ExoPlanet News
An Electronic Newsletter

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1 Editorial

Welcome to edition 101 of the ExoPlanet News!

We are very happy to distribute and share with you the first edition that was compiled and edited in Switzerland. As you can see, the look-and-feel of the Newsletter is basically unchanged and also content-wise we are glad to have a great mixture of exciting new science papers, meeting announcements and job ads. Thanks to all of you who contributed to this edition by sending abstracts!

As already announced in our email last week, the editorial team can be reached under exoplanetnews@nccr-planets.ch. Please send your abstract to this new address. Also, we finished migrating the homepage of the Exoplanet Newsletter, which can now be found under http://nccr-planets.ch/exoplanetnews/. The templates for abstract submission as well as all previous editions of the Newletter can be found there.

Please let us know any feedback / suggestions you might have concerning style and content of both the Newsletter and the webpage. We already have a few ideas for updates and new developments that we plan to implement step-by-step, but input from the community is very welcome.

With best regards

Sascha P. Quanz
Yann Alibert
Adrien Leleu
Christoph Mordasini

2 Abstracts of refereed papers

Planetesimal formation starts at the snow line

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Astronomy & Astrophysics, in press (arXiv:1710.00009)

The formation stage of planetesimals represents a major gap in our understanding of the planet formation process. Late-stage planet accretion models typically make arbitrary assumptions about planetesimal and pebble distribution, while dust evolution models predict that planetesimal formation is only possible at some orbital distances. We tested the importance of the water snow line in triggering the formation of the first planetesimals during the gas-rich phase of a protoplanetary disk, when cores of giant planets have to form.

We connected prescriptions for gas disk evolution, dust growth and fragmentation, water ice evaporation and recondensation, the transport of both solids and water vapor, and planetesimal formation via streaming instability into a single one-dimensional model for protoplanetary disk evolution. We found that processes taking place around the snow line facilitate planetesimal formation in two ways. First, because the sticking properties between wet and dry aggregates change, a ”traffic jam” inside of the snow line slows the fall of solids onto the star. Second, ice evaporation and outward diffusion of water followed by its recondensation increases the abundance of icy pebbles that trigger planetesimal formation via streaming instability just outside of the snow line.

Planetesimal formation is hindered by growth barriers and radial drift and thus requires particular conditions to take place. The snow line is a favorable location where planetesimal formation is possible for a wide range of conditions, but not in every protoplanetary disk model, however. This process is particularly promoted in large cool disks with low intrinsic turbulence and an increased initial dust-to-gas ratio.

Download/Website: `https://arxiv.org/abs/1710.00009`

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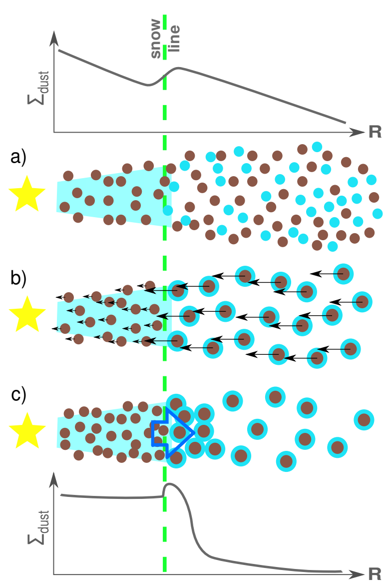

Figure 1: Drążkowska & Alibert: This sketch explains the processes that facilitate the formation of the snow line pile-up of pebbles: a) In the initial condition, ice increases the solids density outside of the snow line; b) coagulation is more efficient for aggregates that incorporate water ice. Thus, solids grow to larger sizes and drift faster outside of the snow line. The quick drift results in an efficient delivery of the embedded refractory material, which does not drift rapidly, causing a ”traffic jam” and increasing the dust concentration in the inner disk; c) the outward diffusion and recondensation of water vapor locally enhances the abundance of solids just outside of the snow line, contributing to the pile-up of icy pebbles, which become sufficient to trigger planetesimal formation via streaming instability.

Accreting Transition Discs with large cavities created by X-ray photoevaporation in C and O depleted discs

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Monthly Notices of the Royal Astronomical Society Letters, in press (2017arXiv171003816E)

Circumstellar discs with large dust depleted cavities and vigorous accretion onto the central star are often considered signposts for (multiple) giant planet formation. In this letter we show that X-ray photoevaporation operating in discs with modest (factors 3-10) gas-phase depletion of Carbon and Oxygen at large radii (> 15 AU) yield the inner radius and accretion rates for most of the observed discs, without the need to invoke giant planet formation. We present one-dimensional viscous evolution models of discs affected by X-ray photoevaporation assuming moderate gas-phase depletion of Carbon and Oxygen, well within the range reported by recent observations. Our models use a simplified prescription for scaling the X-ray photoevaporation rates and profiles at different metallicity, and our quantitative result depends on this scaling. While more rigorous hydrodynamical modelling of mass loss profiles at low metallicities is required to constrain the observational parameter space that can be explained by our models, the general conclusion that metal sequestering at large radii may be responsible for the observed diversity of transition discs is shown to be robust. Gap opening by giant planet formation may still be responsible for a number of observed transition discs with large cavities and very high accretion rate.

Download/Website: `https://arxiv.org/pdf/1710.03816.pdf`

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X-ray photoevaporation's limited success in the formation of planetesimals by the streaming instability

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Monthly Notices of the Royal Astronomical Society, published (2017MNRAS.472.4117E)

The streaming instability is often invoked as solution to the fragmentation and drift barriers in planetesimal formation, catalyzing the aggregation of dust on kyr timescales to grow km-sized cores. However there remains a lack of consensus on the physical mechanism(s) responsible for initiating it. One potential avenue is disc photoevaporation, wherein the preferential removal of relatively dust-free gas increases the disc metallicity. Late in the disc lifetime, photoevaporation dominates viscous accretion, creating a gradient in the depleted gas surface density near the location of the gap. This induces a local pressure maximum that collects drifting dust particles, which may then become susceptible to the streaming instability. Using a one-dimensional viscous evolution model of a disc subject to internal X-ray photoevaporation, we explore the efficacy of this process to build planetestimals. Over a range of parameters we find that the amount of dust mass converted into planetesimals is often $< 1 M_{Earth}$ and at most a few M_{Earth} spread across tens of AU. We conclude that photoevaporation may at best be relevant for the formation of debris discs, rather than a common mechanism for the formation of planetary cores. Our results are in contrast to a recent, similar investigation that considered an FUV-driven photoevaporation model and reported the formation of tens of M_{Earth} at large (> 100 AU) disc radii. The discrepancies are primarily a consequence of the different photoevaporation profiles assumed. Until observations more tightly constrain photoevaporation models, the relevance of this process to the formation of planets remains uncertain.

Download/Website: `https://arxiv.org/pdf/1709.00361.pdf`

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The nature of the giant exomoon candidate Kepler-1625 b-i

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Astronomy & Astrophysics, submitted (arXiv:1710.06209)

The recent announcement of a Neptune-sized exomoon candidate around the transiting Jupiter-sized object Kepler-1625 b could indicate the presence of a hitherto unknown kind of gas giant moons, if confirmed. Three transits of Kepler-1625 b have been observed, allowing estimates of the radii of both objects. Mass estimates, however, have not been backed up by radial velocity measurements of the host star. Here we investigate possible mass regimes of the transiting system that could produce the observed signatures and study them in the context of moon formation in the solar system, i.e. via impacts, capture, or in-situ accretion. The radius of Kepler-1625 b suggests it could be anything from a gas giant planet somewhat more massive than Saturn (0.4 $M_{\rm Jup}$) to a brown dwarf (BD) (up to 75 $M_{\rm Jup}$) or even a very-low-mass star (VLMS) (112 $M_{\rm Jup} \approx 0.11\,M_\odot$). The proposed companion would certainly have a planetary mass. Possible extreme scenarios range from a highly inflated Earth-mass gas satellite to an atmosphere-free water-rock companion of about 180 $M_\oplus$. Furthermore, the planet-moon dynamics during the transits suggest a total system mass of $17.6^{+19.2}_{-12.6}\,M_{\rm Jup}$. A Neptune-mass exomoon around a giant planet or low-mass BD would not be compatible with the common mass scaling relation of the solar system moons about gas giants. The case of a mini-Neptune around a high-mass BD or a VLMS, however, would be located in a similar region of the satellite-to-host mass ratio diagram as Proxima b, the TRAPPIST-1 system, and LHS 1140 b. The capture of a Neptune-mass object around a 10 $M_{\rm Jup}$ planet during a close binary encounter is possible in principle. The ejected object, however, would have had to be a super-Earth object, raising further questions of how such a system could have formed. In summary, this exomoon candidate is barely compatible with established moon formation theories. If it can be validated as orbiting a super-Jovian planet, then it would pose an exquisite riddle for formation theorists to solve.

Download/Website: `https://arxiv.org/abs/1710.06209`

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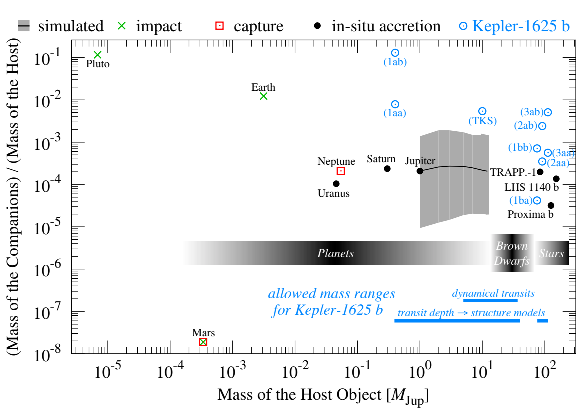

Figure 2: Heller: Mass ratios of companions and hosts, i.e. moons around planets and planets around VLMSs. Host masses are shown along the abscissa, mass ratios on the ordinate. Solar system planets with moons are shown with different symbols to indicate the respective formation scenarios of their satellites (see legend above the panel). Three VLMSs with roughly Earth-mass planets (TRAPPIST-1, LHS 1140, Proxima Centauri) are plotted as examples of formation via accretion in the stellar regime. The solid black line expanding from Jupiter's position signifies simulations of moon formation in the super-Jovian regime, with the grey shaded region referring to uncertainties in the parameterization of the accretion disk. Possible scenarios for the planetary, BD, and VLMS nature of Kepler-1625 b are indicated with blue open circles. The plausible mass ranges for Kepler-1625 b is shown with a blue line in the lower right corner.

