ExoPlanet News
An Electronic Newsletter

No. 150, 14 December 2021

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1 Editorial

Dear readers,

Welcome to the December edition of the ExoPlanet News!

As this is **the 150th edition of the newsletter** we would like to take a moment to thank all the editors, contributors and readers of the past 14.5 years.
In this issue you will find abstracts of scientific papers, job advertisements, announcements (conferences, book), the latest exoplanet talks, updates from the Exoplanet archive, and an overview of exoplanet-related articles on astro-ph.

We remind you of some **guidelines for using our templates**. If you follow these guidelines, you will make our job easier:

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For the next month we look forward to your paper abstracts, job ads or meeting announcements. Also special announcements 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 on January 11, 2022.

Julia Venturini
Daniel Angerhausen
Lokesh Mishra
Holly Capelo
Timm-Emanuel Riesens

2 Abstracts of refereed papers

Planets or asteroids? A geochemical method to constrain the masses of White Dwarf pollutants

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:2111.08779)

Polluted white dwarfs that have accreted planetary material provide a unique opportunity to probe the geology of exoplanetary systems. However, the nature of the bodies which pollute white dwarfs is not well understood: are they small asteroids, minor planets, or even terrestrial planets? We present a novel method to infer pollutant masses from detections of Ni, Cr and Si. During core–mantle differentiation, these elements exhibit variable preference for metal and silicate at different pressures (i.e., object masses), affecting their abundances in the core and mantle. We model core–mantle differentiation self-consistently using data from metal–silicate partitioning experiments. We place statistical constraints on the differentiation pressures, and hence masses, of bodies which pollute white dwarfs by incorporating this calculation into a Bayesian framework. We show that Ni observations are best suited to constraining pressure when pollution is mantle-like, while Cr and Si are better for core-like pollution. We find 3 systems (WD0449-259, WD1350-162 and WD2105-820) whose abundances are best explained by the accretion of fragments of small parent bodies ($< 0.2 M_{\oplus}$). For 2 systems (GD61 and WD0446-255), the best model suggests the accretion of fragments of Earth-sized bodies, although the observed abundances remain consistent ($< 3\sigma$) with the accretion of undifferentiated material. This suggests that polluted white dwarfs potentially accrete planetary bodies of a range of masses. However, our results are subject to inevitable degeneracies and limitations given current data. To constrain pressure more confidently, we require serendipitous observation of (nearly) pure core and/or mantle material.

Download/Website: `https://arxiv.org/abs/2111.08779`

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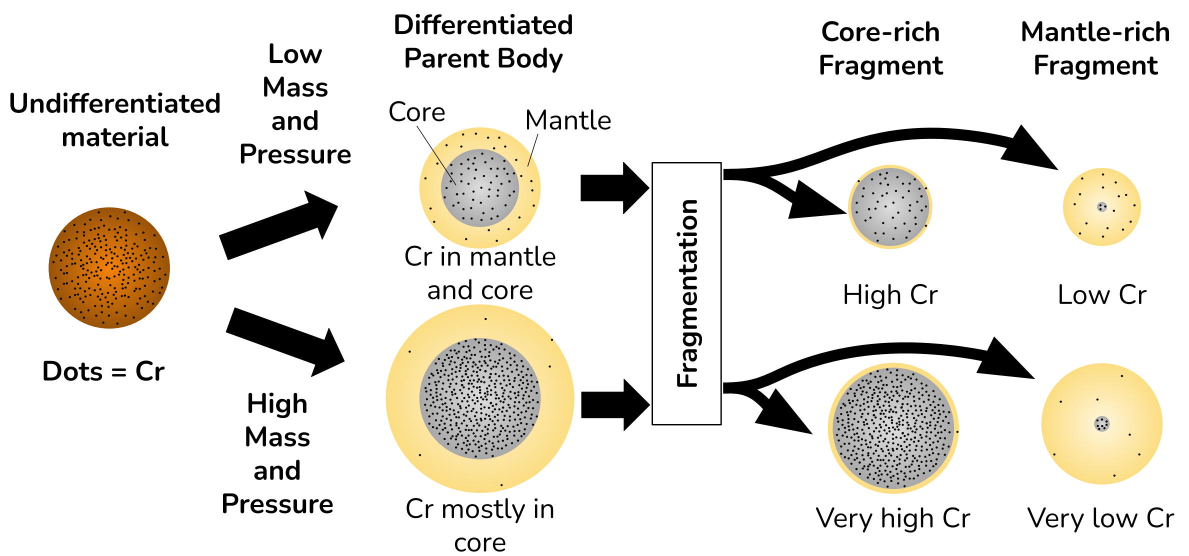

Figure 1: A schematic illustrating how the Cr content of planetary cores and mantles changes in planetary bodies of different sizes. The aim is to detect these differences in planetary bodies accreted by white dwarfs. Assuming planetary differentiation occurs with little change in the attendant redox conditions, higher pressures of core–mantle segregation result in Cr exhibiting increasingly siderophile behaviour and becoming more concentrated in the core. This altered compositional signature remains present in any fragments derived from the parent, enabling constraints on the size of the parent body from the composition of fragments observed in polluted white dwarfs. In our working hypothesis, fragmentation occurs via collisional processing, but our model does not include any treatment of the fragmentation mechanism so this choice is inconsequential. The increased bulk concentration of Cr in the high pressure parent body (compared to the low pressure parent body) is to aid visual clarity. Si exhibits similar behaviour to Cr, becoming increasingly siderophile with the increasing temperature concomitant with rising core formation pressures. Ni exhibits the opposite behaviour, becoming more lithophile with increasing pressure.

The atmospheres of rocky exoplanets
II. Influence of surface composition on the diversity of cloud condensates

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Astronomy & Astrophysics, in press (2021arXiv211114144H/arXiv:2111.14144)

Clouds are an integral part of planetary atmospheres, with most planets hosting clouds. Understanding not only the formation, but also the composition of clouds, is crucial to understand future observations.
As observations of the planet's surface will remain very difficult, it is essential to link the observable high atmosphere gas and cloud composition to the surface conditions.
We present a fast and simple chemical equilibrium model for the troposphere of rocky exoplanets, which is in chemical and phase equilibrium with the crust. The hydrostatic equilibrium atmosphere is built from bottom to top. In each atmospheric layer, chemical equilibrium is solved and all thermally stable condensates are removed, depleting the atmosphere above in the effected elements. These removed condensates build an upper limit for cloud formation and can be separated into high and low temperature condensates.
The most important cloud condensates for $1000\,\mathrm{K} \geq T_{\mathrm{gas}} \geq 400\,\mathrm{K}$ are KCl[s], NaCl[s], FeS[s], FeS_2[s], FeO[s], Fe_2O_3[s], and Fe_3O_4[s]. For $T_{\mathrm{gas}} \leq 400\,\mathrm{K}$ H_2O[l,s], C[s], NH_3[s], NH_4Cl[s], and NH_4SH[s] are thermally stable, while for even lower temperatures of $T_{\mathrm{gas}} \leq 150\,\mathrm{K}$ CO_2[s], CH_4[s], NH_3[s], and H_2S[s] become stable. The inclusion of clouds with trace abundances results in the thermal stability of a total of 72 condensates for atmospheres with different surface conditions ($300\,\mathrm{K} \leq T_{\mathrm{surf}} \leq 1000\,\mathrm{K}$ and $p_{\mathrm{surf}} = 1\,\mathrm{bar}, 100\,\mathrm{bar}$). The different cloud condensates are not independent of each other, but follow sequences of condensation, which are robust against changes in crust composition, surface pressure, and surface temperature. Independent of the existence of water as a crust condensate, H_2O[l,s] is a thermally stable cloud condensate for all investigated elemental abundances. However, the water cloud base depends on the hydration level of the crust. Therefore, the detection of water condensates alone does not necessarily imply stable water on the surface, even if the temperature could allow for water condensation.

