ExoPlanet News
An Electronic Newsletter

No. 135, 15 September 2020

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1 Editorial

Dear readers,

Welcome to Edition 135 of the ExoPlanet News!

Our exoplanet community, yesterday, celebrated and welcomed the news of the detection of the gas – Phosphine – in the atmosphere of Earth's sister planet Venus. While the scientific ramifications of this discovery will take months or even years to be fully understood, this discovery has renewed public interest/discourse on extraterrestrial life, in particular, and exoplanets, in general. We congratulate the team on their discovery.

In this edition, we bring you abstracts of scientific papers, job ads, conference announcements, and an overview of exoplanet-related articles on astro-ph. We thank all of you who contributed to this issue of the newsletter.

As before, we are looking forward to your abstracts, ads or announcements for the next issue. This is a community newsletter and, as such, we are eager to receive feedback and suggestions from you, the community. 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 13 October 2020.

Thanks again for your support, and best regards from the editorial team,

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

2 Abstracts of refereed papers

The GALAH Survey: Using Galactic Archaeology to Refine our Knowledge of *TESS* Target Stars

Jake T. Clark[1], Mathieu Clerté[1], Natalie R. Hinkel[2], Cayman T. Unterborn[3], Robert A. Wittenmyer[1], Jonathan Horner[1], Duncan J. Wright[1], Brad Carter[1], Timothy D. Morton[4], Lorenzo Spina[5], Martin Asplund[6], Sven Buder[6,7], Joss Bland-Hawthorn[8,7], Andy Casey[5], Gayandhi De Silva[5], Valentina D'Orazi[9], Ly Duong[6], Michael Hayden[8,7], Ken Freeman[6], Janez Kos[10,7], Geraint Lewis[8], Jane Lin[6], Karin Lind[11], Sarah Martell[12,7], Sanjib Sharma[8], Jeffrey Simpson[8,7], Dan Zucker[13,14], Tomaz Zwitter[10], Christopher G. Tinney[15,16], Yuan-Sen Ting (UTF8gbsn)[17,18,19,6], Thomas Nordlander[6,7], and Anish M. Amarsi[11,7]

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:2008.05372)

An unprecedented number of exoplanets are being discovered by the Transiting Exoplanet Survey Satellite (*TESS*). Determining the orbital parameters of these exoplanets, and especially their mass and radius, will depend heavily upon the measured physical characteristics of their host stars. We have cross-matched spectroscopic, photometric, and astrometric data from GALAH Data Release 2, the *TESS* Input Catalog and *Gaia* Data Release 2, to create a curated, self-consistent catalog of physical and chemical properties for 47,285 stars. Using these data we have derived isochrone masses and radii that are precise to within 5%. We have revised the parameters of three confirmed, and twelve candidate, *TESS* planetary systems. These results cast doubt on whether CTOI-20125677 is indeed a planetary system since the revised planetary radii are now comparable to stellar sizes. Our GALAH-TESS catalog contains abundances for up to 23 elements. We have specifically analysed the molar ratios for C/O, Mg/Si, Fe/Si and Fe/Mg, to assist in determining the composition and structure of planets with $R_p < 4R_\oplus$. From these ratios, 36 % fall within 2 sigma of the Sun/Earth values, suggesting that these stars may host rocky exoplanets with geological compositions similar to planets found within our own Solar system.

The GALAH-TESS catalog will be available on VizieR after acceptance. However, if you'd like access to the catalog prior to, please contact jake.clark@usq.edu.au

Download/Website: `https://arxiv.org/abs/2008.05372`

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Gas trapping of hot dust around main-sequence stars

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:2008.07505)

In 2006 Vega was discovered to display excess near-infrared emission. Surveys now detect this phenomenon for one fifth of main-sequence stars, across various spectral types and ages. The excesses are interpreted as populations of small, hot dust grains very close to their stars, which must originate from comets or asteroids. However, the presence of such grains in copious amounts is mysterious, since they should rapidly sublimate or be blown out of the system. Here we investigate a potential mechanism to generate excesses: dust migrating inwards under radiation forces sublimates near the star, releasing modest quantities of gas which then traps subsequent grains. This mechanism requires neither specialised system architectures nor high dust supply rates, and could operate across diverse stellar types and ages. The model naturally reproduces many features of inferred dust populations, in particular their location, preference for small grains, steep size distribution, and dust location scaling with stellar luminosity. For Sun-like stars the mechanism can produce $2.2\ \mu\text{m}$ excesses that are an order of magnitude larger than those at $8.5\ \mu\text{m}$, as required by observations. However, for A-type stars the simulated near-infrared excesses were only twice those in the mid infrared; grains would have to be $5-10$ times smaller than those trapped in our model to be able to explain observed near-infrared excesses around A stars. Further progress with any hot dust explanation for A stars requires a means for grains to become very hot without either rapidly sublimating or being blown out of the system.

Download/Website: `https://ui.adsabs.harvard.edu/abs/2020arXiv200807505P/abstract`

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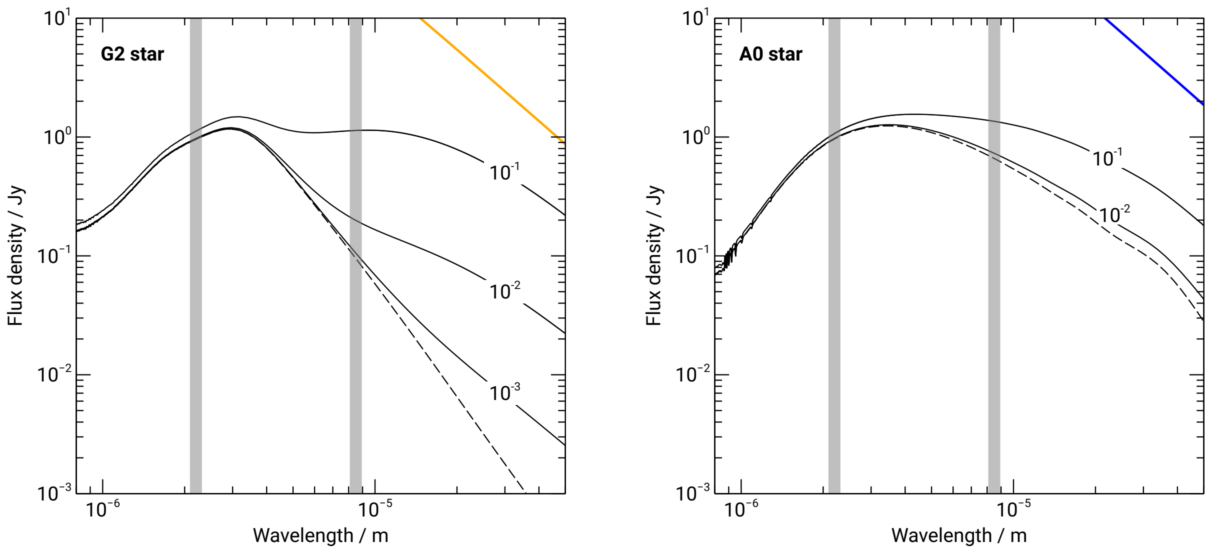

Figure 1: Simulated emission from dust in the gas trap mechanism. Grains migrate inwards under radiation forces, before getting trapped close to the star in gas released by dust sublimation. Solid black lines show dust emission for different values of the gas viscosity parameter α, and dashed lines show emission from trapped grains alone. The G2 and A0 star fluxes are the thick yellow and blue lines, respectively. Vertical bands mark 2.2 and $8.5\ \mu$m; to reproduce typical near- and mid-infrared observations, the $2.2\ \mu$m dust flux should be at least ten times that at $8.5\ \mu\mathrm{m}$. The model reproduces observations for Sun-like stars, provided $\alpha < 10^{-2}$. For A-type stars the $8.5\ \mu$m flux is about five times too large, because gas cannot trap sub-blowout grains.

