ExoPlanet News
An Electronic Newsletter

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1 Editorial

Welcome to edition 116 of the ExoPlanet News!

We are pleased to send you the second ExoPlanet newsletter in 2019 with numerous abstracts of new scientific papers, job ads, conference and school announcements, the monthly updates from the NASA exoplanet archive, and the overview of the new exoplanet-related articles on astro-ph. Thanks a lot to all of you who contributed to this extensive issue of the newsletter!

Looking ahead to edition 117, we are again looking forward to your paper abstract, job ad or meeting announcement. Also special announcements of all kinds are welcome. As always, we would also be happy to receive feedback concerning the newsletter. The Latex template for submitting contributions, as well as all previous editions of ExoPlanet News, can be found on the ExoPlanet News webpage (http://nccr-planets.ch/exoplanetnews/).

The next issue will appear 18 March 2019.

Thanks for all your support and best regards from Switzerland,

Christoph Mordasini
Yann Alibert
Adrien Leleu
Sascha P. Quanz

2 Abstracts of refereed papers

High-resolution confirmation of an extended helium atmosphere around WASP-107b

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Astronomy and Astrophysics, accepted (arXiv:1901.08073)

Probing the evaporation of exoplanet atmospheres is key to understand the formation and evolution of exoplanetary systems. The main tracer of evaporation in the UV is the Lyman-α transition, which can reveal extended exospheres of neutral hydrogen. Recently, the near-infrared (NIR) metastable helium triplet (10833 Å) revealed extended thermospheres in several exoplanets, opening a new window into evaporation. We aim at spectrally resolving the first helium absorption signature detected in the warm Saturn WASP-107b with *HST*/WFC3. We obtained one transit of WASP-107b with the high-resolution spectrograph CARMENES on the 3.5m telescope in Calar Alto. We detect an excess helium absorption signature of 5.54 ± 0.27 % (20σ) in the planet rest frame during the transit. The detection is in agreement with the previous detection done with *HST*/WFC3. The signature shows an excess absorption in the blue part of the lines suggesting that HeI atoms are escaping from the atmosphere of WASP-107b. We interpret the time-series absorption spectra using the 3D EVE code. Our observations can be explained by combining an extended thermosphere filling half the Roche lobe and a large exospheric tail sustained by an escape rate of metastable helium on the order of 10^6 g·s^{-1}. In this scenario, however, the upper atmosphere needs to be subjected to a reduced photoionisation and radiation pressure from the star for the model to match the observations. We confirm the presence of helium in the atmosphere of WASP-107b at high-confidence. The helium feature is detected from space and the ground. The ground-based high-resolution signal brings detailed information about the spatial and dynamical structure of the upper atmosphere, and simulations suggest that the HeI signature of WASP-107b probes both its thermosphere and exosphere establishing this signature as a robust probe of exoplanetary upper atmospheres. Surveys with NIR high-resolution spectrographs (e.g. CARMENES, SPIRou or NIRPS) will deliver a statistical understanding of exoplanet thermospheres and exospheres via the helium triplet.

Download/Website: `https://arxiv.org/abs/1901.08073`

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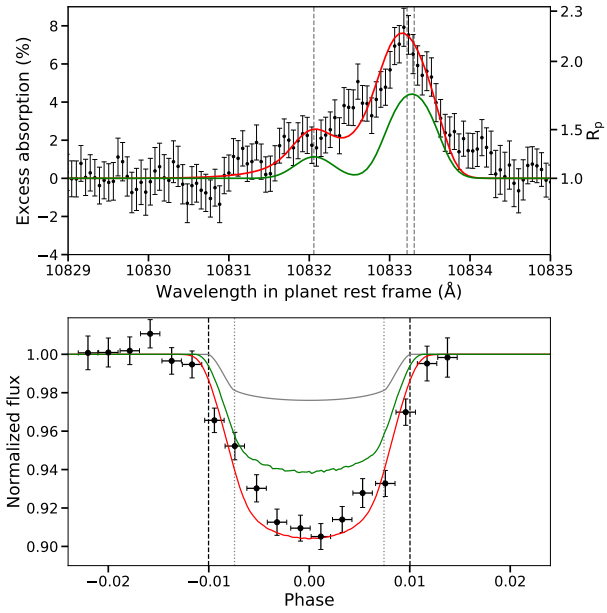

Figure 1: Allart et al.: *Top panel:* Transmission spectrum of WASP-107b in the region of the HeI triplet (black points), in the planet frame. The red line shows the theoretical profile obtained with the EVE code for the model. The green line shows the contribution from the model thermosphere alone. The three vertical grey dashed lines correspond to the helium triplet transition. *Bottom panel:* Helium light curve integrated from 10832.80 to 10833.55 Å from the observations (black), the theoretical atmospheric continuum (grey) obtained with Batman, and the simulated EVE atmosphere (same color code as the top panel). The two vertical black dashed lines correspond to the contact points t_I and t_{IV} while the two vertical grey dotted lines correspond to t_{II} and t_{III}.

Retrieving Temperatures and Abundances of Exoplanet Atmospheres with High-resolution Cross-correlation Spectroscopy

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The Astronomical Journal, published (2018arXiv181101681B)

High-resolution spectroscopy ($R \geq 25,000$) has recently emerged as one of the leading methods for detecting atomic and molecular species in the atmospheres of exoplanets. However, it has so far been lacking a robust method to extract quantitative constraints on the temperature structure and molecular/atomic abundances. In this work, we present a novel Bayesian atmospheric retrieval framework applicable to high-resolution cross-correlation spectroscopy (HRCCS) that relies on the cross-correlation between data and models for extracting the planetary spectral signal. We successfully test the framework on simulated data and show that it can correctly determine Bayesian credibility intervals on atmospheric temperatures and abundances, allowing for a quantitative exploration of the inherent degeneracies. Furthermore, our new framework permits us to trivially combine and explore the synergies between HRCCS and low-resolution spectroscopy (LRS) to maximally leverage the information contained within each. This framework also allows us to quantitatively assess the impact of molecular line opacities at high resolution. We apply the framework to VLT CRIRES K-band spectra of HD 209458 b and HD 189733 b and retrieve abundant carbon monoxide but subsolar abundances for water, which are largely invariant under different model assumptions. This confirms previous analysis of these datasets, but is possibly at odds with detections of H_2O at different wavelengths and spectral resolutions. The framework presented here is the first step toward a true synergy between space observatories and ground-based high-resolution observations.

Download/Website: `https://iopscience.iop.org/article/10.3847/1538-3881/aaffd3/meta`

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ISPY - the NaCo Imaging Survey for Planets around Young stars: A young companion candidate embedded in the R CrA cloud

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Astronomy & Astrophysics, https://arxiv.org/abs/1902.04092

Within the NaCo-ISPY exoplanet imaging program, we aim at detecting and characterizing the population of low-mass companions at wide separations (¡10AU), focusing in particular on young stars either hosting a known protoplanetary disk or a debris disk. R CrA is one of the youngest (1-3 Myr) and most promising objects in our sample because of two previous studies that suggested the presence of a close companion. Our aim is to directly image and characterize the companion for the first time. We observed R CrA twice with the NaCo instrument at VLT in the L' filter with a one year time baseline in between. The high-contrast imaging data were reduced and analyzed, and in both datasets the companion candidate was detected. We used artificial negative signals to determine the position and brightness of the companion and the related uncertainties. The companion is detected at a separation of $196.8 \pm 4.5/196.6 \pm 5.9$ mas ($18.7 \pm 1.3/18.7 \pm 1.4$ AU) and position angle of $134.7 \pm 0.5^{\circ}/133.7 \pm 0.7^{\circ}$ in the first/second epoch observation. We measure a contrast of $7.29 \pm 0.18/6.70 \pm 0.15$ mag with respect to the primary. Stellar proper motion study rejects the hypothesis of the signal being a background object. The companion candidate orbits in the clockwise direction and, if on a face-on circular orbit, its period is $\sim 43 - 47$ yr. This value disagrees with the estimated orbital motion and therefore a face-on circular orbit may be excluded. Depending on the assumed age, extinction and brightness of the primary, the stellar companion has a mass between $0.10 \pm 0.02\ M_{\odot}$ and $1.03^{+0.20}_{-0.18}\ M_{\odot}$ range, if no contribution from circumsecondary material is taken into account. As already hypothesized by previous studies, we have directly detected a low-mass stellar companion orbiting the young Herbig Ae/Be star R CrA. Depending on the age assumptions, the companion is among the youngest forming companions imaged to date, and its presence needs to be taken into account when analyzing the complex circumstellar environment of R CrA.

Download/Website: `https://arxiv.org/abs/1902.04092`

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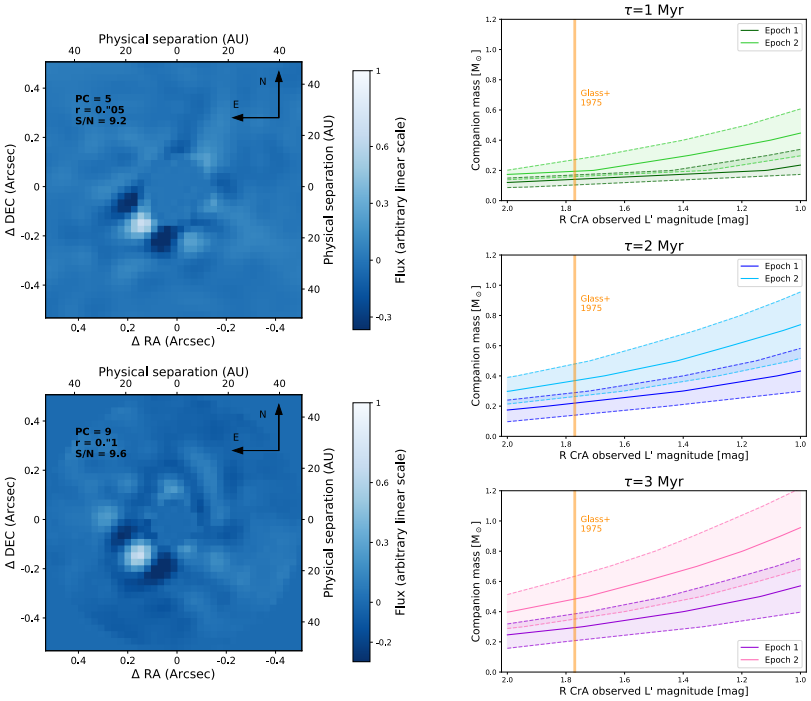

Figure 2: Cugno et al.: *Left:* First and second epoch detections (top and bottom panels respectively) with the highest S/N. The numbers of subtracted PCs from the central PSF, the applied mask radius and the SNR are reported on the top left corner of the original images. *Right:* Companion mass as a function of the primary L' magnitude for $\tau = 1, 2, 3$ Myr (top to bottom). The shaded regions represent the 1σ uncertainty range coming from contrast, photometric uncertainty of the PSF template, distance and extinction. The orange solid line indicates the value provided by Glass & Penston (1975).