Download/Website: `https://arxiv.org/abs/2111.14144`

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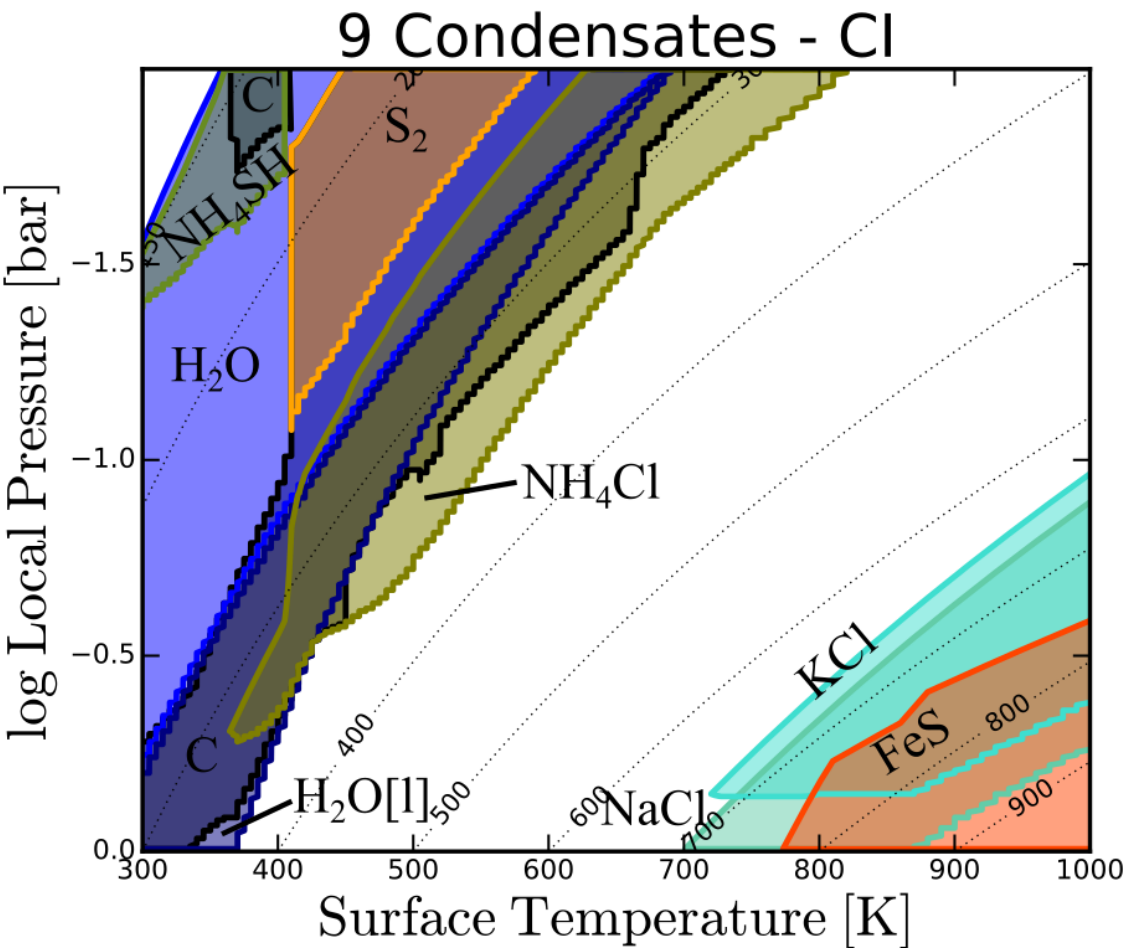

Figure 2: Visualised are the most abundant thermally stable cloud condensates for a CI chondrite total element abundance. The atmospheric models are calculated for a surface pressure of 1 bar and a surface temperature ranging from 300 K to 1000 K. While building the atmospheric model from bottom to top, the (p, T) profile follows the hydrostatic equilibrium with a polytropic index of $\gamma = 1.25$. All thermally stable condensates are removed and deplete the atmosphere above in the respective elements. The regions where a given condensate exceeds number densities of 10^{-9} are coloured above. The black dotted lines show the local gas temperature.

A wide-orbit giant planet in the high-mass b Centauri binary system

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Nature, published (Nature 600, 231, 2021)

Planet formation occurs around a wide range of stellar masses and stellar system architectures. An improved understanding of the formation process can be achieved by studying it across the full parameter space, particularly toward the extremes. Earlier studies of planets in close-in orbits around high-mass stars have revealed an increase in giant planet frequency with increasing stellar mass until a turnover point at 1.9 solar masses, above which the frequency rapidly decreases. This could potentially imply that planet formation is impeded around more massive stars, and that giant planets around stars exceeding 3 solar masses may be rare or non-existent. However, the methods used to detect planets in small orbits are insensitive to planets in wide orbits. Here we demonstrate the existence of a planet at 560 times the Sun-Earth distance from the 6–10 solar mass binary b Centauri through direct imaging. The planet-to-star mass ratio of 0.10–0.17% is similar to the Jupiter-Sun ratio, but the separation of the detected planet is $\sim$100 times wider than that of Jupiter. Our results show that planets can reside in much more massive stellar systems than what would be expected from extrapolation of previous results. The planet is unlikely to have formed in-situ through the conventional core accretion mechanism, but might have formed elsewhere and arrived to its present location through dynamical interactions, or might have formed via gravitational instability.

Download/Website: `https://arxiv.org/abs/2112.04833`

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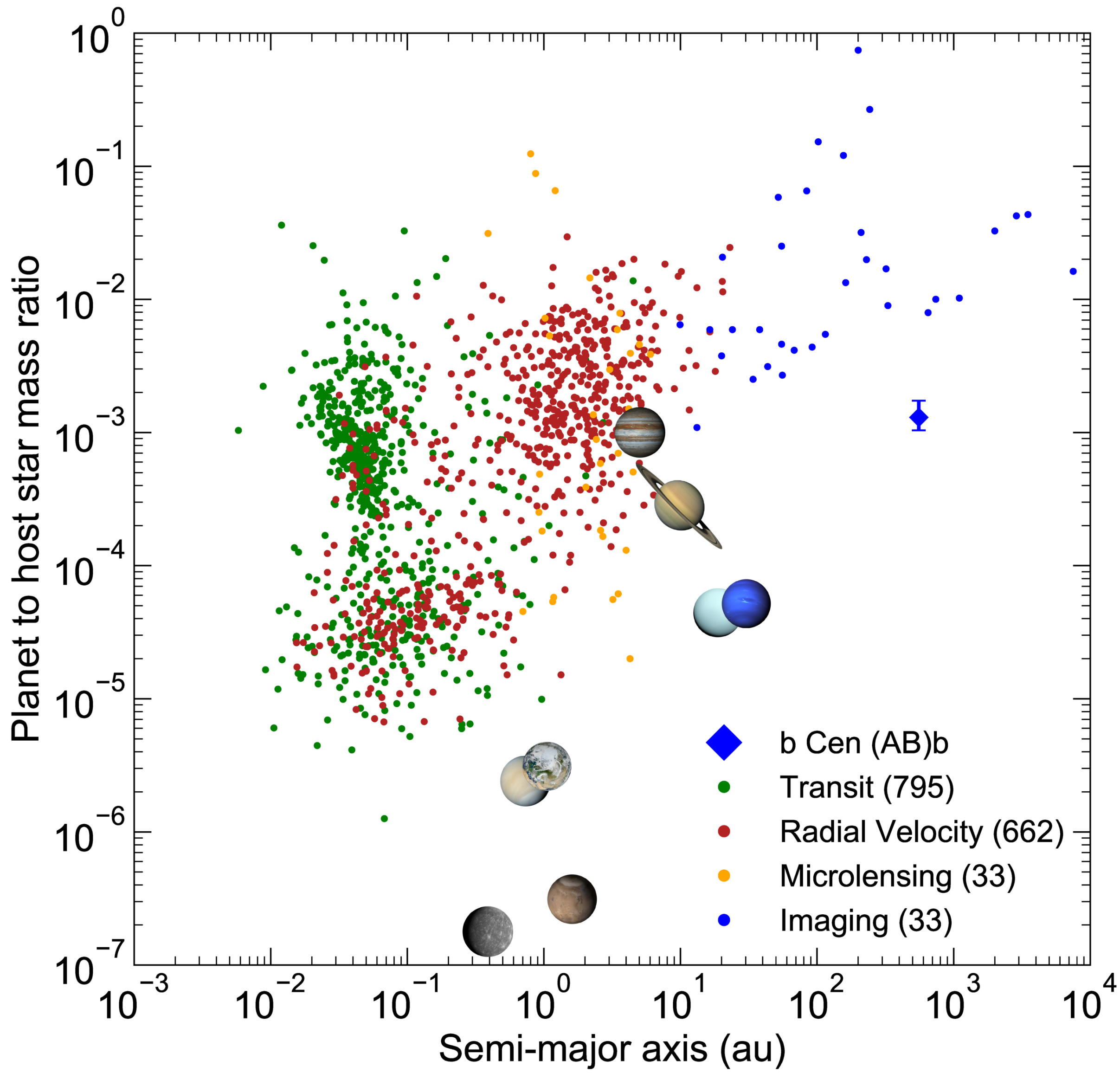