Magma oceans and enhanced volcanism on TRAPPIST-1 planets due to induction heating

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Nature Astronomy, in press (arXiv:1710.08761)

Low-mass M stars are plentiful in the Universe and often host small, rocky planets detectable with current instrumentation. These stars host magnetic fields, some of which have been observed to exceed a few hundred gauss. Recently, seven small planets have been discovered orbiting the ultra-cool M dwarf TRAPPIST-1, which has an observed magnetic field of 600 G. We suggest electromagnetic induction heating as an energy source inside these planets. If the stellar rotation and magnetic dipole axes are inclined with respect to each other, induction heating can melt the upper mantle and enormously increase volcanic activity, sometimes producing a magma ocean below the planetary surface. We show that induction heating leads the four innermost TRAPPIST-1 planets, one of which is in the habitable zone, either to evolve towards a molten mantle planet, or to experience increased outgassing and volcanic activity, while the three outermost planets remain mostly unaffected.

Download/Website: `https://www.nature.com/articles/s41550-017-0284-0`

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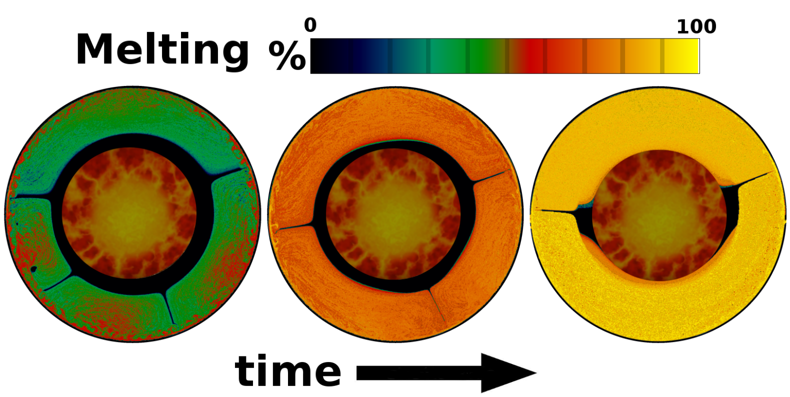

Figure 3: Kislyakova et al.: Development of a magma ocean through induction heating in the mantle of exoplanet Trappist-1c (Copyright: IWF/ÖAW).

The long egress of GJ 436b's giant exosphere

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Astronomy & Astrophysics, published (2017A&A...605L...7L)

The M dwarf GJ 436 hosts a transiting warm Neptune known to experience atmospheric escape. Previous observations revealed the presence of a giant hydrogen exosphere transiting the star for more than 5 h, and absorbing up to 56% of the flux in the blue wing of the stellar Lyman-α line of neutral hydrogen (HI Lyα). The unexpected size of this comet-like exosphere prevented observing the full transit of its tail. In this Letter, we present new Lyα observations of GJ 436 obtained with the *Space Telescope Imaging Spectrograph* (STIS) instrument onboard the *Hubble Space Telescope*. The stability of the Lyα line over six years allowed us to combine these new observations with archival data sets, substantially expanding the coverage of the exospheric transit. Hydrogen atoms in the tail of the exospheric cloud keep occulting the star for 10–25 h after the transit of the planet, remarkably confirming a previous prediction based on 3D numerical simulations with the `EVaporating Exoplanet` code (EVE). This result strengthens the interpretation that the exosphere of GJ 436b is shaped by both radiative braking and charge exchanges with the stellar wind. We further report flux decreases of $15 \pm 2\%$ and $47 \pm 10\%$ in the red wing of the Lyα line and in the line of ionised silicon (SiIII). Despite some temporal variability possibly linked with stellar activity, these two signals occur during the exospheric transit and could be of planetary origin. Follow-up observations will be required to assess the possibility that the redshifted Lyα and SiIII absorption signatures arise from interactions between the exospheric flow and the magnetic field of the star.

Download/Website: `https://arxiv.org/abs/1709.04686`

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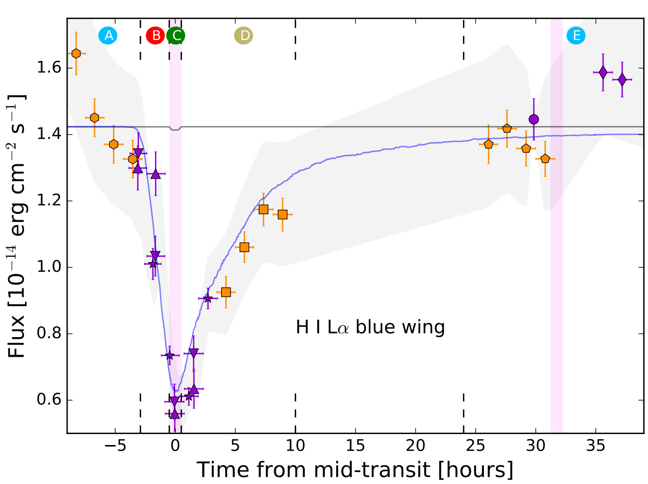

Figure 4: Lavie et al.: Light curves of GJ 436 integrated over the Lyα blue wing. New visits described in this work are in orange while previous visits are plotted in violet. Symbols are in Table A1. Different temporal regions are defined: (A) before transit, (B) ingress, (C) optical transit, (D) egress, and (E) after transit. The grey-filled region represents the 1σ confidence interval of the systematic correction method using the Gaussian processes. The vertical magenta zones show the optical primary and secondary transit. The optical transit light curve of GJ 436b is indicated with the black line. Horizontal dashed lines indicate the out-of-transit flux (blue - regions A and E) and the in-transit flux (pink - regions B, C, and D)

Investigation of the inner structures around HD169142 with VLT/SPHERE

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MNRAS, published (doi:10.1093/mnras/stx2318)

We present observations of the Herbig Ae star HD169142 with VLT/SPHERE instruments InfraRed Dual-band Imager and Spectrograph (IRDIS) ($K1K2$ and $H2H3$ bands) and the Integral Field Spectrograph (IFS) (Y, J and H bands). We detect several bright blobs at ∼180 mas separation from the star, and a faint arc-like structure in the IFS data. Our reference differential imaging (RDI) data analysis also finds a bright ring at the same separation. We show, using a simulation based on polarized light data, that these blobs are actually part of the ring at 180 mas. These results demonstrate that the earlier detections of blobs in the H and K_S bands at these separations in Biller et al. as potential planet/substellar companions are actually tracing a bright ring with a Keplerian motion. Moreover, we detect in the images an additional bright structure at ∼93 mas separation and position angle of 355°, at a location very close to previous detections. It appears point-like in the YJ and K bands but is more extended in the H band. We also marginally detect an inner ring in the RDI data at ∼100 mas. Follow-up observations are necessary to confirm the detection and the nature of this source and structure.

Download/Website: `https://academic.oup.com/mnras/article/473/2/1774/4587911`

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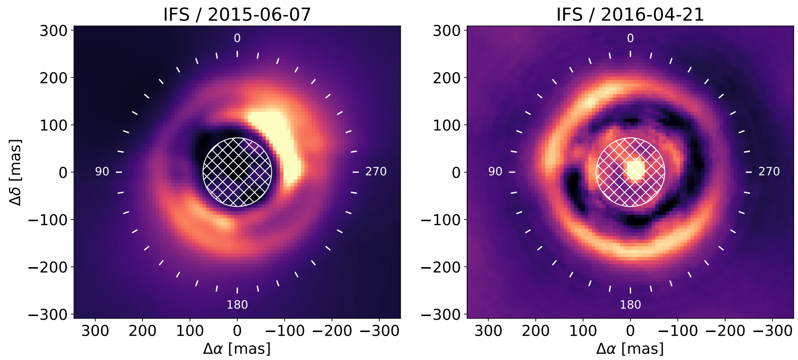

Figure 5: Ligi et al.: Result of the RDI analysis of the IFS data from June 2015 and April 2016. We clearly see an inhomogeneous bright ring at ~180 mas, and possibly another inner ring, although its position close to the star makes it less trustable. North is up and East is left.

Characterization of exoplanets from their formation III: The statistics of planetary luminosities

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Astronomy & Astrophysics, in press (arXiv:1708.00868)

This paper continues a series in which we predict the main observable characteristics of exoplanets based on their formation. In Paper I we described our global planet formation and evolution model. In Paper II we studied the planetary mass–radius relationship. Here we present an extensive study of the statistics of planetary luminosities during both formation and evolution. Our results can be compared with individual directly imaged (proto)planets as well as statistical results from surveys. We calculated three synthetic planet populations assuming different efficiencies of the accretional heating by gas and planetesimals. We describe the temporal evolution of the planetary mass-luminosity relation. We study the shock and internal luminosity during formation. We predict a statistical version of the post-formation mass versus entropy "tuning fork" diagram. We find high nominal post-formation luminosities for hot and cold gas accretion. Individual formation histories can still lead to a factor of a few spread in the post-formation luminosity at a given mass. However, if the gas and planetesimal accretional heating is unknown, the post-formation luminosity may exhibit a spread of as much as 2–3 orders of magnitude at a fixed mass covering cold, warm, and hot states. As a key result we predict a flat log-luminosity distribution for giant planets, and a steep increase towards lower luminosities due to the higher occurrence rate of low-mass planets. Future surveys may detect this upturn. During formation an estimate of the planet mass may be possible for cold gas accretion if the gas accretion rate can be estimated. Due to the "core-mass effect" planets that underwent cold gas accretion can still have high post-formation entropies. Once the number of directly imaged exoplanets with known ages and luminosities increases, the observed distributions may be compared with our predictions.

