research direction will be determined in collaboration with the successful applicant, taking their skill set into consideration, as well as their long-term career goals. Wesleyan has a Planetary Science Group that includes faculty and postdocs from several departments. The successful candidate will be encouraged to interact with other faculty and to carry out independent research with full access to observational facilities available to Wesleyan. Experience with data reduction and analysis, high resolution spectroscopy, multi-object spectroscopy and observational studies of exoplanets and/or the ISM will be helpful. Applicants must have a Ph.D. in astronomy or astrophysics at the start of the appointment.

Wesleyan University is located between New York City and Boston, and has a small but active astronomy program which emphasizes involvement of undergraduate and M.A. students in research. We are particularly interested in candidates who feel that they could both contribute to and flourish in this unique educational environment. The postdoc would have the opportunity, if desired, to take advantage of this setting to develop educational skills through mentoring students in research and possibly teaching. Initial appointment would be for two years, with funding for at least one additional year available. The starting date is Summer/Fall 2018; some flexibility can be accommodated. Salary is competitive and includes health and retirement benefits as well as a travel allowance. Applicants should send a cover letter, curriculum vitae, bibliography, statement of research experience and interests, and arrange for three letters of reference to be sent to the address above by 15 December 2017.

Wesleyan University is an equal opportunity, affirmative action employer M/W/D/V and strongly encourages applications from individuals underrepresented in astronomy.

Download/Website: `https://jobregister.aas.org/ad/8f0262e5`

Contact: `sredfield@wesleyan.edu`

Up to 8 Exoplanet PhD positions at Warwick

Astronomy and Astrophysics Group

The Astronomy and Astrophysics group at the University of Warwick has recently undergone a major expansion in the field of exoplanetary science, hiring 5 new academic faculty members and establishing an interdisciplinary Centre for Exoplanets and Habitability.

Our exoplanetary activities include observation, instrumentation and theory. We are actively engaged in detecting and characterizing exoplanetary systems across the full spectrum of size (gas giant, ice giant, super-Earth, terrestrial, asteroidal, dust), time (formation & evolution, main-sequence, post-main-sequence) and host-stars (M stars, G stars, white dwarfs, binaries). We study planetary atmospheres, composition, habitability and dynamics, as well as proto-planetary discs, debris discs around both main-sequence stars and white dwarfs, and host star activity.

We play leading roles in the super-WASP (Wide Angle Search for Planets) programme, Next Generation Transit Survey (NGTS) and PLATO (PLAnetary Transits and Oscillations of Stars) mission, and are amongst Europe's leaders in winning Hubble Space Telescope (HST) orbits for characterizing planetary systems. We also have our own 1m telescope on La Palma, and regularly use other ground-based telescopes throughout the world such as ALMA, the VLT and those in the ING. Our theoretical endeavours include numerical simulations, high performance computing, and pencil-and-paper analytics.

We are currently recruiting up to 8 outstanding (first-class degree) MPhys students for PhD studentships in exoplanetary science. Truly exceptional non-EU students are eligible for the prestigious Chancellor's International Scholarships. All potential students will have flexibility in choosing their research activities within our consolidated and welcoming environment, but can be guided by a representative list of potential projects on the associated webpage. The deadline for submission is 18 Jan 2018 at 5 PM UK time.

Download/Website: `https://warwick.ac.uk/fac/sci/physics/research/astro/postgraduate/`

Contact: `d.veras@warwick.ac.uk`

Research Fellow in ALMA Studies of Protoplanetary Disks

Dr Catherine Walsh
School of Physics and Astronomy, EC Stoner Building, University of Leeds, Leeds, LS2 9JT, UK