Figure 3: The planet-to-star mass ratio of b Cen (AB)b in an exoplanetary context. Small circles are confirmed exoplanets with parent stellar masses known to better than 30% precision, retrieved from the NASA (National Aeronautics and Space Administration) Exoplanet Archive. Both single and binary star systems are included. The planets are colour-coded by detection method, where green circles are transit detections, red are radial velocity detections, black are microlensing detections, and blue are imaging detections. The Solar System planets (images from NASA) are also plotted for reference. The diamond symbol denotes b Cen (AB)b, which has an unusually low mass ratio to the central system relative to other detected planets in the wide, directly imaged population. The error bar for b Cen (AB)b is dominated by the range of possible values for the system mass (Methods).

Direct emission spectroscopy of exoplanets with the medium resolution imaging spectrometer on board JWST MIRI: I. Molecular mapping and sensitivity to instrumental effects

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Astronomy and Astrophysics, in press (arXiv:2110.15756)

The Medium Resolution Spectrometer (MRS) of the Mid-Infrared Instrument (MIRI) on board the James Webb Space Telescope (JWST) will give access to mid-infrared (mid-IR) spectra (5-28 microns) while retaining spatial information. With the unparalleled sensitivity of JWST and the MIRI detectors, the MRS has the potential to revolutionise our understanding of giant exoplanet atmospheres. Molecular mapping is a promising detection and characterisation technique used to study the spectra of directly imaged exoplanets. We aim to examine the feasibility and application of this technique to MRS observations. We used the instrument simulator `MIRISIM` to create mock observations of resolved star and exoplanet systems. As an input for the simulator, we used stellar and planet parameters from literature, with the planet spectrum being modelled with the radiative transfer code `petitRADTRANS`. We identified limiting factors in spectroscopic characterisation of directly imaged exoplanets with the MRS and simulated observations of two representative systems, HR8799 and GJ504. In both systems, we could detect the presence of multiple molecules that were present in the input model of their atmospheres. We used two different approaches with single molecule forward models, used in literature, that are sensitive to detecting mainly H_20, CO, CH_4, and NH_3, and a log-likelihood ratio test that uses full atmosphere forward models and is sensitive to a larger number of less dominant molecular species. We show that the MIRI MRS can be used to characterise widely separated giant exoplanets in the mid-IR using molecular mapping. Such observations would provide invaluable information for the chemical composition of the atmosphere, complementing other JWST observing modes, as well as ground-based observations.

Download/Website: `https://arxiv.org/abs/2110.15756`

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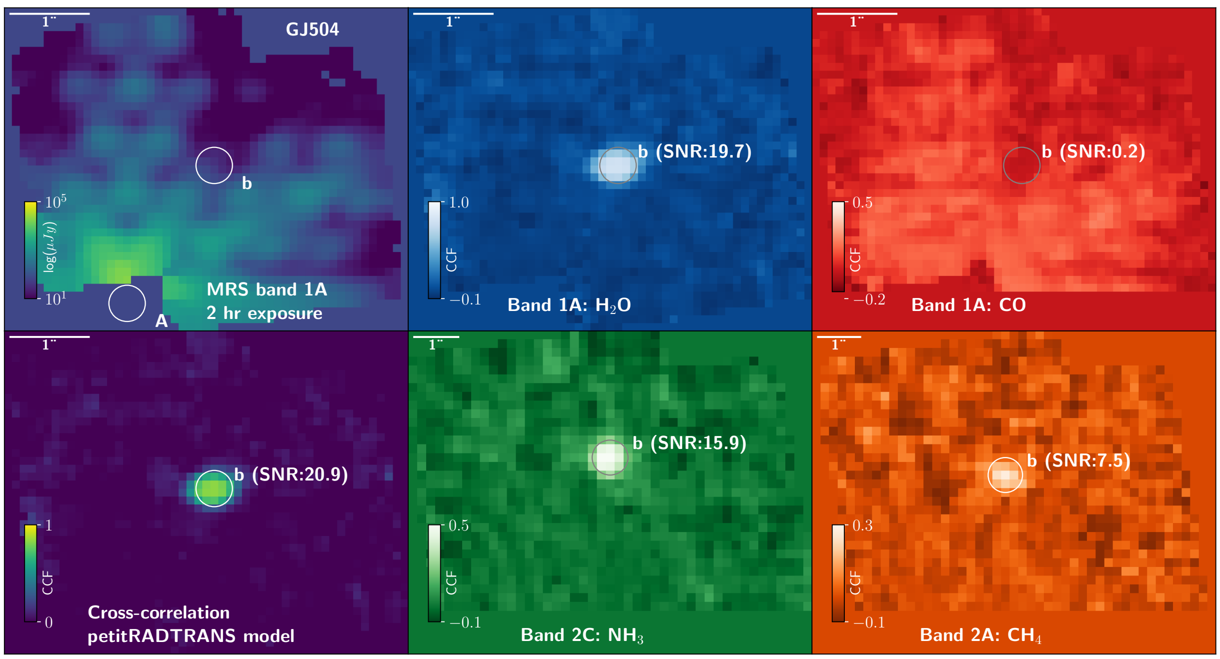

Figure 4: Result of molecular mapping for a simulated observation of GJ504 b with the MRS for single sub-bands. *First vertical column:* Single log-scaled frame from the flux calibrated and reconstructed cube, and the same frame cross-correlated with its input spectrum for sub-band 1A. *Second and third vertical columns:* Cross correlation maps of filtered cubes with individual molecular templates correctly identify the abundant species of H_20, CH_4, and NH_3. No CO is detected (top right panel), as expected from chemical equilibrium models for cold objects as for instance GJ 504 b. Values in parentheses indicate the S/N and the sub-bands with the highest S/N are plotted.

K2-99 revisited: a non-inflated warm Jupiter, and a temperate giant planet on a 522-d orbit around a subgiant

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:2111.14660)

We report new photometric and spectroscopic observations of the K2-99 planetary system. Asteroseismic analysis of the short-cadence light curve from *K2*'s Campaign 17 allows us to refine the stellar properties. We find K2-99 to be significantly smaller than previously thought, with $R_\star = 2.55 \pm 0.02$ $\mathrm{R}_\odot$. The new light curve also contains four transits of K2-99 b, which we use to improve our knowledge of the planetary properties. We find the planet to be a non-inflated warm Jupiter, with $R_\mathrm{b} = 1.06 \pm 0.01$ $\mathrm{R_{Jup}}$. Sixty new radial velocity measurements from HARPS, HARPS-N, and HIRES enable the determination of the orbital parameters of K2-99 c, which were previously poorly constrained. We find that this outer planet has a minimum mass $M_\mathrm{c} \sin i_\mathrm{c} = 8.4 \pm 0.2$ $\mathrm{M_{Jup}}$, and an eccentric orbit ($e_\mathrm{c} = 0.210 \pm 0.009$) with a period of 522.2 ± 1.4 d. Upcoming TESS observations in 2022 have a good chance of detecting the transit of this planet, if the mutual inclination between the two planetary orbits is small.