Observing protoplanetary discs with the Square Kilometre Array – I. Characterising pebble substructure caused by forming planets

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:2009.00562)

High angular resolution observations of discs at mm wavelengths (on scales of a few au) are now commonplace, but there is a current lack of a comparable angular resolution for observations at cm wavelengths. This presents a significant barrier to improving our understanding of planet formation, in particular how dust grains grow from mm to cm sizes. In this paper, we examine the ability of the Square Kilometre Array (SKA) to observe dust substructure in a young, planet-forming disc at cm wavelengths. We use dusty hydrodynamics and continuum radiative transfer to predict the distribution and emission of 1 cm dust grains (or pebbles) within the disc, and simulate continuum observations with the current SKA1-MID design baseline at frequencies of 12.5 GHz (Band 5b, 2.4 cm) on 5-10 au scales. The SKA will provide high-fidelity observations of the cm dust emission substructure in discs for integration times totalling 100's of hours. Radial structure can be obtained at a sufficient resolution and S/N from shorter (10's of hours) integration times by azimuthal averaging in the image plane. By modelling the intensity distribution directly in the visibility plane, it is possible to recover a similar level of (axisymmetric) structural detail from observations with integration times 1-2 orders of magnitude lower than required for high-fidelity imaging. Our results demonstrate that SKA1-MID will provide crucial constraints on the distribution and morphology of the raw material for building planets, the pebbles in protoplanetary discs.

Download/Website: `https://arxiv.org/abs/2009.00562`

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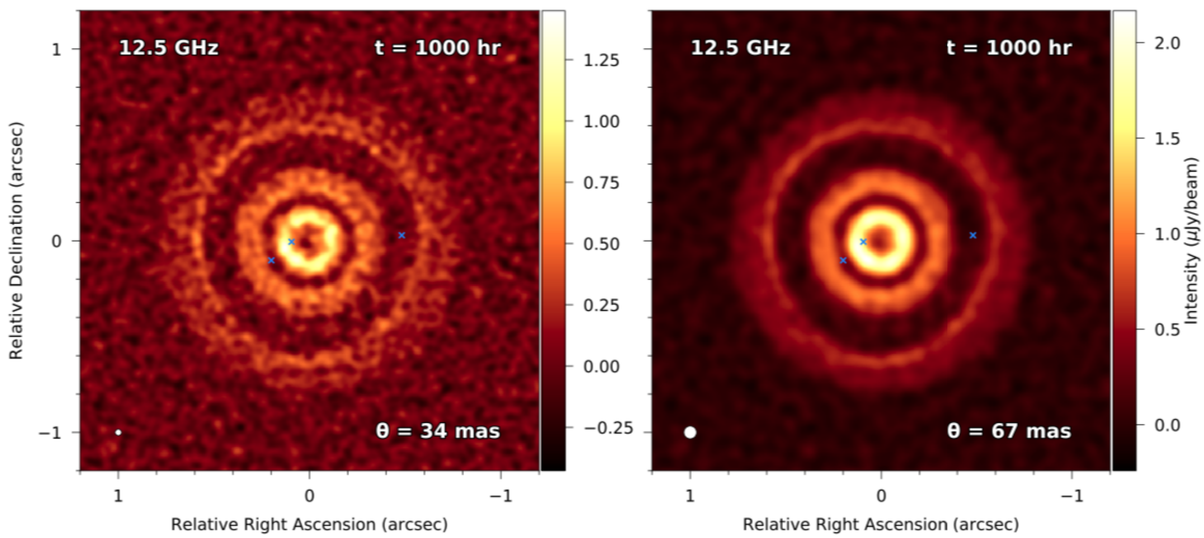

Figure 2: Simulated SKA observations at 12.5 GHz of a young protoplanetary disc hosting three planets (locations marked with blue crosses).

Survey of planetesimal belts with ALMA: gas detected around the Sun-like star HD 129590

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Monthly Notices of the Royal Astronomical Society, published (2020MNRAS.497.2811K)

Gas detection around main sequence stars is becoming more common with around 20 systems showing the presence of CO. However, more detections are needed, especially around later spectral type stars to better understand the origin of this gas and refine our models. To do so, we carried out a survey of 10 stars with predicted high likelihoods of secondary CO detection using ALMA in band 6. We looked for continuum emission of mm-dust as well as gas emission (CO and CN transitions). The continuum emission was detected in 9/10 systems for which we derived the discs' dust masses and geometrical properties, providing the first mm-wave detection of the disc around HD 106906, the first mm-wave radius for HD 114082, 117214, HD 15745, HD 191089 and the first radius at all for HD 121191. A crucial finding of our paper is that we detect CO for the first time around the young 10-16 Myr old G1V star HD 129590, similar to our early Sun. The gas seems colocated with its planetesimal belt and its total mass is likely between $2 - 10 \times 10^{-5}$ $M_{\oplus}$. This first gas detection around a G-type main-sequence star raises questions as to whether gas may have been released in the Solar System as well in its youth, which could potentially have affected planet formation. We also detected CO gas around HD 121191 at a higher S/N than previously and find that the CO lies much closer-in than the planetesimals in the system, which could be evidence for the previously suspected CO viscous spreading owing to shielding preventing its photodissociation. Finally, we make estimates for the CO content in planetesimals and the HCN/CO outgassing rate (from CN upper limits), which we find are below the level seen in Solar System comets in some systems.

Download/Website: `https://arxiv.org/abs/2005.05841`

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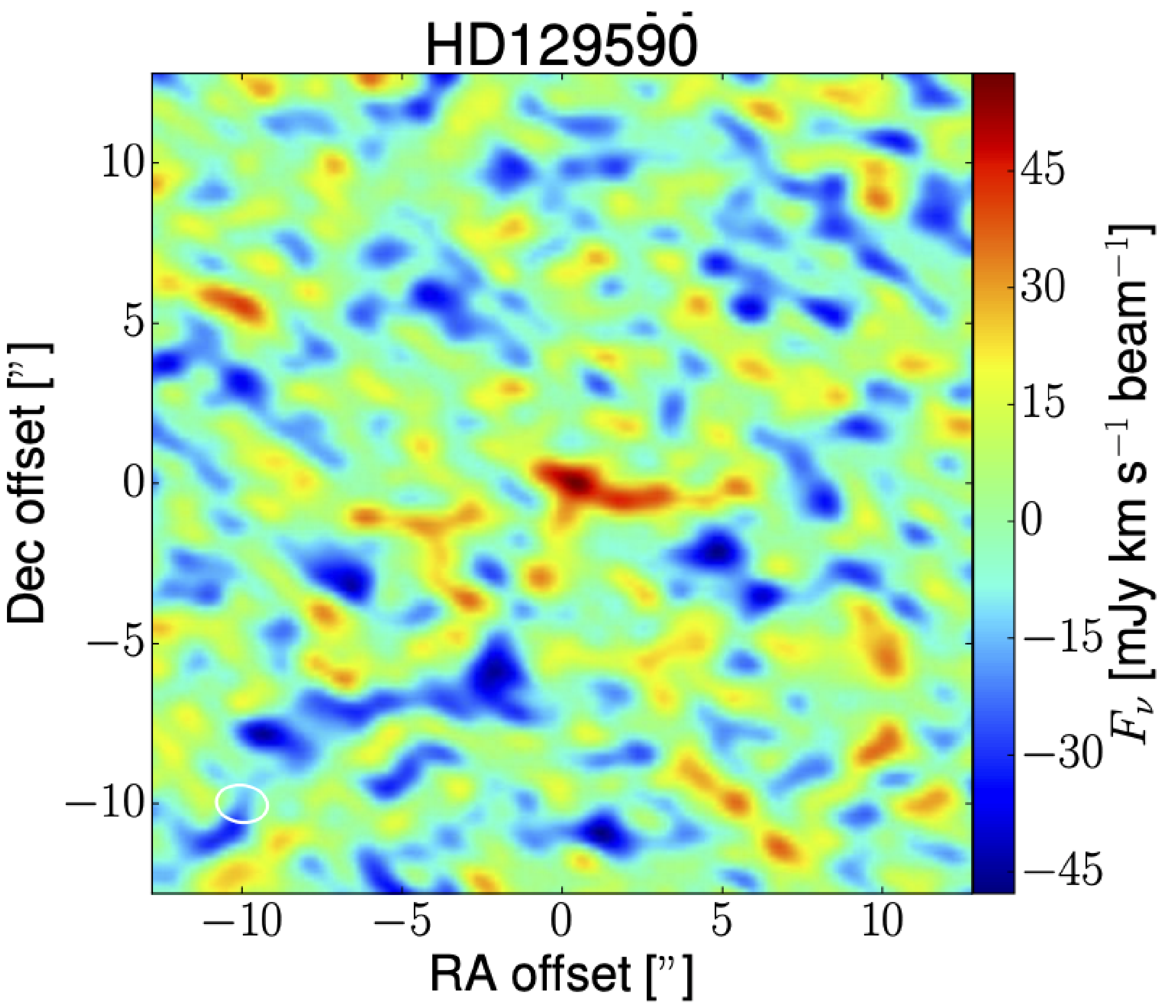