Tidal Heating and the Habitability of the TRAPPIST-1 Exoplanets

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Astronomy & Astrophysics, accepted (arXiv:1902.03867)

New estimates of the masses and radii of the seven planets orbiting the ultracool M-dwarf TRAPPIST-1 star permit improved modelling of their compositions, heating by tidal dissipation, and removal of tidal heat by solid-state convection. Here, we compute the heat flux due to insolation and tidal heating for the inner four planets. We apply a Maxwell viscoelastic rheology to compute the tidal response of the planets using the volume-weighted average of the viscosities and rigidities of the metal, rock, high-pressure ice and liquid water/ice I layers. We show that TRAPPIST-1d and e can avoid entering a runaway greenhouse state. Planet e is the most likely to support a habitable environment, with Earth-like surface temperatures and possibly liquid water oceans. Planet d also avoids a runaway greenhouse, if its surface reflectance is at least as high as that of the Earth. Planets b and c, closer to the star, have heat fluxes high enough to trigger a runaway greenhouse and support volcanism on the surfaces of their rock layers, rendering them too warm for life. Planets f, g, and h are too far from the star to experience significant tidal heating, and likely have solid ice surfaces with possible subsurface liquid water oceans.

Download/Website: `https://arxiv.org/abs/1902.03867`

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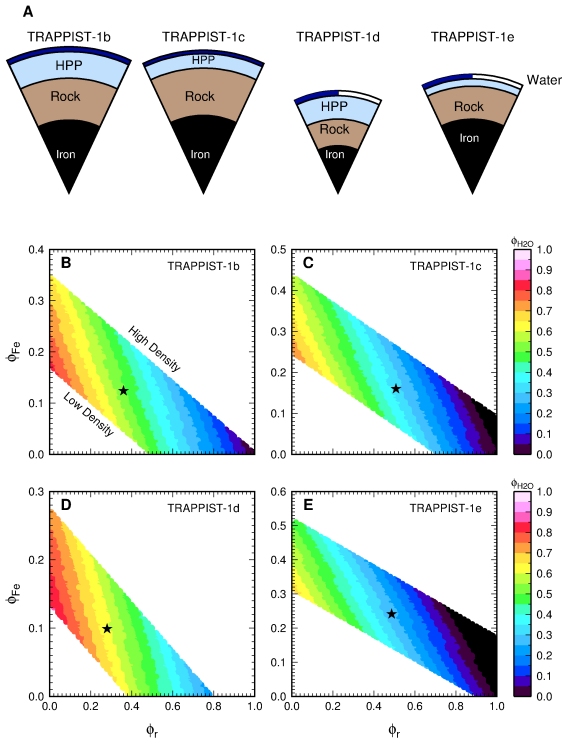

Figure 3: Dobos, Barr & Kiss: Compositions and interior structures of planets TRAPPIST-1b through e. (A) Representative possible interior structures of planets b through e, with layers of liquid water (dark blue), high-pressure ice polymorphs (light blue), rock (brown), and iron (black). Planets d and e are far enough from the TRAPPIST-1 star to potentially have a layer of solid ice (white) on their surfaces. (B) – (E) Compositions of planets b through e, where colours indicate the volume fraction of H_2O permitted in each planet ($\phi_{\rm H2O} = \phi_{\rm iw} + \phi_{\rm hpp}$) as a function of its volume fraction of iron ($\phi_{\rm Fe}$) and rock ($\phi_{\rm r}$). Black stars indicate the cases shown in panel A. Planets b and d are substantially more H_2O-rich than planets c and e.

Hints for a Turnover at the Snow Line in the Giant Planet Occurrence Rate

Rachel B. Fernandes[1,2], *Gijs D. Mulders*[3,2], *Ilaria Pascucci*[1,2], *Christoph Mordasini*[4], *Alexandre Emsenhuber*[1,4]

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The Astrophysical Journal, in press (arXiv:1812.05569)

The orbital distribution of giant planets is crucial for understanding how terrestrial planets form and predicting yields of exoplanet surveys. Here, we derive giant planets occurrence rates as a function of orbital period by taking into account the detection efficiency of the *Kepler* and radial velocity (RV) surveys. The giant planet occurrence rates for *Kepler* and RV show the same rising trend with increasing distance from the star. We identify a break in the RV giant planet distribution between ∼2-3 au — close to the location of the snow line in the Solar System — after which the occurrence rate decreases with distance from the star. Extrapolating a broken power-law distribution to larger semi-major axes, we find good agreement with the $\sim 1\%$ planet occurrence rates from direct imaging surveys. Assuming a symmetric power law, we also estimate that the occurrence of giant planets between $0.1-100$ au is $26.6^{+7.5}_{-5.4}\%$ for planets with masses 0.1-20 $M_{\rm J}$ and decreases to $6.2^{+1.5}_{-1.2}\%$ for planets more massive than Jupiter. This implies that only a fraction of the structures detected in disks around young stars can be attributed to giant planets. Various planet population synthesis models show good agreement with the observed distribution, and we show how a quantitative comparison between model and data can be used to constrain planet formation and migration mechanisms.

Download/Website: `https://arxiv.org/abs/1812.05569`

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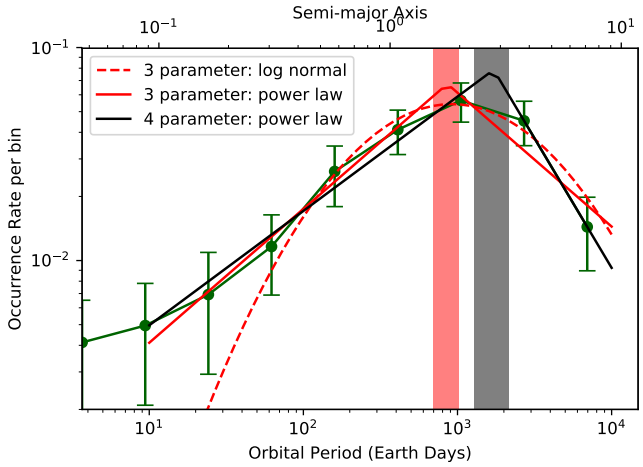

Figure 4: Fernandes et al.: Occurrence rate of 0.1-20 $M_{\rm J}$ planets (green) with best fit relations beyond 10 days: asymmetric broken power-law (solid black line), symmetric broken power-law (solid red line), and log-normal (dotted red curve). The location of the break is shown as a shaded region (gray for the asymmetric broken power-law and light red for the other two fits).

Sparkling nights and very hot days on WASP-18b: the formation of clouds and the emergence of an ionosphere

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A&A, in press (arXiv:1901.08640)

WASP-18b is an utra-hot Jupiter with a temperature difference of upto 2500K between day and night. Such giant planets begins to emerge as planetary laboratory for understanding cloud formation and gas chemistry in well-tested parameter regimes in order to better understand planetary mass loss and for linking observed element ratios to planet formation and evolution. We aim to understand where clouds form, their interaction with the gas phase chemistry through depletion and enrichment, the ionisation of the atmospheric gas and the possible emergence of an ionosphere on ultra-hot Jupiters. We utilize 1D profiles from a 3D atmosphere simulations for WASP-18b as input for kinetic cloud formation and gas-phase chemical equilibrium calculations. We solve our kinetic cloud formation model for these 1D profiles that sample the atmosphere of WASP-18b at 16 different locations along the equator and in the mid-latitudes and derive consistently the gas-phase composition. The dayside of WASP-18b emerges as completely cloud-free due to the very high atmospheric temperatures. In contrast, the nightside is covered in geometrically extended and chemically heterogeneous clouds with disperse particle size distributions. The atmospheric C/O ratio increases to > 0.7 and the enrichment of the atmospheric gas with cloud particles is $\rho_{\rm d}/\rho_{\rm gas} > 10^{-3}$. The clouds that form at the limbs appear located farther inside the atmosphere and they are the least extended. Not all day-night terminator regions form clouds. The gas-phase is dominated by H_2/H, CO, SiO, H_2O, H_2S, CH_4, SiS. In addition, the dayside has a substantial degree of ionisation due to ions like Na^+, K^+, Ca^+, Fe^+. Al^+ and Ti^+ are the most abundant of their element classes. We find that WASP-18b, as one example for ultra-hot Jupiters, develops an ionosphere on the dayside.

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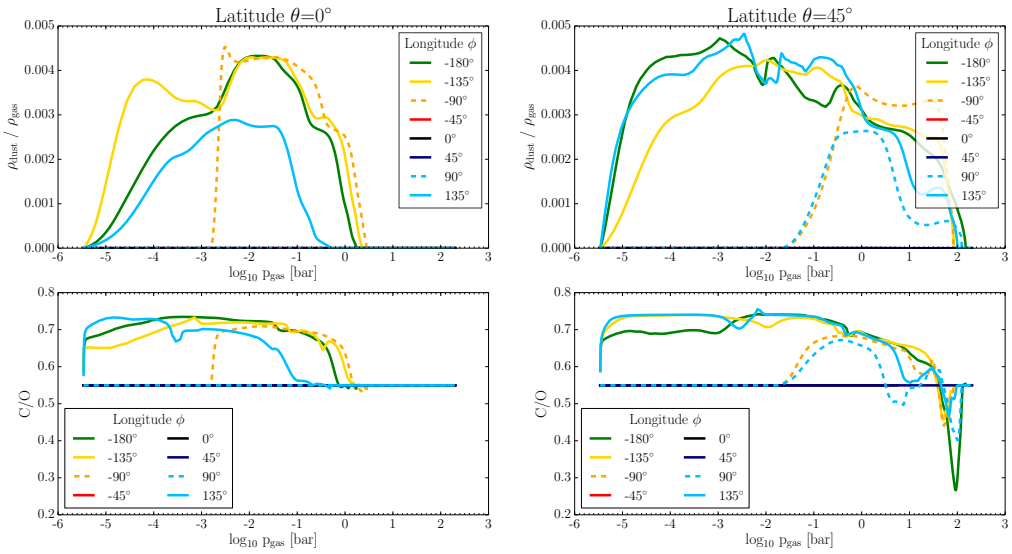

Figure 5: Helling et al.: The cloud particle load in terms of mass density ratios (top; $\rho_{\rm dust}/\rho_{\rm gas}$) and the C/O element ratio (bottom) at the equator (left) and in the norther hemisphere (right) of the WASP-18b atmosphere profiles studied. C/O remains at the solar value of 0.53 for profiles without clouds forming ($\phi = -45^o, 135^o$).