University of Leeds, 1st April 2018

The School of Physics and Astronomy at the University of Leeds invites applications for a 2-year fixed-term research postdoctoral fellow in ALMA Studies of Protoplanetary Disks. The post involves working on an STFC-funded project in collaboration with Dr Catherine Walsh in the Astrophysics Group investigating the chemistry of complex organic molecules (COMs) in disks around nearby young stars.
You will carry out a research programme to search for emission from COMs in nearby protoplanetary disks using the Atacama Large Millimeter/submillimeter Array (ALMA). You will conduct analyses of the data to derive the

distribution and abundance of COMs using molecular line radiative transfer methods. In addition, you will aid interpretation of the data by running astrochemical models to determine the chemical origin of COMs in protoplanetary disks.
With a PhD in Astrophysics or a related field (or if you will have submitted your thesis prior to taking up the appointment), you will have experience in the reduction and analysis of observational data at (sub)millimeter or radio wavelengths and a developing track record of peer reviewed publications in international journals.
The application deadline is 15th January 2018 and the starting date will be 1st April 2018 or as soon as possible thereafter. For more information and to apply, please follow the link given below). For more information on the project, you can also contact Dr Catherine Walsh at the e-mail address below.

Download/Website: `https://jobs.leeds.ac.uk/Vacancy.aspx?ref=MAPPA1049`

Contact: `c.walsh1@leeds.ac.uk`

4 Conference announcements

COSPAR 2018 sessions on Planet Formation and Exoplanets

S. Kraus[1], *F. Altieri*[2], *G. Vasisht*[3], *L.B.F.M. Waters*[4]

[1] School of Physics and Astronomy, University of Exeter, Exeter, UK
[2] INAF - IAPS Rome, Rome, Italy
[3] JPL, Pasadena, California, USA
[4] SRON, Netherlands Institute for Space Research, Netherlands

Pasadena, California/USA, 2018 July 14-22

The 42nd Committee on Space Research (COSPAR) Scientific Assembly will be held at Caltech (Pasadena, California) between July 14 and 22, 2018. COSPAR assemblies typically attract a large audience of about 4000 participants, where the focus is on research conducted from space. We would like to advertise the following sessions related to planet formation and exoplanet science:

Session E4.2: ”Planet Formation at High Resolution”

The discovery that many stars have planetary systems drastically different from our own has upended our ideas about the origins of planets. Learning how these diverse planets formed from protostellar gas and dust disks requires measurements with enough spatial and/or spectral resolution to reveal signatures of processes such as gas accretion, gravitational instability, orbital migration, planet-planet scattering, and many others. Finding such signatures will both advance our knowledge of our own origins, and help in the hunt for other planets like Earth. This COSPAR session will cover the birth of planets in protostellar disks, and searches for and characterization of exoplanets around young and mature stars. We will review some of the recent breakthroughs achieved with ground-based instrumentation and discuss the exciting new questions that can soon be tackled with JWST, and further ahead with WFIRST. Finally we will explore concepts for future spectroscopy or imaging missions that might employ interferometry and advanced coronagraphy/nulling techniques in order to achieve the high resolution and high contrast needed for detecting planets and protostellar disk features within a few astronomical unit of the host stars.

Website: https://www.cospar-assembly.org/admin/sessioninfo.php?session=744

Solicited Speakers: Ilsedore Cleeves (CfA), Michael Ireland (ANU), Hannah Jang-Condell (Wyoming), Christoph Mordasini (Bern), Stephanie Sallum (Arizona)

Organisers: S. Kraus (Exeter), G. Vasisht (JPL); SOC: R. Alexander (Leicester), F. Altieri (INAF), M. Benisty (IPAG), S. Casassus (U. de Chile), D. Defrere (Liege), M. Fukagawa (Nagoya U.), L. Hartmann (Michigan), T. Henning (MPIA), A. Isella (Rice U.), J. Monnier (Michigan), I. Pascucci (Arizona), S. Rinehardt (NASA Goddard), L.B.F.M. Waters (SRON), A. Weinberger (Carnegie DTM)

Session E4.1: ”Current and Future Projects for Exoplanets Detections and Characterisation”

Thanks to synergies between ground and space-based observations, we have learned that planets orbiting other stars are quite common and we have been able to perform statistical surveys of their occurrence, masses, sizes and eccentricities. At the same time, we have discovered that the architecture of exoplanetary systems shows a remarkable diversity and that exoplanet properties can be very different, indeed, from what we can expect based on the knowledge of our Solar System. Spectra of increasing quality and resolution enable us to investigate their rotation, atmospheric chemical composition, the presence of clouds and day to night side differences. These more detailed observations require more sophisticated modeling efforts. In the near future, CHEOPS, TESS, JWST and PLATO missions are going to open a new era in the exoplanet studies and revolutionize our picture. In view of the outcomes from the next exoplanet missions, this COSPAR event aims to put together the broad community interested in the field to review major results, discuss models and present new projects.