Download/Website: `http://adsabs.harvard.edu/abs/2017arXiv170800868M`

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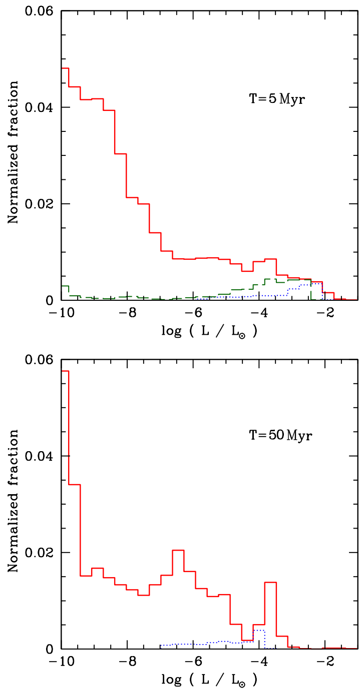

Figure 6: Mordasini et al.: Distribution of planetary luminosities in the cold-nominal population at 5 and 50 Myr after the beginning of formation (*left and right panel respectively*). The red solid line shows the total luminosity L, which includes the internal luminosity $L_{\rm int}$ and (for planets undergoing accretion) the shock luminosity $L_{\rm shock}$. The green long-dashed line shows $L_{\rm shock}$ separately, while the blue dotted line shows the deuterium burning luminosity $L_{\rm D}$ alone. The upturn at low luminosities reflects the transition from giant planets to the much more numerous lower-mass planets. At higher $\log L/L_{\odot}$, the distribution is to first order flat, with important implications for the expected yield of direct imaging searches. It can be understood from the $1/M$ scaling of the mass function from 0.3 to 10 $M_{\rm J}$ (both here and in observations) combined with the well-known $L \propto M^2$ relation at fixed time. The clear peak at $\log L/L_{\odot} \approx -3.8$ at 50 Myr reflects the deuterium burning, which slows down the cooling of planets with masses here between about 12 and 25 $M_{\rm J}$. For reference, Jupiter has a current luminosity $\log L_{\rm J}/L_{\odot} = -9.06$.

Hubble PanCET: An isothermal day-side atmosphere for the bloated gas-giant HAT-P-32Ab

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accepted for publication in Monthly Notices of the Royal Astronomical Society, arXiv:submit/2056753)

We present a thermal emission spectrum of the bloated hot Jupiter HAT-P-32Ab from a single eclipse observation made in spatial scan mode with the Wide Field Camera 3 (WFC3) aboard the Hubble Space Telescope (*HST*). The

spectrum covers the wavelength regime from 1.123 to 1.644 μm which is binned into 14 eclipse depths measured to an averaged precision of 104 parts-per million. The spectrum is unaffected by a dilution from the close M-dwarf companion HAT-P-32B, which was fully resolved. We complemented our spectrum with literature results and performed a comparative forward and retrieval analysis with the 1D radiative-convective `ATMO` model. Assuming solar abundance of the planet atmosphere, we find that the measured spectrum can best be explained by the spectrum of a blackbody isothermal atmosphere with $T_p = 1995 \pm 17$ K, but can equally-well be described by a spectrum with modest thermal inversion. The retrieved spectrum suggests emission from VO at the WFC3 wavelengths and no evidence of the 1.4 μm water feature. The emission models with temperature profiles decreasing with height are rejected at a high confidence. An isothermal or inverted spectrum can imply a clear atmosphere with an absorber, a dusty cloud deck or a combination of both. We find that the planet can have continuum of values for the albedo and recirculation, ranging from high albedo and poor recirculation to low albedo and efficient recirculation. Optical spectroscopy of the planet's day-side or thermal emission phase curves can potentially resolve the current albedo with recirculation degeneracy.

Download/Website: *http://www.astro.ex.ac.uk/people/nkn202/Nikolay_Homepage/Welcome.html*

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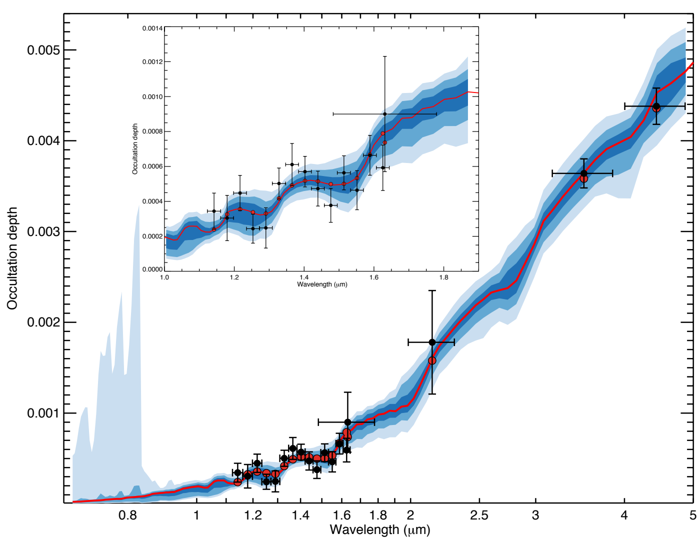

Figure 7: Nikolov et al.: Emission spectrum of HAT-P-32Ab (dots with 1σ uncertainties) with model emission spectra (lines) binned to the resolution of the data (red dots), obtained during the retrieval analysis. The continuous red line shows the best-fit retrieved model along with 1-, 2- and 3-σ confidence levels. A zoom around the WFC3 is shown in the top left corner.

A spectral approach to transit timing variations

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ApJS, in press (arXive-1710.10930)

The high planetary multiplicity revealed by *Kepler* implies that Transit Time Variations (TTVs) are intrinsically common. The usual procedure for detecting these TTVs is biased to long-period, deep transit planets whereas most transiting planets have short periods and shallow transits. Here we introduce the Spectral Approach to TTVs technique that allows expanding the TTVs catalog towards lower TTV amplitude, shorter orbital period, and shallower transit depth. In the Spectral Approach we assume that a sinusoidal TTV exists in the data and then calculate the

improvement to χ^2 this model allows over that of linear ephemeris model. This enables detection of TTVs even in cases where the transits are too shallow so individual transits cannot be timed. The Spectral Approach is more sensitive due to the reduced number of free parameters in its model. Using the Spectral Approach, we: (a) detect 131 new periodic TTVs in *Kepler* data (an increase of $\sim 2/3$ over a previous TTV catalog); (b) Constrain the TTV periods of 34 long-period TTVs and reduce amplitude errors of known TTVs; (c) Identify cases of multi-periodic TTVs, for which absolute planetary mass determination may be possible. We further extend our analysis by using perturbation theory assuming small TTV amplitude at the detection stage, which greatly speeds up our detection (to a level of few seconds per star). Our extended TTVs sample shows no deficit of short period or low amplitude transits, in contrast to previous surveys in which the detection schemes were significantly biased against such systems.

Download/Website:

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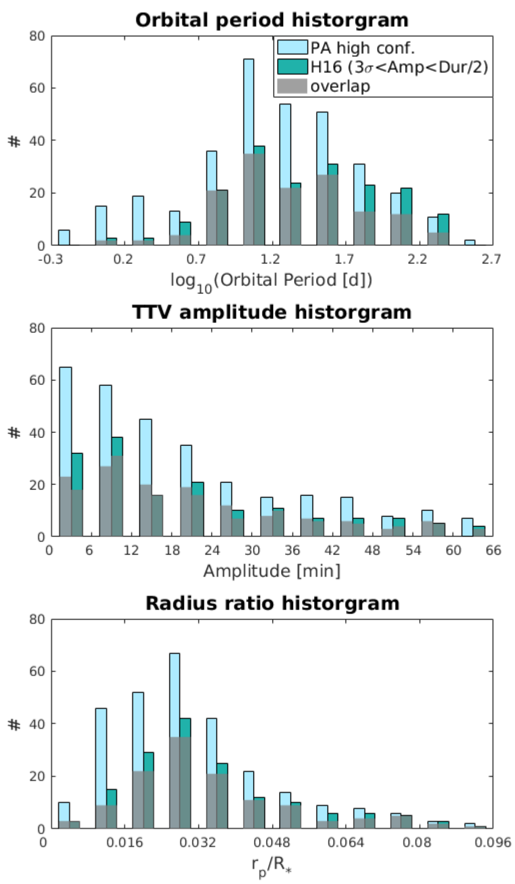

Figure 8: Ofir et al.: High Confidence TTVs detected by the perturbative approximation (PA, light blue), the TTVs detected by H16 that have amplitude significant to more than 3σ and are not High Amplitude (cyan) and the overlap between the two sets (darker shade), focusing on the lower range of all parameters. **Upper panel:** Orbital periods distribution: PA overdetects TTVs on short-period planets. **Middle panel:** TTV amplitude distribution: PA overdetects TTVs of lower amplitude. Note that identical objects may have somewhat differently determined TTV amplitudes in each catalog, hence the slightly different overlap regions in similar bins. **Lower panel:** relative planets size distribution: PA overdetects TTVs on planets with smaller relative ratii. Note that since H16 does not quote this parameter, all r_p/R_* were taken from the MAST database for both sets of KOIs.