A circumbinary protoplanetary disc in a polar configuration

Grant M. Kennedy[1], *Luca Matrà*[2], *Stefano Facchini*[3], *Julien Milli*[4], *Olja Panić*[5], *Daniel Price*[6], *David J. Wilner*[2], *Mark C. Wyatt*[7], *Ben M. Yelverton*[7]

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Nature Astronomy, published (2019NatAs.tmp..189K)

Nearly all young stars are initially surrounded by 'protoplanetary' discs of gas and dust, and in the case of single stars at least 30% of these discs go on to form planets. The process of protoplanetary disc formation can result in initial misalignments, where the disc orbital plane is different to the stellar equator in single star systems, or to the binary orbital plane in systems with two stars. A quirk of the dynamics means that initially misaligned 'circumbinary' discs – those that surround two stars – are predicted to evolve to one of two possible stable configurations, one where the disc and binary orbital planes are coplanar, and one where they are perpendicular (a 'polar' configuration). Prior work has found coplanar circumbinary discs, but no polar examples were known until now. Here we report the first discovery of a protoplanetary circumbinary disc in the polar configuration, supporting the predictions that such discs should exist. The disc shows some characteristics that are similar to discs around single stars, and that are attributed to dust growth. Thus, the first stages of planet formation appear able to proceed in polar circumbinary discs.

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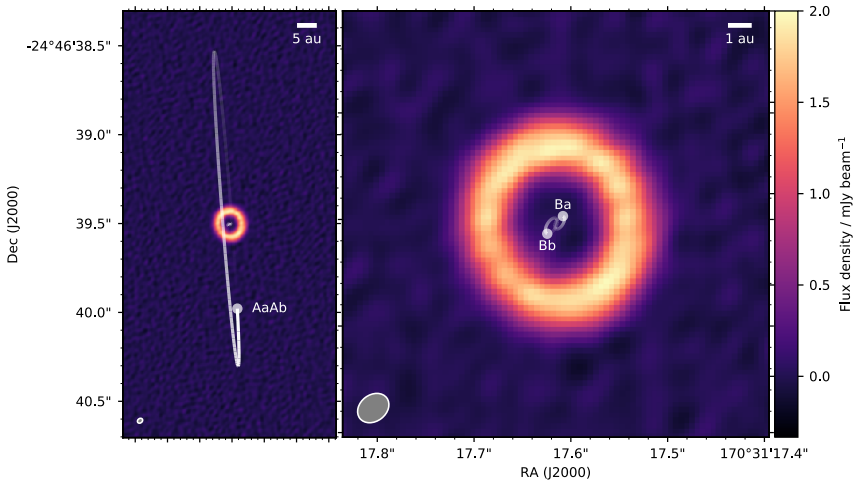

Figure 6: Kennedy et al.: ALMA 1.3 millimetre continuum image of the HD 98800 dust disc, showing a narrow dust ring 3.5 au in radius that is 2 au wide. White semi-transparent lines show the orbits of the inner binary (BaBb) and the path of the outer binary (AaAb) with respect to BaBb, with dots at the star locations at the time of the ALMA observation. The resolution of these 'uniformly-weighted' images (32×25 milli-arcseconds, or 1.4×1.1au) is given by the ellipse in the lower left corner. The left panel shows the entire system, and the right panel is zoomed in on BaBb.

A water budget dichotomy of rocky protoplanets from ^{26}Al-heating

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Nature Astronomy Letters, published (2019arXiv190204026L)

In contrast to the water-poor planets of the inner Solar System, stochasticity during planetary formation and order-of-magnitude deviations in exoplanet volatile contents3 suggest that rocky worlds engulfed in thick volatile ice layers are the dominant family of terrestrial analogues among the extrasolar planet population. However, the distribution of compositionally Earth-like planets remains insufficiently constrained, and it is not clear whether the Solar System is a statistical outlier or can be explained by more general planetary formation processes. Here we use numerical mod- els of planet formation, evolution and interior structure to show that a planet's bulk water fraction and radius are anti-correlated with initial ^{26}Al levels in the planetesimal-based accretion framework. The heat generated by this short-lived radionuclide rapidly dehydrates planetesimals before their accretion onto larger protoplanets and yields a system-wide correlation of planetary bulk water abundances, which, for instance, can explain the lack of a clear orbital trend in the water budgets of the TRAPPIST-1 planets. Qualitatively, our models suggest two main scenarios for the formation of planetary systems: high-^{26}Al systems, like our Solar System, form small, water-depleted planets, whereas those devoid of ^{26}Al predominantly form ocean worlds. For planets of similar mass, the mean planetary transit radii of the ocean planet population can be up to about 10% larger than for planets from the ^{26}Al-rich formation scenario.

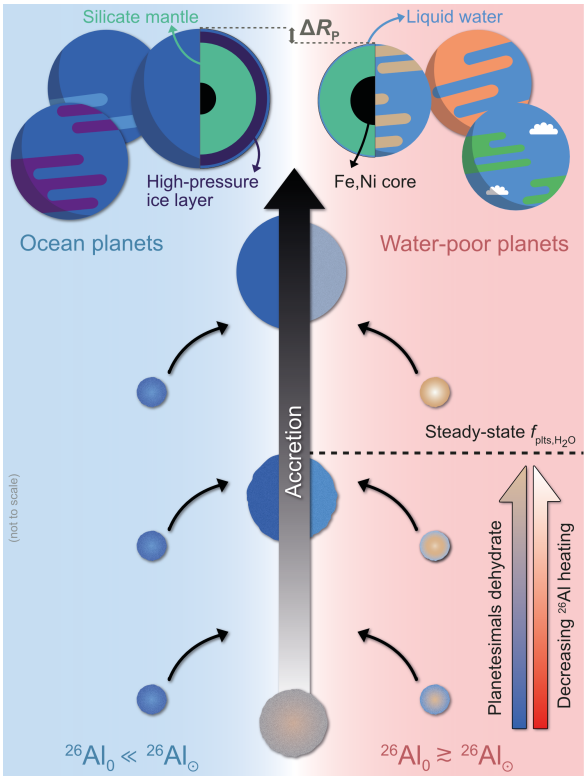

Figure 7: Lichtenberg et al.: Qualitative sketch of the water budget dichotomy from ^{26}Al-heating during planetary accretion.

Download/Website: `https://arxiv.org/abs/1902.04026`; *blog post:* `https://go.nature.com/2QEYth5`

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Observing the gas component of circumplanetary disks around wide-orbit planet-mass companions in the (sub)mm regime

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Astronomy & Astrophysics, in press (arXiv:1902.04096)

Several detections of wide-orbit planet-mass/sub-stellar companions around young solar-like stars were reported in the last decade. The origin of those possible planets is still unclear but accretion tracers and VLT/SPHERE observations indicate that they are surrounded by circumplanetary material or even a circumplanetary disk.
We want to investigate if the gas component of disks around wide-orbit companions is detectable with current (ALMA) and future (ngVLA) (sub)mm telescopes and what constraints such gas observations can provide on the nature of the circumplanetary material and on the mass of the companion. We applied the radiation thermo-chemical disk code PRODIMO to model the dust and gas component of passive circumplanetary disks and produced realistic

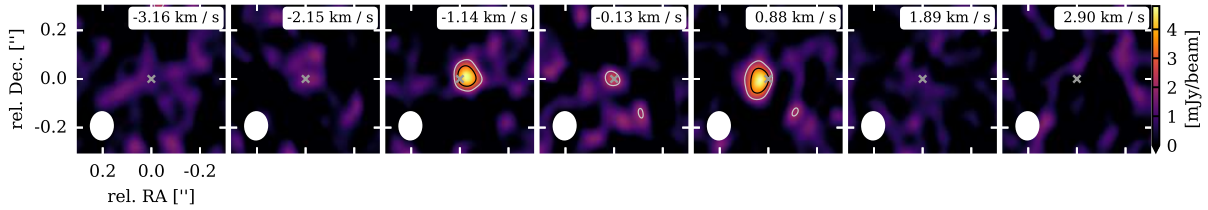

Figure 8: Rab et al.: $^{12}\mathrm{CO}\,J = 3-2$ (ALMA B7) synthetic channel intensity maps for a CS Cha companion circumplanetary disk model using 6h on-source integration time. The gray cross indicates the location of the planet-mass companion. The white ellipse in each panel shows the beam with a size of $0.11'' \times 0.09''$. In the upper right corner of each panel the velocity relative to the systemic velocity is indicated. The gray and black contours show three and five times the theoretical rms level of $0.65\ \mathrm{mJy/beam}$.

synthetic observables. We considered different companion properties (mass, luminosity), disk parameters (mass, size, dust properties) and radiative environments (background fields) and compared the resulting synthetic observables to telescope sensitivities and to existing dust observations. The main criterion for a successful detection is the size of the circumplanetary disk. At a distance of about $150\,\mathrm{pc}$, a circumplanetary disk with an outer radius of about $10\,\mathrm{au}$ is detectable with ALMA in about 6 hours in optically thick CO lines. Other aspects such as the companion's luminosity, disk inclination and background radiation fields are also relevant, and should be considered to optimize the observing strategy for detection experiments.
For most of the known wide-orbit planet-mass companions, their maximum theoretical disk size of one third of the Hill radius would be sufficient to allow detection of CO lines. It is therefore feasible to detect their gas disks and constrain the mass of the companion through the kinematic signature. Even in the case of non-detections such observations will provide stringent constraints on disk size and gas mass, information crucial for formation theories.

Download/Website: `http://arxiv.org/abs/1902.04096`

Contact: `rab@astro.rug.nl`

The Transit Light Source Effect II: The Impact of Stellar Heterogeneity on Transmission Spectra of Planets Orbiting Broadly Sun-like Stars

Benjamin V. Rackham[1,5]*, Dániel Apai*[1,2,3,5]*, Mark S. Giampapa*[2,4]

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[2] Department of Planetary Sciences, The University of Arizona, 1629 E. University Blvd, Tucson, AZ 85721, USA
[3] Max Planck Institute for Astronomy, Königstuhl 17, D-69117, Heidelberg, Germany
[4] National Solar Observatory, 950 N. Cherry Avenue, Tucson, AZ 85719, USA
[5] Earths in Other Solar Systems Team, NASA Nexus for Exoplanet System Science

The Astronomical Journal, published (2019AJ...157..96R)

Transmission spectra probe exoplanetary atmospheres, but they can also be strongly affected by heterogeneities in host star photospheres through the transit light source effect. Here we build upon our recent study of the effects of unocculted spots and faculae on M-dwarf transmission spectra, extending the analysis to FGK dwarfs. Using a suite of rotating model photospheres, we explore spot and facula covering fractions for varying activity levels and the associated stellar contamination spectra. Relative to M dwarfs, we find that the typical variabilities of FGK dwarfs imply lower spot covering fractions, though they generally increase with later spectral types, from $\sim$0.1% for F dwarfs to 2–4% for late-K dwarfs. While the stellar contamination spectra are considerably weaker than those for typical M dwarfs, we find that typically active G and K dwarfs produce visual slopes that are detectable in high-precision transmission spectra. We examine line offsets at Hα and the Na and K doublets and find that unocculted