Download/Website: `https://arxiv.org/abs/2111.14660`

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An upper limit on late accretion and water delivery in the Trappist-1 exoplanet system

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Nature Astronomy, published (arxiv:2111.13351)

The Trappist-1 system contains seven roughly Earth-sized planets locked in a multi-resonant orbital configuration, which has enabled precise measurements of the planets' masses and constrained their compositions. Here we use the system's fragile orbital structure to place robust upper limits on the planets' bombardment histories. We use N-body simulations to show how perturbations from additional objects can break the multi-resonant configuration by either triggering dynamical instability or simply removing the planets from resonance. The planets cannot have interacted with more than $\sim 5\%$ of an Earth mass ($M_\oplus$) in planetesimals – or a single rogue planet more massive than Earth's Moon – without disrupting their resonant orbital structure. This implies an upper limit of 10^{-4} to $10^{-2} M_\oplus$ of late accretion on each planet since the dispersal of the system's gaseous disk. This is comparable to or less than the late accretion on Earth after the Moon-forming impact, and demonstrates that the Trappist-1 planets' growth was complete in just a few million years, roughly an order of magnitude faster than Earth's. Our results imply that any large water reservoirs on the Trappist-1 planets must have been incorporated during their formation in the gaseous disk.

Download/Website: `https://arxiv.org/abs/2111.13351`

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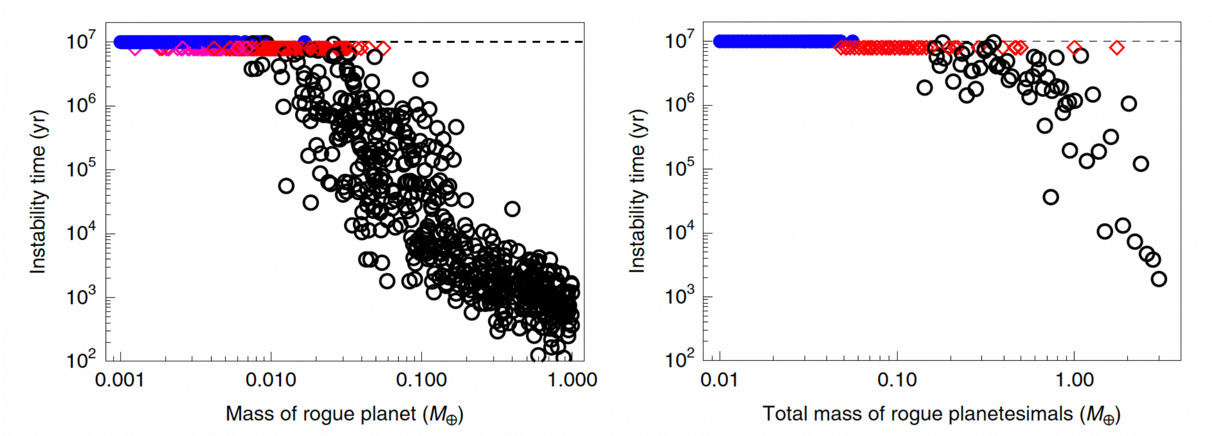

Figure 5: **Response of the Trappist-1 system when interacting with a single rogue planet (left panel) or 1000 rogue planetesimals (right panel).** Blue circles represent simulations that are consistent with the observed system: the planets' orbits remained stable for the 10 Myr integration and retained their multi-resonant configuration. The red symbols denote systems that were stable for 10 Myr (shifted slightly downward for visibility) but whose resonant structure was disrupted, as quantified using Laplace resonant angles for the outer triplets of planets (see Methods). The black circles represent systems that underwent dynamical instabilities, leading to planet-planet collisions. The starting orbits of the rogue planets or planetesimals were chosen assuming that they were scattered inward from just exterior to the known planets. The results of simulations with different configurations of the Trappist-1 planets produced near-identical results (see Methods Section 5).

Collisional properties of cm-sized high-porosity ice and dust aggregates and their applications to early planet formation

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:2111.09141)

In dead zones of protoplanetary discs, it is assumed that micrometre-sized particles grow Brownian, sediment to the midplane and drift radially inward. When collisional compaction sets in, the growing aggregates collect slower and therefore dynamically smaller particles. This sedimentation and growth phase of highly porous ice and dust aggregates is simulated with laboratory experiments in which we obtained mm- to cm-sized ice aggregates with a porosity of 90% as well as cm-sized dust agglomerates with a porosity of 85%. We modelled the growth process during sedimentation in an analytical calculation to compute the agglomerate sizes when they reach the midplane of the protoplanetary disc. In the midplane, the dust particles form a thin dense layer and gain relative velocities by, e.g., the streaming instability or the onset of shear turbulence. To investigate also these collisions, we performed additional laboratory drop tower experiments with the high-porosity aggregates formed in the sedimentary-growth experiments and determined their mechanical parameters, including their sticking threshold velocity, which is important for their further collisional evolution on their way to form planetesimals. Finally, we developed a method to calculate the packing-density-dependent fundamental properties of our dust and ice agglomerates, the Young's modulus, the Poisson ratio, the shear viscosity and the bulk viscosity from compression measurements. With these parameters, it was possible to derive the coefficient of restitution which fits our measurements. In order to physically describe these outcomes, we applied a collision model. With this model, predictions about general dust-aggregate collisions are possible.

Download/Website: `https://arxiv.org/abs/2111.09141`

Contact: `r.schraepler@tu-braunschweig.de`

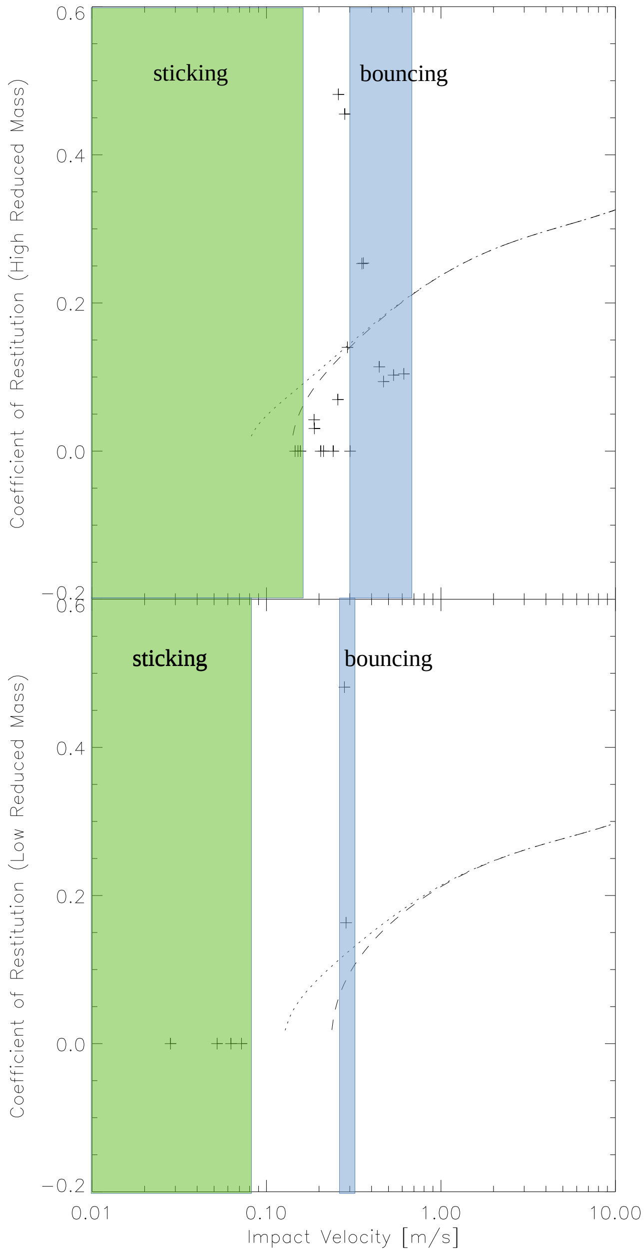

Figure 6: Coefficient of restitution for high-porosity water-ice agglomerates as a function of impact velocity. Top: Using the type 2 sample-release mechanism, the water-ice-agglomerate masses ranged from 2.5×10^{-5} kg to 6.5×10^{-5} kg (mean agglomerate mass of 4.14×10^{-5} kg) and the collision velocities ranged from $\sim 0.15\,\mathrm{m\,s^{-1}}$ to $\sim 0.62\,\mathrm{m\,s^{-1}}$. Bottom: Using the type 1 sample-release mechanism, the water-ice-agglomerate masses ranged from 3×10^{-7} kg to 1×10^{-5} kg (mean agglomerate mass of 4.74×10^{-6} kg) and the collision velocities ranged from $\sim 0.03\,\mathrm{m\,s^{-1}}$ to $\sim 0.3\,\mathrm{m\,s^{-1}}$. The curves show our impact model using mean reduced masses and a monomer surface energy of γ=20 mJ m^{-2} (dotted curves) and γ=77 mJ m^{-2} (dashed curves), respectively. The color coding shows the regions where sticking and bouncing was found by our experiments.