Website: https://www.cospar-assembly.org/admin/sessioninfo.php?session=743

Solicited Speakers: Charles Beichman (NExScI), Christopher Broeg (Bern), George Ricker (MIT Kavli)

Organisers: F. Altieri (INAF), R. Waters (SRON); SOC: D. Angerhausen (Bern), T. Greene (NASA Ames), S. Kraus (Exeter), A. Mandell (NASA Goddard), G. Micela (INAF), M. Tamura (Tokyo), D. Turrini (INAF-IAPS), S. Udry (Geneva), G. Vasisht (JPL)

Abstracts for talks and posters are accepted until February 9, 2018, and might present recent results (obtained either from the ground or space), outline science opportunities, explore enabling technologies, or highlight current/upcoming/potential future missions related to these science areas. Please submit your abstract on the following website: https://www.cospar-assembly.org/user/mypapers.php?log=1

Download/Website: `http://www.cospar2018.org`

Contact: `s.kraus@exeter.ac.uk, francesca.altieri@iaps.inaf.it`

Diversis mundi: The Solar System in an Exoplanetary context (OPS-III)

Jorge Lillo-Box & Cyrielle Opitom
ESO, Alonso de Cordova 3107, Santiago, Chile

Santiago de Chile, 5-9 March, 2018

This one-week workshop has for objective to bring together the solar system and exoplanet scientific communities and explore how the expertise and recent discoveries in those fields can feed and contrast each other. Strong interactions and collaborations between both communities are essential, as the discovery of exoplanetary systems with a large variety of architectures can teach us about the formation and history of our own solar system, and the deep understanding of our own environment can help us towards our search for life traces outside of the solar system. Various aspects such as formation and architecture of planetary systems, small components of planetary systems, or planetary atmospheres and biomarkers will be discussed from both points of view and in the context of the forthcoming new observational facilities. During this workshop, emphasis will be made on developing new ideas and encouraging synergies between both fields, and plenty of time will be left for discussion and interactions. The main topics and related questions are:

- Formation of planetary systems and their components: How do theories for the formation of exoplanets affect Solar System formation models? How well do they match the observations?
- Architecture and evolution of planetary systems: How does the Solar System structure compare to other planetary systems? Why haven't we yet found a Solar System analog? What are the consequences of planet migration here and beyond?
- Small components of planetary systems: moons, comets, trojans, asteroid/Kuiper belts, debris disks, rings, etc. Are they all the usual outcome of the formation of planetary systems? What is the status of the search for exomoons, exorings, exotrojans, exocomets and how do they compare with the components in our Solar System?
- Atmospheres and biomarkers: How do exoatmospheres compare to Solar System planets? What are the prospects for the atmospheres of rocky exoplanets based on Venus/Mars/Earth? How do moon atmospheres compare in the Solar System and what do we expect for exomoons?

Early registration deadline is January 20th and late registration deadline is February 20th. Please note that the total number of participants is limited to 110 by the conference facilities. For more updated news and announcements about the conference please follow us on Twitter as @DiversisMundi18 or in our Facebook page https://www.facebook.com/DiversisMundi18/

Download/Website: `http://www.eso.org/sci/meetings/2018/ops2018.html`

Contact: `ops2018@eso.org`

IAUS 345 – Origins: From the Protosun to the First Steps of Life

Bruce Elmegreen[1], *Viktor Tóth*[2], *Manuel Güdel*[3], *Nader Haghighipour*[4], *co-chairs, organizing committee*
[1] IBM Research, Yorktown Heights, NY, USA
[2] Eötvös University, Budapest, Hungary
[3] University of Vienna, Austria
[4] University of Hawaii, USA

Vienna Austria, 20-23 August 2018

IAU Symposium 345 will take place during the first week of the General Assembly of the IAU in Vienna Austria, 2018. Major topics include: star formation in the solar neighborhood and cloud cores, early environment of the pre-solar nebula, formation and evolution of protoplanetary disks, physical and chemical properties of protoplanetary disks, formation of Earth and Earth-like planets, early planetary atmospheres and surfaces, early conditions on the Earth, Earth-like planets, and early life on Earth.
Registration is now open. The deadline for early registration is 31 January 2018, for abstracts and grant requests, 28 February, and for regular registration, 30 June.