Constraining planet structure and composition from stellar chemistry: trends in different stellar populations

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Astronomy & Astrophysics, in press

The chemical composition of stars that have orbiting planets provides important clues about the frequency, architecture, and composition of exoplanet systems. We explore the possibility that stars from different galactic populations that have different intrinsic abundance ratios may produce planets with a different overall composition. We compiled abundances for Fe, O, C, Mg, and Si in a large sample of solar neighbourhood stars that belong to different galactic populations. We then used a simple stoichiometric model to predict the expected iron-to-silicate mass fraction and water mass fraction of the planet building blocks, as well as the summed mass percentage of all heavy elements in the disc. Assuming that overall the chemical composition of the planet building blocks will be reflected in the composition of the formed planets, we show that according to our model, discs around stars from different galactic populations, as well as around stars from different regions in the Galaxy, are expected to form rocky planets with significantly different iron-to-silicate mass fractions. The available water mass fraction also changes significantly from one galactic population to another. The results may be used to set constraints for models of planet formation and chemical composition. Furthermore, the results may have impact on our understanding of the frequency of planets in the Galaxy, as well as on the existence of conditions for habitability.

Download/Website: `http://xxx.lanl.gov/abs/1711.00777`

Contact: `nuno.santos@astro.up.pt`

Expelled grains from an unseen parent body around AU Microscopii

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Astronomy & Astrophysics, in press (arXiv:1707.09761)

Recent observations of the edge-on debris disk of AU Mic have revealed asymmetric, fast outward-moving arch-like structures above the disk midplane. Although asymmetries are frequent in debris disks, no model can readily explain the characteristics of these features.
We present a model aiming to reproduce the dynamics of these structures, more specifically their high projected speeds and their apparent positions. We test the hypothesis of dust emitted by a point source and then expelled from the system by the strong stellar wind of this young M-type star. In this model we make the assumption that the dust grains follow the same dynamics as the structures, i.e., they are not local density enhancements.
We perform numerical simulations of test particle trajectories to explore the available parameter space, in particular the radial location R_0 of the dust producing parent body and the size of the dust grains as parameterized by the value of β (ratio of stellar wind and radiation pressure forces over gravitation). We consider the cases of a static and of an orbiting parent body.
We find that for all considered scenarios (static or moving parent body), there is always a set of (R_0,β) parameters

able to fit the observed features. The common characteristics of these solutions is that they all require a high value of β, of around 6. This means that the star is probably very active, and the grains composing the structures are submicronic in order for observable grains to reach such high β values. We find that the location of the hypothetical parent body is closer in than the planetesimal belt, around 8 ± 2 au (orbiting case) or 28 ± 7 au (static case). A nearly periodic process of dust emission appears, of 2 years in the orbiting scenarios and 7 years in the static case.
We show that the scenario of sequential dust releases by an unseen point-source parent body is able to explain the radial behavior of the observed structures. We predict the evolution of the structures to help future observations discriminate between the different parent body configurations that have been considered. In the orbiting parent body scenario, we expect new structures to appear on the northwest side of the disk in the coming years.

Download/Website: `https://doi.org/10.1051/0004-6361/201731061`

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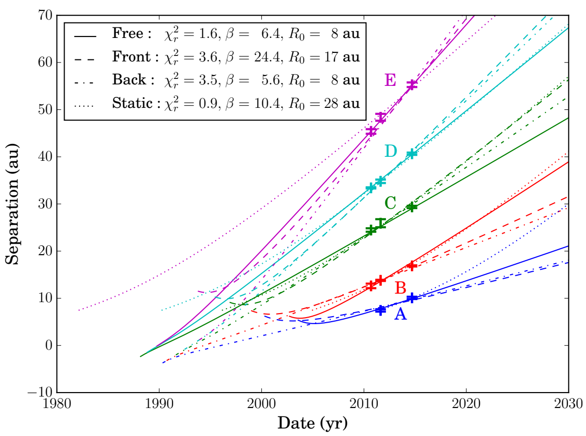

Figure 9: Sezestre et al.: Separation of the structures from the star over the time. The points with error bars are the observations and the lines are the differents models developped in the paper. No scenario can be currently discarded, but noticeable differences will appear in the coming years.

The search for radio emission from exoplanets using LOFAR low-frequency beam-formed observations: Data pipeline and preliminary results for the 55 Cnc system

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Planetary Radio Emissions VIII, in press (refereed proceedings), ADS-Bibcode: 2017arXiv171004997T, arXiv:1710.04997

Detection of radio emission from exoplanets can provide information on the star-planet system that is difficult to study otherwise, such as the planetary magnetic field, magnetosphere, rotation period, interior structure, atmospheric dynamics and escape, and any star-planet interactions. Such a detection in the radio domain would open up a whole new field in the study of exoplanets. However, currently there are no confirmed detections of an exoplanet at radio frequencies. In this study, we search for non-thermal radio emission from the 55 Cnc system which has 5 known exoplanets. According to theoretical predictions 55 Cnc e, the innermost planet, is among the best targets for this search. We observed for 18 hours with the Low-Frequency Array (LOFAR) Low Band Antenna in the frequency range 26-73 MHz with full-polarization and covered 85% of the orbital phase of 55 Cnc e. During the observations

four digital beams within the station beam were recorded simultaneously on 55 Cnc, nearby "empty" sky, a bright radio source, and a pulsar. A pipeline was created to automatically find and mask radio frequency interference, calibrate the time-frequency response of the telescope, and to search for bursty planetary radio signals in our data. Extensive tests and verifications were carried out on the pipeline. Analysis of the first 4 hours of these observations do not contain any exoplanet signal from 55 Cnc but we can confirm that our setup is adequate to detect faint astrophysical signals. We find a 3-sigma upper limit for 55 Cnc of 230 mJy using the pulsar to estimate the sensitivity of the observations and 2.6 Jy using the time-series difference between the target and sky beam. The full data set is still under-going analysis. In the near future we will apply our observational technique and pipeline to the most promising exoplanet candidates for which LOFAR observations have already been obtained.

Download/Website: `https://arxiv.org/abs/1710.04997`

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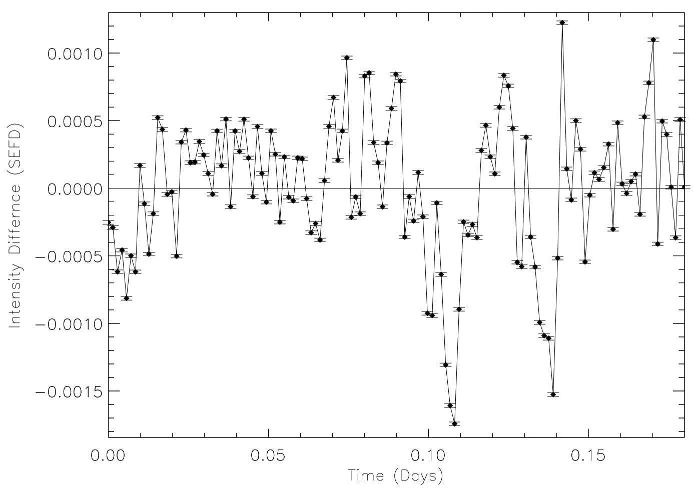

Figure 10: Turner et al.: Time-series of the intensity difference of the 55 Cnc and sky beam. No bursty radio emission from 55 Cnc is seen. We find a 3-sigma upper limit for the 55 Cnc system of 2.6 Jy using the standard deviation of this time series. This upper limit is a factor of ∼50 greater than the theoretical sensitivity. A factor of 5 is likely due to imperfect coherent addition of station signals and possibly residual RFI. The additional factor of ∼11 is attributed for a large part to large-scale differential variations of the ionosphere between the two beams. This result suggests that the ionosphere substantially varies at an angular scale of a few degrees.

VUV-absorption cross section of carbon dioxide from 150 to 800 K and applications to warm exoplanetary atmospheres

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Astronomy & Astrophysics, in press (arXiv:1709.08415)

Context Most exoplanets detected so far have atmospheric temperatures significantly higher than 300 K. Often close to their star, they receive an intense UV photons flux that triggers important photodissociation processes. The temperature dependency of vacuum ultraviolet (VUV) absorption cross sections are poorly known, leading to an undefined uncertainty in atmospheric models. Similarly, data measured at low temperatures similar to those of the

high atmosphere of Mars, Venus, and Titan are often lacking.
Aims Our aim is to quantify the temperature dependency of the VUV absorption cross sections of important molecules in planetary atmospheres. We want to provide high-resolution data at temperatures prevailing in these media, and a simple parameterisation of the absorption in order to simplify its use in photochemical models. This study focuses on carbon dioxide (CO_2).
Methods We performed experimental measurements of CO_2 absorption cross sections with synchrotron radiation for the wavelength range (115–200 nm). For longer wavelengths (195–230 nm), we used a deuterium lamp and a 1.5 m Jobin-Yvon spectrometer. We used these data in our one-dimensional (1D) thermo-photochemical model in order to study their impact on the predicted atmospheric compositions.
Results The VUV absorption cross section of CO_2 increases with the temperature. The absorption we measured at 150 K seems to be close to the absorption of CO_2 in the fundamental ground state. The absorption cross section can be separated into two parts: a continuum and a fine structure superimposed on the continuum. The variation in the continuum of absorption can be represented by the sum of three Gaussian functions. Using data at high temperature in thermo-photochemical models significantly modifies the abundance and the photodissociation rates of many species in addition to CO_2, such as methane and ammonia. These deviations have an impact on synthetic transmission spectra, leading to variations of up to 5 ppm.
Conclusion We present a full set of high-resolution ($\Delta\lambda$ = 0.03 nm) absorption cross sections of CO_2 from 115 to 230 nm for temperatures ranging from 150 to 800 K. A parameterisation allows us to calculate the continuum of absorption in this wavelength range. Extrapolation at higher temperature has not been validated experimentally and therefore should be used with caution. Similar studies on other major species are necessary to improve our understanding of planetary atmospheres.