Figure 3: CO gas detected with ALMA around the G1V star HD 129590. This first gas detection around a G-type main-sequence star raises questions as to whether gas may have been released in the Solar System as well in its youth, which could potentially have affected planet formation.

Direct characterization of young giant exoplanets at high spectral resolution by coupling SPHERE and CRIRES+

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Astronomy & Astrophysics, in press (arXiv:2009.01841)

Studies of atmospheres of directly imaged extrasolar planets with high-resolution spectrographs have shown that their characterization is predominantly limited by noise on the stellar halo at the location of the studied exoplanet. An instrumental combination of high-contrast imaging and high spectral resolution that suppresses this noise and resolves the spectral lines can therefore yield higher quality spectra. We study the performance of the proposed HiRISE fiber coupling between the direct imager SPHERE and the spectrograph CRIRES+ at the Very Large Telescope for spectral characterization of directly imaged planets. Using end-to-end simulations of HiRISE we determine the signal-to-noise ratio (S/N) of the detection of molecular species for known extrasolar planets in H and K bands, and compare them to CRIRES+. We investigate the ultimate detection limits of HiRISE as a function of stellar magnitude, and we quantify the impact of different coronagraphs and of the system transmission. We find that HiRISE largely outperforms CRIRES+ for companions around bright hosts like β Pictoris or 51 Eridani. For an $H = 3.5$ host, we observe a gain of a factor of up to 36 in observing time with HiRISE to reach the same S/N on a companion at 200 mas. More generally, HiRISE provides better performance than CRIRES+ in two-hour integration times between 50–400 mas for hosts with $H < 8.5$ and between 50–800 mas for $H < 7$. For fainter hosts like PDS 70 and HIP 65426, no significant improvements are observed. We find that using no coronagraph yields the best S/N when characterizing known exoplanets due to higher transmission and fiber-based starlight suppression. We demonstrate that the overall transmission of the system is in fact the main driver of performance. Finally, we show that HiRISE outperforms the best detection limits of SPHERE for bright stars, opening major possibilities for the characterization of future planetary companions detected by other techniques.

Download/Website: `https://arxiv.org/abs/2009.01841`

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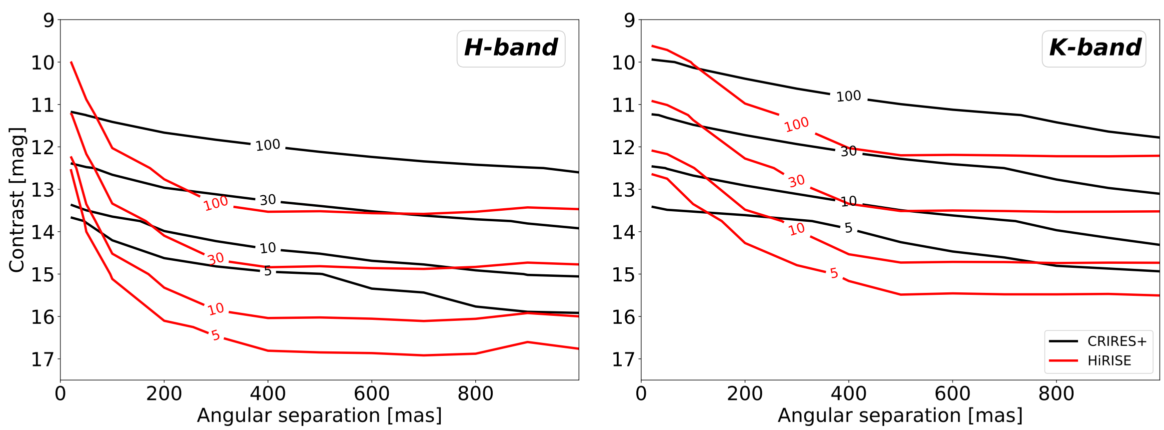

Figure 4: SNR as a function of contrast (Δm) and separation for HiRISE without a coronagraph (red contour lines) and CRIRES+ standalone (black contour lines). The simulation is performed for a β Pictoris-like host star ($H = 3.5$) with a 1200 K planet and 2 hours of integration time.

Astrophysical Simulations and Data Analyses on the Formation, Detection, and Habitability of Moons Around Extrasolar Planets

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Habilitation thesis, accepted (arXiv:2009.01881)

While the solar system contains as many as about 20 times more moons than planets, no moon has been definitively detected around any of the thousands of extrasolar planets so far. The question naturally arises why an exomoon detection has not yet been achieved. This cumulative habilitation thesis covers three of the key aspects related to the ongoing search for extrasolar moons: 1. the possible formation scenarios for moons around extrasolar planets; 2. new detection strategies for these moons; and 3. the potential of exomoons as hosts to extrasolar life. This work is structured as follows. Part I gives a broad introduction to the field of extrasolar moons with special attention to their formation, detection, and habitability. Part II presents the cumulative part of this thesis with a total of 16 peer-reviewed journal publications listing the author of this thesis as a lead author, and six publications with the author of this thesis as a co-author. Part III shares some insights into our ongoing research on exomoons in collaboration with master student Anina Timmermann at the Georg-August University of Göttingen and former PhD student Kai Rodenbeck at the International Max Planck Research School for Solar System Science and the University of Göttingen. The Appendix is a collection of non-peer-reviewed conference proceedings and popular science publications by the author that further disseminate our research of extrasolar moons.

