ExoPlanet News
An Electronic Newsletter

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Contents

1 Editorial

Welcome to edition 105 of the ExoPlanet News!

Thanks again to all of you who contributed to this edition of the newsletter. Also this time we have an interesting selection of job advertisements, workshop announcements and paper abstracts. Please make sure that you use the up-to-date Latex template for submitting a contribution, which is the same irrespective of your type of contribution. The template, as well as all previous editions of ExoPlanet News, can be found at http://nccr-planets.ch/exoplanetnews/.

If you have any feedback concerning the newsletter or suggestions related to its style, scope or content please do not hesitate to send an email to exoplanetnews@nccr-planets.ch. The next issue of the newsletter will appear in mid April 2018.

Thanks for all your support and best regards from Switzerland

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2 Abstracts of refereed papers

The extremely truncated circumstellar disc of V410 X-ray 1: a precursor to TRAPPIST-1?

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1802.07120)

Protoplanetary discs around brown dwarfs and very low mass stars offer some of the best prospects for forming Earth-sized planets in their habitable zones. To this end, we study the nature of the disc around the very low mass star V410 X-ray 1, whose SED is indicative of an optically thick and very truncated dust disc, with our modelling suggesting an outer radius of only 0.6 au. We investigate two scenarios that could lead to such a truncation, and find that the observed SED is compatible with both. The first scenario involves the truncation of both the dust and gas in the disc, perhaps due to a previous dynamical interaction or the presence of an undetected companion. The second scenario involves the fact that a radial location of 0.6 au is close to the expected location of the H_2O snowline in the disc. As such, a combination of efficient dust growth, radial migration, and subsequent fragmentation within the snowline leads to an optically thick inner dust disc and larger, optically thin outer dust disc. We find that a firm measurement of the CO $J = 2–1$ line flux would enable us to distinguish between these two scenarios, by enabling a measurement of the radial extent of gas in the disc. Many models we consider contain at least several Earth-masses of dust interior to 0.6 au, suggesting that V410 X-ray 1 could be a precursor to a system with tightly-packed inner planets, such as TRAPPIST-1.

Download/Website: `http://arxiv.org/abs/1802.07120`

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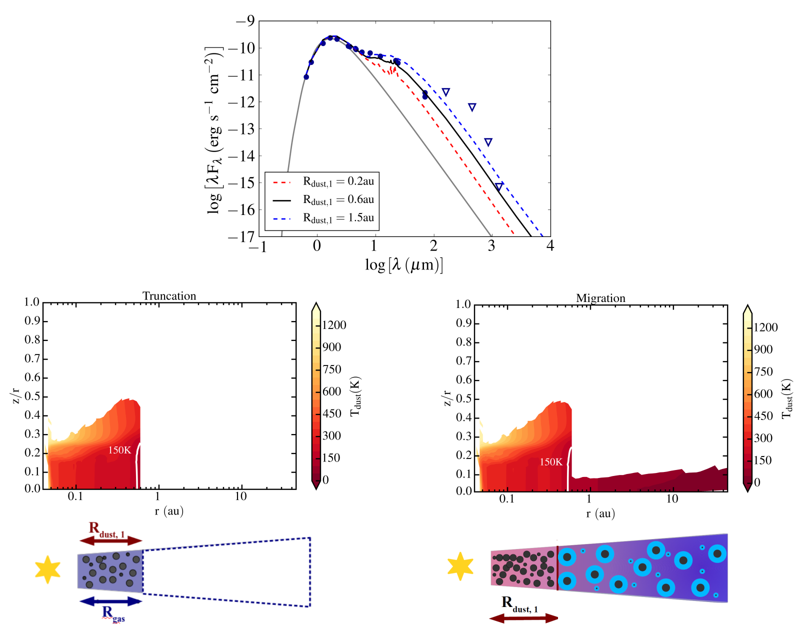

Figure 1: Boneberg: We investigate two scenarios that can lead to the SED of V410 X-ray 1 (*top panel*): In the first scenario, both the dust and the gas are truncated at a radius of 0.6 au (*left panels*). In the second one, the disc consists of an optically thick inner dust disc and a larger optically thin dust component outside of 0.6 au (*right panels*). Our modelling suggests that both of these are compatible with the observed SED.

Planetesimal formation during protoplanetary disk buildup

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Astronomy & Astrophysics, in press (arXiv:1803.00575)

Models of dust coagulation and subsequent planetesimal formation are usually computed on the backdrop of an already fully formed protoplanetary disk model. At the same time, observational studies suggest that planetesimal formation should start early, possibly even before the protoplanetary disk is fully formed. In this paper, we investigate under which conditions planetesimals already form during the disk buildup stage, in which gas and dust fall onto the disk from its parent molecular cloud. We couple our earlier planetesimal formation model to a simple model of disk formation and evolution. We find that under most conditions planetesimals only form after the buildup stage, when the disk becomes less massive and less hot. However, there are parameters for which planetesimals already form during the disk buildup. This occurs when the viscosity driving the disk evolution is intermediate ($\alpha_v \sim 10^{-3} - 10^{-2}$) while the turbulent mixing of the dust is reduced compared to that ($\alpha_t \leq 10^{-4}$), and with the assumption that water vapor is vertically well-mixed with the gas. Such $\alpha_t \ll \alpha_v$ scenario could be expected for layered accretion, where the gas flow is mostly driven by the active surface layers, while the midplane layers, where most of the dust resides, are quiescent.

We found that the water snow line is the preferable place for planetesimal formation, both when the disk is already fully formed and during its buildup. However, planetesimal formation during the buildup stage is less likely than during the class II protoplanetary disk stage. This is because it relies solely on the cold finger effect (the outward diffusion and recondensation of water vapor), while in the class II disk stage it is supported by the traffic jam effect arising because of the fast drift of icy pebbles outside of the snow line and inefficient drift of dry dust aggregates inside of the snow line.

Download/Website: `https://arxiv.org/abs/1803.00575`

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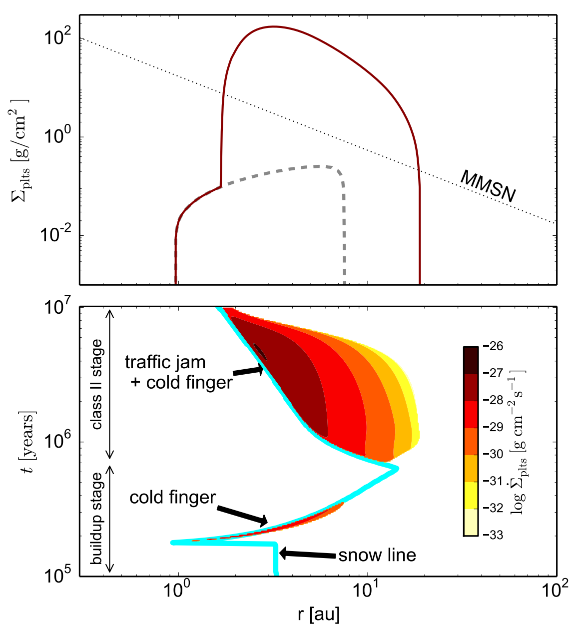

Figure 2: Drążkowska: Results of model with $\alpha_v = 10^{-3}$ and $\alpha_t = 10^{-5}$: *Upper panel:* Surface density of planetesimals at the end of the disk buildup stage (at $7 \cdot 10^5$ years, gray dashed line) and at the end of the disk lifetime (at 10^7 years, red solid line). The black dotted line corresponds to the minimum mass solar nebula. *Lower panel:* Radial and time distribution of planetesimal formation in the same model. The light blue solid line shows the location of the snow line.

Observable signatures of wind–driven chemistry with a fully consistent three dimensional radiative hydrodynamics model of HD 209458b

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The Astrophysical Journal Letters, in press (arXiv:1802.09222)

We present a study of the effect of wind-driven advection on the chemical composition of hot Jupiter atmospheres using a fully-consistent 3D hydrodynamics, chemistry and radiative transfer code, the Met Office Unified Model (UM). Chemical modelling of exoplanet atmospheres has primarily been restricted to 1D models that cannot account for 3D dynamical processes. In this work we couple a chemical relaxation scheme to the UM to account for the chemical interconversion of methane and carbon monoxide. This is done consistently with the radiative transfer meaning that departures from chemical equilibrium are included in the heating rates (and emission) and hence complete the feedback between the dynamics, thermal structure and chemical composition. In this letter we simulate the well studied atmosphere of HD 209458b. We find that the combined effect of horizontal and vertical advection leads to an increase in the methane abundance by several orders of magnitude; directly opposite to the trend found in previous works. Our results demonstrate the need to include 3D effects when considering the chemistry of hot Jupiter atmospheres. We calculate transmission and emission spectra, as well as the emission phase curve, from our simulations. We conclude that gas-phase non-equilibrium chemistry is unlikely to explain the model–observation discrepancy in the 4.5μm *Spitzer*/IRAC channel. However, we highlight other spectral regions, observable with the James Webb Space Telescope, where signatures of wind-driven chemistry are more prominant.

Download/Website: `https://arxiv.org/abs/1802.09222`

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The Solar Wind In Time: A change in the wind behaviour at old ages?

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Monthly Notices of the Royal Astronomical Society, published (arXiv:1802.04575)

We model the winds of solar analogues at different ages to investigate the evolution of the solar wind. Recently, it has been suggested that winds of solar type stars might undergo a change in properties at old ages, whereby stars older than the Sun would be less efficient in carrying away angular momentum than what was traditionally believed. Adding to this, recent observations suggest that old solar-type stars show a break in coronal properties, with a steeper decay in X-ray luminosities and temperatures at older ages. We use these X-ray observations to constrain the thermal acceleration of winds of solar analogues. Our sample is based on the stars from the 'Sun in time' project with ages between 120-7000 Myr. The break in X-ray properties leads to a break in wind mass-loss rates ($\dot{M}$) at roughly 2 Gyr, with $\dot{M}$ (t ¡ 2 Gyr) $\propto t^{-0.74}$ and $\dot{M}$ (t ¿ 2 Gyr) $\propto t^{-3.9}$. This steep decay in $\dot{M}$ at older ages could be the reason why older stars are less efficient at carrying away angular momentum, which would explain the anomalously rapid rotation observed in older stars. We also show that none of the stars in our sample would have winds dense enough to produce thermal emission above 1-2 GHz, explaining why their radio emissions have not yet been detected. Combining our models with dynamo evolution models for the magnetic field of the Earth we find that, at early ages ($\approx$100 Myr) our Earth had a magnetosphere that was 3 or more times smaller than its current size.