Download/Website: `https://doi.org/10.1051/0004-6361/201731295`

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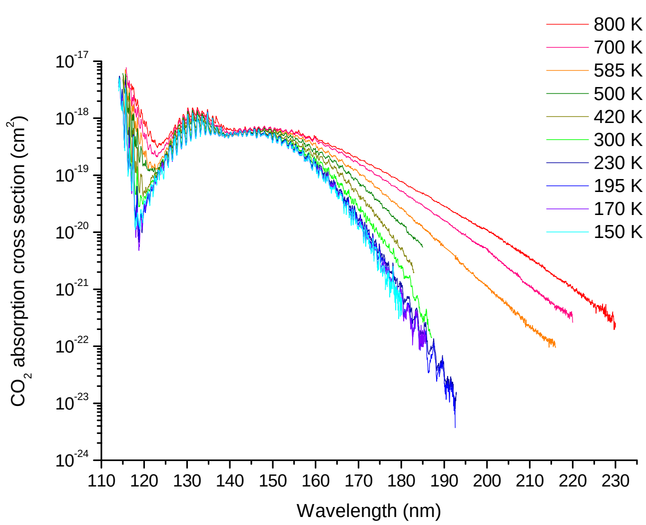

Figure 11: Venot et al.: Absorption cross section of CO_2 (cm^2) at temperatures between 150 and 800 K.

Collisional Fragmentation Is Not a Barrier to Close-in Planet Formation

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The Astronomical Journal, published (2017AJ....154..175W)

Collisional fragmentation is shown to not be a barrier to rocky planet formation at small distances from the host star. Simple analytic arguments demonstrate that rocky planet formation via collisions of homogeneous gravity-dominated bodies is possible down to distances of order the Roche radius (r_{Roche}). Extensive N-body simulations with initial bodies ∼1700 km and greater that include plausible models for fragmentation and merging of gravity-dominated bodies confirm this conclusion and demonstrate that rocky planet formation is possible down to ∼1.1 r_{Roche}. At smaller distances, tidal effects cause collisions to be too fragmenting to allow mass build-up to a final, dynamically stable planetary system. We argue that even differentiated bodies can accumulate to form planets at distances that are not much larger than r_{Roche}.

Download/Website: `https://ui.adsabs.harvard.edu/#abs/2017AJ....154..175W/abstract`

Contact: `joshuajw@astro.princeton.edu`

CO emission tracing a warp or radial flow within ≲100 au in the HD 100546 protoplanetary disk

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Astronomy & Astrophysics, in press (arXiv:1710.00703)

We present spatially resolved Atacama Large Millimeter/submillimeter Array (ALMA) images of ^{12}CO J = 3 − 2 emission from the protoplanetary disk around the Herbig Ae star, HD 100546. We expand upon earlier analyses of this data and model the spatially-resolved kinematic structure of the CO emission. Assuming a velocity profile which prescribes a flat or flared emitting surface in Keplerian rotation, we uncover significant residuals with a peak of $\approx 7\delta v$, where $\delta v = 0.21\ km\ s^{-1}$ is the width of a single spectral resolution element. The shape and extent of the residuals reveal the possible presence of a severely warped and twisted inner disk extending to at most 100 au. Adapting the model to include a misaligned inner gas disk with (i) an inclination almost edge-on to the line of sight, and (ii) a position angle almost orthogonal to that of the outer disk reduces the residuals to $< 3\delta v$. However, these findings are contrasted by recent VLT/SPHERE, MagAO/GPI, and VLTI/PIONIER observations of HD 100546 that show no evidence of a severely misaligned inner *dust* disk down to spatial scales of ∼ 1 au. An alternative explanation for the observed kinematics are fast radial flows mediated by (proto)planets. Inclusion of a radial velocity component at close to free-fall speeds and inwards of ≈ 50 au results in residuals of $\approx 4\delta v$. Hence, the model including a radial velocity component only does not reproduce the data as well as that including a twisted and misaligned inner gas disk. Molecular emission data at a higher spatial resolution (of order 10 au) are required to further constrain the kinematics within ≲ 100 au. HD 100546 joins several other protoplanetary disks for which high spectral resolution molecular emission shows that the gas velocity structure cannot be described by a purely Keplerian velocity profile with a universal inclination and position angle. Regardless of the process, the most likely cause is the presence of an unseen planetary companion.

Download/Website: `https://arxiv.org/abs/1710.00703`

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

3 Jobs and Positions

Postdoctoral position in exoplanets and/or stellar activity research at Queen's University Belfast

Katja Poppenhaeger, Chris Watson & Neale Gibson
Queen's University Belfast

Belfast, UK, BT7 1NN

A funded postdoctoral research position in the area of exoplanets and/or stellar activity is available in the Astrophysics Research Centre at Queen's University Belfast. This is a 3 year post, for which funding is available immediately and we intend to fill by 1st April 2018. Applicants must hold, or about to be awarded, a PhD in astrophysics, and have experience relevant to observational or theoretical studies of exoplanets and/or stellar activity.

The successful candidate will be expected to work on collaborative programmes with the established exoplanet & stellar activity research team at Queen's, consisting of Dr. Chris Watson, Dr. Katja Poppenhaeger, and Dr. Neale Gibson. The successful candidate will be expected to conduct original research in one or more of the following areas: exoplanet atmosphere observations and/or theory; stellar activity and/or rotation in relation to exoplanet discovery or characterisation.

The successful candidate will be hired on Grade AC2 (£32,548 - £38,833 per annum depending on experience). Women and members of underrepresented groups are particularly encouraged to apply. Please refer to the information package available at the application website for further details about the post.

Please send a CV, research plan, and cover letter.

Download/Website: `http://www.qub.ac.uk/sites/QUBJobVacancies/ResearchJobs/`

Contact: `n.gibson@qub.ac.uk, k.poppenhaeger@qub.ac.uk, c.a.watson@qub.ac.uk`

PhD position at TU Berlin: Characterization of exoplanet atmospheres

A. García Muñoz, Technische Universität Berlin, Germany

Deadline for application, 12/11/2017

We are offering a PhD position on the characterization of exoplanet atmospheres at the Technical University of Berlin. The position is funded for 3 years by Germany's DFG under the recently-approved SPP program Exploring the diversity of exoplanets (www-astro.physik.tu-berlin.de/exoplanet-diversity/). Specific information on the position can be found through the link below.

Download/Website: `https://tub.stellenticket.de/de/offers/41335/`

Contact: `garciamunoz@astro.physik.tu-berlin.de; http://antoniogarciamunoz.wordpress.com/`

2 post-doctoral positions at ETH Zurich

Sascha P. Quanz
Institute for Particle Physics and Astrophysics, ETH Zurich

Zurich, Switzerland, Summer / Fall 2018

The Star and Planet Formation Research Group at ETH Zurich (http://www.schmid-group.ethz.ch) invites applications for 2 new post-doctoral positions to work with Dr. Sascha P. Quanz on extra-solar planets (position 1) and Prof. Hans Martin Schmid on circumstellar disks (position 2). Research in our group covers several areas including the direct detection and characterization of extra-solar planets, the structure and evolution of circumstellar disks, and the formation of planets in those disks. We are also involved in the development of new instruments for the VLT (ERIS) and also for the ELT (METIS).
Position 1 will mainly be in support of currently ongoing large exoplanet imaging surveys at the VLT (and related follow-up observations). For position 2 we are primarily seeking an expert in (sub-)mm observations (e.g., with ALMA) to support a new initiative aiming at the combination of (spatially resolved) circumstellar disk data from various instruments (i.e., from the optical to the (sub-)mm).
Salary and duration of the appointment will be commensurate with experience. Starting salary begins at around CHF 85,000, with an initial appointment of 2+1 years (year 3 depending on performance and available funding). Successful applicants will have the opportunity to work with students at all levels. Switzerland is a member of ESO and ESA, and the successful applicants will have full access to their facilities. Our Institute for Particle and Astrophysics maintains access to a range of high performance computing options, including stand-alone machines, large clusters, and the resources of the Swiss National Supercomputing Center (CSCS). Interested applicants will also be welcome to explore research opportunities in our Astronomical Instrumentation Laboratory. Both positions are embedded in the Swiss National Centre for Competence in Research (NCCR) PlanetS Project, an interdisciplinary and inter-institutional research program focussed on the origin, evolution, and characterization of planets inside and outside the Solar System. More information can be found here http://nccr-planets.ch.
Applications should consist of a cover letter (stating which position one is interested in), a CV and brief descriptions of past/proposed research (combined length not to exceed 6 pages). A separate publication list should be attached. Materials should be sent electronically in a single pdf file. This file, as well as three letters of reference (sent directly by the referees), should be sent to eth-astro-star-planet@phys.ethz.ch. Review of applications will begin December 1, 2017, and will continue until the position is filled. Any questions can also be addressed to the email address above.
The ETH Zurich will provide benefits for maternity leave, retirement, and accident insurance. For more information please see https://www.ethz.ch/en/the-eth-zurich/working-teaching-and-research.html

Download/Website: `http://www.schmid-group.ethz.ch/the-group/open-positions.html`

Download/Website: `http://nccr-planets.ch/blog/2017/10/30/2-post-doctoral-positions-eth-zurich/`

Contact: `eth-astro-star-planet@phys.ethz.ch`

SAC postdoctoral fellowship in the field of exoplanet and/or stellar astrophysics research

Jørgen Christensen-Dalsgaard

Aarhus, Denmark, summer 2018

The Department of Physics and Astronomy and the Stellar Astrophysics Centre (SAC) at Aarhus University invite applications for postdoctoral fellowships in the fields of extrasolar planets and/or stellar astrophysics. SAC is a world leader in the fields of asteroseismology, stellar structure and evolution, planetary systems, and galactic archaeology. The centre plays a prominent role in the use of data from the NASA Kepler/K2 and TESS missions, the ground-based SONG network, and large-scale stellar surveys such as APOGEE and Gaia. The goal of the centre is to ensure that full use is made of these possibilities to perform coherent studies of exoplanetary systems, their host stars, structure and evolution of stars, and composite stellar populations in the context of Galaxy formation. SAC was recently extended and as part of this extension, we now have annual calls for 3 year SAC fellowships.