Download/Website: www2.mps.mpg.de/homes/heller/downloads/files/Habilitationsschrift.pdf

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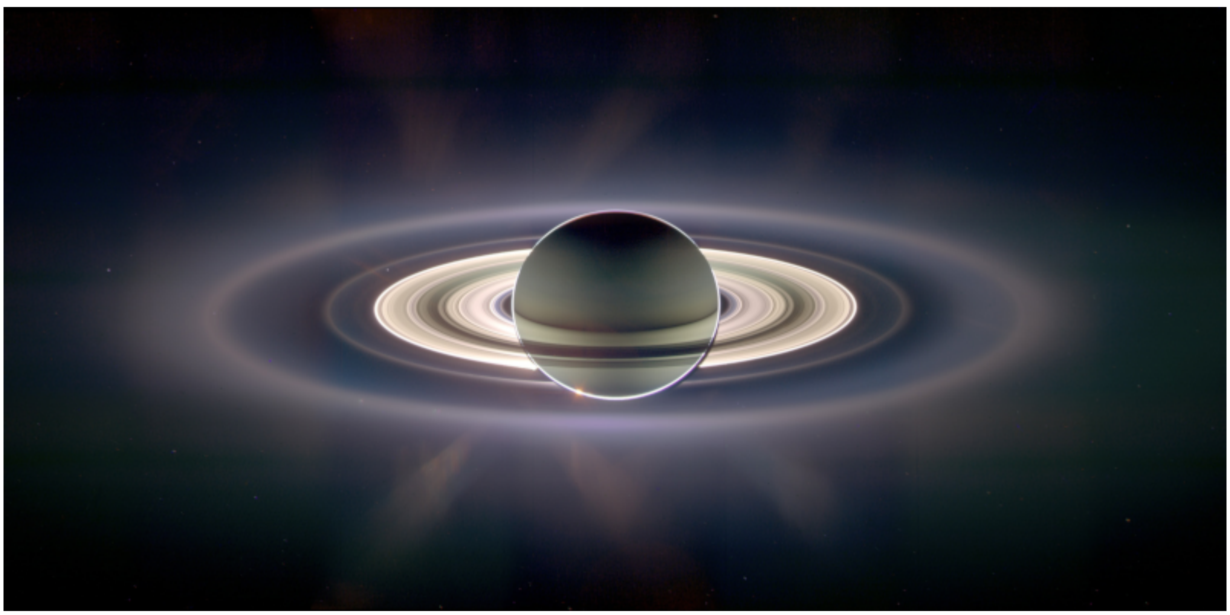

Figure 5: Transit of Saturn and its ring system in front of the sun as seen by the Cassini spacecraft in September 2016. Note how the rings bend the sun light around the planet, an effect knows as diffraction. Image credit: NASA/JPL/Space Science Institute.

Low-cost precursor of an interstellar mission

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Astronomy & Astrophysics, published, arXiv:2007.12814

The solar photon pressure provides a viable source of thrust for spacecraft in the solar system. Theoretically it could also enable interstellar missions, but an extremely small mass per cross section area is required to overcome the solar gravity. We identify aerographite, a synthetic carbon-based foam with a density of $0.18\,\mathrm{kg\,m^{-3}}$ (15,000 times more lightweight than aluminum) as a versatile material for highly efficient propulsion with sunlight. A hollow aerographite sphere with a shell thickness $\epsilon_{\rm shl} = 1\,\mathrm{mm}$ could go interstellar upon submission to solar radiation in interplanetary space. Upon launch at 1 AU from the Sun, an aerographite shell with $\epsilon_{\rm shl} = 0.5\,\mathrm{mm}$ arrives at the orbit of Mars in 60 d and at Pluto's orbit in 4.3 yr. Release of an aerographite hollow sphere, whose shell is $1\,\mu$m thick, at 0.04 AU (the closest approach of the Parker Solar Probe) results in an escape speed of nearly $6900\,\mathrm{km\,s^{-1}}$ and 185 yr of travel to the distance of our nearest star, Proxima Centauri. The infrared signature of a meter-sized aerographite sail could be observed with JWST up to 2 AU from the Sun, beyond the orbit of Mars. An aerographite hollow sphere, whose shell is $100\,\mu$m thick, of 1 m (5 m) radius weighs 230 mg (5.7 g) and has a 2.2 g (55 g) mass margin to allow interstellar escape. The payload margin is ten times the mass of the spacecraft, whereas the payload on chemical interstellar rockets is typically a thousandth of the weight of the rocket. Using 1 g (10 g) of this margin (e.g., for miniature communication technology with Earth), it would reach the orbit of Pluto 4.7 yr (2.8 yr) after interplanetary launch at 1 AU. Simplistic communication would enable studies of the interplanetary medium and a search for the suspected Planet Nine, and would serve as a precursor mission to α Centauri. We estimate prototype developments costs of 1 million USD, a price of 1000 USD per sail, and a total of $<$ 10 million USD including launch for a piggyback concept with an interplanetary mission.

Download/Website: `https://doi.org/10.1051/0004-6361/202038687`

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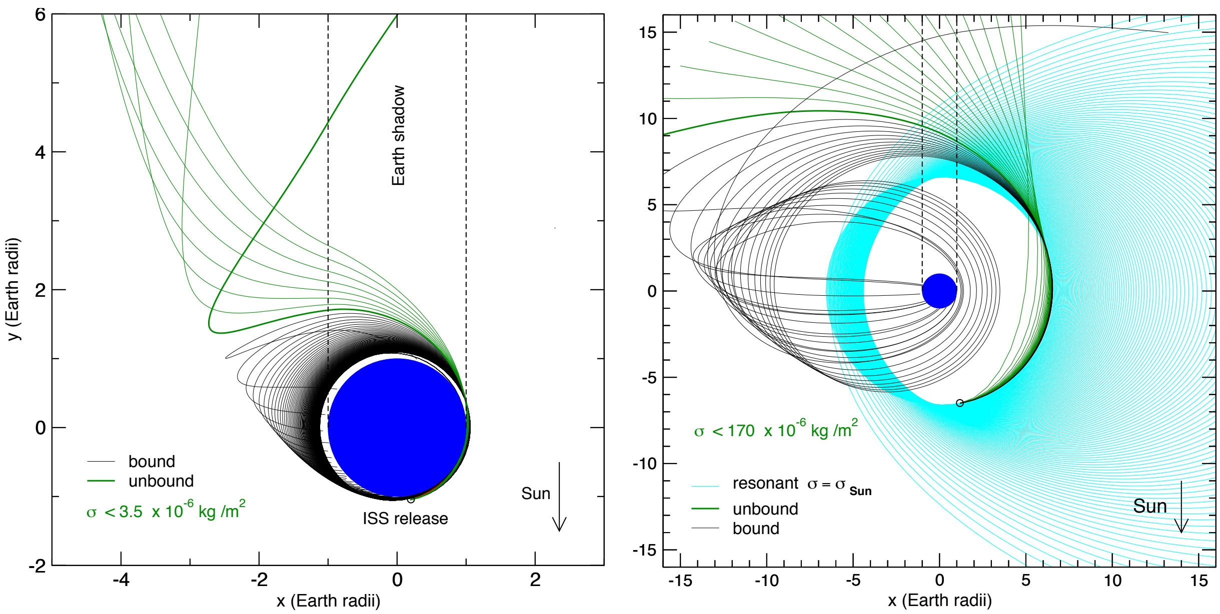

Figure 6: Numerical simulations of an aerographite sail under the effect of the solar radiation force and the gravitational field of the Earth and the Sun. The Earth is shown as the large filled blue circle. The radiative force is switched off in the Earth's shadow (dashed lines). The direction of the Sun is indicated with an arrow. *Left*: Launch from ISS. Black lines illustrate bound orbits resulting in collision with the Earth. Green lines show successful launches into interstellar space with sufficiently low σ values (see legend). Red lines indicate immediate collision with Earth after release from ISS. The step size for σ in these numerical simulations is $0.25 \times 10^{-6}\,\mathrm{kg\,m^{-2}}$. *Right*: Launch from geostationary orbit. Line styles correspond to those in the left panel. The cyan lines (four in this plot) refer to the resonance for σ close to $\sigma_{\odot}$. The step size for σ in these numerical simulations is $2.5 \times 10^{-6}\,\mathrm{kg\,m^{-2}}$.