Download/Website: `http://ninlil.elte.hu/IAUS345/`

Download/Website: `http://astronomy2018.univie.ac.at/registration/`

Download/Website: `http://astronomy2018.univie.ac.at/symposia/symposium345/`

Contact: `bge@us.ibm.com`

5 As seen on astro-ph

The following list contains entries largely relating to exoplanets that we spotted on astro-ph during November 2017.

November 2017

astro-ph/1711.00185: **Surface Imaging of Proxima b and Other Exoplanets: Topography, Biosignatures, and Artificial Mega-Structures** by *Svetlana V. Berdyugina, Jeff R. Kuhn*

astro-ph/1711.00191: **Modeling synthetic spectra for transiting extrasolar giant planets: detectability of H2S and PH3 with JWST** by *Dong Wang, Yamila Miguel, Jonathan Lunine*

astro-ph/1711.00358: **Pipeline for the Detection of Serendipitous Stellar Occultations by Kuiper Belt Objects with the Colibri Fast-Photometry Array** by *Emily Pass et al.*

astro-ph/1711.00410: **Photobiological effects at Earth's surface following a 50 pc Supernova** by *Brian C. Thomas*

astro-ph/1711.00445: **Pole, Pericenter, and Nodes of the Interstellar Minor Body A/2017 U1** by *C. de la Fuente Marcos, R. de la Fuente Marcos*

astro-ph/1711.00467: **Signatures of Nitrogen Chemistry in Hot Jupiter Atmospheres** by *Ryan J. MacDonald, Nikku Madhusudhan*

astro-ph/1711.00494: **SPIDERMAN: an open-source code to model phase curves and secondary eclipses** by *Tom Louden, Laura Kreidberg*

astro-ph/1711.00578: **ALMA Discovery of Dust Belts Around Proxima Centauri** by *Guillem Anglada et al.*

astro-ph/1711.00594: **Formation of Super-Earths by Tidally-Forced Turbulence** by *Cong Yu*

astro-ph/1711.00777: **Constraining planet structure and composition from stellar chemistry: trends in different stellar populations** by *N. C. Santos et al.*

astro-ph/1711.00859: **Hubble PanCET: An isothermal day-side atmosphere for the bloated gas-giant HAT-P-32Ab** by *N. Nikolov et al.*

astro-ph/1711.01112: **Characterization of Exoplanet-Host Stars** by *Vardan Adibekyan, Sergio G. Sousa, Nuno C. Santos*

astro-ph/1711.01133: **Towards a population synthesis model of self-gravitating disc fragmentation and tidal downsizing II: The effect of fragment-fragment interactions** by *D.H. Forgan et al.*

astro-ph/1711.01267: **Validation of small Kepler transiting planet candidates in or near the habitable zone** by *Guillermo Torres et al.*

astro-ph/1711.01274: **The signatures of the parental cluster on field planetary systems** by *Maxwell Xu Cai, Simon Portegies Zwart, Arjen van Elteren*

astro-ph/1711.01278: **Analytic Scattering and Refraction Models for Exoplanet Transit Spectra** by *Tyler D. Robinson, Jonathan J. Fortney, William B. Hubbard*

astro-ph/1711.01281: **Synergies between Asteroseismology and Exoplanetary Science** by *Daniel Huber*

astro-ph/1711.01300: **Origin of Interstellar Object A/2017 U1 in a Nearby Young Stellar Association?** by *Eric Gaidos, Jonathan P. Williams, Adam Kraus*

astro-ph/1711.01342: **Solar System Science with ESA Euclid** by *Benoit Carry*

astro-ph/1711.01344: **Implications for planetary system formation from interstellar object 1I/2017 U1 ('Oumuamua)** by *David E. Trilling et al.*