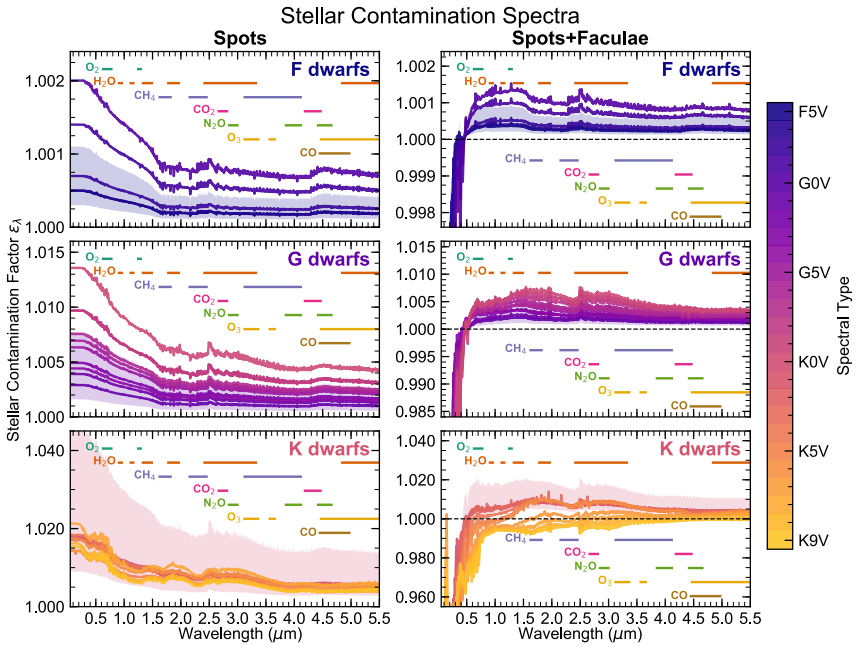

Figure 9: Rackham et al.: Stellar contamination spectra for models with spots only (left) and both spots and faculae (right). Contamination spectra for F, G, and K dwarfs are color-coded by spectral type and shown in the top, middle, and bottom panels, respectively. Solid lines indicate the contamination spectrum for the mean spot covering fraction consistent with the median *Kepler* variability amplitude for the spectral type. The shaded regions illustrate the range of contamination spectra produced by spot covering fractions consistent with that same variability for the earliest spectral type in each panel. Wavelength bands for key molecular features in exoplanetary atmospheres are given. Note the different y-axis scales.

faculae in K dwarfs can appreciably alter transit depths around the Na D doublet. We find that band-averaged transit depth offsets at molecular bands for CH_4, CO, CO_2, H_2O, N_2O, O_2, and O_3 are not detectable for typically active FGK dwarfs, though stellar TiO/VO features are potentially detectable for typically active late-K dwarfs. Generally, this analysis shows that inactive FGK dwarfs do not produce detectable stellar contamination features in transmission spectra, though active FGK host stars can produce such features and care is warranted in interpreting transmission spectra from these systems.

Download/Website: `https://ui.adsabs.harvard.edu/#abs/2019AJ....157...96R`

Contact: `brackham@as.arizona.edu`

The search for radio emission from exoplanets using LOFAR beam-formed observations: Jupiter as an exoplanet

Jake D. Turner[1,2,3], *Jean-Mathias Grießmeier*[3,4], *Philippe Zarka*[4,5], *Iaroslavna Vasylieva*[6],

[1] Department of Astronomy, Cornell University, Ithaca, NY, USA
[2] Department of Astronomy, University of Virginia, Charlottesville, VA, USA
[3] Laboratoire de Physique et Chimie de l'Environnement et de l'Espace (LPC2E) Université d'Orléans/CNRS, Orléans, France
[4] Station de Radioastronomie de Nançay, Observatoire de Paris, PSL Research University, CNRS, Univ. Orléans, OSUC, 18330 Nançay, France
[5] LESIA, Observatoire de Paris, CNRS, PSL, Meudon, France
[6] Institute of Radio Astronomy, National Academy of Sciences of Ukraine, Kharkov, Ukraine

Astronomy & Astrophysics, in press/(arXiv:1802.07316)

Context. The magnetized Solar System planets are strong radio emitters and theoretical studies suggest that the radio emission from nearby exoplanets in close-in orbits could reach intensity levels $10^3 - 10^7$ times higher than Jupiter's decametric emission. Detection of exoplanets in the radio domain would open up a brand new field of research, however, currently there are no confirmed detections at radio frequencies.
Aims. We investigate the radio emission from Jupiter, scaled such that it mimics emission coming from an exoplanet, with low-frequency beam-formed observations using LOFAR. The goals are to define a set of observables that can be used as a guideline in the search for exoplanetary radio emission and to measure effectively the sensitivity limit for LOFAR beam-formed observations.
Methods. We observe "Jupiter as an exoplanet" by dividing a LOFAR observation of Jupiter by a down-scaling factor and adding this observation to beam-formed data of the "sky background". Then we run this artificial dataset through our total intensity (Stokes-I) and circular polarization (Stokes-V) processing and post-processing pipelines and determine up to which down-scaling factor Jupiter is still detected in the dataset.
Results. We find that exoplanetary radio bursts can be detected at 5 pc if the circularly polarized flux is 10^5 times stronger than the typical level of Jupiter's radio bursts during active emission events ($\sim 4 \times 10^5$ Jy). Equivalently, circularly polarized radio bursts can be detected up to a distance of 20 pc (encompassing the known exoplanets 55 Cnc, Tau Boötis, and Upsilon Andromedae) assuming the level of emission is 10^5 times stronger than the peak flux of Jupiter's decametric burst emission ($\sim 6 \times 10^6$ Jy).

Download/Website: `https://arxiv.org/abs/1802.07316`

Contact: `jaketurner@cornell.edu`

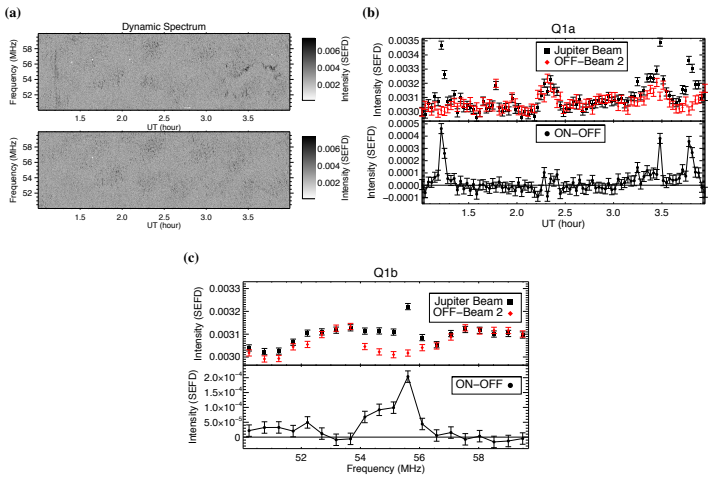

Figure 10: Turner et al.: Figure caption: Dynamic spectra and extended emission observable Q1 in Stokes-V ($\|V^{'}\|$) for a Jupiter scaling parameter of $\alpha = 10^{-4}$. **(a)** Dynamic spectra for the ON-beam (top) and the OFF-beam (bottom). **(b)** Q1a (time-series integrated over all frequencies). **(c)** Q1b (integrated spectrum summed over all times). For all plots the black squares are the ON-beam, red diamonds are the OFF-beam, and black circles are the difference between beams. The scaled Jupiter emission can be seen clearly in all panels.

Speeding past planets? Asteroids radiatively propelled by giant branch Yarkovsky effects

Dimitri Veras[1,2]*, Arika Higuchi*[3]*, Shigeru Ida*[4]

[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] RISE Project Office, National Astronomical Observatory of Japan, Osawa, Mitaka, Tokyo 181-8588, Japan
[4] Earth-Life Science Institute, Tokyo Institute of Technology, Meguro, Tokyo 152-8550, Japan

MNRAS, In Press, arXiv:1902.02795

Understanding the fate of planetary systems through white dwarfs which accrete debris crucially relies on tracing the orbital and physical properties of exo-asteroids during the giant branch phase of stellar evolution. Giant branch luminosities exceed the Sun's by over three orders of magnitude, leading to significantly enhanced Yarkovsky and YORP effects on minor planets. Here, we place bounds on Yarkovsky-induced differential migration between asteroids and planets during giant branch mass loss by modelling one exo-Neptune with inner and outer exo-Kuiper belts. In our bounding models, the asteroids move too quickly past the planet to be diverted from their eventual fate, which can range from: (i) populating the outer regions of systems out to 10^4-10^5 au, (ii) being engulfed within the host star, or (iii) experiencing Yarkovsky-induced orbital inclination flipping without any Yarkovsky-induced semimajor axis drift. In these violent limiting cases, temporary resonant trapping of asteroids with radii of under about 10 km by the planet is insignificant, and capture within the planet's Hill sphere requires fine-tuned dissipation. The wide variety of outcomes presented here demonstrates the need to employ sophisticated structure and radiative exo-asteroid models in future studies. Determining where metal-polluting asteroids reside around a white dwarf depends on understanding extreme Yarkovsky physics.

Download/Website: `https://arxiv.org/abs/1902.02795`

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

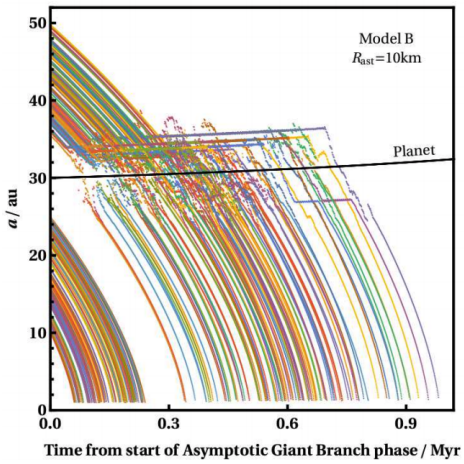

Figure 11: Veras et al.: Asteroids being radiatively flung into the star, with only a minor delay due to a planet.

3 Jobs and Positions

CHEOPS Postdoctoral Fellowship

Prof. Willy Benz
University of Bern, CH-3012 Bern, Switzerland

University of Bern and MIT, starting date: 1.6.2019

Switzerland has established the National Center of Competences in Research (NCCR) PlanetS with a broad scope which includes planet origin, evolution and characterisation, considering both the Solar System and exoplanets. With the CHEOPS postdoctoral Fellowship programme PlanetS wants to support the scientific exploitation of the ESA CHEOPS mission - the first dedicated to search for transits of exoplanets by means of ultrahigh precision photometry on bright stars already known to host planets (see http://cheops.unibe.ch.)

The current call is open for one CHEOPS Fellowship on exoplanet data science focused on an established synergistic collaboration between the CHEOPS and TESS missions: the CHESS programme. The successful applicant while based in Bern (Switzerland) will be working with the TESS team at MIT to ensure the liaison between the two missions regarding the CHESS programme. The CHEOPS Fellow will have expertise in exoplanet data science, including transit light-curve analysis and statistics and is also expected to conduct competitive research programmes in exoplanets on her/his own. In collaboration with the CHEOPS Science Team members, she/he will have access to the relevant CHEOPS GTO data. A research budget of 10'000 CHF per year will be available to the Fellow to support expenses related to her/his project. The duration of the Fellowship is of 3 years. with the first 1-2 years expected to be spent at MIT (with several trips to Switzerland per year) and the reminder at the University of Bern. A possible extension by 1 year can be considered if appropriate.