Evidence of Three Mechanisms Explaining the Radius Anomaly of Hot Jupiters

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Astronomy & Astrophysics, in press (arXiv:2009.04291)

The anomalously large radii of hot Jupiters are still not fully understood, and all of the proposed explanations are based on the idea that these close-in giant planets possess hot interiors. Most of the mechanisms proposed have been tested on a handful of exoplanets. We approach the radius anomaly problem by adopting a statistical approach. We want to infer the internal luminosity for the sample of hot Jupiters, study its effect on the interior structure, and put constraints on which mechanism is the dominant one. We develop a flexible and robust hierarchical Bayesian model that couples the interior structure of exoplanets to the observed properties of close-in giant planets. We apply the model to 314 hot Jupiters and infer the internal luminosity distribution for each planet and study at the population level (*i*) the mass–luminosity–radius distribution and as a function of equilibrium temperature the distributions of the (*ii*) heating efficiency, (*iii*) internal temperature, and the (*iv*) pressure of the radiative–convective–boundary (RCB). We find that hot Jupiters tend to have high internal luminosity with $10^4\,L_\mathrm{J}$ for the largest planets. As a result, we show that all the inflated planets have hot interiors with internal temperature ranging from 200 K up to 800 K for the most irradiated ones. This has important consequences on the cooling rate and we find that the RCB is located at low pressures between 3 and 100 bar. Assuming that the ultimate source of the extra heating is the irradiation from the host star, we also illustrate that the heating efficiency increases with increasing equilibrium temperature, reaches a maximum of 2.5% at $\sim$1860 K, beyond which the efficiency decreases, in agreement with previous results. We discuss our findings in the context of the proposed heating mechanisms and illustrate that ohmic dissipation, advection of potential temperature, and thermal tides are in agreement with certain trends inferred from our analysis and thus all three models can explain aspects of the observations. We provide new insights on the interior structure of hot Jupiters and show that with our current knowledge it is still challenging to firmly identify the universal mechanism driving the inflated radii. The Gaussian distribution inferred from our analysis (left panel) along with the agreement of our results with the internal luminosity values of other theoretical work (middle and right panels) provide evidence for ohmic dissipation, thermal tides, and advection of potential temperature as possible mechanisms to explain the radius inflation conundrum.

Download/Website: `https://arxiv.org/abs/2009.04291`

Contact: `paula.sarkis@space.unibe.ch`

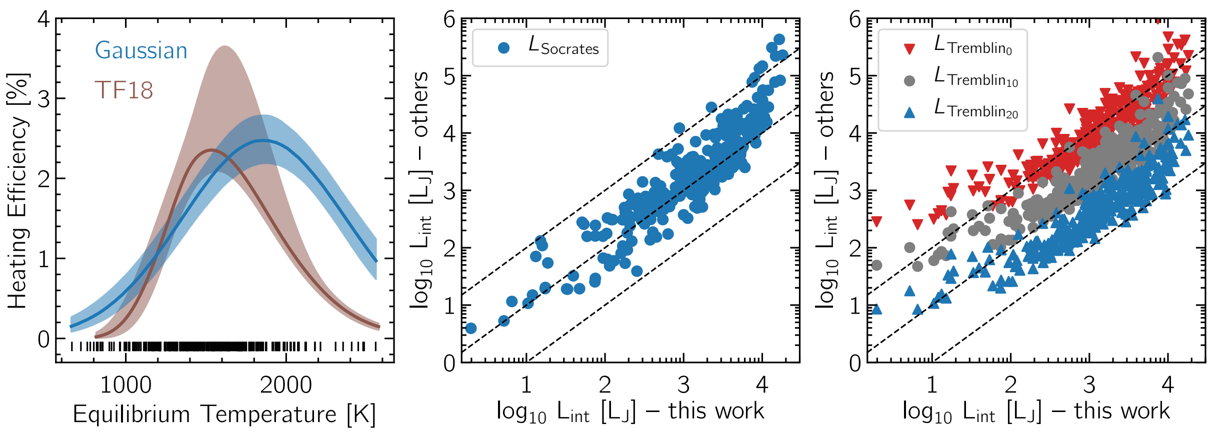

Figure 7: The Gaussian distribution inferred from our analysis (left panel) along with the agreement of our results with the internal luminosity values of other theoretical work (middle and right panels) provide evidence for ohmic dissipation, thermal tides, and advection of potential temperature as possible mechanisms to explain the radius inflation conundrum.

Solution to the debris disc mass problem: planetesimals are born small?

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:2008.07406)

Debris belts on the periphery of planetary systems, encompassing the region occupied by planetary orbits, are massive analogues of the Solar system's Kuiper belt. They are detected by thermal emission of dust released in collisions amongst directly unobservable larger bodies that carry most of the debris disc mass. We estimate the total mass of the discs by extrapolating up the mass of emitting dust with the help of collisional cascade models. The resulting mass of bright debris discs appears to be unrealistically large, exceeding the mass of solids available in the systems at the preceding protoplanetary stage. We discuss this "mass problem" in detail and investigate possible solutions to it. These include uncertainties in the dust opacity and planetesimal strength, variation of the bulk density with size, steepening of the size distribution by damping processes, the role of the unknown "collisional age" of the discs, and dust production in recent giant impacts. While we cannot rule out the possibility that a combination of these might help, we argue that the easiest solution would be to assume that planetesimals in systems with bright debris discs were "born small", with sizes in the kilometre range, especially at large distances from the stars. This conclusion would necessitate revisions to the existing planetesimal formation models, and may have a range of implications for planet formation. We also discuss potential tests to constrain the largest planetesimal sizes and debris disc masses.

Download/Website: `https://arxiv.org/abs/2008.07406`

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A Search for FeH in Hot-Jupiter Atmospheres with High-Dispersion Spectroscopy

A.Y. Kesseli[1]*, I.A.G. Snellen*[1]*, F.J. Alonso-Floriano*[1]*, P. Mollière*[2]*, D.B. Serindag*[1]

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AJ, in press (arXiv:2009.04474)

Most of the molecules detected thus far in exoplanet atmospheres, such as water and CO, are present for a large range of pressures and temperatures. In contrast, metal hydrides exist in much more specific regimes of parameter space, and so can be used as probes of atmospheric conditions. Iron hydride (FeH) is a dominant source of opacity in low-mass stars and brown dwarfs, and evidence for its existence in exoplanets has recently been observed at low resolution. We performed a systematic search of archival CARMENES near-infrared data for signatures of FeH during transits of 12 exoplanets. These planets span a large range of equilibrium temperatures ($600 \leq T_{eq} \leq 4000$K) and surface gravities ($2.5 \leq \log g \leq 3.5$). We did not find a statistically significant FeH signal in any of the atmospheres, but obtained potential low-confidence signals (SNR$\sim$3) in two planets, WASP-33b and MASCARA-2b. Previous modeling of exoplanet atmospheres indicate that the highest volume mixing ratios (VMRs) of 10^{-7} to 10^{-9} are expected for temperatures between 1800 and 3000K and $\log\ g \geq 3$. The two planets for which we find low-confidence signals are in the regime where strong FeH absorption is expected. We performed injection and recovery tests for each planet and determined that FeH would be detected in every planet for VMRs $\geq 10^{-6}$, and could be detected in some planets for VMRs as low as $10^{-9.5}$. Additional observations are necessary to conclusively detect FeH and assess its role in the temperature structures of hot Jupiter atmospheres.