Areas of work for the successful applicant may include:

- Detection of planetary systems as well as detailed studies of exoplanet system architecture, and exoplanet atmospheres.
- Detailed studies of stellar structure and evolution, including convection, mixing processes, and rotation using asteroseismic data.
- Characterisation of stellar populations for studies of the formation and evolution of the Milky Way.
- Instrumentation and data analysis, e.g. the SONG network for determining high-precision radial-velocities of stars and the Sun.

The SAC fellow is encouraged to pursue an independent research programme in connection with the research carried out by other members of SAC. SAC has established direct collaborations with research groups from the University of Birmingham, Leiden Observatory, MIT, MPA, MPIA, NASA Ames Space Center, and the University of Sydney, among others. There is an extensive exchange with our collaborators, with shorter and longer visits to, and by, them. The many visitors and the postdoc and PhD programme at SAC provide a vibrant working environment and we invite the successful applicant to be a part of this environment. SAC also has access to telescopes through the Danish membership of the European Southern Observatory (ESO) and the Nordic Optical Telescope (NOT).

Candidates for the postdoctoral fellowship must have a PhD in astronomy or physics, or equivalent, by the date of their appointment. The starting date is expected to be in summer 2018, but the exact date is negotiable. The duration of the position is three years.

Applicants must submit a cover letter, a CV, a list of publications, and a statement explaining their past and current research (maximum 3 pages) as well as a research proposal (maximum 3 pages). Furthermore, applicants should arrange for three letters of recommendation to be send before the deadline to shrjeani@jobsys.au.dk or uploaded as part of the application. Questions regarding this job offer are encouraged and should be directed to the centre leader of SAC, Jørgen Christensen-Dalsgaard (jcd@phys.au.dk).

Deadline: 01.12.2017

Download/Website: `https://jobregister.aas.org/ad/e3d9faf5`

Contact: `jcd@phys.au.dk`

4 Conference announcements

The 2nd Rencontres du Vietnam on Exoplanetary Science

Guillaume Hébrard
[1] Institut d'Astrophysique de Paris, UMR7095 CNRS, Université Pierre & Marie Curie, 98bis boulevard Arago, 75014 Paris, France

Quy Nhon, Vietnam, February 25 - March 2, 2018

Exoplanetology has experienced extraordinary developments, and is now a mature and particularly dynamic research field of astrophysics. The various detection techniques such as radial velocities, transit, microlensing, direct imaging, timing or astrometry, provided thousands of planet detections. The characterization of these systems has also improved, and now reaches the details of the orbital parameters or the physics and chemistry of planetary atmospheres. The 2nd Rencontres du Vietnam on Exoplanetary Science will offer over five days a fruitful meeting of observers involved in various ground- and space-based programs with modelers and theoreticians. The conference will raise news observations and new models to improve our comprehension and knowledges of exoplanets, their formation, their evolution. It will expand exchanges, interactions, and collaborations between scientists from different parts of the world. The conference will consist of plenary sessions for oral presentations, including review talks and contributions on more specialized topics, as well as posters. The conference will be preceded by a two-day international school (Feb. 24-25) for students involved in those topics, with instructors and teachers chosen among the conference participants.

Important dates:
- **December 1st, 2017**: deadline for abstract submissions and financial support applications.
- February 1st, 2018: deadline for registrations.

Confirmed invited reviews:
- Eiji Akiyama (Japan): *Observations of protoplanetary discs: pathway to planet formation*.
- Shigeru Ida (Japan): *Dependence of predicted exoplanet distributions on theoretical models*.
- Anne-Marie Lagrange (France): *Results from directly imaged planets*.
- Nuno Santos (Portugal): *Stellar physics for planets detection and characterization*.
- Rodrigo F. Daz (Argentina): *Statistical methods and tools for analysis of exoplanet datasets*.
- Claire Moutou (USA): *High precision radial velocities in optical and infrared*.
- Andrew Howard (USA): *Statistics on planetary populations: observational properties and biases*.
- Leslie Rogers (USA): *Internal structures from terrestrial to giant planets: observations and models*.
- Amaury Triaud (UK): *TRAPPIST-1 and other planetary systems around low-mass stars*.
- Jeremy Leconte (France): *Habitable planets: properties, environment, and detections*.
- Jack Lissauer (USA): *Multi-planetary systems: Observations and models of dynamical interactions*.
- David Ehrenreich (Switzerland): *Observations and theories for atmospheres of transiting planets*.
- René Doyon (Canada): *Future instruments for exoplanets detections and studies*.

Download/Website: `http://rencontresduvietnam.org/conferences/2018/exoplanetary_science`

Contact: `hebrard@iap.fr`

Water during planet formation and evolution

Joanna Drazkowska, Tim Lichtenberg, Caroline Dorn, Julia Venturini

Zurich, Switzerland, 12-16 February, 2018

The workshop will focus on processes governing the delivery of water to planetary bodies in solar and exoplanetary systems, during their formation and long-term evolution. The respective roles of water (ice) inheritance from the interstellar medium, condensation in the protoplanetary nebula and processing and delivery during accretion will be discussed. We will further consider in detail the implications of the late-stage impact phase and long-term consequences for the remarkable diversity of processes affecting the water budget during the evolution of a planetary body. The goal of the workshop is to critically assess the interplay of theory and observations/experiments on the effects of water on planets and establish new research directions.

Download/Website: `https://waterzurich.github.io`

Contact: `waterzurich@gmail.com`

Call for Abstracts: Merging giant-star asteroseismology with the fate of extrasolar planetary systems — An RAS Specialist Discussion Meeting

Tiago Campante[1], *Dimitri Veras*[2]
[1] University of Porto, Portugal
[2] University of Warwick, UK

London, UK, 9 March 2018

Abstract submission is now open! We kindly invite you to visit the meeting's website and submit an abstract for an oral contribution or poster. The deadline for abstract submission is February 1st 2018.

Rationale: Although stars spend a significant fraction of their lives on the main sequence, they undergo their most dramatic physical changes during post-main-sequence evolution. The fates of their planetary systems may be similarly violent. Hence, the simultaneous study of both planets and stars along the latter's subgiant and giant-branch phases is capable of providing constraints on tidal, mass-loss and radiative processes, as well as valuable insight into the processes of planet formation and evolution. During this 1-day Royal Astronomical Society (RAS) Specialist Discussion Meeting — taking place in London on March 9th 2018 — we will review our current understanding of the evolution and fate of extrasolar planetary systems during the subgiant and giant stellar evolutionary phases. By bringing together members of the exoplanets and asteroseismology communities, we expect to establish a roadmap for the effective and synergetic exploitation of the wealth of space-based data that will soon become available to both communities. In this regard, we highlight the upcoming NASA TESS and ESA CHEOPS satellites, both with launches scheduled for 2018, thus stressing the timeliness of this meeting.

Download/Website: `https://sites.google.com/view/ras-evolsystems`

Contact: `tiago.campante@astro.up.pt`

5 Announcements

Book: Habitability of the Universe Before Earth

Gordon, R. & A.A. Sharov

Gordon, R. & A.A. Sharov, Ed. (2017). Habitability of the Universe Before Earth [Volume 1 in the series: Astrobiology: Exploring Life on Earth and Beyond, series editors: Pabulo Henrique Rampelott, Joseph Seckbach & Richard Gordon]. Amsterdam, Elsevier B.V., In press.

Download/Website: https://www.elsevier.com/books/habitability-of-the-universe-before-earth/rampelotto/978-0-12-811940-2

Contact: DickGordonCan@gmail.com

6 As seen on astro-ph

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

October 2017

astro-ph/1710.00006: **Hot Jupiters driven by high-eccentricity migration in globular clusters** by *Adrian S. Hamers, Scott Tremaine*

astro-ph/1710.00009: **Planetesimal formation starts at the snow line** by *Joanna Drazkowska, Yann Alibert*

astro-ph/1710.00026: **Precise Masses in the WASP-47 System** by *Andrew Vanderburg et al.*

astro-ph/1710.00076: **The discovery and mass measurement of a new ultra-short-period planet: EPIC 228732031b** by *Fei Dai et al.*

astro-ph/1710.00345: **Redox evolution via gravitational differentiation on low mass planets: implications for biosignatures, water loss and habitability** by *R. Wordsworth, L. Schaefer, R. Fischer*

astro-ph/1710.00434: **Origin of the RNA World: The Fate of Nucleobases in Warm Little Ponds** by *Ben K. D. Pearce et al.*

astro-ph/1710.00435: **Demarcating circulation regimes of synchronously rotating terrestrial planets near the inner edge of the habitable zone** by *Jacob Haqq-Misra et al.*

astro-ph/1710.00523: **RoboTAP - target priorities for robotic microlensing observations** by *M. Hundertmark et al.*

astro-ph/1710.00606: **Is There a Temperature Limit in Planet Formation at 1000 K?** by *Tunahan Demirci et al.*

astro-ph/1710.00703: **CO emission tracing a warp or radial flow within $\leq$ 100 au in the HD 100546 protoplanetary disk** by *Catherine Walsh et al.*

astro-ph/1710.00766: **Galactic perturbations on the population of wide binary stars with exoplanets** by *J. A. Correa-Otto, R. A. Gil-Hutton*

astro-ph/1710.00858: **Tidal Dissipation in WASP-12** by *Nevin N. Weinberg et al.*

astro-ph/1710.00924: **OGLE-2016-BLG-0613LABb: A Microlensing Planet in a Binary System** by *C. Han et al.*

astro-ph/1710.01019: **Centrifugal Experiments with Simulated Regolith:Effects of Gravity, Size Distribution, and Particle Shape on Porosity** by *Tomomi Omura et al.*