Download/Website: `https://arxiv.org/abs/1802.04575`

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On mapping exoplanet atmospheres with high-dispersion spectro-polarimetry. Some model predictions.

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The Astrophysical Journal, 854, 108 (2018), https://doi.org/10.3847/1538-4357/aaaa1f

Planets reflect and linearly polarize the radiation that they receive from their host stars. The emergent polarization is sensitive to aspects of the planet atmosphere such as the gas composition and the occurrence of condensates and their optical properties. Extracting this information will represent a major step in the characterization of exoplanets. The numerical simulations presented here show that the polarization of a spatially-unresolved exoplanet may be detected by cross-correlating high-dispersion linear polarization and intensity (brightness) spectra of the planet-star system. The Doppler shift of the planet-reflected starlight facilitates the separation of this signal from the polarization introduced by the interstellar medium and the terrestrial atmosphere. The selection of the orbital phases and wavelengths at which to study the planet is critical. An optimal choice however will partly depend on information about the atmosphere that is a priori unknown. We elaborate on the cases of close-in giant exoplanets with non-uniform cloud coverage, an outcome of recent brightness phase curve surveys from space, and for which the hemispheres east and west of the sub-stellar point will produce different polarizations. With integration times on the order of hours at a 10-m telescope, the technique might distinguish amongst some proposed asymmetric cloud scenarios with fractional polarizations of 10 parts per million for one such planet orbiting a V-mag=5.5 host star. Future 30-40-m telescopes equipped with high-dispersion spectro-polarimeters will be able to investigate the linear polarization of smaller planets orbiting fainter stars and look for molecular features in their polarization spectra.

Download/Website: `https://doi.org/10.3847/1538-4357/aaaa1f` `https://arxiv.org/abs/1802.01024`

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Laboratory Simulations of Haze Formation in the Atmospheres of super-Earths and mini-Neptunes: Particle Color and Size Distribution

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Astrophysical Journal Letters, accepted (arXiv: 1803.01706)

Super-Earths and mini-Neptunes are the most abundant types of planets among the ~3500 confirmed exoplanets, and are expected to exhibit a wide variety of atmospheric compositions. Recent transmission spectra of super-Earths and mini-Neptunes have demonstrated the possibility that exoplanets have haze/cloud layers at high altitudes in their atmospheres. However, the compositions, size distributions, and optical properties of these particles in exoplanet atmospheres are poorly understood. Here, we present the results of experimental laboratory investigations of photochemical haze formation within a range of planetary atmospheric conditions, as well as observations of the color and size of produced haze particles. We find that atmospheric temperature and metallicity strongly affect particle color and size, thus altering the particles' optical properties (e.g., absorptivity, scattering, etc.); on a larger scale, this affects the atmospheric and surface temperature of the exoplanets, and their potential habitability. Our results

provide constraints on haze formation and particle properties that can serve as critical inputs for exoplanet atmosphere modeling, and guide future observations of super-Earths and mini-Neptunes with the Transiting Exoplanet Survey Satellite (TESS), the James Webb Space Telescope (JWST), and the Wide-Field Infrared Survey Telescope (WFIRST).

Download/Website: http://arxiv.org/abs/1803.01706

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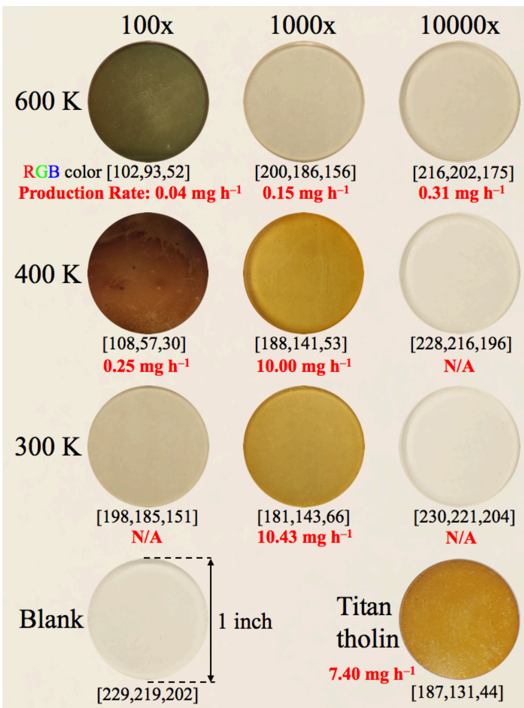

Figure 3: He: Pictures of the tholin films deposited on quartz discs [diameter: 1"(2.54 cm)]. Blank is the picture of a clean blank quartz disc, and Titan tholin is the picture of the Titan tholin film on quartz discs from our standard Titan experiment (5% CH4 in 95% N2). Average red, green, and blue (RGB) colors of the pictures are shown in the brackets under the pictures. Production rates (mg/h) the haze particles produced from the nine experiments (Hörst et al. 2018) and our previous Titan experiment (He et al. 2017) are shown under the pictures in red. N/A indicates that the solid sample was not enough to collect and weigh.

Haze production rates in super-Earth and mini-Neptune atmosphere experiments

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Nature Astronomy, In Press (arXiv: 1801.06512)

Numerous Solar System atmospheres possess photochemically generated hazes, including the characteristic organic hazes of Titan and Pluto. Haze particles substantially impact atmospheric temperature structures and may provide organic material to the surface of a world, potentially affecting its habitability. Observations of exoplanet atmospheres suggest the presence of aerosols, especially in cooler (<800 K), smaller (<0.3 Jupiter's mass) exoplanets. It remains unclear whether the aerosols muting the spectroscopic features of exoplanet atmospheres are condensate clouds or photochemical hazes, which is difficult to predict from theory alone. Here, we present laboratory

haze simulation experiments that probe a broad range of atmospheric parameters relevant to super-Earth- and mini-Neptune-type planets, the most frequently occurring type of planet in our galaxy. It is expected that photochemical haze will play a much greater role in the atmospheres of planets with average temperatures below 1,000 K, especially those planets that may have enhanced atmospheric metallicity and/or enhanced C/O ratios, such as super-Earths and Neptune-mass planets. We explored temperatures from 300 to 600 K and a range of atmospheric metallicities (100, 1,000 and 10,000 solar). All simulated atmospheres produced particles, and the cooler (300 and 400 K) 1,000 solar metallicity ('H2O-dominated' and CH4-rich) experiments exhibited haze production rates higher than our standard Titan simulation (∼10 mg/h versus 7.4 mg/h for Titan). However, the particle production rates varied greatly, with measured rates as low as 0.04 mg/h (for the case with 100 solar metallicity at 600 K). Here, we show that we should expect great diversity in haze production rates, as some–but not all–super-Earth and mini-Neptune atmospheres will possess photochemically generated haze.

Download/Website: `https://www.nature.com/articles/s41550-018-0397-0`

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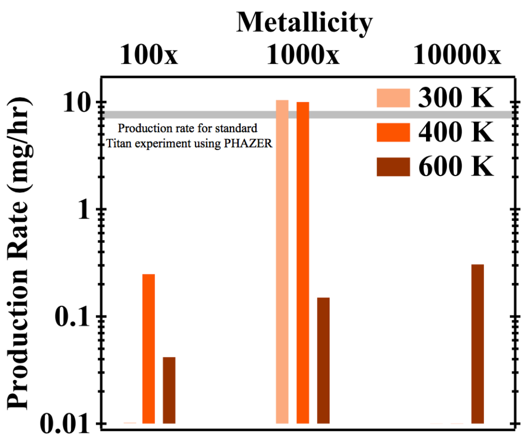

300 K	Film	10.43	Film
400 K	0.25	10.00	Film
600 K	0.04	0.15	0.31

Figure 4: Hörst: Shown here are the production rates measured for experiments shown in Figure 1 and Table 1. "Film" indicates that there was enough solid produced by the experiment to result in a visible film on the substrates, but there was not enough to collect and weigh.

Interior structure models and fluid Love numbers of exoplanets in the super-Earth regime

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Astronomy & Astrophysics, in press

Space missions such as *CoRoT* and *Kepler* have made the transit method the most successful technique in observing extrasolar planets. However, although the mean density of a planet can be derived from its measured mass and radius, no details about its interior structure, such as the density profile, can be inferred so far. If determined precisely enough, the shape of the transiting light curve might, in principle, reveal the shape of the planet, and in particular, its deviation from spherical symmetry. These deformations are caused, for instance, by the tidal interactions of the planet with the host star and by other planets that might orbit in the planetary system. The deformations depend on

the interior structure of the planet and its composition and can be parameterized as Love numbers k_n. This means that the diversity of possible interior models for extrasolar planets might be confined by measuring this quantity. We present results of a wide-ranging parameter study in planet mass, surface temperature, and layer mass fractions on such models for super-Earths and their corresponding Love numbers. Based on these data, we find that k_2 is most useful in assessing the ratio of rocky material to iron and in ruling out certain compositional configurations for measured mass and radius values, such as a prominent core consisting of rocky material. Furthermore, we apply the procedure to exoplanets K2-3b and c and predict that K2-3c probably has a thick outer water layer.