Download/Website: `http://arxiv.org/abs/2009.04474`

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MIRACLES: atmospheric characterization of directly imaged planets and substellar companions at 4–5 μm. II.Constraints on the mass and radius of the enshrouded planet PDS 70 b

T. Stolker[1], *G.-D. Marleau*[2,3,4], *G. Cugno*[1], *P. Mollière*[4], *S. P. Quanz*[1], *K. O. Todorov*[5], *J. Kühn*[3,1]

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Astronomy & Astrophysics, in press (arXiv:2009.04483)

The circumstellar disk of PDS 70 hosts two forming planets, which are actively accreting gas from their environment. The physical and chemical characteristics of these planets remain ambiguous due to their unusual spectral appearance compared to more evolved objects. In this work, we report the first detection of PDS 70 b in the Brα and M' filters with VLT/NACO, a tentative detection of PDS 70 c in Brα, and a reanalysis of archival NACO L' and SPHERE $H23$ and $K12$ imaging data. The near side of the disk is also resolved with the Brα and M' filters, indicating that scattered light is non-negligible at these wavelengths. The spectral energy distribution (SED) of PDS 70 b is well described by blackbody emission, for which we constrain the photospheric temperature and photospheric radius to $T_{\rm eff} = 1193 \pm 20$ K and $R = 3.0 \pm 0.2\ R_{\rm J}$. The relatively low bolometric luminosity, $\log(L/L_\odot) = -3.79 \pm 0.02$, in combination with the large radius, is not compatible with standard structure models of fully convective objects. With predictions from such models, and adopting a recent estimate of the accretion rate, we derive a planetary mass and radius in the range of $M_{\rm p} \approx 0.5$–$1.5\ M_{\rm J}$ and $R_{\rm p} \approx 1$–$2.5\ R_{\rm J}$, independently of the age and post-formation entropy of the planet. The blackbody emission, large photospheric radius, and the discrepancy between the photospheric and planetary radius suggests that infrared observations probe an extended, dusty environment around the planet, which obscures the view on its molecular composition. Therefore, the SED is expected to trace the reprocessed radiation from the interior of the planet and/or partially from the accretion shock. The photospheric radius lies deep within the Hill sphere of the planet, which implies that PDS 70 b not only accretes gas but is also continuously replenished by dust. Finally, we derive a rough upper limit on the temperature and radius of potential excess emission from a circumplanetary disk, $T_{\rm eff} \lesssim 256$ K and $R \lesssim 245\ R_{\rm J}$, but we do find weak evidence that the current data favors a model with a single blackbody component.

Download/Website: `https://arxiv.org/abs/2009.04483`

Contact: `tomas.stolker@phys.ethz.ch`

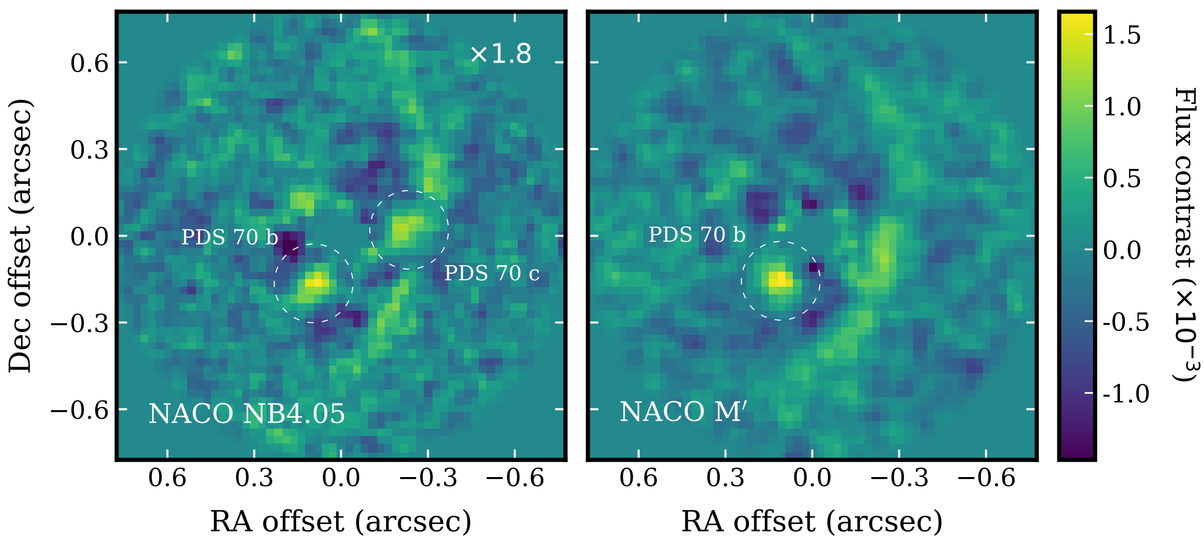

Figure 8: Detection of the PDS 70 planetary system and circumstellar disk with the NACO NB4.05 (*left*) and M' (*right*) filters.

3 Jobs and Positions

PhD position in exoplanet atmospheres

Dr. Graham K.H. Lee[1]
[1] CSH, University of Bern

CSH, University of Bern, Latest start - March 2021

An SNSF funded PhD position (4 years duration) is available to study the atmospheres of exoplanets under the guidance of Dr. Graham K.H. Lee at the Center for Space and Habitability (CSH), University of Bern in Switzerland. With the onset of launch of JWST, astronomers are set to revolutionise our understanding of exoplanet atmospheres. Motivated in concert with this observational effort, modelling and simulation of exoplanet atmospheres are required to be further developed in order to build physical pictures of the observational data. In this project you will investigate the 3D nature of exoplanet atmospheres by utilising and developing state-of-the art atmospheric models, and unveiling how the 3D nature of exoplanets affects the physical interpretation of observational data.
For further information, see the link below or e-mail.

Download/Website: `http://nccr-planets.ch/blog/2020/09/08/phd-position-study-the-atmospheres-of-exoplanets/`

Contact: `graham.lee@csh.unibe.ch`

Postdoctoral Scholar at NASA Exoplanet Science Institute - Caltech/IPAC

Dr. David R. Ciardi
NASA Exoplanet Science Institute - Caltech/IPAC, Pasadena, CA 91125 USA

Pasadena, CA USA, As soon as available

Applications are invited for a Postdoctoral Scholar at the Caltech/IPAC NASA Exoplanet Science Institute (NExScI). Under the supervision of Dr. David Ciardi, your primary responsibility will be determining the stellar companion rates of planet hosting stars utilizing high resolution imaging obtained with our team resources on Palomar, Gemini-North, Gemini-South, WIYN and the DCT supplemented with Gaia astrometry, and stellar spectroscopic and radial velocity data.

You will join a large and extremely productive and collaborative team that is focused on the characterization and follow-up of exoplanet host systems. In particular, the group you will be joining is working on determining the rate and characteristics of stellar companions in planetary hosting stars discovered by K2 and TESS. The Postdoctoral Scholar will be encouraged to join the team and to participate in any aspect of the science. They will also carry out their own independent scientific research and will be able to propose to both the JPL access to the Palomar telescopes and to the IPAC allocation of LCO time, in addition to other telescope resources.

Qualifications and Experience
• By the starting date, a Ph.D. in astronomy, physics or equivalent, in an area relevant to the responsibilities.
• Prior experience with stellar companion detection and characterization, high resolution imaging, stellar multiplicity, or statistical analysis is highly desirable.

Appointment Details
• This appointment is for two years, with an additional year available contingent on performance and funding.
• Email-only applications are due by November 20, 2020 and should be directed to applications@ipac.caltech.edu

Required Documents
• Resume
• Publication list
• Contact information of 3 professional references

We are an equal opportunity employer and all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin, disability status, protected veteran status, or any other characteristic protected by law.

If you would like to request an accommodation in completing this application, interviewing, or otherwise participating in the employee selection process, please contact us via the email above.

Application Deadline: Friday, November 20, 2020

Download/Website: `https://jobregister.aas.org/ad/30f22f3b`

Contact: `ciardi@ipac.caltech.edu`

Call for Applications for the 2021 NASA Hubble Fellowship Program

Dr. Andrew Fruchter, Space Telescope Science Institute

Dr. Dawn M. Gelino, NASA Exoplanet Science Institute

Dr. Paul Green, Smithsonian Astrophysical Observatory

Applications Due: November 5, 2020 at 7:00 PM EST (4:00 PM PST 24:00 UTC),

On behalf of the NASA Astrophysics Division, the Space Telescope Science Institute (STScI) announces the call for applications for postdoctoral fellowships under the NASA Hubble Fellowship Program (NHFP) beginning in the fall of 2021.