The interested applicants, who should be less than 4 years after PhD at the beginning of the position, should present in a 2-page document their research interests. This document together with a summary of their past and present research (2 pages), a CV (2 pages), a publication list, and a cover letter including the name of three referees willing to write a support letter should be sent as a single pdf file to the address below as soon as possible but no later than before March 22, 2019.

Send application to: Janine Jungo, Sidlerstrasse 5, CH-3012 Bern, Tel: +41 (0)31 631 3239,
mail: janine.jungo@space.unibe.ch

Contact: `Willy Benz, wbenz@space.unibe.ch`

Exoplanets Postdoctoral research positions in Geneva

Stéphane Udry, Francesco Pepe, François Bouchy
Observatoire de Genève, Université de Genève, 51 Ch. des Maillettes, 1290 Versoix, Switzerland

Department of Astronomy of University of Geneva, positions open for immediate start

The exoplanet team of the University of Geneva has an opening for four postdoctoral researchers to work on detection and characterization of exoplanets through high-precision radial velocity measurements. Focusing on the low-mass range of exoplanets and using the high-precision spectrographs CORALIE, HARPS, HARPS-N, ESPRESSO, SPIROU, and NIRPS, our team is strongly involved in blind radial velocity surveys as well as in the follow-up of transiting candidates from NGTS, K2 and TESS photometric surveys. The selected applicants are expected to work on: the optimization of the data-reduction, calibration and RV-extraction from both visible and near-infrared high-resolution spectrographs; the mitigation of the stellar activity; the combination of RV data with photometric, astrometric and direct imaging measurements, including dynamical developments for the characterization of

multi-planetary systems. They will be strongly involved in the science exploitation of large programs and guarantee observing time of aforementioned spectrographs and in the development of specific tools for the Data and Analysis Center for Exoplanets (DACE) for validation and combined analysis of exoplanets.
The Department of Astronomy of the University of Geneva offers a modern and vibrant work environment, with a wide range of activities including theory, numerical simulations, observations and instrumental developments in the domains of exoplanets, stellar physics, galactic dynamics, observational cosmology and high-energy astrophysics. Our exoplanet team is well-renowned and has strong involvement in exoplanets detection, the determination of the planet physical properties, the characterization of planet atmospheres, and the development of an associated world-class instrumentation. We are also co-leading the Swiss-wide National Centre of Competence in Research (NCCR) PlanetS, dedicated to the study of the origin, evolution, and characterization of planets inside and outside our Solar System, providing thus the applicants with opportunities to develop collaborations with members of PlanetS.
Applicants are expected to have experience in observation, data reduction and analysis, especially of high-precision radial velocities. The duration of the postdoc contract is of 2 years, with possible extension to a third year depending on available funds. Candidates should have less than 3 years after their PhD at start of the employment. The positions are funded by Swiss National Science Foundation with a gross salary around 80,000 CHF and are open for immediate start.
Interested candidates should contact Prof. S. Udry, Prof. F. Pepe and Prof. F. Bouchy, at the Astronomy Department of University of Geneva, and send (in a singe pdf file) a CV, a publication list, a motivation letter, a short research statement describing past achievements and future projects and arrange for up to two letters of recommendation to be sent before 15th March 2019.

Download/Website: `http://nccr-planets.ch/, http://www.exoplanets.ch/`

Contact: `stephane.udry@unige.ch, francesco.pepe@unige.ch, francois.bouchy@unige.ch`

Post-doctoral position "Exoplanet characterization with future instruments"

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

ETH Zurich, Start date: preferably mid 2019; later dates can be negotiated

The Star and Planet Formation Research Group at the Institute for Particle Physics and Astrophysics at ETH Zurich invites applications for a new post-doctoral fellowship to work with Dr. Sascha Quanz on the characterization of (small) extra-solar planets. The position is part of our 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 (for more information see: http://nccr-planets.ch). We are looking for a postdoc with expertise in atmospheres / atmospheric retrieval techniques and/or habitability research to help us assess and maximize the exoplanet characterization potential of future ground- and space-based instruments (e.g., ELT/METIS, ELT/HiRES, LIFE). Close collaborations with other "PlanetS" groups in Geneva and Bern are foreseen.
Salary and duration of the appointment will be commensurate with experience. Starting salary begins at around CHF $\sim$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 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).
Applications should consist of 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 contact information for three potential referees, should be sent to eth-astro-star-planet@phys.ethz.ch. For questions please contact Dr. Sascha Quanz (sascha.quanz@phys.ethz.ch). Review of applications will begin end of March, 2019 and continue until the position is filled.

The ETH Zurich will provide benefits for maternity leave, retirement, and accident insurance. Weblink: https://www.ethz.ch/en/the-eth-zurich/working-teaching-and-research.html

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

PostDoctoral Research on exoplanets with CHEOPS

Sérgio Sousa[1,2]*, Susana Barros*[1,2]

[1] Instituto de Astrofísica e Ciências do Espaço, Universidade do Porto, CAUP, Rua das Estrelas, 4150-762 Porto, Portugal
[2] https://www.astro.up.pt/exoearths/

Porto, Portugal, Starting date: up to 1st May 2019

Centro de Investigação em Astronomia/Astrofísica da Universidade do Porto (CAUP) is advertising a postdoctoral position in the field of exoplanets. The position has duration of 25 months and cannot exceed the end date of the project, 21st of May 2021. The starting date of the position is negotiable, but not later than 1st May 2019. The gross monthly remuneration is 2128.34 EUR.

The researcher is expected to give support to the participation of the team in CHEOPS satellite data exploitation. Within the scientific themes of CHEOPS, the researcher will have the opportunity to be involved in:

- the search of transits of already known exoplanets, the better characterization of its radius and composition;
- the study of the exoplanet's atmosphere by using observations of the transit occultation and/or the observed phase curves;
- support to CHEOPS data exploitation including precise characterization of planetary systems;
- other relevant science cases with CHEOPS data that the candidate is interested in can also be considered;
- a small percentage of the time can also be allocated to the institute's CHEOPS outreach activities.

The call will be open until 8th March 2019. Candidates shall submit their application through the form available online (link bellow), including all supporting documentation, namely: motivation letter; certificate or PhD diploma copy; Curriculum Vitae, detailed and structured according to section 8 of this announcement; other documentation relevant for the evaluation of qualifications in a related scientific area; and a brief description of the most relevant scientific activities of the last 5 years;

IA assembles more than two-thirds of all active researchers working in Space Sciences in Portugal. The research and development effort at the IA includes most of the topics at the forefront of research in Astrophysics and Space Sciences, complemented by work on instrumentation and systems with potential use in Astronomy and Astrophysics. IA provides all necessary research conditions in a friendly and scientifically active environment.

Full details of this call is presented in the online anouncement: www.iastro.pt/jobs/IA2019-05-CTTI

Please contact us if you need further information.

Download/Website: www.iastro.pt/jobs/IA2019-05-CTTI

Contact: sergio.sousa@astro.up.pt, susana.barros@astro.up.pt

4 Conferences

$3^{\rm rd}$ Advanced School on Exoplanetary Science:
"Demographics of Exoplanetary Systems"

Katia Biazzo [1]*, Valerio Bozza* [2]*, Luigi Mancini* [3,4]*, Alessandro Sozzetti* [5]

[1] INAF – Catania Astrophysical Observatory, Via S. Sofia 78 – 95123 Catania, Italy
[2] Department of Physics, University of Salerno, Via Giovanni Paolo II 132, 84084 – Fisciano (SA), Italy
[3] Department of Physics, University of Rome Tor Vergata, Via della Ricerca Scientifica 1, 00133 – Rome, Italy
[4] Max Planck Institute for Astronomy, Königstuhl 17, 69117 – Heidelberg, Germany
[5] INAF – Turin Astrophysical Observatory, via Osservatorio 20, 10025 – Pino Torinese, Italy

Vietri sul Mare (Salerno), Italy, from 27 to 31 May, 2019

Rationale:
The Advanced School on Exoplanetary Science – taking place close to the enchanting Amalfi Coast – is aimed at providing a comprehensive, state-of-the-art picture of the rich variety of relevant aspects of the fast-developing, highly interdisciplinary field of exoplanet research (both from an observational and theoretical viewpoint). The School is addressed to graduate students and young post-doctoral researchers, and offers the fascinating possibility to interact with world-class experts engaged in different areas of the astrophysics of planetary systems. The $3^{\rm rd}$ edition of the School will be focused on the Demographics of Exoplanetary Systems, covering both the theoretical and observational perspectives.

Organizing Committee:
K. Biazzo (INAF - Catania Astrophysical Observatory)
V. Bozza (University of Salerno)
L. Mancini (University of Rome "Tor Vergata"; Max Planck Institute for Astronomy, Heidelberg)
A. Sozzetti (INAF - Turin Astrophysical Observatory)

Confirmed School Lecturers:
Planet formation : Prof. A. Morbidelli, Observatoire de la Cote d'Azur, Nice, France
Dynamical evolution: Prof. Sean N. Raymond, Laboratoire d'Astrophysique de Bordeaux, France
Wide-separation Exoplanets: Prof. Scott Gaudi, Ohio State University, USA
Close-in Exoplanets: Prof. Andrew W. Howard, California Institute of Technology, USA
Star–Planet interactions: Prof. Antonino F. Lanza, INAF – Catania Astrophysical Observatory

Lecture Notes: The Lecture Notes of the $3^{\rm rd}$ Advanced School on Exoplanetary Science will be published by Springer in its Astrophysics and Space Science Library series. A copy of the book will be given to each participant. The first two books of the series are available on www.springer.com/gp/book/9783319274560 and www.springer.com/gp/book/9783319897004, respectively.

Registration, abstract submission:
Registration deadline: March 1, 2019.
There is a limited number of time slots for brief seminars of participants to present their own research. Title/Abstract submission is possible at any later moment after registration by sending an email to the Organizing Committee (deadline: April 1, 2019). All participants are allowed and encouraged to bring a poster.

Sponsors:
The $3^{\rm rd}$ Advanced School on Exoplanetary Science is supported by the University of Salerno, the University of Rome "Tor Vergata", the National Institute of Astrophysics (INAF), the Max Planck Institute of Astronomy (MPIA, Heidelberg), Progetto Premiale INAF 2015 "Frontiera" of the Italian Ministry of the University and Research and by Europlanet 2020 RI Work Package NA1 – Innovation through Science Networking, Task 5. The EU-project.

Europlanet 2020 RI has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654208.