Download/Website: https://doi.org/10.1051/0004-6361/201731775

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Kuiper Belt Analogues in Nearby M-type Planet-host Systems

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Monthly Notices of the Royal Astronomical Society, in press (2018arXiv180302832K)

We present the results of a *Herschel* survey of 21 late-type stars that host planets discovered by the radial velocity technique. The aims were to discover new disks in these systems and to search for any correlation between planet presence and disk properties. In addition to the known disk around GJ 581, we report the discovery of two new disks, in the GJ 433 and GJ 649 systems. Our sample therefore yields a disk detection rate of 14%, higher than the detection rate of 1.2% among our control sample of DEBRIS M-type stars with 98% confidence. Further analysis however shows that the disk sensitivity in the control sample is about a factor of two lower in fractional luminosity than for our survey, lowering the significance of any correlation between planet presence and disk brightness below 98%. In terms of their specific architectures, the disk around GJ 433 lies at a radius somewhere between 1 and 30au. The disk around GJ 649 lies somewhere between 6 and 30au, but is marginally resolved and appears more consistent with an edge-on inclination. In both cases the disks probably lie well beyond where the known planets reside (0.06-1.1au), but the lack of radial velocity sensitivity at larger separations allows for unseen Saturn-mass planets to orbit out to ~5au, and more massive planets beyond 5au. The layout of these M-type systems appears similar to Sun-like star + disk systems with low-mass planets.

Download/Website: http://adsabs.harvard.edu/abs/2018arXiv180302832K

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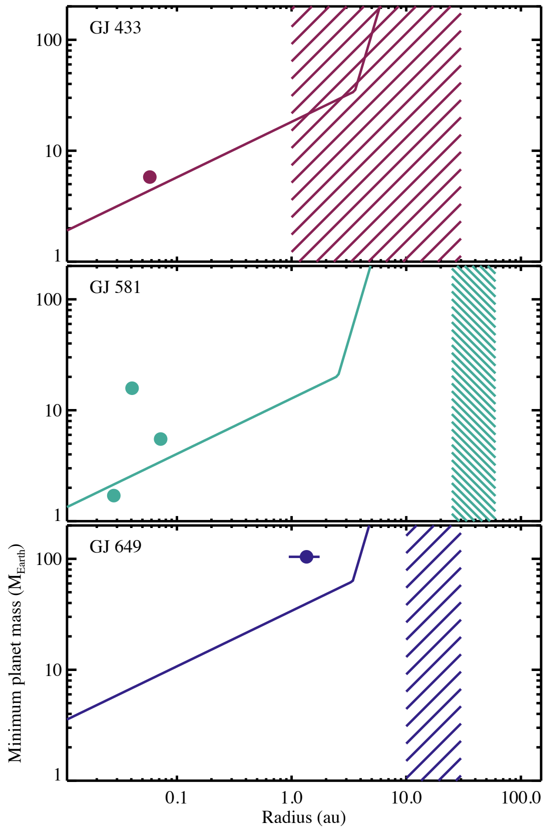

Figure 5: Kennedy: Mass semi-major axis diagrams showing the GJ 433, GJ 581, and GJ 649 planets (dots), the approximate RV sensitivity (lines), and the possible range of disk locations (hatched regions, showing the disk extent in the case of GJ 581). In each case, with the possible exception of GJ 433, there remains room in the detection space for sizeable planets that reside between the known planets and the disk, but that could not have been detected with the current RV observations.

Simulating the cloudy atmospheres of HD 209458 b and HD 189733 b with the 3D Met Office Unified Model

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Astronomy & Astrophysics, Accepted (arXiv:1803.00226)

Our aim is to understand and compare the 3D atmospheric structure of HD 209458 b and HD 189733 b, focusing on the formation and distribution of cloud particles, as well as their feedback on the dynamics and thermal profile. We couple the 3D Met Office Unified Model (UM), including detailed treatments of atmospheric radiative transfer and dynamics, to a kinetic cloud formation scheme. The resulting model self–consistently solves for the formation of condensation seeds, surface growth and evaporation, gravitational settling and advection, cloud radiative feedback via absorption and, crucially, scattering. We use fluxes directly obtained from the UM to produce synthetic spectral energy distributions and phase curves.

Our simulations show extensive cloud formation in both HD 209458 b and HD 189733 b. However, cooler temperatures in the latter result in higher cloud particle number densities. Large particles, reaching 1 μm in diameter, can form due to high particle growth velocities, and sub-μm particles are suspended by vertical flows leading to extensive upper-atmosphere cloud cover. A combination of meridional advection and efficient cloud formation in cooler high latitude regions, result in enhanced cloud coverage for latitudes > 30° and leads to a zonally banded structure for all our simulations. The cloud bands extend around the entire planet, for HD 209458 b and HD 189733 b, as the temperatures, even on the day side, remain below the condensation temperature of silicates and oxides. Therefore, the simulated optical phase curve for HD 209458 b shows no 'offset', in contrast to observations. Efficient scattering of stellar irradiation by cloud particles results in a local maximum cooling of up to 250 K in the upper atmosphere, and an advection-driven fluctuating cloud opacity causes temporal variability in the thermal emission. The inclusion of this fundamental cloud-atmosphere radiative feedback leads to significant differences with approaches neglecting these physical elements, which have been employed to interpret observations and determine thermal profiles for these planets. This suggests both a note of caution of interpretations neglecting such cloud feedback and scattering, and merits further study.

Download/Website: https://arxiv.org/abs/1803.00226

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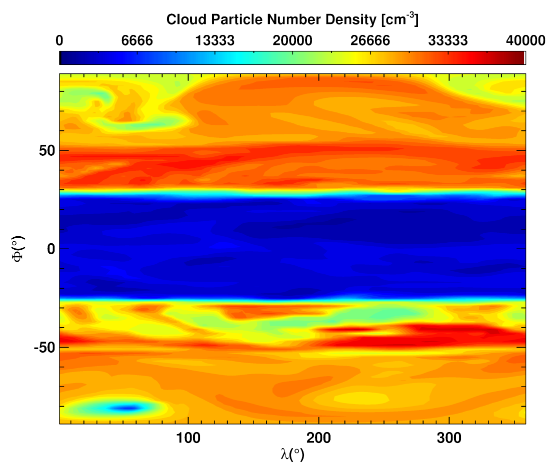

Figure 6: Lines: Cloud particle number density at P = 1mbar for HD 209458 b, showing the zonal banding caused by both meridional advection and enhanced cloud formation at cooler, higher latitudes.

The Transit Light Source Effect: False spectral features and incorrect densities for M-dwarf transiting planets

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The Astrophysical Journal, published (2018ApJ...853..122R)

Transmission spectra are differential measurements that utilize stellar illumination to probe transiting exoplanet atmospheres. Any spectral difference between the illuminating light source and the disk-integrated stellar spectrum due to starspots and faculae will be imprinted in the observed transmission spectrum. However, few constraints exist for the extent of photospheric heterogeneities in M dwarfs. Here, we model spot and faculae covering fractions consistent with observed photometric variabilities for M dwarfs and the associated 0.3–5.5 μm stellar contamination

spectra. We find that large ranges of spot and faculae covering fractions are consistent with observations and corrections assuming a linear relation between variability amplitude and covering fractions generally underestimate the stellar contamination. Using realistic estimates for spot and faculae covering fractions, we find stellar contamination can be more than 10× larger than transit depth changes expected for atmospheric features in rocky exoplanets. We also find that stellar spectral contamination can lead to systematic errors in radius and therefore the derived density of small planets. In the case of the TRAPPIST-1 system, we show that TRAPPIST-1's rotational variability is consistent with spot covering fractions $f_{spot} = 8^{+18}_{-7}\%$ and faculae covering fractions $f_{fac} = 54^{+16}_{-46}\%$. The associated stellar contamination signals alter transit depths of the TRAPPIST-1 planets at wavelengths of interest for planetary atmospheric species by roughly 1–15 × the strength of planetary features, significantly complicating *JWST* follow-up observations of this system. Similarly, we find that stellar contamination can lead to underestimates of bulk densities of the TRAPPIST-1 planets of $\Delta(\rho) = -3^{+3}_{-8}\%$, thus leading to overestimates of their volatile contents.

Download/Website: `http://adsabs.harvard.edu/abs/2018ApJ...853..122R`

Contact: `brackham@as.arizona.edu`

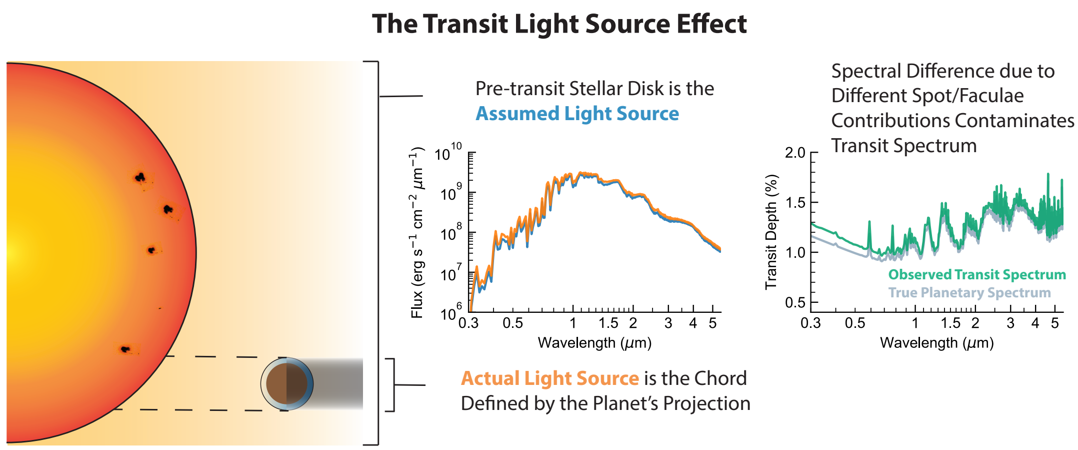

Figure 7: Rackham: A Schematic of the Transit Light Source Effect. During a transit, exoplanet atmospheres are illuminated by the portion of a stellar photosphere immediately behind the exoplanet from the point of view of the observer. Changes in transit depth must be measured relative to the spectrum of this light source. However, the light source is generally assumed to be the disk-integrated spectrum of the star. Any differences between the assumed and actual light sources will lead to apparent variations in transit depth. By modeling rotating M-dwarf photospheres with spots and faculae, we place realistic constraints on spot and faculae covering fraction consistent with observed variabilities. For M dwarfs with typical variability amplitudes, we find stellar contamination signals can be roughly 1–15 × stronger than planetary atmospheric transmission signals for small planets transiting M-dwarf host stars, which can complicate density calculations and transmission spectroscopy studies for these targets.