astro-ph/1710.01138: **The TROY project: Searching for co-orbital bodies to known planets. I. Project goals and first results from archival radial velocity** by *J. Lillo-Box et al.*

astro-ph/1710.01174: **Chondrules in enstatite chondrites** by *Emmanuel Jacquet, Laurette Piani, Michael K. Weisberg*

astro-ph/1710.01219: **Methanol formation in TW Hya and future prospects for detecting larger complex molecules in disks with ALMA** by *Catherine Walsh*

astro-ph/1710.01240: **Effects of global gas flows on type I migration** by *Masahiro Ogihara et al.*

astro-ph/1710.01304: **Disk Accretion Driven by Spiral Shocks** by *Lev Arzamasskiy et al.*

astro-ph/1710.01405: **Effects of eccentricity on climates and habitability of terrestrial exoplanets around M dwarfs** by *Yuwei Wang et al.*

astro-ph/1710.01524: **On the cavity of a debris disc carved by a giant planet** by *Zs. Regaly et al.*

astro-ph/1710.01595: **The CARMENES search for exoplanets around M dwarfs. First visual-channel radial-velocity measurements and orbital parameter updates of seven M-dwarf planetary systems** by *T. Trifonov et al.*

astro-ph/1710.01714: **A search for photometric variability in the young T3.5 planetary-mass companion GU Psc b** by *Marie-Eve Naud et al.*

astro-ph/1710.01715: **PSYM-WIDE: a survey for large-separation planetary-mass companions to late spectral type members of young moving groups** by *Marie-Eve Naud et al.*

astro-ph/1710.01737: **Exterior Companions to Hot Jupiters Orbiting Cool Stars are Coplanar** by *Juliette C. Becker et al.*

astro-ph/1710.01770: **Formation, stratification, and mixing of the cores of Earth and Venus** by *Seth A. Jacobson et al.*
astro-ph/1710.01804: **Dynamical Evolution Induced by Planet Nine** by *Konstantin Batygin, Alessandro Morbidelli*
astro-ph/1710.01997: **Random sampling technique for ultra-fast computations of molecular opacities for exoplanet atmospheres** by *Michiel Min*
astro-ph/1710.02074: **Micrometer-Sized Water Ice Particles for Planetary Science Experiments: Influence of Surface Structure on Collisional Properties** by *Sabrina Grtner et al.*
astro-ph/1710.02427: **Aerosol Constraints on the Atmosphere of the Hot Saturn-mass planet WASP-49b** by *Patricio Cubillos et al.*
astro-ph/1710.02519: **Dynamics of resonances and equilibria of Low Earth Objects** by *Alessandra Celletti, Ctlin GaleÅ*
astro-ph/1710.02532: **Variable dynamics in the inner disk of HD 135344B revealed with multi-epoch scattered light imaging** by *Tomas Stolker et al.*
astro-ph/1710.02542: **Diffusive Tidal Evolution for Migrating hot Jupiters** by *Yanqin Wu*
astro-ph/1710.02556: **An Algorithm to Compress Line-transition Data for Radiative-transfer Calculations** by *Patricio Cubillos*
astro-ph/1710.02604: **Optically Thin Core Accretion: How Planets Get Their Gas in Nearly Gas-Free Disks** by *Eve J. Lee, Eugene Chiang, Jason W. Ferguson*
astro-ph/1710.02638: **Near Mean-motion Resonances in the Systems Observed by Kepler: Affected by Mass Accretion and Type I Migration** by *Su Wang, Jianghui Ji*
astro-ph/1710.02795: **Three years of SPHERE: the latest view of the morphology and evolution of protoplanetary discs** by *Antonio Garufi et al.*
astro-ph/1710.02993: **Gas mass tracers in protoplanetary disks: CO is still the best** by *Tamara Molyarova et al.*
astro-ph/1710.03019: **Dynamical models to explain observations with SPHERE in planetary systems with double debris belts** by *C. Lazzoni et al.*
astro-ph/1710.03134: **Steamworlds: atmospheric structure and critical mass of planets accreting icy pebbles** by *John Chambers*
astro-ph/1710.03153: **The Architecture of the GW Ori Young Triple Star System and Its Disk: Dynamical Masses, Mutual Inclinations, and Recurrent Eclipses** by *Ian Czekala et al.*
astro-ph/1710.03239: **Planetary Systems around Low-mass Stars Unveiled by K2** by *Teruyuki Hirano et al.*
astro-ph/1710.03245: **SPH calculations of Mars-scale collisions: the role of the Equation of State, material rheologies, and numerical effects** by *Alexandre Emsenhuber, Martin Jutzi, Willy Benz*
astro-ph/1710.03250: **Coupling SPH and thermochemical models of planets: Methodology and example of a Mars-sized body** by *Gregor J. Golabek et al.*
astro-ph/1710.03273: **Fitting Formulae and Constraints for the Existence of S-type and P-type Habitable Zones** by *Zhaopeng Wang, Manfred Cuntz*
astro-ph/1710.03324: **Dust concentration and emission in protoplanetary disks vortices** by *Anibal Sierra, Susana Lizano, Pierre Barge*
astro-ph/1710.03336: **Ammonia in Jupiter's troposphere from high-resolution 5-μ m spectroscopy** by *Rohini S. Giles et al.*
astro-ph/1710.03342: **A Case for an Atmosphere on Super-Earth 55 Cancri e** by *Isabel Angelo, Renyu Hu*
astro-ph/1710.03556: **Linking the Climate and Thermal Phase Curve of 55 Cancri e** by *Mark Hammond, Raymond Pierrehumbert*
astro-ph/1710.03560: **Observing exoplanets from the planet Earth: how our revolution around the Sun affects the detection of 1-year periods** by *Federico Borin et al.*
astro-ph/1710.03657: **The Effects of Protostellar Disk Turbulence on CO Emission Lines: A Comparison Study of Disks with Constant CO Abundance vs. Chemically Evolving Disks** by *Mo Yu et al.*
astro-ph/1710.03669: **Transfer, loss and physical processing of water in hit-and-run collisions of planetary**

embryos by *C. Burger et al.*

astro-ph/1710.03809: **The Effect of Jupiter's Formation on the Distribution of Refractory Elements and Inclusions in Meteorites** by *Steven J. Desch, Anusha Kalyaan, Conel M. O'D. Alexander*

astro-ph/1710.03816: **Accreting Transition Discs with large cavities created by X-ray photoevaporation in C and O depleted discs** by *Barbara Ercolano et al.*

astro-ph/1710.03826: **Evaporation of Low-Mass Planet Atmospheres: Multidimensional Hydrodynamics with Consistent Thermochemistry** by *Lile Wang, Fei Dai*

astro-ph/1710.03902: **The disturbing function for asteroids with arbitrary inclinations** by *Fathi Namouni, Maria Helena Moreira Morais*

astro-ph/1710.03969: **A complete study of the precision of the concentric MacLaurin spheroid method to calculate Jupiter's gravitational moments** by *Florian Debras, Gilles Chabrier*

astro-ph/1710.03976: **A Review of Exoplanetary Biosignatures** by *John Lee Grenfell*

astro-ph/1710.04185: **A Direct Imaging Survey of Spitzer detected debris disks: Occurrence of giant planets in dusty systems** by *Tiffany Meshkat et al.*

astro-ph/1710.04194: **The Science Case for an Extended Spitzer Mission** by *Jennifer C. Yee et al.*

astro-ph/1710.04418: **Inferring giant planets from ALMA mm continuum and line observations in (transition) disks** by *Stefano Facchini et al.*

astro-ph/1710.04530: **Constraints on Obliquities of Kepler Planet-Hosting Stars** by *Joshua N. Winn et al.*

astro-ph/1710.04617: **Planetary formation and water delivery in the habitable zone around solar-type stars in different dynamical environments** by *Patricio Salvador Zain et al.*

astro-ph/1710.04707: **A search for transit timing variations and orbital decay in WASP-46b** by *R. Petrucci et al.*

astro-ph/1710.04946: **Optical properties of potential condensates in exoplanetary atmospheres** by *Daniel Kitzmann, Kevin Heng*

astro-ph/1710.04997: **The search for radio emission from exoplanets using LOFAR low-frequency beam-formed observations: Data pipeline and preliminary results for the 55 Cnc system** by *Jake D. Turner et al.*

astro-ph/1710.05142: **On the Origin of Banded Structure in Dusty Protoplanetary Discs: HL Tau and TW Hya** by *Aaron C. Boley*

astro-ph/1710.05176: **Exoplanet phase curves at large phase angles. Diagnostics for extended hazy atmospheres** by *A. Garca Muoz, J. Cabrera*

astro-ph/1710.05178: **Checking the Compatibility of the Cold Kuiper Belt with a Planetary Instability Migration Model** by *Rodney Gomes et al.*

astro-ph/1710.05240: **Double-diffusive erosion of the core of Jupiter** by *R. Moll et al.*

astro-ph/1710.05276: **High-Resolution Spectroscopic Detection of TiO and Stratosphere in the Day-side of WASP-33b** by *Stevanus K. Nugroho et al.*

astro-ph/1710.05398: **An asteroseismic view of the radius valley: stripped cores, not born rocky** by *Vincent Van Eylen et al.*

astro-ph/1710.05605: **Assessing the Interior Structure of Terrestrial Exoplanets with Implications for Habitability** by *Caroline Dorn, Dan J. Bower, Antoine B. Rozel*

astro-ph/1710.05920: **Chaotic quadruple secular evolution and the production of misaligned exomoons and Warm Jupiters in stellar multiples** by *Evgeni Grishin, Dong Lai, Hagai B. Perets*

astro-ph/1710.05929: **Modelling the KIC8462852 light curves: compatibility of the dips and secular dimming with an exocomet interpretation** by *M. C. Wyatt et al.*

astro-ph/1710.06007: **Radiation Hydrodynamical Turbulence In Protoplanetary Disks: Numerical Models and Observational Constraints** by *Mario Flock et al.*