Important Dates:
1st March 2019: Registration Deadline
1st April 2019: Oral contribution Deadline
1st May 2019: Final School programme
27th – 31st May 2019: The School

Download/Website: `http://www.mpia.de/ases3`
Contact: `ases3@mpia.de - facebook.com/ases2019 - twitter.com/ases2019 - #ases3`

EWASS Symposium S9: The future of exoplanets: synergy between small-scale and large-scale telescopes

T. Fouchet, A. García Muñoz, K. Lam, A. Smith, I. Boisse, A. Cassian, A.-M. Lagrange, H. Deeg, S. Barros, P. Kabath

Lyon, France, 24–25 June 2019

Aims and scope

Exoplanet science is currently undergoing a transformation. Interestingly, much of this progress is driven by telescopes of small and moderate apertures (say, of up to 50 cm in space or aboard stratospheric balloons, and 4 m on the ground). These facilities have their own niches in which they are highly complementary to larger telescopes in the detection and characterization of exoplanets. mphasizing the complementarity between small and large telescopes and the science that can be obtained from each of these classes of facilities is a major motivation for this Symposium.
Also, as new instrumentation on mid and large telescopes now enables characterization of exoplanets, it becomes crucial to highlight the ongoing advances in the exploration of the solar system at both the technical and scientific level. Fostering the exchange of ideas and methods between the solar system and exoplanet communities is also a major motivation for this Symposium.
In summary, we welcome scientific contributions (observational, but also theoretical and modeling) that describe the state-of-the-art in the planetary sciences of the solar system and beyond. We particularly welcome contributions that emphasize: 1) the synergistic role of small and large facilities towards new and exciting discoveries; 2) the significance of exchanging ideas within the entire planetary community.

Invited speakers

- Gwenaël Boué (Paris Observatory).

- Sasha Hinkley (University of Exeter).
- Sylvestre Lacour (Paris Observatory).
- Stéphane Mathis (CEA).
- Aline A. Vidotto (University of Dublin).
- Ignas Snellen (Leiden University).
- Peter Wheatley (Warwick University).
- Kate Isaak - TBC (ESA/ESTEC)

Deadline for abstract submission: 03/03/2019

Download/Website: https://eas.unige.ch/EWASS2019/session.jsp?id=S9
Contact: Thierry.Fouchet@obspm.fr; garciamunoz@astro.physik.tu-berlin.de

Gordon Conference on Origins of Solar Systems: Meteoritical, Spacecraft and Astrophysical Perspectives on the Assembly and Composition of Planets

Larry R. Nittler

Mount Holyoke College, USA, June 23-28, 2019

The Gordon Research Conference on Origins of Solar Systems brings together a diverse group of scientists to discuss research at the frontier of understanding how planets and planetary systems form. Invited speakers from the fields of astronomy, astrophysics, cosmochemistry, and planetary science will present their latest findings. A particular focus at this meeting will be the latest results from the Hayabusa2, Osiris-Rex, and New Horizons missions to primitive solar system bodies, exoplanet results from the TESS space telescope, and results from ground-based astronomical facilities like the Atacama Large Millimeter Array. Discussions will include how theory, spacecraft and astronomical observations, and meteoritic analyses provide complementary constraints on a range of topics, including the birth environment of the Solar System, how gas and dust may rapidly be converted into planetary bodies in disks, the origin and evolution of carbon and other volatiles in disks and the diversity of planetary system architectures and compositions in the Galaxy. The 2019 meeting will continue the tradition of past meetings by promoting cross-disciplinary conversations, and invites all attendees to present posters on their latest work. Support for early career researchers will be available.
Please see https://www.grc.org/origins-of-solar-systems-conference/2019 to register and for more information and https://www.grc.org/origins-of-solar-systems-grs-conference/2019/ for the related Gordon Research Seminar for graduate students and postdocs.

Download/Website: https://www.grc.org/origins-of-solar-systems-conference/2019
Contact: lnittler@ciw.edu

2019 Sagan Summer Workshop: Astrobiology for Astronomers

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

Pasadena, CA, July 15-19, 2019

The 2019 Sagan Summer Workshop will focus on astrobiology and will feature introductions on the formation of Earth and terrestrial planets, their evolution over time, current geochemical cycles on Earth, and the emergence of life on Earth. Our knowledge of Exo-Earths will be reviewed, including demographics, composition, atmospheric signatures, and comparison with Earth. Detection of biosignatures, with an emphasis on false positives and false negatives, will also be discussed. Attendees will participate in hands-on group projects related to astrobiology and 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.

Registration and the application for financial assistance to attend the workshop are now available along with the preliminary agenda. The hotel reservation link is also posted on the workshop website.

Important Dates

- February 5: Registration available and Application for Travel Support period open
- March 6: Application for Travel Support and Recommendation Letters due
- March 21: Travel Support decisions announced via email
- May 9: POP/Poster/Talk submission link available
- early June: food ordering site open
- June 13: Hotel Reservation Deadline for workshop hotel
- June 28: Deadline to submit POP and poster presentations
- July 5: Final agenda posted with POP schedule
- July 15-19: Sagan Exoplanet Summer Workshop

Download/Website: `http://nexsci.caltech.edu/workshop/2019`
Contact: `sagan_workshop@ipac.caltech.edu`

Extreme Solar Systems IV

Fred Rasio (for the organizers)

Reykjavik, Iceland, August 19 - 23, 2019

Dear Colleagues,
Registration and abstract submission for the conference will open soon. To make sure you are included in our mailing list, please pre-register now if you haven't done so yet.
Simply follow the link to the pre-registration form online at

Download/Website: `https://sites.northwestern.edu/iceland2019/`
Contact: `rasio@northwestern.edu`

5 Exoplanet Archive Updates

January Updates at the NASA Exoplanet Archive

The NASA Exoplanet Archive team
Caltech/IPAC-NASA Exoplanet Science Institute, MC 100-22 Pasadena CA 91125

Pasadena CA USA, February 11, 2019

Note: Data for all new planets can be viewed in the Confirmed Planets (`http://bit.ly/2MqFnub`), Composite Planet Data (`http://bit.ly/2l84Qw9`), and Extended Planet Data (`http://bit.ly/2NLy1Ci`) tables.
January 31, 2019
This week we added K2-289 b and the third confirmed TESS planet, HD 202772 A b.

We also removed HD 73256 b based on a published refutation. Note: For a comprehensive list of all targets removed or excluded from the archive, see the Removed Targets page (`http://bit.ly/2ToWIXN`. For more information about the archive's criteria for classifying and including objects, see our Exoplanet Criteria page (`http://bit.ly/2GedDZl`).

January 24, 2019
Five New Planets: We've added five new planets this week, including LHS 3844 b, the second confirmed planet discovered by the Transiting Exoplanet Survey Satellite (TESS) mission. The other four planets are: K2-290 b & c, K2-291 b, and GJ 4276 b.
UKIRT DR3 Microlensing Survey Data: We've added almost 26 million light curves from the 2018 United Kingdom InfraRed Telescope (UKIRT) Microlensing Survey, which tips the total number of light curves in the archive above 100 million! Other data sets served include Kepler, K2, KELT, SuperWASP, CoRoT, and others. See our Holdings page (`http://bit.ly/2RNaYN5`) for details.
You may access the UKIRT DR3 data, as well as previous UKIRT releases, from the UKIRT Bulk Download page (`http://bit.ly/2CLiYE3`). Or, use the UKIRT search interface (`http://bit.ly/2HDG710`) to find a subset of data and browse them in an interactive table (enter **2018** for Survey Year to view DR3 data). Read the documentation (`http://bit.ly/2Hsv4aE`) for more information. Many thanks to the UKIRT Microlensing Team for providing these data to our users.

January 17, 2019
There have been 11 transiting and two radial velocity planets added to the archive this week. They are: Kepler-730 c, HD 202696 b & c, HATS-60 b, HATS-61 b, HATS-62 b, HATS-63 b, HATS-64 b, HATS-65 b, HATS-66 b, HATS-67 b, HATS-68 b, and HATS-69 b.

January 10, 2019
The first planets to be added in 2019 are three single, transiting K2 planets, one of which (K2-288 B b) was found by citizen scientists using Exoplanet Explorers! The other two planets are K2-286 b and K2-287 b. See the press briefing for K2-288 B b (`https://go.nasa.gov/2Bkd6ll`) and read the discovery paper (`http://bit.ly/2t6wuh5`).

Download/Website: `https://exoplanetarchive.ipac.caltech.edu`

Contact: `mharbut@caltech.edu`

6 Announcements

2019B NASA Keck Call for General Observing Proposals

Dr. Dawn M. Gelino
NASA Exoplanet Science Institute, California Institute of Technology, Pasadena, CA

Proposals due March 14, 2019 at 4 pm PDT,

NASA is soliciting proposals to use the Keck Telescopes for the 2019B observing semester (August 1, 2019 - January 31, 2020). Complete call information is available on the website below and all proposals are due by March 14, 2019 at 4 pm PDT. The opportunity to propose as Principal Investigators for NASA time on the Keck Telescopes is open to all U.S.-based astronomers (a U.S.-based astronomer has their principal affiliation at a U.S. institution). **Investigators from institutions outside of the U.S. may participate as Co-Investigators on proposals for NASA Keck time**. NASA intends the use of the Keck telescopes to be highly strategic in support of on-going space missions and/or high priority, long-term science goals. Proposals are sought in the following discipline areas: (1) investigations in support of EXOPLANET EXPLORATION science goals and missions; (2) investigations of our own SOLAR SYSTEM; (3) investigations in support of COSMIC ORIGINS science goals and missions; and (4) investigations in support of PHYSICS OF THE COSMOS science goals and missions. Direct mission support proposals in any of these scientific areas are also encouraged.

Important Dates

- Thursday, February 28: deadline to request letters from NASA HQ for Key Strategic Mission Support and General Mission Support proposals.
- Thursday, March 14: All proposals and supporting letters due to NExScI by 4 pm PDT

Download/Website: `//nexsci.caltech.edu/missions/KeckSolicitation/index.shtml`

Contact: `KeckCFP@ipac.caltech.edu`

7 As seen on astro-ph

The following list contains all the entries relating to exoplanets that we spotted on astro-ph during January 2019.