The TRAPPIST-1 system: Orbital evolution, tidal dissipation, formation and habitability

J. C. B. Papaloizou[1], *E. Szuszkiewicz*[2], *C. Terquem*[3]
[1] DAMTP, University of Cambridge, Wilberforce Road, Cambridge, CB3 0WA, U.K
[2] Institute of Physics and CASA*, Faculty of Mathematics and Physics, University of Szczecin, ul. Wielkopolska 15, 70-451 Szczecin, Poland.
[3] Physics Department, University of Oxford, Keble Road, Oxford OX1 3RH, U.K.

Monthly Notices of the Royal Astronomical Society, in press (arXiv:1711.07932 [astro-ph.EP])

The seven confirmed TRAPPIST-1 planets with masses in the terrestrial mass range orbiting very close to their central star compose a remarkable configuration: The frequencies of their revolutions form a chain of commensurabilities (resonances) - see Figure 1.
In the article just appeared in the Monthly Notices of the Royal Astronomical Society, John Papaloizou, Ewa Szuszkiewicz and Caroline Terquem have linked, for the first time, the dynamics of the system to the planet habitability. The dynamical simulations performed by the authors have shown clearly that the current configuration can be understood in a natural way in terms of post formation migration together with tidal interaction with the central star acting over the lifetime of the system. One of the interesting outcomes of these simulations is that the TRAPPIST-1 system most likely consists of two subsytems merged together. The three innermost planets remaining in a Laplace relation (chain of two consequtive commensurabilities) form the first subsystem. The second subsystem includes the five outermost planets joined with each other with a sequence of the Laplace relations. The existence of these commensurabilities is crucial for maintaining the eccentricities of the planetary orbits that enable the tidal heating to work. In turn, the production of tidal heating could lead to tectonic plate activity, which is essential for life as we know it. Taking into account the most fundamental requirements for habitability, the authors have demonstrated that the best conditions for harbouring life can exist on TRAPPIST-1 e. This planet is located in the insolation habitable zone (the stellar flux received is sufficient to enable the existence of liquid water on the planet's surface) as well as in the tidal habitable zone (the internal heat produced by tides can support plate tectonic activity).
Examining the current structure, orbital evolution of planets and tidal dissipation in the TRAPPIST-1 system the authors have succeeded in putting self-consistent constrains on the formation scenario of this system, the values of the eccentricities of the planetary orbits, the interior structure of the planets, the system age and the internal heat produced by tidal interaction between the star and its planets. All of these has been possible thanks to the elegant resonant configuration of the TRAPPIST-1 system.

Contact: `szusz@feynman.fiz.univ.szczecin.pl`

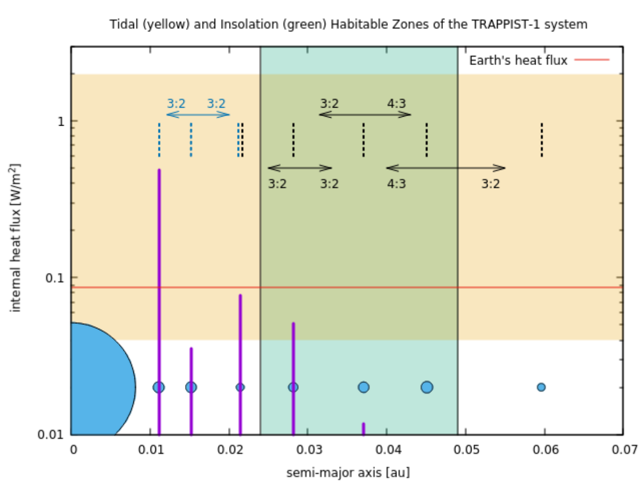

Figure 8: Papaloizou: The inner three planets are linked by a Laplace resonance where the commensurabilities indicated such as 3:2 hold exactly in an appropriately rotating frame. A similar situation applies to the outer five planets which are linked by a sequence of three Laplace resonances.

Dynamical and biological panspermia constraints within multi-planet exosystems

Dimitri Veras[1,2], *David J. Armstrong*[1,2], *James A. Blake*[1,2], *Jose F. Gutierrez-Marcos*[1,3], *Alan P. Jackson*[4,5], *Hendrik Schaefer*[1,3]

[1] Centre for Exoplanets and Habitability, University of Warwick, Coventry, CV4 7AL, UK
[2] Department of Physics, University of Warwick, Coventry, CV4 7AL, UK
[3] School of Life Sciences, University of Warwick, Coventry, CV4 7AL, UK
[4] Centre for Planetary Sciences, University of Toronto at Scarborough, Toronto, ON, Canada
[5] School of Earth and Space Exploration, Arizona State University, AZ, USA

Astrobiology, In Press, arXiv:1802.04279

As discoveries of multiple planets in the habitable zone of their parent star mount, developing analytical techniques to quantify extrasolar intra-system panspermia will become increasingly important. Here, we provide user-friendly prescriptions that describe the asteroid impact characteristics which would be necessary to transport life both inwards and outwards within these systems within a single framework. Our focus is on projectile generation and delivery and our expressions are algebraic, eliminating the need for the solution of differential equations. We derive a probability distribution function for life-bearing debris to reach a planetary orbit, and describe the survival of micro-organisms during planetary ejection, their journey through interplanetary space, and atmospheric entry.

Download/Website: `https://arxiv.org/abs/1802.04279`

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

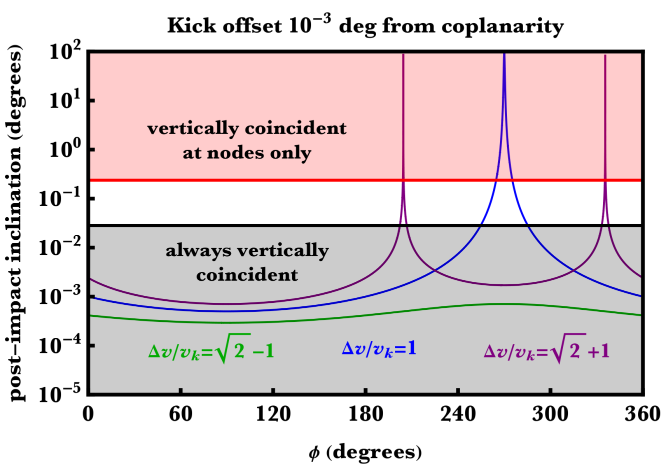

Figure 9: Veras: How the kick direction affects the inclination of the ejecta orbit. By assuming coplanarity amongst all TRAPPIST-1 planets, we plot, for three different values of the ratio of kick velocity to circular Keplerian velocity $\Delta v/v_{\rm k}$, the dependence on the kick direction in the sources orbital plane ϕ. The gray region corresponds to where the resulting ejecta orbital inclination is never large enough to exceed the radius of any TRAPPIST-1 target at any point in the orbit, and the red region corresponds to the opposite extreme, where vertical coincidence occurs only near the orbital nodes.

3 Jobs and Positions

2 PhD positions in the long-term evolution of Mars constrained by Mars InSight Lander results

Dr. Martin Jutzi, Prof. Paul Tackley
University of Bern / ETH Zurich, Switzerland

Bern / Zurich, June 1st 2018 or soon thereafter

The Institute of Geophysics at ETH Zurich and the Institute of Physics at the University of Bern each have an opening for a PhD position as part of a joint project. The positions are fully funded for three years. The salary is competitive and in accordance with Swiss National Science Foundation standards.
The goal of this project is to obtain a systematic understanding of how the current state of Mars has arisen as a result of 4.5 billion years of evolution from an early post-accretion phase that included a giant impact forming the crustal dichotomy. The project is based on numerical modelling constrained by observations, including expected new observations by the Mars InSight Lander.
One PhD project will be carried out in the Geophysical Fluid Dynamics group led by Prof. Paul Tackley, a diverse group of ~ 20 scientists working on a range of problems related to crust, lithosphere and mantle dynamics on the Earth, planets and moons. The working language is English. This goal of this subproject to study the evolution from the post-impact structure to the present day by running a large number of 3-D simulations of Mars thermo-chemical evolution and using machine learning to compare results with observations.
The other PhD project will be carried out in the Theoretical Astrophysics and Planetary Science group at the University of Bern (a member of the Center for Space and Habitability and the Swiss national framework PlanetS), and will be supervised by Dr. Martin Jutzi. This subproject focusses on impact simulations using a smoothed-particle hydrodynamics approach coupled with global models of the immediate post-impact phase, which track in particular the cooling and solidification of the resulting regional magma ocean and the sinking and merging of the impactor core with Mars core. Both students will also collaborate with a team at the Bayerisches Geoinstitut, led by Prof. Gregor Golabek.
Requirements: Applicants must have an MSc or diploma in Earth science, Astronomy, Physics, or other relevant field such as mathematics. Experience in programming and numerical modeling is beneficial, as is knowledge of fluid dynamics and applied mathematics.
Start date: June 1st 2018 or soon thereafter.
How to apply: Send by email to Professor Paul Tackley (ptackley@ethz.ch) or Dr. Martin Jutzi (martin.jutzi@space.unibe.ch): (1) A curriculum vitae and a list of publications (if applicable). (2) Details of your BSc and MSc, including copies of transcripts showing lists of courses with grades. (3) A brief statement about their research interests, motivation and skills. (4) Names, addresses and emails of two references that may be contacted for a recommendation letter.
Deadline: Complete applications received by April 1st, 2018, will receive full consideration. After this date, applications will be considered depending on availability.