Ground-based HCN submillimetre measurements in Titan's atmosphere: an intercomparison with Herschel observations

M. Rengel[1], D. Shulyak[1,2], P. Hartogh[1], H. Sagawa[3], R. Moreno[4], C. Jarchow[1], D. Breitschwerdt[5],

[1] Max-Planck-Institut für Sonnensystemforschung, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany
[2] Instituto de Astrofísica de Andalucía - CSIC, c/ Glorieta de la Astronomía s/n, 18008 Granada, Spain
[3] Faculty of Science, Kyoto Sangyo University, Kyoto 603-8555, Japan
[4] LESIA – Observatoire de Paris, CNRS, Université Paris 6, Université Paris-Diderot, 5 place Jules Janssen, 92195 Meudon, France
[5] Zentrum für Astronomie und Astrophysik, Technische Universität Berlin, Hardenbergstrasse 36, D-10623 Berlin, Germany

Astronomy&Astrophysics, in press (arXiv:2112.04125)

The aim of this study is to measure the vertical distribution of HCN on Titan's stratosphere using ground-based submillimetre observations acquired quasi-simultaneously with the Herschel ones. This allows us to perform a consistency check between space and ground-based observations and to build a reference mean HCN vertical profile in Titan's stratosphere. Using APEX and IRAM 30-m, we obtained the spectral emission of HCN (4-3) and (3-2) lines. Observations were reduced with GILDAS-CLASS. We applied a line-by-line radiative transfer code to calculate the synthetic spectra of HCN, and a retrieval algorithm based on optimal estimation to retrieve the temperature and HCN vertical distributions. We used the standard deviation-based metric to quantify the dispersion between the ground-based and Herschel HCN profiles and the mean one. Our derived HCN abundance profiles are consistent with an increase from 40 ppb at $\sim$100 km to 4 ppm at $\sim$200 km, which is an altitude region where the HCN signatures are sensitive. We also demonstrate that the retrieved HCN distribution is sensitive to the data information and is restricted to Titan's stratosphere. The HCN obtained from APEX data is less accurate than the one from IRAM data because of the poorer data quality, and covers a narrower altitude range. Comparisons between our results and the values from Herschel show similar abundance distributions, with maximum differences of 2.5 ppm ranging between 100 and 300 km in the vertical range. These comparisons also allow us to inter-validate both data sets and indicate reliable and consistent measurements. The inferred abundances are also consistent with the vertical distribution in previous observational studies, with the profiles from ALMA, Cassini/CIRS, and SMA (the latest ones below $\sim$230 km). Our HCN profile is also comparable to photochemical models by Krasnopolsky (2014) and Vuitton et al. (2019) below 230 km and consistent with that of Loison et al. (2015) above 250 km. However, it appears to show large differences with respect to the estimates by Loison et al. (2015), Dobrijevic & Loison (2018), and Lora et al. (2018) below 170 km, and by Dobrijevic & Loison (2018) and Lora et al. (2018) above 400 km, although they are similar in shape. We conclude that these particular photochemical models need improvement.

Download/Website: `https://arxiv.org/abs/2112.04125`

Contact: `rengel@mps.mpg.de`

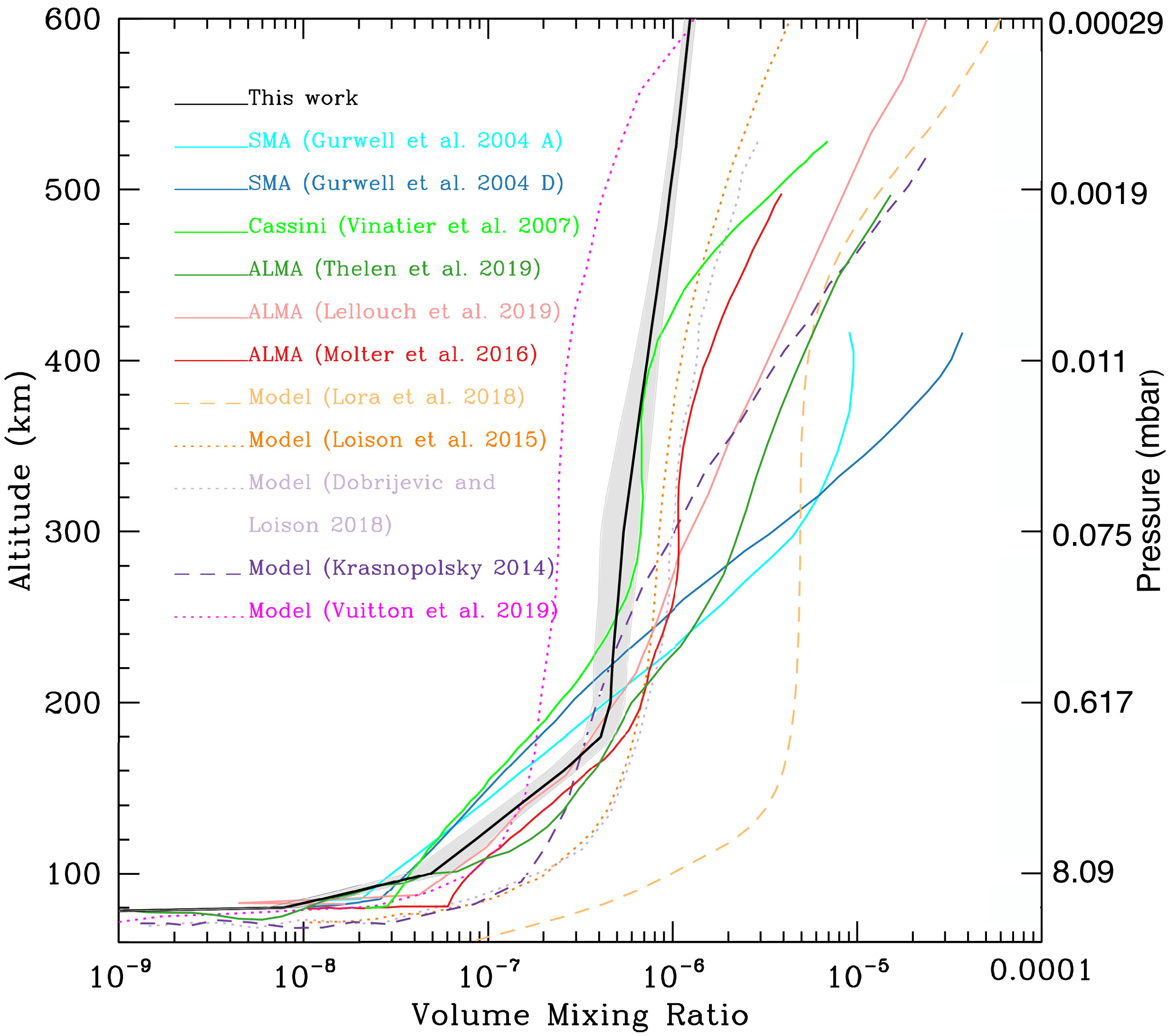

Figure 7: Mean HCN profile derived here (black) compared to observed profiles from the literature (coloured solid lines), and to predicted HCN profiles from photochemical models for Titan (coloured dashed lines) and for the atmosphere of planets around G stars Lora et al. (2018).