The NHFP supports postdoctoral scientists performing independent research that contributes to NASA Astrophysics (see https://science.nasa.gov/astrophysics/ for more information). The research may be theoretical, observational, and/or instrumental. If your application is successful and you accept our offer, you will become an Einstein, Hubble, or Sagan fellow depending on the research area. We are continuing the legacy of those three earlier programs in this way, and through joint management of the program by STScI, in collaboration with the Chandra X-ray Center and the NASA Exoplanet Science Institute.

The NHFP is open to applicants of any nationality who have earned (or will have earned) their doctoral degree on or after January 1, 2018 in astronomy, physics or related disciplines. The duration of the Fellowship is up to three years: an initial one-year appointment, and two annual renewals contingent on satisfactory performance and availability of NASA funds. Eligibility may extend to those who received their PhD as early as January 1, 2017, if professional work was necessarily delayed by personal considerations. Extended eligibility must be justified in an email to nhfp@stsci.edu at least 2 weeks in advance of the application deadline.

We anticipate offering up to 24 NHFP Fellowships this year. The Fellowships are tenable at a U.S. host institution of the fellow's choice, subject to a maximum of two new fellows per host institution per year, and no more than five fellows at any single host institution, except for short periods of overlap.

The Announcement of Opportunity, which includes detailed program policies and application instructions, is available at the website: http://nhfp.stsci.edu.http://nhfp.stsci.edu The application submission page will be open from September 8 until November 5, 2020. Applicants should follow the instructions given in the Announcement and also read the Frequently Asked Questions. Please send any further inquiries about the NHFP to nhfp@stsci.edu.

Important Dates

- November 5, 2020, 7:00 PM EST (4:00 PM PST 24:00 UTC): Applications due
- November 12, 2020: Letters of reference due (applications are due one week before the letters)

Offers will be made in early February 2021 and new appointments should begin on or about September 1, 2021. NHFP Fellowships are open to English-speaking citizens of all nations. All applicants will receive consideration without regard to race, creed, color, age, gender, gender identity or expression, sexual orientation or national origin. Women and members of minority groups are strongly encouraged to apply.

Download/Website: `http://nhfp.stsci.edu`

Contact: `nhfp@stsci.edu`

4 Conferences

Exoplanet Demographics I Conference

J. Christiansen
NASA Exoplanet Science Institute, California Institute of Technology, Pasadena, CA, USA

Pasadena, CA, November 9-12, 2020

The final agenda is now available for the first Exoplanet Demographics conference, which will be hosted by the NASA Exoplanet Science Institute, November 9-12, 2020. This will be a fully virtual meeting and free registration is still open. The meeting will be held via Zoom webinar and you must be registered to receive the webinar information.

This conference will bring together community members working both theoretically and observationally on understanding exoplanet demographics focusing on the following themes.

- What are the current limitations on our ability to discern the true underlying planet population from the observed distribution?
- What can the size and/or mass distribution of exoplanets teach us about the dominant planet formation, migration, and evolution pathways?
- What properties of stars affect the types of planets that form, and how can we use the properties of stars to study planet formation?
- What can we learn from planetary systems or disks around stellar remnants and substellar objects?
- How will upcoming missions advance our understanding of exoplanet demographics?

Download/Website: `http://nexsci.caltech.edu/workshop/2020`

Contact: `exodem@ipac.caltech.edu`

5 Announcements

CHEOPS Discretionary Programme

Kate Isaak
ESA CHEOPS Project Scientist, European Space Agency/ESTEC, the Netherlands

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ESA is accepting proposals for the CHEOPS discretionary programme. The programme provides the means through which to submit requests for observing time on CHEOPS at any time of the year, and specifically outside the annual announcements of opportunity.

Details of the programme - including all tools/manuals/information needed to prepare and submit observing proposals - can be found at the link given below.

A target must meet very specific criteria for a proposal to be eligible for time within this programme - these are given on the webpage itself, and in the programme documentation (Policies and Procedures document) which is listed on the webpage under *Documentation*. When submitting a proposal, it is important to take into account that, for operational reasons, it will take at best a minimum of around 3 weeks from proposal submission to target observation.

Download/Website: `https://www.cosmos.esa.int/web/cheops-guest-observers-programme/discretionary-programme`

Contact: `cheops-support@cosmos.esa.int`

Coming soon: exoplanet-talks.org

Ignas Snellen

exoplanet-talks.org, September 15, 2020

The corona-crisis has made us think about the future of conferences and symposia. Although meetings will always play an important role in our scientific lives, it will take a while before we can all travel again and spend time with hundreds in a cramped room. Also, long-distant travel is not particularly green. In addition, the current situation makes it increasingly difficult for early career scientists to present and promote themselves - something that has always been challenging.

We are going to try something different, and set up a web-based scientific presentation platform for the field of extrasolar planets. Anybody registered can upload a presentation to the system, e.g. when they have published a paper, a thesis, or at any time. The presentation is stored in the system with a range of keywords to make the database easily searchable - no frills, no likes, no number of views. Anybody can view a presentation until the presenter removes it again from the database. Registered scientists can ask questions either publicly or privately via a discussion console - even months after a talk has been uploaded.

Although clearly not all of the important aspects of real-life conferences will be replaced by this platform, especially networking, it will have many benefits - even after the immediate Covid-19 crisis is over. Early Career Scientists will have an easily accessible way to present their work, allowing high quality talks, with potentially a long-term legacy value - and will learn the important skills of making state-of-the-art video presentations. We envisage this will become a novel path for scientists to interact with each other: Journal clubs starting paper discussions with a short video, and academic recruiters watching online presentations of candidates.

This week is the technical kick-off of the project, with an anticipated running time of about 12 weeks before going live. In addition to a local team, we have an informal international advisory committee (Jayne Birkby, Jean-Michel Désert, Debra Fischer, Kevin Heng, Laura Kreidberg, Didier Queloz and Sascha Quanz). We are particularly aware of security and (social) safety challenges. You will need to be a scientist affiliated with a recognised institute to register and be able to post a video or place comments. The public at large can only watch the videos.

We hope you will become as enthusiastic about this idea as we are, and will try to help to make it a success. Think about upcoming articles/projects you, or your team member, could give a short presentation on. Probably in a few weeks we will start pre-registration. If you want to make sure you do not miss any updates on this, you can leave your name and email via this link (also for your comments and suggestions): https://docs.google.com/forms/d/1Gg23EJ63xjy7uKtvv5JPBSxJxnxpNidceyVkidZqyak

Contact: `snellen@strw.leidenuniv.nl`

6 As seen on astro-ph

List of exoplanet related entries seen on astro-ph during August 2020.

August 2020

astro-ph/2008.00309: **SCExAO/CHARIS Near-IR Integral Field Spectroscopy of the HD 15115 Debris Disk** by *Kellen Lawson et al.*

astro-ph/2008.00906: **Wind-MRI interactions in local models of protoplanetary discs: I. Ohmic resistivity** by *Philip Kwong Ching Leung, Gordon I. Ogilvie*

astro-ph/2008.00915: **Barycentric Corrections for Precise Radial Velocity Measurements of Sunlight** by *Jason T. Wright, Shubham Kanodia*

astro-ph/2008.00971: **LRG-BEASTS: Ground-based Detection of Sodium and a Steep Optical Slope in the Atmosphere of the Highly Inflated Hot-Saturn WASP-21b** by *L. Alderson et al.*

astro-ph/2008.00995: **Colour-magnitude diagrams of transiting Exoplanets – III. A public code, nine strange planets, and the role of Phosphine** by *Georgina Dransfield, Amaury H.M.J Triaud*

astro-ph/2008.01105: **Primordial Radius Gap and Potentially Broad Core Mass Distributions of Super-Earths and Sub-Neptunes** by *Eve J. Lee, Nicholas J. Connors*