Download/Website: `http://taps.space.unibe.ch`

Download/Website: `http://www.gfd.ethz.ch`

Contact: `martin.jutzi@space.unibe.ch / ptackley@ethz.ch`

Postdoctoral position in Planetary Atmospheres

Dr. Miriam Rengel
Max Planck Institute for Solar System Research, Germany

Göttingen, Germany, 2018

The Max Planck Institute for Solar System Research (MPS) in Göttingen/Germany invites applications for a postdoctoral research position in Planetary Atmospheres within the recently stablished Priority Program 1992 "Exploring the Diversity of Extrasolar Planets" funded by the German Research Foundation (DFG) (http://www-astro.physik.tu-berlin.de/exoplanet-diversity/about).
The successful candidate will carry out original research in the framework of a project to study physical-chemical processes in exoplanetary atmospheres (in terms of temperature and composition profiles) by assessing the mechanisms into the predictions and considering observations as key to validation assessment. The postdoc will closely work with Dr. Miriam Rengel (PI of the research project), will be joining the Atmospheric Planetary Group (APG) – which resides in the Planetary Department of the MPS – and will also work closely with other colleagues at MPS and at the Institute for Astrophysics at the Georg-August-Universität Göttingen. The APG has a solid experience in modelling, observation, calibration, and analysis of spectroscopic planetary data, as well as a significant contribution to several space missions (e.g. Herschel and JUICE). The MPS is located in Göttingen (Germany), a lively and scenic university town, in a striking new building.
Requirements:

- Applicants must hold a Ph.D. in physics with a background in astrophysics/astronomy, atmospheric physics and/or molecular spectroscopy, or a related topic.
- Experience in scientific programming in high-level language, e. g. Python, FORTRAN or C++.
- Strong interest in numerical modelling and algorithms, radiative transfer, remote sensing data of planets, observational spectroscopy, and/or meteorology/climate.
- Experience in radiative transfer modeling, astronomy in infrared, and/or exoplanet research is an asset.

The appointment is for three years, is funded by the German Research Foundation (DFG), and is paid according to the German public service scale (TVöD 13). Applicants should send a curriculum vitae, a list of publications, a summary of previous research (2 pages max.), research interests (1 page max.), and the names of at least two persons who can be contacted for letters of references. Applications can be sent in electronic form or regular post (please send only copies, documents will not be returned) to the address below by March 15, 2018, for full consideration. Applications will be considered until the position is filled. The preferred starting date is May 1, 2018, but earlier or later starting dates can be negotiated.

The MPS seeks to increase the fraction of female scientists in research, and particularly encourages applications from women. Disabled candidates are given preference if equally qualified.

Applications should be sent to:
Dr. Miriam Rengel
Max Planck Institute for Solar System Research
Justus-von-Liebig-Weg 3
D-37077 Göttingen
Email: rengel@mps.mpg.de

Download/Website: `http://www.mps.mpg.de/5262428/job_full_offer_11941807?c=2169`
Contact: `rengel@mps.mpg.de`

PDRA in exoplanet discovery and characterisation

Suzanne Aigrain

Dept of Physics, University of Oxford, from July 2018

The Astrophysics Sub-Department of the Department of Physics at the University of Oxford invites applications for a Postdoctoral Research Assistant to with Prof Suzanne Aigrain on transiting exoplanet discovery and characterisation. The position, which forms part of the development phase of the European Space Agency's PLATO mission, is available starting in the summer of 2018.

The European Space Agency's PLATO mission, due for launch in 2026, will discover thousands of planets transiting bright stars, including habitable planets, and will probe the internal structure of the host stars using asteroseismology. The PDRA will work with Prof Aigrain to develop, implement and test algorithms which will ultimately be included in the PLATO exoplanet discovery and characterisation pipeline. In particular, our work will focus on minimizing the impact of stellar activity on transit detection and follow-up, and optimizing the synergy between the characterisation of the host stars, and that of their companion planets. To test and refine these tools, the PDRA will also work with data from the TESS mission, helping to discover new exoplanets, and will be involved in their subsequent characterisation. The PDRA will abe expected to write software definition documents, participate in regular PLATO team meetings, and promote the science objectives of the mission by presenting their research at international conferences.

Applicants should have, or be very close to obtaining, a Ph.D. in Astronomy, Physics, Applied Mathematics or a related field., and ideally possess a background in stellar or planetary astrophysics. Prior experience with transiting exoplanet discovery and characterisation will be advantageous, though not required. The post-holder will have the opportunity to teach and co-supervise undergraduate research projects.

The post is available for a fixed-term duration of 2 years, but could also be a longer duration part-time position. There is some flexibility in the start date.

For further details and how to apply, see URL below. The application deadline is **April 3, 2018**.

Download/Website: `https://goo.gl/zQQAA6`

Contact: `Suzanne.Aigrain@physics.ox.ac.uk`

PhD fellowship in exoplanet imaging

Olivier Absil

University of Liège, 1 September 2018

The STAR Institute of the University of Liège invites applications for a PhD fellowship in the field of exoplanet imaging, open in the Planetary & Stellar system Imaging Laboratory (PSILab) of Dr Olivier Absil. The proposed research project focuses on the development and exploitation of deep learning techniques for high-contrast image processing, along the lines described here: https://arxiv.org/abs/1712.02841. It will be carried out in close collaboration with the Montefiore Institute for Electrical Engineering and Computer Science at ULige (Prof M. Van Droogenbroeck), and with the Grenoble Alpes Data Institute (Dr C. Gomez Gonzalez).

We seek excellent students with strong background in (astro)physical and computer sciences. A successful candidate must hold a Masters degree or equivalent by the starting date of the position. Previous research experience and skills will be important criteria for the selection. Strong collaboration spirit and good communication skills in oral and written English are required. The PhD positions are not restricted by nationality.

Applicants should send a CV, transcripts of study records (with grades), and a brief statement of past research and research interests to Dr Olivier Absil (olivier.absil@uliege.be). They should also arrange for a reference letter to be sent to this address by the application deadline.

Review of applications will begin 16 April 2018, and will continue until the position is filled. The starting date of the appointments is 1 September 2018, although later dates could be considered. The initial appointment is for two years, with a renewal for two more years contingent upon continued funding and satisfactory progress.

The position comes with full benefits and a competitive salary.

Download/Website: `https://jobregister.aas.org/ad/8f81aa87`

Contact: `olivier.absil@uliege.be`

Two postdoctoral positions in exoplanet imaging

Olivier Absil

University of Liège, 1 September 2018

The STAR Institute of the University of Liège invites applications for two postdoctoral fellowships in the field of exoplanet imaging, open in the Planetary & Stellar system Imaging Laboratory (PSILab) of Dr Olivier Absil. The first postdoctoral fellow will focus on the development, commissioning, and scientific exploitation of a new mid-infrared vortex coronagraph on VLT/VISIR, within the Breakthrough Watch program (search for rocky planets around alpha Centauri). The second fellow will support the development of the high-contrast imaging mode of ELT/METIS, and explore the impact of its combination with high-resolution spectroscopy on the scientific yield of the instrument. Both fellows are expected to spend about 70% of their time on the proposed projects, while the rest of their time can be spent on a personal research subject related to high-contrast imaging of planetary/stellar systems. They will have the opportunity to collaborate with the rest of the PSILab team and with its international partners on on-going observing programs, including vortex coronagraph observations at Keck and VLT.

Candidates must hold a PhD in astronomy or a related field by, but not for more than 6 years before, the starting date of the position. They must additionally not have worked more than 24 months in Belgium over the last 3 years. Applications should include:

- a cover letter
- a curriculum vitae and a list of publications
- a statement of past and future research (up to 3 pages)

The application, merged into one single pdf file, should be sent by email to Olivier Absil (olivier.absil@uliege.be). The applicants should also provide the names and contact details of three referees who could be contacted for reference letters.

Complete applications received by 16 April 2018 will receive full consideration. The starting date of the appointments is 1 September 2018, although later dates could be considered. The appointments are for two years, with a possible renewal for a third year contingent upon continued funding and satisfactory progress.

The positions come with full benefits and a competitive salary.

Download/Website: `https://jobregister.aas.org/ad/f9cda70e`

Contact: `olivier.absil@uliege.be`

PhD student position in stellar and planetary astrophysics

Ulrike Heiter and Oleg Kochukhov
Department of Physics and Astronomy, Uppsala University, Sweden

Uppsala University, from 1 Sep 2018

Applications are invited for a fully-funded PhD student position in stellar and planetary astrophysics, under the supervision of Ulrike Heiter and Oleg Kochukhov. The PhD project is expected to focus on the study of high-resolution spectra of cool stars (M dwarfs) with and without planets at infrared wavelengths. The work will be done in preparation of the future PLATO mission by ESA, which aims at the detection of terrestrial exoplanets from photometric transits. The project is expected to involve both data analysis and numerical modelling.
This position requires a university degree in Astronomy or Physics at an advanced level (e.g. a MSc degree) completed by the time of employment. The applicant must be eligible for studies at the graduate level at Uppsala University. Women are especially invited to apply for this position. Employment as a PhD student is for four years. More information about the position and PhD studies at Uppsala University can be found in the detailed announcement (see link to Website).
Applications should be submitted via the on-line application system, following the link given in the detailed announcement. Applications should include a brief description of research interests and relevant experience, CV, copies of university grades, certificates and diplomas, BSc/MSc thesis (or drafts thereof), reference letters and other documents which the applicant wishes to provide. The deadline for applying for this position is **30 April 2018**. In any correspondence, please use the reference number UFV-PA 2018/801.

Download/Website: `http://www.uu.se/en/about-uu/join-us/details/?positionId=196318`

Contact: `ulrike.heiter@physics.uu.se`

Permanent PLATO Science consortium position

Prof. D. L. Pollacco
Department of Physics, University of Warwick, Gibbet Hill Road, Coventry, CV4 7AL, UK

University of Warwick, UK

Applications are invited for a full time and permanent Research Fellow position at the University of Warwick, UK. **Closing date for applications is 23rd March 2018.**

The position is in support of ESA's M-class PLATO mission, and is based in the Science Management Office. It is funded by the UK Space Agency and the University of Warwick.

The successful candidate will hold a PhD degree, a proven research track record, and preferably experience of working in an (international) project environment.

Duties include organisational support of the PLATO Science consortium, and there will be other opportunities to become involved with the PLATO mission, both technically and scientifically. Opportunities are also available to become scientifically involved in ESA's first S-class mission, CHEOPS (due for launch in 2018), and in ground based experiments in which Warwick has significant roles (e.g. NGTS and SuperWASP). We expect that some of the post holder's time will be available for research, preferably in the area of extra-solar planets with the Astronomy and Astrophysics Group at Warwick.

An application form MUST be completed if you wish to be considered for this post. Applicants should also submit a signed covering letter, concise description of research accomplishments, relevant organisational and technical experience (including computing experience), and a CV including a full publication list.