3 Jobs and Positions

Postdoctoral Position in Star-Exoplanet connections

A. A. Vidotto
Leiden Observatory, Leiden University, the Netherlands

Leiden Observatory, Start date: Negotiable; available from early 2022

Leiden Observatory invites applications for a postdoctoral position to work in the ERC Consolidator Project ASTROFLOW (PI Aline Vidotto). The research area of the ASTROFLOW group is centred around star-exoplanet connections, ranging from stellar outflows (stellar winds, coronal mass ejections), exoplanetary outflows (atmospheric escape), and magnetism (stellar and planetary).

Applicants with experience in any of these research areas are encouraged to apply. Experience in numerical and/or theoretical modelling is required. By the starting date, candidates must have a PhD in Astronomy, Physics or related scientific field. The starting date is negotiable and the position is available from early 2022.

Interested candidates should upload their applications to the web link below by 31 December 2021 to receive full consideration. The application should contain a cover letter, CV, publication list, and a statement of research experience and interests (max 2 pages excluding references). In your cover letter, please mention how your past experience and skills could complement the research carried out by the ASTROFLOW group. Candidates should arrange for three reference letters to be submitted at the same web link before the indicated deadline.

The postdoc position is for 2.5 years, consisting of an initial appointment of 1 year and an extension of 1.5 years contingent on satisfactory performance. Further extensions may be possible pending on funding.

Included Benefits: Salary ranges from 3,408 to 4,474 Euros gross per month based on a full time employment (38 hours/week, pay scale 10 in accordance with the Collective Labour Agreement for Dutch Universities). Leiden University offers an attractive benefits package with additional holiday allowance and end-of-year bonus (8% and 8.3% of annual income, respectively), training and career development, paid vacation, sick leave, disability insurance, maternity and parental leave, and retirement benefits. Our individual choices model gives you some freedom to assemble your own set of terms and conditions. Candidates from outside the Netherlands may be eligible for a substantial tax break. Compulsory medical insurance is not included (100-150 euro/month/adult).

The candidate will benefit from a vibrant local and national astronomy community. Leiden Observatory is the largest astronomy department in the Netherlands, with about 35 faculty and adjunct faculty, 50 postdoctoral researchers, 30 support staff, 80 PhD students and 100 MSc students. Leiden is a charming university town with international flair.

Download/Website: `https://jobs.strw.leidenuniv.nl/2021/VidottoPD/`

Contact: `vidotto@strw.leidenuniv.nl`

Phd position on the atmospheres of temperate planets and their observability using RISTRETTO and HIRES

Emeline Bolmont[1], *Christophe Lovis*[1], *Martin Turbet*[2]
[1] Observatoire de Genève, Université de Genève, Chemin Pegasi 51, 1290, Sauverny, Switzerland
[2] Laboratoire de Météorologie Dynamique, IPSL, Sorbonne Universités, UPMC Université Paris 06, CNRS, Paris, France

University of Geneva, June 2022

Applications are invited for a research assistant (PhD student) position at the University of Geneva (Geneva Observatory) working with Prof. Christophe Lovis and Prof. Emeline Bolmont on the modeling and future characterization of temperate/hot rocky planets around low-mass stars. The successful applicant is expected to work with a global climate model to study the effect of a variety of different parameters on the atmosphere and habitability of planets. The work will involve to run extensive simulations with the 3D Global Climate Model LMD-Generic and analyze the resulting outputs. The LMD-Generic (http://www-planets.lmd.jussieu.fr) is a generic version of the Earth global climate model used to study global warming. The student will work in close collaboration with Dr. Martin Turbet from the LMD. The student will also work on the implementation of new physical processes in the model, in particular the heat flux due to tidal dissipation inside planets and the impact of volcanic gases and aerosols on the atmosphere. The student will also link the outputs of the simulations of atmospheres to observables for future instruments, in which Geneva has a leading role: RISTRETTO (VLT) and HIRES (ELT). A particular emphasis will be put on high-resolution spectroscopic diagnostics in reflected light. This PhD will therefore bring an important modeling effort for the preparation of these future atmospheric characterization instruments.

Setting: The Geneva Observatory offers one of the most vibrant environments worldwide for exoplanet research. Nearly 60 people contributes to the exoplanet team (www.exoplanets.ch), currently including 10 faculty members, 15 postdoctoral researchers, 17 PhD students, and 22 project staff members. Research topics include exoplanet detection, exoplanet characterization (atmospheres, interiors), planetary system dynamics, and instrumentation. Team members are directly involved into a large number of projects, including photometric instruments (CHEOPS, TESS, PLATO, NGTS), high-resolution spectrographs (HARPS, HARPS-North, NIRPS and ESPRESSO) and direct imaging (SPHERE at VLT). The exoplanet team is also part of PlanetS (www.nccr-planets.ch), a Swiss research network focused on planetary science, which includes 130 scientists from the Universities of Geneva, Bern, Zurich and ETH Zurich. The successful applicant will be able to take advantage of this unique collaborative framework and also participate to at least one observational run per year.
The University of Geneva is an equal opportunity employer committed to diversity in its workplace.
Start date: no later than June 2022.
Duration: This is a 4-year position.
Salary: 48,000 CHF/year gross salary, according to rules of the University and Canton of Geneva.
Deadline: Candidates are encouraged to apply by December 15th, 2021, but later applications will be reviewed until the position is filled.
Requirements: A MSc degree in astronomy, astrophysics or related fields. The successful applicant will be immersed in a team work environment, therefore good team playing abilities and focus will be praised soft skills.

The following application materials should be encapsulated within a single pdf and sent to Prof. Bolmont

- A curriculum vitae (2 pages).
- A cover letter (1 page) listing the names of 2 references/referees.

The two letters of recommendation should be sent directly to Prof. Bolmont by the referees themselves.

Download/Website: `https://eas.unige.ch/jobs.jsp?type=phd&id=1428`

Contact: `emeline.bolmont@unige.ch`

Research Fellow in the Climates of Exoplanets

Dr Catherine Walsh, Associate Professor
School of Physics and Astronomy, University of Leeds, Leeds, UK

University of Leeds, start date upon mutual agreement

The School of Physics and Astronomy at the University of Leeds invites applications for a postdoctoral research fellow (three years, fixed term) in the Climates of Exoplanets, working on an UKRI-funded project with Dr Catherine Walsh.

You will investigate the role of impacts from volatile-rich small bodies on the chemistry and climate of terrestrial exoplanets. You will simulate the structure and composition of the atmospheres of rocky planets and will produce simulated observations to make predictions with future facilities.

You will have a PhD (or will have submitted the thesis prior to taking up the appointment) in astronomy, astrophysics, or atmospheric science, experience in the simulation of planetary atmospheres, and a developing track record of peer reviewed publications in international journals.

The application deadline is **Monday the 3rd of January 2022** and the application must be submitted online. The starting date will be by arrangement.

For more information on the application process and other details such as salary, please follow the provided URL.

For more information on the project, please contact Dr Catherine Walsh at the provided e-mail address.

Download/Website: `https://jobs.leeds.ac.uk/Vacancy.aspx?ref=EPSPA1046`
Contact: `c.walsh1@leeds.ac.uk`

Assistant Professor in Astromaterials, Solar System, and Planetary System Formation

Department of Physics, Washington University in St. Louis

St. Louis Missouri, USA, Summer/Fall 2022

Job Description

The Department of Physics at Washington University in St. Louis invites applications for a tenure-track assistant professor faculty position specializing in the study of the formation and evolution of planetary systems. Areas of interest include observation and analysis of planetary systems from ground and space-based observatories or the investigation of astromaterials to study the formation and evolution of planetary systems. The appointment is supported by the McDonnell Center for the Space Sciences (MCSS) and will begin in Fall 2022. Information about our department is at `https://physics.wustl.edu` and information about the MCSS is at `https://mcss.wustl.edu`.