astro-ph/1710.06200: **Composition of Jupiter irregular satellites sheds light on their origin** by *M. Bhatt et al.*

astro-ph/1710.06209: **The nature of the giant exomoon candidate Kepler-1625 b-i** by *Ren Heller*

astro-ph/1710.06321: **The discovery of WASP-151b, WASP-153b, WASP-156b: Insights on giant planet migra-**

tion and the upper boundary of the Neptunian desert by *Olivier. D. S. Demangeon et al.*
astro-ph/1710.06328: **Finding the Needles in the Haystacks: High-Fidelity Models of the Modern and Archean Solar System for Simulating Exoplanet Observations** by *Aki Roberge et al.*
astro-ph/1710.06400: **Direct Measurement of Interparticle Forces of Titan Aerosol Analogs ("Tholin") Using Atomic Force Microscopy** by *Xinting Yu et al.*
astro-ph/1710.06411: **Mapping Vinyl Cyanide and Other Nitriles in Titan's Atmosphere Using ALMA** by *J. C.-Y. Lai et al.*
astro-ph/1710.06433: **Retrieval of Exoplanet Emission Spectra with HyDRA** by *Siddharth Gandhi, Nikku Madhusudhan*
astro-ph/1710.06435: **Breaking mean-motion resonances during Type I planet migration** by *T. O. Hands, R. D. Alexander*
astro-ph/1710.06479: **Detection of sodium in the atmosphere of WASP-69b** by *N. Casasayas-Barris et al.*
astro-ph/1710.06485: **The circumstellar disk HD169142: gas, dust and planets acting in concert?** by *A. Pohl et al.*
astro-ph/1710.06599: **A history of violence: insights into post-accretionary heating in carbonaceous chondrites from volatile element abundances, Zn isotopes, and water contents** by *Brandon Mahan et al.*
astro-ph/1710.06721: **Radioactive heat production of six geologically important nuclides** by *Thomas Ruedas*
astro-ph/1710.06758: **Planetary Candidates Observed by Kepler. VIII. A Fully Automated Catalog With Measured Completeness and Reliability Based on Data Release 25** by *Susan E. Thompson et al.*
astro-ph/1710.07194: **Variability of the Lowest Mass Objects in the AB Doradus Moving Group** by *Johanna M. Vos et al.*
astro-ph/1710.07203: **Three Small Planets Transiting a Hyades Star** by *John H. Livingston et al.*
astro-ph/1710.07222: **Repercussions of thermal atmospheric tides on the rotation of terrestrial planets in the habitable zone** by *Pierre Auclair-Desrotour, Stphane Mathis, Jacques Laskar*
astro-ph/1710.07293: **Know the Planet, Know the Star: Precise Stellar Densities from Kepler Transit Light Curves** by *Emily Sandford, David Kipping*
astro-ph/1710.07303: **Obliquity Variations of Habitable Zone Planets Kepler-62f and Kepler-186f** by *Yutong Shan, Gongjie Li*
astro-ph/1710.07337: **A Six-Planet System Around the Star HD 34445** by *Steven S. Vogt et al.*
astro-ph/1710.07482: **How alien can alien worlds be?** by *V. Adibekyan, P. Figueira, N. C. Santos*
astro-ph/1710.07489: **An Explanation of the Very Low Radio Flux of Young Planet-mass Companions** by *Ya-Lin Wu et al.*
astro-ph/1710.07610: **Dynamically correlated minor bodies in the outer Solar system** by *C. de la Fuente Marcos, R. de la Fuente Marcos*
astro-ph/1710.07642: **Phase curves of WASP-33b and HD 149026b and a New Correlation Between Phase Curve Offset and Irradiation Temperature** by *Michael Zhang et al.*
astro-ph/1710.07687: **Annama H chondrite - mineralogy, physical properties, cosmic ray exposure, and parent body history** by *TomÅ Kohout et al.*
astro-ph/1710.07690: **Tidal dissipation in rotating fluid bodies: the presence of a magnetic field** by *Yufeng Lin, Gordon I. Ogilvie*
astro-ph/1710.07846: **Evidence for the formation of comet 67P/Churyumov-Gerasimenko through gravitational collapse of a bound clump of pebbles** by *Jrgen Blum et al.*
astro-ph/1710.08052: **Obliquity Evolution of the Potentially Habitable Exoplanet Kepler-62f** by *Billy Quarles et al.*
astro-ph/1710.08235: **Toward the analysis of JWST exoplanet spectra: Identifying troublesome model parameters** by *Jean-Loup Baudino et al.*
astro-ph/1710.08295: **Circularizing Planet Nine through dynamical friction with an extended, cold planetesimal belt** by *Linn E.J. Eriksson, Alexander J. Mustill, Anders Johansen*
astro-ph/1710.08365: **Effect of stellar flares on the upper atmospheres of HD 189733b and HD 209458b** by *J.*

M. Chadney et al.
astro-ph/1710.08462: **What confines the rings of Saturn?** by *Radwan Tajeddine et al.*
astro-ph/1710.08761: **Magma oceans and enhanced volcanism on TRAPPIST-1 planets due to induction heating** by *K. G. Kislyakova et al.*
astro-ph/1710.08892: **K2 Looks Towards WASP-28 and WASP-151** by *T. Monik, C. Hellier, D. R. Anderson*
astro-ph/1710.08920: **The evolution of photo-evaporating viscous discs in binaries** by *Giovanni P. Rosotti, Cathie J. Clarke*
astro-ph/1710.09140: **Close-by planets and flares in their host stars** by *A. F. Lanza*
astro-ph/1710.09393: **DZ Cha: a bona fide photoevaporating disc** by *H. Canovas et al.*
astro-ph/1710.09455: **Ninth Planet or Wandering Star?** by *Gilles Couture*
astro-ph/1710.09776: **Constraints on Super-Earths Interiors from Stellar Abundances** by *B. Brugger et al.*
astro-ph/1710.09866: **Aerosols and Methane in the Ice Giant Atmospheres Inferred from Spatially Resolved, Near-Infrared Spectra: I. Uranus, 2001-2007** by *Michael T. Roman, Don Banfield, Peter J. Gierasch*
astro-ph/1710.09870: **Exoplanet Atmosphere Retrieval using Multifractal Analysis of Reflectance Spectra** by *Sahil Agarwal, John S. Wettlaufer*
astro-ph/1710.09974: **OGLE-2016-BLG-1190Lb: First Spitzer Bulge Planet Lies Near the Planet/Brown-Dwarf Boundary** by *Y.-H. Ryu et al.*
astro-ph/1710.09977: **Palomar Optical Spectrum of Hyperbolic Near-Earth Object A/2017 U1** by *Joseph Masiero*
astro-ph/1710.10058: **Layered semi-convection and tides in giant planet interiors** by *Q. Andrew, S. Mathis, A. J. Barker*
astro-ph/1710.10083: **LRG-BEASTS III: Ground-based transmission spectrum of the gas giant orbiting the cool dwarf WASP-80** by *J. Kirk et al.*
astro-ph/1710.10213: **Kepler's Dark Worlds: a Low Albedo for an Ensemble of Neptunian and Terran Exoplanets** by *Tiffany Jansen, David Kipping*
astro-ph/1710.10269: **A library of ATMO forward model transmission spectra for hot Jupiter exoplanets** by *Jayesh M. Goyal et al.*
astro-ph/1710.10541: **A possible dynamically Cold Classical contact binary: (126719) 2002 CC249** by *Audrey Thirouin, Scott S. Sheppard*
astro-ph/1710.10557: **Atmospheric Evolution** by *Colin Goldblatt*
astro-ph/1710.10863: **Planet population synthesis driven by pebble accretion in cluster environments** by *Nelson Ndugu, Bertram Bitsch, Edward Jurua*
astro-ph/1710.10930: **A spectral approach to transit timing variations** by *Aviv Ofir et al.*
astro-ph/1710.11099: **NGTS-1b: A hot Jupiter transiting an M-dwarf** by *Daniel Bayliss et al.*
astro-ph/1710.11100: **The Next Generation Transit Survey (NGTS)** by *Peter J. Wheatley et al.*
astro-ph/1710.11117: **Measuring molecular abundances in comet C/2014 Q2 (Lovejoy) using the APEX telescope** by *M. de Val-Borro et al.*
astro-ph/1710.00193: **A Catalog of Cool Dwarf Targets for the Transiting Exoplanet Survey Satellite** by *Philip S. Muirhead et al.*
astro-ph/1710.00587: **Forward modeling of coronal mass ejection flux ropes in the inner heliosphere with 3DCORE** by *Christian Mstl et al.*
astro-ph/1710.00791: **Estimation of Exoplanetary Planet-to-Star Radius Ratio with Homomorphic Processing** by *Rodrigo Mahu et al.*
astro-ph/1710.01081: **A 1574-day periodicity of transits orbiting KIC 8462852** by *Gary Sacco, Linh Ngo, Julien Modolo*
astro-ph/1710.01460: **Empirical, Accurate Masses and Radii of Single Stars with TESS and Gaia** by *Keivan G. Stassun et al.*
astro-ph/1710.01790: **Towards Space-like Photometric Precision from the Ground with Beam-Shaping Diffusers** by *Gudmundur Stefansson et al.*

astro-ph/1710.02233: **Linear Analysis of the Evolution of Nearly Polar Low Mass Circumbinary Discs** by *Stephen H. Lubow, Rebecca G. Martin*

astro-ph/1710.02640: **Cloudless atmospheres for young low-gravity substellar objects** by *P. Tremblin et al.*

astro-ph/1710.03004: **Insight into atmospheres of extrasolar planets through plasma processes** by *Ch. Helling, I. Vorgul*

astro-ph/1710.03174: **Large-scale dynamos in rapidly rotating plane layer convection** by *P. J. Bushby et al.*

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