Information about the PLATO Science consortium: https://warwick.ac.uk/plato-science/

Information about the Astronomy & Astrophysics Group:
https://warwick.ac.uk/fac/sci/physics/research/astro/h

Download/Website: http://bit.ly/2GReDQH

Contact: d.pollacco@warwick.ac.uk

Postdoctoral Position in Astrostatistics and High-precision Doppler planet surveys

Jessi Cisewski-Kehe and Debra Fischer

Department of Statistics and Data Science, Yale University, USA, To begin summer 2018

The Department of Statistics and Data Science at Yale University invites applications for a postdoctoral position in astrostatistics working with Professor Jessi Cisewski-Kehe and Professor Debra Fischer (Yale Astronomy), along with other collaborators to begin summer 2018. This position is at the intersection of statistics and exoplanet astronomy and will entail developing statistical and computational methodology for high-precision Doppler planet surveys (especially, EXPRES: http://exoplanets.astro.yale.edu/instrumentation/expres.php) to find and characterize low-mass exoplanets amid stellar activity and other stellar surface noise. Training in any of the following areas is helpful, though not required: Bayesian modeling, functional data analysis, signal separation, or time series analysis. Applicants should have a Ph.D. in Astrostatistics, Statistics, Computer Science, Astronomy, Physics, or a related field prior to the start date. This is a fixed term appointment for one year (with the possibility for renewal for a second year).
To apply, send a cover letter, description of research experience, and CV as a single PDF document to Professor Jessi Cisewski-Kehe at jessica.cisewski@yale.edu, and arrange to have three letters of reference sent to the same email address. The application deadline is Apr 15, 2018; review will begin immediately and continue until the position is filled.
Yale is an affirmative action equal opportunity employer. Yale values diversity among its students, staff, and faculty and strongly welcomes applications from women, persons with disabilities, underrepresented minorities, and protected veterans.

Download/Website: http://www.stat.yale.edu/ jc3222/

Contact: jessica.cisewski@yale.edu

4 Conference announcements

The Chemistry, Observations, and Modelling of Planetary Assembly, Special Session, Goldschmidt

Mikhel Kama, Amy Bonsor, Oliver Shorttle, Stephen Mojzsis, Ramon Brasser, Soko Matsumura

Boston, MA, USA , Aug 12-17 2018 (Abstract Deadline March 30th

The Goldschmidt meeting is the major international geoscience conference, with a focus on geochemistry. At Goldschmidt 2018, this August, we (Mihkel Kama, Amy Bonsor, Oliver Shorttle, Stephen Mojzsis, Ramon Brasser, Soko Matsumura) are organising a session on all aspects of recent progress on the composition of protoplanetary, planetary, and post-planetary material. We'd like to invite you to attend the session either as a speaker (deadline March 30) or participant (early registration June 12, regular until July 12). See at bottom for key dates and links.

This is a rare opportunity to advertise to – and build links with – all concerned areas of astronomy, solar system science, and earth science. We're delighted to say our keynote speaker bridging the various communities will be professor Ted Bergin (University of Michigan, Ann Arbor).

Topics we would like to see at the session include, but are not limited to, the composition of gas, ice, and dust in protoplanetary disks; the composition of planetary cores and atmospheres; the composition of small bodies such as planetesimals falling onto white dwarfs. We also await abstracts from modellers. Our aim is to link these topics to planet and planetesimal formation in the solar system, and it would be truly great to have as many astronomers as possible present, to cover the many recent advances. We encourage you to boldly suggest links between your work and other topics covered in the session abstract:

Mysteries that surround the physical-chemical nature of the inner regions of planetary systems are slowly being unravelled. This progress is being driven by clues from meteorites, dynamical simulations, and observations of extrasolar systems. Such insights from home and abroad are refining our models of planet formation which incorporate dust, planetesimal, and planet growth; mixing and migration; and astro- and cosmochemistry. This session firstly aims to review recent advances; secondly to increase mutual understanding between the geochemical, solar system, planet formation, and exoplanet communities; and thirdly to form a complete perspective on the formation of (in particular, silicate-metal) planets. Suggested topics cover the composition and chemistry; structure; and chronology of planet-forming material and planets. We seek input from all areas of planetary geochemistry, astro- and cosmochemistry, and astronomical observations and modelling, to further our understanding of planet formation in the solar system and beyond.

Download/Website: `Conference website: https://goldschmidt.info/2018/ (to navigate to our session click through Program > Program by Theme > 01: From Stars to Planets > 01e: The Chemistry, Observations, and Modelling of Planetary Assembly)`

Contact: `abonsor@ast.cam.ac.uk; mkama@ast.cam.ac.uk`

2018 Sagan Summer Workshop: Did I Really Just Find an Exoplanet?

D. Gelino, E. Furlan
NASA Exoplanet Science Institute, California Institute of Technology, Pasadena, CA, USA

Pasadena, CA, July 23-27, 2018

The 2018 Sagan Summer Workshop will gather leaders in the field to focus on follow-up work to validate and characterize exoplanet discoveries. The follow-up needs for direct imaging, astrometry, and microlensing, radial velocity and transit detections of planets are similar but differ in the details. These differences will be discussed and explored covering what each method can detect and the shortcomings of each, with particular focus on the transit and radial velocity techniques. Attendees will participate in hands-on group projects applying tools to real data in order to validate planets. They will have the opportunity to present their own work through short presentations (research POPs) and posters.

The Sagan Summer Workshops are aimed at graduate and post doctoral level students, however anyone who is interested in learning more about the field is welcome to attend.

Topics to be covered include:

- Transit Photometry
- Follow-up Observations of Transit Candidates
- Radial Velocity Surveys
- Understanding Host Stars
- Planetary Characterization Observations
- Microlensing
- Finding Planets with Direct Imaging
- Astrometry

Important Upcoming Dates

- March 16, 2018: Travel Support decisions announced via email
- May 1, 2018: POP/Poster/Talk submission link available and Food Ordering site open
- June 22, 2018: Hotel Reservation Deadline for both workshop hotels
- July 6, 2018: Deadline to submit POP and poster presentations
- July 13, 2018: Final agenda posted with POP schedule; deadline for food purchases
- July 23-27, 2018: Sagan Exoplanet Summer Workshop

Download/Website: `http://nexsci.caltech.edu/workshop/2018`

Contact: `sagan_workshop@ipac.caltech.edu`

Conference "Spectroscopy of Exoplanets", 8-11 July 2018, Cumberland Lodge, Windsor Great Park

Sergey Yurchenko, Jonathan Tennyson, Giovanna Tinetti, Ingo Waldmann
[1] Department of Physics & Astronomy, University College London, Gower Street, London, UK

In July this year, we will be holding a conference 'Spectroscopy of Exoplanets' at Cumberland Lodge near to London. The conference will begin in the afternoon on Sunday 8 July with departure after lunch on Wednesday 11 July 2018.

Provisional topics include: Spectroscopy of atmospheres of exoplanets; Molecules in stellar and Galactic context; Sources of opacity data (theoretical and laboratory); Characterising exoplanetary atmospheres; Observational issues; Chemistry and structure of exoplanets; Direct imaging; Cloud formation; Advances in understanding brown dwarf atmospheres.

We have gaps for 20 minute talks and posters if you want to present work.

Location: Cumberland Lodge is a 17th Century house in beautiful parkland. The location of Cumberland Lodge offers easy access to Heathrow and is close to Windsor Castle. You may like to look at the Cumberland Lodge website: `http://www.cumberlandlodge.ac.uk/`
We have gaps for 20 minute talks and posters if you want to present work.
You will find further details including: a registration form, details of payments and abstract submissions on the Conference website.
We very much hope that you will be able to attend the conference.

Download/Website: `http://www.exomol.com/conferences/ExoMol2018/`

Contact: `Sergey Yurchenko: s.yurchenko@ucl.ac.uk`

Astrophysical Frontiers in the Next Decade and Beyond: Planets, Galaxies, Black Holes, and the Transient Universe

C. Casey[1], *L. Chomiuk*[2], *B. Matthews*[3]
[1] University of Texas at Austin, Austin, TX 78712, USA
[2] Michigan State University, East Lansing, MI, 48824, USA
[3] Herzberg Astronomy & Astrophysics, NRC Canada, Victoria, BC, V9E 2E7, Canada

Portland, Oregon, USA, 26 - 29 June 2018

We are pleased to announce that registration is now open for the conference ”Astrophysical Frontiers in the Next Decade and Beyond: Planets, Galaxies, Black Holes, and the Transient Universe”. This ambitious conference will bring together a large cross-section of the multi-wavelength astronomical community to discuss how best to tackle the most pressing astrophysical questions in the near-future.

Over the past decade, many areas of astrophysics and cosmology have seen rapid progress, revealing numerable exciting discoveries. Highlights include the first detailed pictures of the complex nature of planet formation in a solar system analog; the discovery of rapidly star-forming galaxies and supermassive black hole growth detected well into the epoch of re-ionization; the direct detection of gravitational radiation from merging black holes; and the existence of unexplained transient phenomena like Fast Radio Bursts. Building on this heterogeneous list, we can look beyond the scientific frontier outlined by New Worlds, New Horizons now better informed, into an uncharted realm of new discovery space.

This conference will consist of plenary sessions of invited speakers and three parallel sessions that will include invited and contributed presentations covering Origins of Exoplanets and Protoplanetary Disks; Mechanisms of Galaxy Evolution; and Black Holes and Transient Phenomena.

Each session will highlight recent advances in observations and theory, unanswered questions, and future research directions, in the context of the suite of next-generation facilities across the electromagnetic spectrum such as the including a next-generation Very Large Array, the Large Synoptic Survey Telescope, 30m-class optical-infrared telescopes, the Advanced Laser Interferometer Gravitational-Wave Observatory, and the Square Kilometre Array.

While this meeting is sponsored by NRAO, the science areas explored are truly multi-wavelength/messenger, and the science program has strong representation from communities across the electromagnetic spectrum.

Registration is only $250 through May 1, 2018. Student registration has been discounted to $100 plus free hotel accommodations with double occupancy. Travel assistance is available. We hope to see you in Portland in June!