astro-ph/2008.01119: **Streaming Instability with Multiple Dust Species: I. Favourable Conditions for the Linear Growth** by *Zhaohuan Zhu, Chao-Chin Yang*

astro-ph/2008.01288: **A dayside thermal inversion in the atmosphere of WASP-19b** by *A. S. Rajpurohit et al.*

astro-ph/2008.01419: **The Habitability of the Galactic Bulge** by *Amedeo Balbi, Maryam Hami, Andjelka B. Kovačević*

astro-ph/2008.01472: **The Dwarf Planet Makemake as seen by X-Shooter** by *A. Alvarez-Candal et al.*

astro-ph/2008.01595: **An astrometric planetary companion candidate to the M9 Dwarf TVLM 513-46546** by *Salvador Curiel et al.*

astro-ph/2008.01727: **Protoplanetary Disk Rings as Sites for Planetesimal Formation** by *Daniel Carrera et al.*

astro-ph/2008.01783: **Vacuum ultraviolet photoabsorption spectroscopy of space-related ices: 1 keV electron irradiation of nitrogen- and oxygen-rich ices** by *S. Ioppolo et al.*

astro-ph/2008.01837: **The Hubble Space Telescope's near-UV and optical transmission spectrum of Earth as an exoplanet** by *Allison Youngblood et al.*

astro-ph/2008.01840: **Changes in a Dusty Ringlet in the Cassini Division after 2010** by *M.M. Hedman, B. Bridges*

astro-ph/2008.01856: **A Library of Self-Consistent Simulated Exoplanet Atmospheres** by *Jayesh M. Goyal et al.*

astro-ph/2008.01968: **Dust particle size, shape, and optical depth during the 2018/MY34 Martian Global Dust Storm retrieved by MSL Curiosity rover navigation cameras** by *Hao Chen-Chen, Santiago Perez-Hoyos, Agustin Sanchez-Lavega*

astro-ph/2008.02339: **A Large Repository of 3D Climate Model Outputs for Community Analysis and Post-processing** by *Adiv Paradise et al.*

astro-ph/2008.02564: **Secular Gravitational Instability of Drifting Dust in Protoplanetary Disks: Formation of Dusty Rings without Significant Gas Substructures** by *Ryosuke T. Tominaga, Sanemichi Z. Takahashi, Shu-ichiro Inutsuka*

astro-ph/2008.02756: **Multiple Transits during a Single Conjunction: Identifying Transiting Circumbinary Planetary Candidates from TESS** by *Veselin B. Kostov et al.*

astro-ph/2008.02789: **Low Albedo Surfaces of Lava Worlds** by *Zahra Essack, Sara Seager, Mihkel Pajusalu*

astro-ph/2008.02802: **On the effect of the central body small deformations on its satellite trajectory in the problem of the two-body gravitational interaction** by *Dmitry G. Kiryan, George V. Kiryan*

astro-ph/2008.02811: **Multiple Explanations for the Single Transit of KIC 5951458 based on Radial Velocity Measurements Extracted with a Novel Matched-template Technique** by *Paul A. Dalba et al.*

astro-ph/2008.02825: **Powering the Galilean Satellites with Moon-Moon Tides** by *Hamish C. F. C. Hay, Antony Trinh, Isamu Matsuyama*
astro-ph/2008.03180: **Spectrophotometric characterization of the Philae landing site and surroundings with the ROSETTA/OSIRIS cameras** by *Hong Van Hoang et al.*
astro-ph/2008.03262: **Tidal dissipation in evolving low-mass and solar-type stars with predictions for planetary orbital decay** by *Adrian J. Barker*
astro-ph/2008.03576: **First in-situ detection of the CN radical in comets and evidence for a distributed source** by *Nora Hänni et al.*
astro-ph/2008.03594: **Water worlds in N-body simulations with fragmentation in systems without gaseous giants** by *Agustín Dugaro, Gonzalo C. de Elía, Luciano A. Darriba*
astro-ph/2008.03613: **An Independent Analysis of the Six Recently Claimed Exomoon Candidates** by *David Kipping*
astro-ph/2008.03657: **Simulations of orbital debris clouds due to breakup events and their characterisation using the Murchison Widefield Array radio telescope** by *Wynand Joubert, Steven Tingay*
astro-ph/2008.03952: **Non-detection of O2/O3 informs frequency of Earth-like planets with LUVOIR but not HabEx** by *Jade H. Checlair et al.*
astro-ph/2008.04014: **Searching for wide-orbit gravitational instability protoplanets with ALMA in the dust continuum** by *J. Humphries et al.*
astro-ph/2008.04044: **Probing the atmosphere of HD189733b with the Na I and K I lines** by *E. Keles et al.*
astro-ph/2008.04207: **Investigating Gravitational Collapse of a Pebble Cloud to form Transneptunian Binaries** by *James E. Robinson et al.*
astro-ph/2008.04324: **Anisotropy of Long-period Comets Explained by Their Formation Process** by *Arika Higuchi*
astro-ph/2008.04335: **Mildly-Hierarchical triple dynamics and applications to the outer solar system** by *Hareesh Gautham Bhaskar et al.*
astro-ph/2008.04818: **A multi-chord stellar occultation by the large trans-Neptunian object (174567) Varda** by *D. Souami et al.*
astro-ph/2008.04927: **Could the Migration of Jupiter have Accelerated the Atmospheric Evolution of Venus?** by *Stephen R. Kane et al.*
astro-ph/2008.04992: **Effects of Flux Variation on the Surface Temperatures of Earth-like Circumbinary Planets** by *Srisurya Karthik Yadavalli et al.*
astro-ph/2008.05142: **Debris cloud of India Anti-Satellite Test to Microsat-R Satellite** by *Yu Jiang*
astro-ph/2008.05372: **The GALAH Survey: Using Galactic Archaeology to Refine our Knowledge of TESS Target Stars** by *Jake T. Clark et al.*
astro-ph/2008.05384: **Characterization of Temporarily-Captured Minimoon 2020 CD3 by Keck Time-resolved Spectrophotometry** by *Bryce T. Bolin et al.*
astro-ph/2008.05411: **Early science with SPIRou: near-infrared radial velocity and spectropolarimetry of the planet-hosting star HD 189733** by *Claire Moutou et al.*
astro-ph/2008.05444: **Optical Transmission Spectroscopy of the Terrestrial Exoplanet LHS 3844b from 13 Ground-Based Transit Observations** by *Hannah Diamond-Lowe et al.*
astro-ph/2008.05480: **A Featureless Infrared Transmission Spectrum for the Super-Puff Planet Kepler-79d** by *Yayaati Chachan et al.*
astro-ph/2008.05497: **Most super-Earths formed by dry pebble accretion are less massive than 5 Earth masses** by *Julia Venturini et al.*
astro-ph/2008.05513: **The Nature of the Radius Valley: Hints from Formation and Evolution Models** by *Julia Venturini et al.*
astro-ph/2008.05549: **Colliding in the shadows of giants: Planetesimal collisions during the growth and migration of gas giants** by *Philip J. Carter, Sarah T. Stewart*
astro-ph/2008.05698: **Strong Scatterings of Cold Jupiters and their Influence on Inner Low-mass Planet Sys-**

tems: Theory and Simulations by *Bonan Pu, Dong Lai*

astro-ph/2008.05841: **Is water ice an efficient facilitator for dust coagulation?** by *Hiroshi Kimura et al.*

astro-ph/2008.05970: **Detection Limits of Low-mass, Long-period Exoplanets Using Gaussian Processes Applied to HARPS-N Solar RVs** by *N. Langellier et al.*

astro-ph/2008.05992: **Where are the Extrasolar Mercuries?** by *Alexandra E. Doyle et al.*

astro-ph/2008.06065: **High-resolution survey for planetary companions to young stars in the Taurus Molecular Cloud** by *A. L. Wallace et al.*

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