January 2019

astro-ph/1901.00051: **The Longest Period TESS Planet Yet: A Sub-Neptune Transiting A Bright, Nearby K Dwarf Star** by *Diana Dragomir et al.*

astro-ph/1901.00196: **Accounting for Incompleteness due to Transit Multiplicity in Kepler Planet Occurrence Rates** by *Jon K. Zink, Jessie L. Christiansen, Bradley M. S. Hansen*

astro-ph/1901.00420: **A special giant impact model: implications on core-mantle chemical differentiation** by *You Zhou et al.*

astro-ph/1901.00443: **Stellar Flares from the First Tess Data Release: Exploring a New Sample of M-dwarfs** by *Maximilian N. Günther et al.*

astro-ph/1901.00506: **Re-Evaluating Small Long-Period Confirmed Planets From Kepler** by *Christopher J. Burke et al.*

astro-ph/1901.00508: **Turning up the heat on 'Oumuamua** by *John C. Forbes, Abraham Loeb*

astro-ph/1901.00567: **The atmospheric circulation and climate of terrestrial planets orbiting Sun-like and M-dwarf stars over a broad range of planetary parameters** by *Thaddeus D. Komacek, Dorian S. Abbot*

astro-ph/1901.00778: **Physics of Planet Trapping with Applications to HL Tau** by *Alex J. Cridland, Ralph E. Pudritz, Matthew Alessi*

astro-ph/1901.01270: **Photosynthesis on habitable planets around low-mass stars** by *Manasvi Lingam, Abraham Loeb*

astro-ph/1901.01323: **Rotational Light Curves of Jupiter from UV to Mid-Infrared and Implications for Brown Dwarfs and Exoplanets** by *Huazhi Ge et al.*

astro-ph/1901.01361: **Estimation of Planetary Photometric Emissions for Extremely Close-in Exoplanets** by *Jennifer L Carter*

astro-ph/1901.01406: **A gap in HD 92945's broad planetesimal disc revealed by ALMA** by *S. Marino et al.*

astro-ph/1901.01435: **Two Super-Earths in the 3:2 MMR around KOI-1599** by *F. Panichi, C. Migaszewski, K. Goździewski*

astro-ph/1901.01439: **Simulations of wobble damping in viscoelastic rotators** by *Alice C. Quillen, Katelyn J. Wagner, Paul Sanchez*

astro-ph/1901.01627: **The BEBOP radial-velocity survey for circumbinary planets I. Eight years of CORALIE observations of 47 single-line eclipsing binaries and abundance constraints on the masses of circumbinary planets** by *David V. Martin et al.*

astro-ph/1901.01643: **A Hot Saturn Orbiting An Oscillating Late Subgiant Discovered by TESS** by *Daniel Huber et al.*

astro-ph/1901.01714: **Pebble accretion in class 0/I YSOs as a possible pathway for early planet formation** by *Yuki A. Tanaka, Yusuke Tsukamoto*

astro-ph/1901.01730: **Analytic solutions to the maximum and average exoplanet transit depth for common stellar limb darkening laws** by *René Heller*

astro-ph/1901.01813: **IPRT polarized radiative transfer model intercomparison project - Phase A** by *C. Emde et al.*

astro-ph/1901.01828: **IPRT polarized radiative transfer model intercomparison project - Three-dimensional test cases (phase B)** by *C. Emde et al.*

astro-ph/1901.01836: **Errors induced by the neglect of polarization in radiance calculations for three-dimensional cloudy atmospheres** by *C. Emde, B. Mayer*

astro-ph/1901.01842: **ALIS: An efficient method to compute high spectral resolution polarized solar radiances using the Monte Carlo approach** by *C. Emde, R. Buras, B. Mayer*

astro-ph/1901.01875: **The XUV irradiation and likely atmospheric escape of the super-Earth π Men c** by *George W. King et al.*

astro-ph/1901.01935: **Two Jovian planets around the giant star HD202696. A growing population of packed massive planetary pairs around massive stars?** by *Trifon Trifonov et al.*

astro-ph/1901.01974: **Revisiting the Long-Period Transiting Planets from Kepler** by *Miranda K. Herman, Wei Zhu, Yanqin Wu*

astro-ph/1901.02015: **Transit Least Squares: Optimized transit detection algorithm to search for periodic transits of small planets** by *Michael Hippke, René Heller*

astro-ph/1901.02017: **Killing Planet Candidates with EVEREST** by *Michael Greklek-McKeon, Drake Deming*

astro-ph/1901.02136: **Assessing the Intrinsic Uncertainty and Structural Stability of Planetary Models: 1) Parameterized Thermal-Tectonic History Models** by *Johnny Seales, Adrian Lenardic, William Moore*

astro-ph/1901.02301: **Bifurcation in the growth of continental crust** by *Dennis Höning et al.*

astro-ph/1901.02367: **The CARMENES search for exoplanets around M dwarfs - The enigmatic planetary system GJ 4276: One eccentric planet or two planets in a 2:1 resonance?** by *E. Nagel et al.*

astro-ph/1901.02383: **The secondary transit of the hot Jupiter WASP-121b at 2 μm** by *Geza Kovacs, Tamas Kovacs*

astro-ph/1901.02407: **The temporal requirements of directly observing self-gravitating spiral waves in protoplanetary discs with ALMA** by *Cassandra Hall et al.*

astro-ph/1901.02465: **The fate of planetesimal discs in young open clusters: implications for 1I/'Oumuamua, the Kuiper belt, the Oort cloud and more** by *Thomas Oliver Hands et al.*

astro-ph/1901.02467: **Multiple spiral arms in the disk around intermediate-mass binary HD 34700A** by *John D. Monnier et al.*

astro-ph/1901.02469: **Testing the Detectability of Extraterrestrial O2 with the ELTs using Real Data with Real Noise** by *Dilovan B. Serindag, Ignas A. G. Snellen*

astro-ph/1901.02555: **Systematic structure and sinks in the YORP effect** by *Oleksiy Golubov, Daniel J. Scheeres*

astro-ph/1901.02593: **On the formation of our solar system and many other protoplanetary systems observed by ALMA and SPHERE** by *Dimitris M. Christodoulou, Demosthenes Kazanas*

astro-ph/1901.02594: **Conundrums and constraints concerning the formation of our solar system – An alternative view** by *Dimitris M. Christodoulou, Demosthenes Kazanas*

astro-ph/1901.02831: **Secular spin-axis dynamics of exoplanets** by *Melaine Saillenfest, Jacques Laskar, Gwenaël Boué*

astro-ph/1901.02897: **Climate sensitivity to ozone and its relevance on the habitability of Earth-like planets** by *Illeana Gomez-Leal et al.*

astro-ph/1901.02901: **Climate Sensitivity to Carbon Dioxide and Moist Greenhouse threshold of Earth-like planets under an increasing solar forcing** by *Illeana Gomez-Leal et al.*

astro-ph/1901.02955: **Simulating Non-hydrostatic atmospheres on Planets (SNAP): formulation, validation and application to the Jovian atmosphere** by *Cheng Li, Xi Chen*

astro-ph/1901.03166: **Fluids mobilization in Arabia Terra, Mars: depth of pressurized reservoir from mounds self-similar clustering** by *Riccardo Pozzobon et al.*

astro-ph/1901.03294: **New wavelength calibration of the HARPS spectrograph** by *Adrien Coffinet et al.*

astro-ph/1901.03392: **Construction of J2-Invariant Periodic Relative Motion in Highly Elliptical Orbits** by *Jackson Kulik*

astro-ph/1901.03680: **Protoplanetary disk rings and gaps across ages and luminosities** by *Nienke van der Marel et al.*

astro-ph/1901.03716: **K2-290: a warm Jupiter and a mini-Neptune in a triple-star system** by *M. Hjorth et al.*

astro-ph/1901.03764: **Toward More Reliable Analytic Thermochemical-equilibrium Abundances** by *Patricio Cubillos, Jasmina Blecic, Ian Dobbs-Dixon*

astro-ph/1901.04057: **A search for technosignatures from TRAPPIST-1, LHS 1140, and 10 planetary systems in the Kepler field with the Green Bank Telescope at 1.15-1.73 GHz** by *Pavlo Pinchuk et al.*

astro-ph/1901.04082: **Nonlinear outcome of gravitational instability in an irradiated protoplanetary disc** by *Shigenobu Hirose, Ji-Ming Shi*

astro-ph/1901.04491: **The implications of clustered star formation for (proto)planetary systems and habitability** by *J. M. Diederik Kruijssen , Steven N. Longmore*

astro-ph/1901.04495: **A Pair of Planets Likely in Mean-Motion Resonance From Gravitational Microlensing** by *Sabrina Madsen, Wei Zhu*

astro-ph/1901.04511: **Memoirs of a giant planet** by *Yanqin Wu , Yoram Lithwick*

astro-ph/1901.04558: **EPIC 247418783b: A rocky super-Earth in a 2.2 day orbit** by *Molly R. Kosiarek et al.*

astro-ph/1901.04582: **Revisiting the dynamics of planets in binaries: evolutionary timescales and the effect of early stellar evolution** by *Bayron Portilla-Revelo , Jorge I. Zuluaga*

astro-ph/1901.04611: **Water delivery by pebble accretion to rocky planets in habitable zones in evolving disks** by *Shigeru Ida, Takeru Yamamura, Satoshi Okuzumi*

astro-ph/1901.04633: **The microstructural evolution of water ice in the solar system through sintering** by *Jamie L. Molaro et al.*

astro-ph/1901.04739: **A transiting super-Earth close to the inner edge of the habitable zone of an M0 dwarf star** by *E. Díez Alonso et al.*

astro-ph/1901.04888: **Chemical network reduction in protoplanetary disks** by *Rui Xu et al.*

astro-ph/1901.05004: **On the Ubiquity and Stellar Luminosity Dependence of Exocometary CO Gas: Detection around M Dwarf TWA 7** by *Luca Matrà et al.*

astro-ph/1901.05006: **Formation of Hot Jupiters through Secular Chaos and Dynamical Tides** by *Jean Teyssandier, Dong Lai, Michelle Vick*

astro-ph/1901.05011: **Detecting Ocean Glint on Exoplanets Using Multiphase Mapping** by *Jacob Lustig-Yaeger et al.*

astro-ph/1901.05018: **A circumbinary protoplanetary disc in a polar configuration** by *Grant M. Kennedy et al.*

astro-ph/1901.05116: **AutoRegressive Planet Search: Methodology** by *Gabriel A. Caceres et al.*

astro-ph/1901.05131: **Models of a protoplanetary disk forming in-situ the Galilean and smaller nearby satellites before Jupiter is fully formed** by *D. M. Christodoulou, D. Kazanas*

astro-ph/1901.05190: **Local simulations of MRI turbulence with meshless methods** by *Hongping Deng et al.*

astro-ph/1901.05338: **HADES RV program with HARPS-N at TNG. IX. A super-Earth around the M dwarf Gl686** by *L. Affer et al.*

astro-ph/1901.05466: **A Wide Orbit Exoplanet OGLE-2012-BLG-0838Lb** by *R. Poleski et al.*

astro-ph/1901.05471: **HARPS-N radial velocities confirm the low densities of the Kepler-9 planets** by *L. Borsato et al.*

astro-ph/1901.05523: **The Rotation-Disk Connection in Young Brown Dwarfs: Strong Evidence for Early Rotational Braking** by *Keavin Moore , Aleks Scholz , Ray Jayawardhana*

astro-ph/1901.05697: **New models of Jupiter in the context of Juno and Galileo** by *Florian Debras, Gilles Chabrier*

astro-ph/1901.05855: **Spitzer transit follow-up of planet candidates from the K2 mission** by *John H. Livingston et al.*

astro-ph/1901.05975: **Experimental phase function and degree of linear polarization of cometary dust analogs** by *Elisa Frattin et al.*

astro-ph/1901.06366: **Transits of Inclined Exomoons - Hide and Seek and an Application to Kepler-1625** by *David V. Martin, Daniel C. Fabrycky, Benjamin T. Montet*

astro-ph/1901.06555: **Blobs, spiral arms, and a possible planet around HD 169142** by *R. Gratton et al.*

astro-ph/1901.06921: **Temperature Structure in the Inner Regions of Protoplanetary Disks: Inefficient Accretion Heating by Energy Dissipation Profile of Nonideal Magnetohydrodynamics** by *Shoji Mori et al.*