Qualifications

Candidates should have a Ph.D. in Physics or a closely related field at the time of appointment, significant research achievements, and an aptitude for teaching physics at the graduate and undergraduate levels. Duties will include, but are not limited to, conducting original research and writing peer-reviewed publications, teaching courses, advising students, and service to the Physics Department and University as well as service to the research community. The typical teaching load for research-active faculty is one course per semester on average.

Application Instructions

Applications should be submitted via `https://apply.interfolio.com/94448`. An application should include: (1) a cover letter; (2) a current resume including publication record; (3) a research statement (2 pages); (4) a teaching, outreach, and diversity statement (up to 2 pages); and (5) names and contact information for three references. Diversity and Inclusion are core values at Washington University, and the strong candidate will demonstrate the ability to create inclusive classrooms and environments in which a diverse array of students can learn and thrive. Applications received by Nov. 24, 2021 will receive full consideration. Application period deadline is Jan 14, 2022.

Questions may be directed to:

Contact: `astromatsearch22@physics.wustl.edu`

4 Announcements

COSPAR2022 B1.3: "Astrochemistry and Composition as Ariadne's Threads for Planet Formation"

Diego Turrini (INAF, Italy) & Maria Drozdovskaya (CSH, Switzerland)

Hybrid from Athens, Greece, 16-24 July, 2022

Dear Colleagues,

the abstract submission is open for the 44th COSPAR Scientific Assembly (16-24 July 2022, Athens, Greece in hybrid mode) and we wish to invite you to participate in the scientific event

B1.3 "Astrochemistry and Composition as Ariadne's Threads for Planet Formation"

Event Description: Understanding how planetary systems form is becoming an increasingly interdisciplinary field of study that is approaching the limits of insight being gained from individual disciplines. The composition of planetary bodies and the astrochemical processes that shape it represent the common thread helping us to navigate the multifaceted problem of planetary formation. Future studies will become even more interdependent and will require combining the information supplied by meteorites and polluted white dwarfs, the interstellar medium and protoplanetary disks, comets and asteroids, planetary surfaces and exoplanetary atmospheres, and more. This event aims to offer an interdisciplinary venue to bring together researchers studying the Solar System, exoplanets, star formation, protoplanetary disks, main sequence and evolved stars to combine the insights provided by their theoretical and experimental perspectives, as well as by observations from ground-based and space-borne facilities.

Confirmed Invited Speakers: Alex Cridland (MPE, Germany), Izaskun Jiménez-Serra (CSIC/INTA, Spain), Nami Sakai (RIKEN, Japan), Myriam Telus (UCSC, USA)

Scientific Organizing Committee: Paola Caselli (MPE, Germany), Stavro Lambrov Ivanovski (INAF-OATs, Italy), Dimitris Stamatellos (University of Central Lancashire, UK), Neal Turner (NASA/JPL, USA), Stephanie Werner (University of Oslo, Norway), Ke Zhang (University of Wisconsin-Madison, USA)

Main Scientific Organizers: Diego Turrini (INAF, Italy) & Maria Drozdovskaya (CSH, Switzerland)

Deadlines and Information

Abstract submission deadline: **11 February 2022**

More information about scientific event B1.3 can be found at:
https://cospar-assembly.org/admin/session_cospar.php?session=1009

More information about COSPAR 2022 and its many other events can be found at:
https://www.cosparathens2022.org
https://www.cospar-assembly.org/admin/congress.php?congress=10

2022 Sagan Summer Hybrid Workshop: Exoplanet Science in the Gaia Era

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

Hybrid Workshop, July 25-29, 2022

The 2022 Sagan Summer Workshop will take place July 25-29, 2022. We are expecting that this will be a hybrid workshop with both in-person and on-line attendance. In-person attendance may be limited due to L. A. County, City of Pasadena, and California Institute of Technology COVID safety guidelines at the time of the workshop. The workshop website will be updated with this information going forward.

The 2022 Sagan Summer Workshop will focus on the topic of exoplanet science in the Gaia era. The ESA Gaia mission has been mapping the Galaxy for over seven years, measuring very accurate positions and motions of over 1 billion stars. It has already greatly contributed to exoplanet science through the determination of more accurate stellar parameters, which in turn improve planet parameters, the detection of stellar companions, and the identification and characterization of young moving groups. In the near future, the unprecedented astrometric accuracy will result in the discovery of new exoplanets, as well as the characterization of known planets. The workshop will introduce the basics of astrometry, the impact of Gaia astrometry on astrophysics, and the astrometric detection and characterization of exoplanets. The synergy between the different planet detection techniques of astrometry, transits, radial velocities, and imaging will be discussed, as well as future advances in astrometry.

There is no registration fee for this workshop and registration will open in February 2022.

Please contact us with any questions or to be added to the email list.

Download/Website: `http://nexsci.caltech.edu/workshop/2022`
Contact: `sagan_workshop@ipac.caltech.edu`

Frontiers Research Topic on "Robotic Telescopes"

Alberto J. Castro-Tirado[1,2], Frederic V. Hessman[3], Chenzhou Cui[4], Bringfried Stecklum[5]

[1] Instituto de Astrofísica de Andalusía, Spanish National Research Council, Granada/ES
[2] Unidad Asociada Departamento de Ingeniería de Sistemas y Automática, Universidad de Málaga, Málaga/ES
[3] Institut für Astrophysik, Georg-August-Universität, Göttingen/DE
[4] National Astronomical Observatories (CAS), Beijing/CN
[5] Thüringer Landessternwarte, Tautenburg/DE

Call for Submissions, 2021-DEC-07

We would like to announce a new *Frontiers Research Topic* on "Robotic Telescopes".

The number of robotic telescopes continues to rise, and many of them are dedicated to the study of exoplanets. The open-access journal *Frontiers in Astronomy and Space Sciences* has now made the topic of "Robotic Telescopes" one of its *Research Topics* and a special open-access online volume on this subject will be issued in 2022.

We invite you to make interesting contributions about the design, operation, upgrade and use of robotic astronomical observatories, including any scientific results explicitly obtained by the use of robotic resources; we are not looking for simple status reports like those often presented at workshops.

The deadline for the submission of abstracts is January 17, 2022 and the papers should be submitted before March 15, 2022.

More details can be found at the link below.

The Topic Editors

Download/Website: `https://www.frontiersin.org/research-topics/27952/robotic-telescopes`

Contact: `hessman@astro.physik.uni-goettingen.de`

5 Exoplanet Archives

November 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, December 14, 2021

Note: Unless otherwise noted, all planetary and stellar data mentioned in the news are in the Planetary Systems Table (`http://bit.ly/2Pt0tM1`), which provides a single location for all self-consistent planetary solutions, and its companion table the Planetary Systems Composite Parameters (`https://bit.ly/2Fer9NU`), which offers a more complete table of parameters combined from multiple references and calculations. Data can also be found in the Microlensing Planets Table (`https://bit.ly/3urUyZU`) or Direct Imaging Planets Table (`http://bit.ly/3ayD185`).

November 23, 2021

Six Planets, Near and Far

This week's new planets range from being very near (28 parsecs) to very far (7,000 parsecs) from Earth. These bring the archive's current planet count to **4,575**.

The new planets are: KMT-2016-BLG-2605L b, OGLE-2019-BLG-0304L b, HD 207897 b, HD 137496 b & c, and HD 29399 b.

November 19, 2021

Introducing the New K2 Planets and Candidates Table

Today marks another day of Archive 2.0 improvements!

The new K2 Planets and Candidates Table (`https://bit.ly/3pBHNe8`) is our most comprehensive collection of K2 planetary object information. Not only does it include all of the archive's data for K2 objects that are confirmed, candidates, or false positives, it also has a more logical layout that is consistent with our new Planetary Systems tables. The new table also supports our Table Access Protocol (TAP) service.