Download/Website: `http://go.nrao.edu/ngVLA18`

Contact: `ngVLA18@nrao.edu`

5 As seen on astro-ph

The following list contains all the entries relating to exoplanets that we spotted on astro-ph during February 2018.

February 2018

astro-ph/1802.00141: **On the bio-habitability of M-dwarf planets** by *Amri Wandel*
astro-ph/1802.00221: **Dust evolution in protoplanetary discs and the formation of planetesimals. What have we learned from laboratory experiments?** by *Jürgen Blum*
astro-ph/1802.00378: **The influence of a sub-stellar continent on the climate of a tidally-locked exoplanet** by *Neil T. Lewis et al.*
astro-ph/1802.00403: **Formation of terrestrial planets in eccentric and inclined giant planet systems** by *Sotiris Sotiriadis, Anne-Sophie Libert, Sean N. Raymond*
astro-ph/1802.00447: **Hidden Planetary Friends: On the Stability Of 2-Planet Systems in the Presence of a Distant, Inclined Companion** by *Paul Denham et al.*
astro-ph/1802.00464: **Fast and Slow Precession of Gaseous Debris Disks Around Planet-Accreting White Dwarfs** by *Ryan Miranda et al.*
astro-ph/1802.00766: **Discovery of WASP-174b: Doppler tomography of a near-grazing transit** by *L.Y. Temple et al.*
astro-ph/1802.00920: **Stability of the Euler Resting N-Body Relative Equlilbria** by *D.J. Scheeres*
astro-ph/1802.00999: **Suppressed Far-UV Stellar Activity and Low Planetary Mass Loss in the WASP-18 System** by *L. Fossati et al.*
astro-ph/1802.01024: **On mapping exoplanet atmospheres with high-dispersion spectro-polarimetry. Some model predictions** by *Antonio Garcia Munoz*
astro-ph/1802.01081: **A search for technosignatures from 14 planetary systems in the Kepler field with the Green Bank Telescope at 1.15-1.73 GHz** by *Jean-Luc Margot et al.*
astro-ph/1802.01293: **Ice loss from the interior of small airless bodies according to an idealized model** by *Norbert Schorghofer, Henry H. Hsieh*
astro-ph/1802.01340: **Experimental Constraints On The Fatigue of Icy Satellite Lithospheres by Tidal Forces** by *Noah P. Hammond et al.*
astro-ph/1802.01352: **Measurements and modeling of absorption by CO2+H2O mixtures in the spectral region beyond the CO2 nu3-band head** by *Ha Tran et al.*
astro-ph/1802.01377: **The nature of the TRAPPIST-1 exoplanets** by *Simon L. Grimm et al.*
astro-ph/1802.01702: **The Dynamics of Tightly-packed Planetary Systems in the Presence of an Outer Planet: case studies using Kepler-11 and Kepler-90** by *A. P. Granados Contreras, A. C. Boley*
astro-ph/1802.01783: **Large Synoptic Survey Telescope Solar System Science Roadmap** by *Megan E. Schwamb et al.*
astro-ph/1802.02075: **Analytic Reflected Lightcurves for Exoplanets** by *Hal M. Haggard, Nicolas B. Cowan*
astro-ph/1802.02086: **The Near-Infrared Transmission Spectra of TRAPPIST-1 Planets b, c, d, e, f, and g and Stellar Contamination in Multi-Epoch Transit Spectra** by *Zhanbo Zhang et al.*
astro-ph/1802.02132: **An Analysis of Transiting Hot Jupiters Observed with K2: WASP-55b and WASP-75b** by *B. J. M. Clark et al.*
astro-ph/1802.02157: **Magma ascent in planetesimals: control by grain size** by *Tim Lichtenberg et al.*
astro-ph/1802.02189: **Mars Thermospheric Variability Revealed by MAVEN EUVM Solar Occultations: Structure at Aphelion and Perihelion, and Response to EUV Forcing** by *E. M. B. Thiemann et al.*
astro-ph/1802.02250: **Atmospheric reconnaissance of the habitable-zone Earth-sized planets orbiting TRAPPIST-1** by *J. de Wit et al.*
astro-ph/1802.02273: **Why is Interstellar Object 1I/2017 U1 ('Oumuamua) Rocky, Tumbling and Very Prolate?** by *J. I. Katz*

astro-ph/1802.02582: **OGLE-2017-BLG-1434Lb: Eighth $q < 1\,10^{-4}$ Mass-Ratio Microlens Planet Confirms Turnover in Planet Mass-Ratio Function** by *A. Udalski et al.*
astro-ph/1802.02590: **Unlocking CO Depletion in Protoplanetary Disks I. The Warm Molecular Layer** by *Kamber R. Schwarz et al.*
astro-ph/1802.02653: **Characterization of dust activity on Mars from MY27 to MY32 by PFS-MEX observations** by *Paulina Wolkenberg et al.*
astro-ph/1802.02742: **Ground-based lightcurve observation campaign of (25143) Itokawa between 2001 and 2004** by *Setsuko Nishihara et al.*
astro-ph/1802.02923: **Limitation of atmospheric composition by combustion-explosion in exoplanetary atmospheres** by *John Lee Grenfell et al.*
astro-ph/1802.03026: **Convective dynamics and disequilibrium chemistry in the atmospheres of giant planets and brown dwarfs** by *Baylee Bordwell, Benjamin P. Brown, Jeffrey S. Oishi*
astro-ph/1802.03047: **Revisiting the Phase Curves of WASP-43b: Confronting Reanalyzed Spitzer Data with Cloudy Atmospheres** by *Joao M. Mendonsa et al.*
astro-ph/1802.03090: **Formation of Super-Earths** by *Hilke E Schlichting*
astro-ph/1802.03121: **Gravitational instability of a dust layer composed of porous silicate dust aggregates in a protoplanetary disk** by *Misako Tatsuuma, Shugo Michikoshi, Eiichiro Kokubo*
astro-ph/1802.03328: **Dust modeling of the combined ALMA and SPHERE datasets of HD163296. Is HD163296 really a Meeus group II disk?** by *G. A. Muro-Arena et al.*
astro-ph/1802.03356: **Tidal evolution of the Moon from a high-obliquity, high-angular-momentum Earth** by *Matija uk et al.*
astro-ph/1802.03859: **The GAPS Programme with HARPS-N at TNG XVII: Measurement of the Rossiter-McLaughlin effect of the transiting planetary systems HAT-P-3, HAT-P-12, HAT-P-22, WASP-39 and WASP-60** by *L. Mancini et al.*
astro-ph/1802.03995: **First scattered light detection of a nearly edge-on transition disk around the T Tauri star RY Lup** by *M. Langlois et al.*
astro-ph/1802.04279: **Dynamical and biological panspermia constraints within multi-planet exosystems** by *Dimitri Veras et al.*
astro-ph/1802.04284: **A Multi-Year Search For Transits Of Proxima Centauri. I: Light Curves Corresponding To Published Ephemerides** by *David L. Blank et al.*
astro-ph/1802.04296: **On the Role of Dissolved Gases in the Atmosphere Retention of Low-Mass Low-Density Planets** by *Yayaati Chachan, David J. Stevenson*
astro-ph/1802.04313: **Debris Disks: Structure, Composition, and Variability** by *A. Meredith Hughes et al.*
astro-ph/1802.04361: **Second-generation dust produced by the formation of giant planets in circumstellar discs** by *D. Turrini et al.*
astro-ph/1802.04415: **Excitation Mechanisms for Jovian Seismic Modes** by *Steve Markham, Dave Stevenson*
astro-ph/1802.04631: **The HARPS search for southern extra-solar planets. XLIII. A compact system of four super-Earth planets orbiting HD 215152** by *J.-B. Delisle et al.*
astro-ph/1802.04772: **The Cosmic Dust Analyzer onboard Cassini: ten years of discoveries** by *Ralf Srama et al.*
astro-ph/1802.05018: **Formation of recurring slope lineae on Mars by rarefied gas-triggered granular flows** by *F. Schmidt et al.*
astro-ph/1802.05034: **Cometary impactors on the TRAPPIST-1 planets can destroy all planetary atmospheres and rebuild secondary atmospheres on planets f, g, h** by *Quentin Kral et al.*
astro-ph/1802.05277: **275 Candidates and 149 Validated Planets Orbiting Bright Stars in K2 Campaigns 0-10** by *Andrew W. Mayo et al.*
astro-ph/1802.05406: **An Analysis of Stochastic Jovian Oscillation Excitation by Moist Convection** by *Ethan Dederick, Jason Jackiewicz, Tristan Guillot*
astro-ph/1802.05434: **Modeling Venus-Like Worlds Through Time** by *M.J. Way, Anthony Del Genio, David S.*

Amundsen

astro-ph/1802.05645: **Exoplanetary atmosphere target selection in the era of comparative planetology** by *J. Morgan et al.*

astro-ph/1802.05736: **Impact of Gas Giant Instabilities on Habitable Planets** by *Sonja Seppeur*

astro-ph/1802.05823: **Single Transits and Eclipses Observed by K2** by *Daryll M. LaCourse, Thomas L. Jacobs*

astro-ph/1802.05893: **A dual origin for water in carbonaceous asteroids revealed by CM chondrites** by *Laurette Piani, Hisayoshi Yurimoto, Laurent Remusat*

astro-ph/1802.06044: **No Giant Planet Pileup Near 1 AU** by *Alexander W. Wise, Sarah E. Dodson-Robinson*

astro-ph/1802.06064: **AD Leonis: Radial velocity signal of stellar rotation or spin-orbit resonance?** by *Mikko Tuomi et al.*

astro-ph/1802.06241: **Sedimentation Efficiency of Condensation Clouds in Substellar Atmospheres** by *Peter Gao, Mark S. Marley, Andrew S. Ackerman*

astro-ph/1802.06620: **Spiral density waves and vertical circulation in protoplanetary discs** by *A. Riols, H. Latter*

astro-ph/1802.06659: **Discovery of a bright microlensing event with planetary features towards the Taurus region: a super Earth planet** by *A.A. Nucita et al.*

astro-ph/1802.06794: **Jupiter Analogues Orbit Stars with an Average Metallicity Close to that of the Sun** by *Lars A. Buchhave et al.*

astro-ph/1802.06795: **UKIRT-2017-BLG-001Lb: A giant planet detected through the dust** by *Y. Shvartzvald et al.*

astro-ph/1802.06805: **exocartographer: A Bayesian Framework for Mapping Exoplanets in Reflected Light** by *Ben Farr et al.*

astro-ph/1802.06855: **Comets in UV** by *Boris Shustov et al.*

astro-ph/1802.06856: **The Habitable Zone of Kepler-16: Impact of Binarity and Climate Models** by *S. Y. Moorman et al.*

astro-ph/1802.06943: **Behavioral Characteristics and CO+CO2 Production Rates of Halley-Type Comets Observed by NEOWISE** by *Joshua D. Rosser et al.*

astro-ph/1802.07036: **The Habitability of our Evolving Galaxy** by *Michael G. Gowanlock, Ian S. Morrison*

astro-ph/1802.07316: **The search for radio emission from exoplanets using LOFAR beam-formed observations: Jupiter as an exoplanet** by *Jake D. Turner et al.*

astro-ph/1802.07723: **Possible Photometric Signatures of Moderately Advanced Civilizations: The Clarke Exobelt** by *Hector Socas-Navarro*

astro-ph/1802.07725: **Increased Heat Transport in Ultra-Hot Jupiter Atmospheres Through H2 Dissociation/Recombination** by *Taylor J. Bell, Nicolas B. Cowan*