astro-ph/1901.07034: **A Multi-Year Search For Transits Of Proxima Centauri. II: No Evidence For Transit Events With Periods Between 1-30 Days** by *Dax L. Feliz et al.*

astro-ph/1901.07040: **Statistical Characterization of Hot Jupiter Atmospheres using Spitzer's Secondary Eclipses** by *Emily Garhart et al.*

astro-ph/1901.07078: **Transitional disk archeology from exoplanet population synthesis** by *Germán Chaparro Molano, Frank Bautista, Yamila Miguel*

astro-ph/1901.07250: **Co-orbital exoplanets from close period candidates: The TOI-178 case** by *Adrien Leleu et al.*

astro-ph/1901.07390: **Simulations of the dynamics of the debris disks in the systems Kepler-16, Kepler-34, and Kepler-35** by *Tatiana Demidova, Ivan Shevchenko*

astro-ph/1901.07459: **Discovery and Vetting of Exoplanets I: Benchmarking K2 Vetting Tools** by *Veselin B. Kostov et al.*

astro-ph/1901.07640: **On the stability of the co-orbital resonance under dissipation: Application to the evolution in protoplanetary discs** by *Adrien Leleu, Gavin Coleman, Sareh Ataiee*

astro-ph/1901.07919: **Are Pebble Pile Planetesimals Doomed?** by *Tunahan Demirci et al.*

astro-ph/1901.07959: **Photoevaporation of protoplanetary disks by Far-UV photons arising from neighbouring massive stars: observation of proplyds and modelling** by *Jason Champion*

astro-ph/1901.08073: **High-resolution confirmation of an extended helium atmosphere around WASP-107b** by *R. Allart et al.*

astro-ph/1901.08089: **Giant planets and brown dwarfs on wide orbits: a code comparison project** by *Mark Fletcher et al.*

astro-ph/1901.08253: **Gas flow around a planet embedded in a protoplanetary disc: the dependence on the planetary mass** by *Ayumu Kuwahara, Hiroyuki Kurokawa, Shigeru Ida*

astro-ph/1901.08258: **Low-Eccentricity Formation of Ultra-Short Period Planets in Multi-Planet Systems** by *Bonan Pu, Dong Lai*

astro-ph/1901.08471: **Truly eccentric. I. Revisiting eight single-eccentric planetary systems** by *Robert A. Wittenmyer et al.*

astro-ph/1901.08472: **Truly eccentric. II. When can two circular planets mimic a single eccentric orbit?** by *Robert A. Wittenmyer et al.*

astro-ph/1901.08485: **Transit timing variations, radial velocities and long-term dynamical stability of the system Kepler-410** by *Pavol Gajdoš et al.*

astro-ph/1901.08542: **Origin of life's building blocks in Carbon and Nitrogen rich surface hydrothermal vents** by *Paul B Rimmer, Oliver Shorttle*

astro-ph/1901.08561: **Rapid falling of an orbiting moon to its parent planet due to tidal-seismic resonance** by *Yuan Tian, Yingcai Zheng*

astro-ph/1901.08610: **Triple-Lens Gravitational Microlensing: Critical Curves for Arbitrary Spatial Configuration** by *Kamil Danek, David Heyrovsky*

astro-ph/1901.08640: **Sparkling nights and very hot days on WASP-18b: the formation of clouds and the emergence of an ionosphere** by *Ch. Helling et al.*

astro-ph/1901.08704: **1I/'Oumuamua As Debris of Dwarf Interstellar Comet That Disintegrated Before Perihelion** by *Zdenek Sekanina*

astro-ph/1901.08719: **Searching for Super-Fast Rotators Using the Pan-STARRS 1** by *Chan-Kao Chang et al.*

astro-ph/1901.08777: **Sectoral r modes and periodic RV variations of Sun-like stars** by *A. F. Lanza et al.*

astro-ph/1901.08896: **Connecting planet formation and astrochemistry: Refractory carbon depletion leading to super-stellar C/O in giant planetary atmospheres** by *Alex J. Cridland, Christian Eistrup, Ewine F. van Dishoeck*

astro-ph/1901.09092: **Near-resonance in a system of sub-Neptunes from TESS** by *Samuel N. Quinn et al.*

astro-ph/1901.09463: **Dynamical effects of multiple impacts: Large impacts on a Mars-like planet** by *Thomas Ruedas, Doris Breuer*

astro-ph/1901.09700: **Thermal conductivity and coordination number of compressed dust aggregates** by *Sota Arakawa et al.*

astro-ph/1901.09719: **A new metric to quantify the similarity between planetary systems - application to dimensionality reduction using T-SNE** by *Yann Alibert*
astro-ph/1901.09932: **Effects of a fully 3D atmospheric structure on exoplanet transmission spectra: retrieval biases due to day-night temperature gradients** by *Anthony Caldas et al.*
astro-ph/1901.09934: **High-Resolution Simulations of Giant Impacts: Efficient Spherical Initial Conditions and Next-Generation Performance with SWIFT** by *J. A. Kegerreis et al.*
astro-ph/1901.09950: **An Eccentric Massive Jupiter Orbiting a Sub-Giant on a 9.5 Day Period Discovered in the Transiting Exoplanet Survey Satellite Full Frame Images** by *Joseph E. Rodriguez et al.*
astro-ph/1901.10223: **Swift UVOT near-UV transit observations of WASP-121 b** by *M. Salz et al.*
astro-ph/1901.10642: **Theoretical models of the protostellar disks of AS 209 and HL Tau presently forming in-situ planets** by *Dimitris M. Christodoulou, Demosthenes Kazanas*
astro-ph/1901.10666: **Tidally-Distorted, Iron-Enhanced Exoplanets Closely Orbiting Their Stars** by *Ellen M. Price, Leslie A. Rogers*
astro-ph/1901.10833: **High Resolution Spectroscopy and High Contrast Imaging with the ELT : looking for O2 in Proxima b** by *George A. Hawker, Ian R. Parry*
astro-ph/1901.10862: **The physical and chemical properties of planet forming disks** by *I. Kamp*
astro-ph/1901.11047: **Meteorite cloudy zone formation as a quantitative indicator of paleomagnetic field intensities and cooling rates on planetesimals** by *Clara Maurel, Benjamin P. Weiss, James F. J. Bryson*
astro-ph/1901.11171: **S-Type and P-Type Habitability in Stellar Binary Systems: A Comprehensive Approach III. Results for Mars, Earth, and super-Earth Planets** by *Zhaopeng Wang, Manfred Cuntz*
astro-ph/1901.11297: **Predicting multiple planet stability and habitable zone companions in the TESS era** by *Matthew T. Agnew et al.*
astro-ph/1901.11426: **The Effects of Gravity on the Climate and Circulation of a Terrestrial Planet** by *Stephen I. Thomson, Geoffrey K. Vallis*
astro-ph/1901.11523: **ExPRES: a Tool to Simulate Exoplanetary and Planetary Radio Emissions** by *C. K. Louis et al.*
astro-ph/1901.00219: **Breezing through the space environment of Barnard's Star b** by *Julián D. Alvarado-Gómez et al.*
astro-ph/1901.00502: **HAZMAT. V. The Ultraviolet and X-ray Evolution of K Stars** by *Tyler Richey-Yowell et al.*
astro-ph/1901.00503: **Wobble: a data-driven method for precision radial velocities** by *Megan Bedell et al.*
astro-ph/1901.00664: **Data Reduction Pipeline of the TOU Optical Very High Resolution Spectrograph and Its sub-m/s Performance** by *Bo Ma, Jian Ge*
astro-ph/1901.01800: **Close-in Super-Earths: The first and the last stages of planet formation in an MRI-accreting disc** by *Marija R. Jankovic, James E. Owen, Subhanjoy Mohanty*
astro-ph/1901.01929: **Star-disc (mis-)alignment in Rho Oph and Upper Sco: insights from spatially resolved disc systems with K2 rotation periods** by *Claire L Davies*
astro-ph/1901.02041: **Time-resolved image polarimetry of Trappist-1 during planetary transits** by *P. A. Miles-Páez et al.*
astro-ph/1901.02048: **The Rise of ROME. I. A Multiwavelength Analysis of the Star-Planet Interaction in the HD 189733 System** by *Matthew Route*
astro-ph/1901.02562: **The Oxyometer: A Novel Instrument Concept for Characterizing Exoplanet Atmospheres** by *Ashley D. Baker, Cullen H. Blake, Sam Halverson*
astro-ph/1901.02747: **Time-variable electromagnetic star-planet interaction: The TRAPPIST-1 system as an exemplary case** by *Christian Fischer, Joachim Saur*
astro-ph/1901.03687: **Benchmarking Substellar Evolutionary Models Using New Age Estimates for HD 4747 B and HD 19467 B** by *Charlotte M. Wood et al.*
astro-ph/1901.04090: **Reference star differential imaging of close-in companions and circumstellar disks with the NIRC2 vortex coronagraph at W.M. Keck Observatory** by *Garreth Ruane et al.*

astro-ph/1901.05029: **Resolved young binary systems and their disks** by *Rachel L. Akeson et al.*
astro-ph/1901.05532: **Age Determination in Upper Scorpius with Eclipsing Binaries** by *Trevor J. David et al.*
astro-ph/1901.06446: **Survey Observations to Study Chemical Evolution from High-Mass Starless Cores to High-Mass Protostellar Objects II. HC3N and N2H+** by *Kotomi Taniguchi et al.*
astro-ph/1901.06457: **OGLE-2016-BLG-0156: Microlensing Event With Pronounced Microlens-Parallax Effects Yielding Precise Lens Mass Measurement** by *Youn Kil Jung et al.*
astro-ph/1901.07567: **The need for single-mode fiber-fed spectrographs** by *Jonathan Crass et al.*
astro-ph/1901.07981: **The PDS 110 observing campaign - photometric and spectroscopic observations reveal eclipses are aperiodic** by *Hugh P. Osborn et al.*
astro-ph/1901.09045: **Internal structure of white dwarfs from gravitational waves** by *L. O. McNeill, Rosemary A. Mardling, B. Müller*
astro-ph/1901.09083: **What the sudden death of solar cycles can tell us about the nature of the solar interior** by *Scott W. McIntosh et al.*
astro-ph/1901.09468: **Most white dwarfs with detectable dust discs show infrared variability** by *Andrew Swan, Jay Farihi, Thomas G. Wilson*
astro-ph/1901.10386: **Clumpy dust rings around non-accreting young stars** by *Aleks Scholz et al.*
astro-ph/1901.11231: **Minerva-Australis I: Design, Commissioning, & First Photometric Results** by *Brett Addison et al.*
astro-ph/1901.11536: **Stochastic tidal heating by random interactions with extended substructures** by *Jorge Peñarrubia*
astro-ph/1901.02286: **Why planetary and exoplanetary protection differ: The case of long duration Genesis missions to habitable but sterile M-dwarf oxygen planets** by *Claudius Gros*