astro-ph/1711.01359: **Magellan/PFS Radial Velocities of GJ 9827, a late K dwarf at 30 pc with Three Transiting Super-Earths** by *Johanna K. Teske et al.*

astro-ph/1711.01372: **Feedback-limited Accretion: Luminous Signatures from Growing Planets** by *Matias Garate, Jorge Cuadra, Matias Montesinos*

astro-ph/1711.01402: **On the rotation period and shape of the hyperbolic asteroid 1I/'Oumuamua (2017) U1 from its lightcurve** by *Matthew M. Knight et al.*

astro-ph/1711.01555: **Polarized Transmission Spectrum of Earth as Observed during a Lunar Eclipse** by *Jun Takahashi et al.*

astro-ph/1711.01564: **Noise Sources in Photometry and Radial Velocities** by *M. Oshagh*
astro-ph/1711.01675: **Organic Haze as a Biosignature in Anoxic Earth-like Atmospheres** by *Giada N. Arney, Shawn D. Domagal-Goldman, Victoria S. Meadows*
astro-ph/1711.01895: **Space dust collisions as a planetary escape mechanism** by *Arjun Berera*
astro-ph/1711.01945: **Percolation clusters of organics in interstellar ice grains as the incubators of life** by *Saibal Mitra*
astro-ph/1711.02097: **EPIC 246393474 b: A 5-M_{earth} super-Earth transiting a K7 V star every 6.7 hours** by *O. Barragan et al.*
astro-ph/1711.02098: **Simulated JWST/NIRISS Transit Spectroscopy of Anticipated TESS Planets Compared to Select Discoveries from Space-Based and Ground-Based Surveys** by *Dana R. Louie et al.*
astro-ph/1711.02103: **Impact splash chondrule formation during planetesimal recycling** by *Tim Lichtenberg et al.*
astro-ph/1711.02106: **How uncertainties on stellar atmospheric parameters impact exoplanet studies?** by *Sergi Blanco-Cuaresma*
astro-ph/1711.02252: **Secular Dynamics of Multiplanetary Circumbinary Systems** by *Eduardo Andrade-Ines, Philippe Robutel*
astro-ph/1711.02260: **On the Consequences of the Detection of an Interstellar Asteroid** by *Gregory Laughlin, Konstantin Batygin*
astro-ph/1711.02320: **1I/2017 U1 ('Oumuamua) is Hot: Imaging, Spectroscopy and Search of Meteor Activity** by *Quan-Zhi Ye et al.*
astro-ph/1711.02452: **An Impacting Descent Probe for Europa and the other Galilean Moons of Jupiter** by *P. Wurz et al.*
astro-ph/1711.02566: **High-precision multi-wavelength eclipse photometry of the ultra-hot gas giant exoplanet WASP-103 b** by *L. Delrez et al.*
astro-ph/1711.02642: **Late accretion to the Moon recorded in zircon (U-Th)/He thermochronometry** by *Nigel M. Kelly et al.*
astro-ph/1711.02681: **Spin-Orbit Misalignment and Precession in the Kepler-13Ab Planetary System** by *Miranda K. Herman et al.*
astro-ph/1711.02684: **Constraining Hot Jupiter Atmospheric Structure and Dynamics through Doppler Shifted Emission Spectra** by *Jisheng Zhang, Eliza Kempton, Emily Rauscher*
astro-ph/1711.02748: **Radiation as a Constraint for Life in the Universe** by *Ximena C. Abrevaya et al.*
astro-ph/1711.02940: **Unstable low-mass planetary systems as drivers of white dwarf pollution** by *Alexander J Mustill et al.*
astro-ph/1711.03138: **Planet Formation in Disks with Inclined Binary Companions: Can Primordial Spin-Orbit Misalignment be Produced?** by *J. J. Zanazzi, Dong Lai*
astro-ph/1711.03376: **Comment on 'Radiative transfer in CO2-rich atmospheres: 1. Collisional line mixing implies a colder early Mars'** by *Martin Turbet, Ha Tran*
astro-ph/1711.03444: **Prospects for unseen planets beyond Neptune** by *Renu Malhotra*
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