This new table replaces the K2 Candidates table, which has been retired and is no longer accessible by web interface or API. Please be sure to update any API scripts to point to the new table using TAP. Here are some resources to help with the transition:

- TAP User Guide (`https://bit.ly/2Tajkgk`)
- K2 Planets and Candidates Data Column Definitions (`https://bit.ly/3dvzeM8`)
- Column mapping between the new and old tables: PDF (`https://bit.ly/3dzqtAM`) CSV (`https://bit.ly/3rLi715`)

For more background on the ongoing changes we're making to the archive, see our Transition page (`https://bit.ly/3jLgrhl`) and the Archive 2.0 Release Notes (`https://bit.ly/3rVQPTx`).

As always, we want to hear what you think about these changes. Get in touch with us through our Helpdesk (`http://bit.ly/38H6zjv`) or social media (`http://bit.ly/2uP9N1b`).

November 12, 2021

Three Eccentric sub-Neptunes

This week's update features three eccentric sub-Neptunes—so eccentric, in fact, that TOI-2257 b's long transit duration makes it the most eccentric planet known to transit an M-dwarf star.

The other two new planets are HIP 97166 b & c. We've also added new parameter sets for Kepler 51 b, c, & d.

November 5, 2021

The Exoplanet Fifteen

The archive grew 15 planets bigger this week. We've gained Earth-sized planets, as well as some super-Earths and sub-Neptunes. This brings the archive's confirmed planet count to 4,566.

The new planets are LHS 1678 b & c, CD Cet b, HD 39194 b, c, & d, HD 93385 b, c, & d, HD 96700 b, c, & d, HD 154088 b, and HD 189567 b & c.

Download/Website: `https://exoplanetarchive.ipac.caltech.edu`
Contact: `mharbut@caltech.edu`

6 As seen on Exoplanet-talks.org

7 As seen on Exoplanet-talks.org

Download/Website: `http://exoplanet-talks.org`
Contact: `info@exoplanet-talks.org`

Instruction video: http://exoplanet-talks.org/talk/164

The Demographics of Giant Exoplanets and Brown Dwarfs in Wide Stellar Binaries by *Clemence Fontanive* - talk/399
Comparison of Planetary H alpha-emission Models: A New Correlation with Accretion Luminosity by *Gabriel-Dominique Marleau* - talk/400

8 As seen on astro-ph

The following list contains the entries relating to exoplanets that we spotted on astro-ph during November 2021.

November 2021

astro-ph/2111.00033: **Was Venus Ever Habitable? Constraints from a Coupled Interior-Atmosphere-Redox Evolution Model** by *Joshua Krissansen-Totton, Jonathan J. Fortney, Francis Nimmo*

astro-ph/2111.00059: **The "Breaking The Chains" migration model for super-Earths formation: the effect of collisional fragmentation** by *Leandro Esteves et al.*

astro-ph/2111.00279: **SimAb: A simple, fast and flexible model to assess the effects of planet formation on the atmospheric composition of gas giants** by *N. Khorshid et al.*

astro-ph/2111.00305: **The Stability Boundary of the Distant Scattered Disk** by *Konstantin Batygin, Rosemary A. Mardling, David Nesvorny*

astro-ph/2111.00471: **Stellar Wind Effect on the Atmospheric Escape of Hot Jupiters** by *Hiroto Mitani, Riouhei Nakatani, Naoki Yoshida*

astro-ph/2111.00828: **Hiding in plain sight: observing planet-starspot crossings with the James Webb Space Telescope** by *Giovanni Bruno et al.*

astro-ph/2111.01295: **The Warm Neptune GJ 3470b has a Polar Orbit** by *Gudmundur Stefansson et al.*

astro-ph/2111.01311: **TOI-2076 and TOI-1807: Two young, comoving planetary systems within 50 pc identified by TESS that are ideal candidates for further follow-up** by *Christina Hedges et al.*

astro-ph/2111.01475: **The fate of icy pebbles undergoing sublimation in protoplanetary discs** by *Stefano Spadaccia et al.*

astro-ph/2111.01702: **Signs of late infall and possible planet formation around DR Tau using VLT/SPHERE and LBTI/LMIRCam** by *D. Mesa et al.*

astro-ph/2111.01749: **TOI-2257 b: A highly eccentric long-period sub-Neptune transiting a nearby M dwarf** by *N. Schanche et al.*

astro-ph/2111.01753: **The Influence of 10 Unique Chemical Elements in Shaping the Distribution of Kepler Planets** by *Robert F. Wilson et al.*

astro-ph/2111.01798: **Turbulent Disk Viscosity and the Bifurcation of Planet Formation Histories** by *Jessica Speedie et al.*

astro-ph/2111.01816: **Orbital Dynamics and the Evolution of Planetary Habitability in the AU Mic System** by *Stephen R. Kane et al.*

astro-ph/2111.01984: **On Tides and Exoplanets** by *Sylvio Ferraz-Mello*

astro-ph/2111.02293: **Photometric Search for Exomoons by using Convolutional Neural Networks** by *Lukas Weghs*

astro-ph/2111.02406: **Orbit determination with the Keplerian integrals** by *Giovanni Federico Gronchi*

astro-ph/2111.02416: **TOI-712: a system of adolescent mini-Neptunes extending to the habitable zone** by *Sydney Vach et al.*

astro-ph/2111.02608: **K2-79b and K2-222b: Mass measurements of two small exoplanets with periods beyond 10 days that overlap with periodic magnetic activity signals** by *Chantanelle Nava et al.*

astro-ph/2111.02726: **Apparent motion of the circumstellar envelope of CQ Tau in scattered light** by *Boris Safonov et al.*

astro-ph/2111.03087: **A Mid-Infrared Study of Directly-Imaged Planetary-Mass Companions using Archival Spitzer/IRAC Images** by *Raquel A. Martinez, Adam L. Kraus*

astro-ph/2111.03109: **Episodic deluges in simulated hothouse climates** by *Jacob Seeley, Robin Wordsworth*

astro-ph/2111.03124: **Polluted White Dwarfs Reveal Exotic Mantle Rock Types on Exoplanets in our Solar Neighborhood** by *Keith D. Putirka, Siyi Xu*

astro-ph/2111.03335: **Narrow belt of debris around the Sco-Cen star HD 141011** by *M. Bonnefoy et al.*

astro-ph/2111.03346: **Investigation of an orbital decay and global modeling of the planet WASP-43 b** by *Fatemeh Davoudi et al.*
astro-ph/2111.03530: **Second-generation dust in planetary systems: The case of HD 163296** by *Gennaro D'Angelo, Francesco Marzari*
astro-ph/2111.03673: **Thermal Phase Curves of XO-3b: an Eccentric Hot Jupiter at the Deuterium Burning Limit** by *Lisa Dang et al.*
astro-ph/2111.03676: **An Edge-On Orbit for the Eccentric Long-Period Planet HR 5183 b** by *Alexander Venner, Logan A. Pearce, Andrew Vanderburg*
astro-ph/2111.03755: **OGLE-2019-BLG-0468Lb,c: two microlensing giant planets around a G-type star** by *Cheongho Han et al.*
astro-ph/2111.04444: **Signal preservation of exomoon transits during light curve folding** by *René Heller*
astro-ph/2111.04531: **The impact of coronal mass ejections and flares on the atmosphere of the hot Jupiter HD189733b** by *Gopal Hazra et al.*
astro-ph/2111.04594: **Migration of Jupiter mass planets in discs with laminar accretion flows** by *E. Lega et al.*
astro-ph/2111.04649: **Tidal evolution and diffusive growth during high-eccentricity planet migration: revisiting the eccentricity distribution of hot Jupiters** by *Hang Yu, Nevin N. Weinberg, Phil Arras*
astro-ph/2111.04859: **ExoMol line lists – XLIV. IR and UV line list for silicon monoxide (SiO)** by *Sergei N. Yurchenko et al.*
astro-ph/2111.04861: **KMT-2021-BLG-0912Lb: A microlensing super Earth around a K-type star** by *Cheongho Han et al.*
astro-ph/2111.04947: **Planetary climate under extremely high vertical diffusivity** by *Yidongfang Si, Jun Yang, Yonggang Liu*
astro-ph/2111.05161: **Growth and evolution of secondary volcanic atmospheres: I. Identifying the geological character of warm rocky planets** by *Philippa Liggins et al.*
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