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astro-ph/1802.07754: **ALICE Data Release: A revaluation of HST-NICMOS coronagraphic images** by *J. B. Hagan et al.*

astro-ph/1802.08257: **Detection of a Millimeter Flare From Proxima Centauri** by *Meredith A. MacGregor et al.*

astro-ph/1802.08300: **Dimensionality and integrals of motion of the Trappist-1 planetary system** by *Johannes Floss, Hanno Rein, Paul Brumer*

astro-ph/1802.08320: **Eyes on K2-3: A system of three likely sub-Neptunes characterized with HARPS-N and HARPS** by *M. Damasso et al.*

astro-ph/1802.08385: **Chaotic Excitation and Tidal Damping in the GJ 876 System** by *Abhijit Puranam, Konstantin Batygin*

astro-ph/1802.08458: **Experimental study of heterogeneous organic chemistry induced by far ultraviolet light: Implications for growth of organic aerosols by CH3 addition in the atmospheres of Titan and early Earth** by *Peng K. Hong et al.*

astro-ph/1802.08693: **Populations of planets in multiple star systems** by *David V. Martin* astro-ph/1802.08697: **Photochemistry, mixing and transport in Jupiter's stratosphere constrained by Cassini** by *Vincent Hue et al.*

astro-ph/1802.08865: **EPIC247098361b: a transiting warm Saturn on an eccentric P=11.2 days orbit around a V=9.9 star** by *Rafael Brahm et al.*

astro-ph/1802.08868: **Stability Limits of Circumbinary Planets: Is There a Pile-up in the Kepler CBPs?** by *Billy Quarles et al.*

astro-ph/1802.08904: **Finding Long Lost Lexell's Comet: The Fate of the First Discovered Near-Earth Object** by *Quan-Zhi Ye, Paul A. Wiegert, Man-To Hui*

astro-ph/1802.08945: **Validation and Initial Characterization of the Long Period Planet Kepler-1654 b** by *C. A. Beichman et al.*

astro-ph/1802.09006: **Valuing life detection missions** by *Edwin S. Kite, Eric Gaidos, Tullis C. Onstott*

astro-ph/1802.09023: **OGLE-2017-BLG-1130: The First Binary Gravitational Microlens Detected From Spitzer Only** by *Tianshu Wang et al.*

astro-ph/1802.09126: **Forming Different Planetary Architectures . I . Formation Efficiency of Hot Jupiters from High-eccentricity Mechanisms** by *Ying Wang et al.*

astro-ph/1802.09222: **Observable signatures of wind–driven chemistry with a fully consistent three dimensional radiative hydrodynamics model of HD 209458b** by *Benjamin Drummond et al.*

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astro-ph/1802.09367: **The Detectability of Earth's Biosignatures Across Time** by *Enric Palle*

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astro-ph/1802.09451: **Is the spiral morphology of the Elias 2-27 circumstellar disc due to gravitational instability?** by *Cassandra Hall et al.*

astro-ph/1802.09508: **Image Reconstruction Techniques in Neutron and Gamma-Ray Spectroscopy: Improving Lunar Prospector Data** by *Jack T. Wilson et al.*

astro-ph/1802.09526: **About 30% of Sun-like Stars Have Kepler-like Planetary Systems: A Study of their Intrinsic Architecture** by *Wei Zhu et al.*

astro-ph/1802.09529: **Identifying Young Kepler Planet Host Stars from Keck-HIRES Spectra of Lithium** by *Travis A. Berger, Andrew W. Howard, Ann Merchant Boesgaard*

astro-ph/1802.09557: **Mass determination of the 1:3:5 near-resonant planets transiting GJ 9827 (K2-135)** by *J. Prieto-Arranz et al.*

astro-ph/1802.09602: **Exoplanet Classification and Yield Estimates for Direct Imaging Missions** by *Ravi kumar Kopparapu et al.*

astro-ph/1802.09721: **Medium-resolution integral-field spectroscopy for high-contrast exoplanet imaging: Molecule maps of the β Pictoris system with SINFONI** by *H.J. Hoeijmakers et al.*

astro-ph/1802.10010: **Near-IR transmission spectrum of HAT-P-32 b using HST/WFC3** by *M. Damiano et al.*

astro-ph/1802.10067: **OGLE-2017-BLG-0373Lb: A Jovian Mass-Ratio Planet Exposes A New Accidental Microlensing Degeneracy** by *J. Skowron et al.*

astro-ph/1802.10126: **Orbit and Dynamical Mass of the Late-T Dwarf Gl 758 B** by *Brendan P. Bowler et al.*

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astro-ph/1802.01539: **ATLAS Probe: Breakthrough Science of Galaxy Evolution, Cosmology, Milky Way, and the Solar System** by *Yun Wang et al.*

astro-ph/1802.02576: **The Chemical Homogeneity of Sun-like Stars in the Solar Neighborhood** by *Megan Bedell et al.*

astro-ph/1802.02946: **The CARMENES search for exoplanets around M dwarfs - Photospheric parameters of target stars from high-resolution spectroscopy** by *V.M. Passegger et al.*

astro-ph/1802.02967: **The chemical connection between 67P/C-G and IRAS 16293-2422** by *Maria Nikolayevna Drozdovskaya et al.*

astro-ph/1802.02977: **The ALMA-PILS survey: The sulphur connection between protostars and comets: IRAS 16293-2422 B and 67P/Churyumov-Gerasimenko** by *Maria N. Drozdovskaya et al.*

astro-ph/1802.03213: **MULTIGRAIN: A smoothed particle hydrodynamics algorithm for multiple small dust grains and gas** by *Mark A. Hutchison, Daniel J. Price, Guillaume Laibe*

astro-ph/1802.04360: **The consequences of a nearby supernova on the early Solar System** by *Simon Portegies Zwart et al.*

astro-ph/1802.05269: **Empirical Tidal Dissipation in Exoplanet Hosts From Tidal Spin-Up** by *Kaloyan Penev et al.*

astro-ph/1802.05452: **A dynamical approach in exploring the unknown mass in the Solar system using pulsar timing arrays** by *Y. J. Guo, K. J. Lee, R. N. Caballero*

astro-ph/1802.05665: **Solar-System Studies with Pulsar Timing Arrays** by *R. N. Caballero*

astro-ph/1802.05716: **Secular dynamics of hierarchical multiple systems composed of nested binaries, with an arbitrary number of bodies and arbitrary hierarchical structure. II. External perturbations: flybys and supernovae** by *Adrian S. Hamers*

astro-ph/1802.07120: **The extremely truncated circumstellar disc of V410 X-ray 1: a precursor to TRAPPIST-1?** by *D. M. Boneberg et al.*

astro-ph/1802.08260: **Signature of Planetary Mergers on Stellar Spins** by *Ahmed Qureshi, Smadar Naoz, Evgenya Shkolnik*

astro-ph/1802.08695: **Short-lived radioisotopes in meteorites from Galactic-scale correlated star formation** by *Yusuke Fujimoto, Mark R. Krumholz, Shogo Tachibana*

astro-ph/1802.09276: **A Serendipitous MWA Search for Narrow-band and Broad-band Low Frequency Radio Transmissions from 1I/2017 U1 'Oumuamua** by *S.J. Tingay et al.*

astro-ph/1802.09280: **Probing midplane CO abundance and gas temperature with DCO+ in the protoplanetary disk around HD 169142** by *M.T. Carney et al.*

astro-ph/1802.09306: **Detailed chemical compositions of the wide binary HD 80606/80607: revised stellar properties and constraints on planet formation** by *F. Liu et al.*

astro-ph/1802.09563: **OGLE-2016-BLG-1266: A Probable Brown-Dwarf/Planet Binary at the Deuterium Fusion Limit** by *M. D. Albrow et al.*

astro-ph/1802.09812: **Aldebaran b's temperate past uncovered in planet search data** by *Will M. Farr et al.*

astro-ph/1802.04154: **Laboratory Space Physics: Investigating the Physics of Space Plasmas in the Laboratory** by *Gregory G. Howes* astro-ph/1802.05503: **Energy cascade rate in isothermal compressible magnetohydrodynamic turbulence** by *Nahuel Andrés et al.*

astro-ph/1802.07582: **Axisymmetric inertial modes in a spherical shell at low Ekman numbers** by *Michel Rieutord, Lorenzo Valdettaro*

astro-ph/1802.07748: **On the Rates of Steady, Quasi-steady and Impulsive Magnetic Reconnection** by *H. Che*

astro-ph/1802.08284: **Dynamo induced by time-periodic force** by *Xing Wei*

astro-ph/1802.08285: **Sites That Can Produce Left-Handed Amino Acids in the Supernova Neutrino Amino Acid Processing Model** by *Richard N. Boyd et al.*