ExoPlanet News An Electronic Newsletter

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1 Editorial

Welcome to the 90th edition of Exoplanet News. It's been a momentous month for exoplanet science with the announcement of the discovery of a terrestrial planet candidate in the classical habitable zone of Proxima Centauri (and I counted at least 9 "follow-up" papers on Proxima b appearing on arXiv during the last week or so). Of course the discovery paper stirred up a predictable media interest, and many of us were (as usual) reminding commentators that we don't know the *size* of the planet, the planetary *mass* quoted is only a lower limit, its presence in the habitable zone does not mean it must have liquid water on the surface, let alone an atmosphere – so, no, it's not necessarily an "Earth-like" habitable planet (even leaving aside the flare star nature of the host). Nonetheless, the discovery by Guillem Anglada-Escudé and colleagues is tremendously exciting, and a fine example of how to separate signals from noise! The Proxima Centauri system would likely have been the first target for human exploration beyond the solar system – in Proxima b, we now have a reason to go there.

This month's newsletter returns to its usual length and contains another excellent selection of abstracts for recent papers, job adverts and conference announcements, along with two months of arXiv entries. Please keep your abstracts and announcements coming in time for the next (October) issue.

best wishes Andrew Norton

2 Abstracts of refereed papers

The Stability of Tidal Equilibrium for Hierarchical Star-Planet-Moon Systems

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Monthly Notices of the Royal Astronomical Society, 462, pp. 2527 – 2541, arXiv:1607.08170

Motivated by the current search for exomoons, this paper considers the stability of tidal equilibrium for hierarchical three-body systems containing a star, a planet, and a moon. In this treatment, the energy and angular momentum budgets include contributions from the planetary orbit, lunar orbit, stellar spin, planetary spin, and lunar spin. The goal is to determine the optimized energy state of the system subject to the constraint of constant angular momentum. Due to the lack of a closed form solution for the full three-body problem, however, we must use use an approximate description of the orbits. We first consider the Keplerian limit and find that the critical energy states are saddle points, rather than minima, so that these hierarchical systems have no stable tidal equilibrium states. We then generalize the calculation so that the lunar orbit is described by a time-averaged version of the circular restricted three-body problem. In this latter case, the critical energy state is a shallow minimum, so that a tidal equilibrium state exists. In both cases, however, the lunar orbit for the critical point lies outside the boundary (roughly half the Hill radius) where (previous) numerical simulations indicate dynamical instability. These results suggest that star-planet-moon systems have no viable long-term stable states analogous to those found for two-body systems.

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Effects of inclined star-disk encounter on protoplanetary disk size

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Astronomy & Astrophysics, in press (arXiv:1608.03239)

Most, if not all, young stars are initially surrounded by protoplanetary disks. Owing to the preferential formation of stars in stellar clusters, the protoplanetary disks around these stars may potentially be affected by the cluster environment. Various works have investigated the influence of stellar fly-bys on disks, although many of them consider only the effects due to parabolic, coplanar encounters often for equal-mass stars, which is only a very special case. We perform numerical simulations to study the fate of protoplanetary disks after the impact of parabolic star-disk encounter for the less investigated case of inclined up to coplanar, retrograde encounters, which is a much more common case. Here, we concentrate on the disk size after such encounters because this limits the size of the potentially forming planetary systems. In addition, with the possibilities that ALMA offers, now a direct comparison to observations is possible. Covering a wide range of periastron distances and mass ratios between the mass of the perturber and central star, we find that despite the prograde, coplanar encounters having the strongest effect on the disk size, inclined and even the least destructive retrograde encounters mostly also have a considerable effect, especially for close periastron passages. Interestingly, we find a nearly linear dependence of the disk size on the orbital inclination for the prograde encounters, but not for the retrograde case. We also determine the final orbital parameters of the particles in the disk such as eccentricities, inclinations, and semi-major axes. Using this information the presented study can be used to describe the fate of disks and also that of planetary systems after inclined encounters.

Download/Website: http://arxiv.org/abs/1608.03239

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Disentangling planetary and stellar activity features in the CoRoT-2 light curve

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Astronomy & Astrophysics, in press (arXiv:1608.01855)

Context. Stellar activity is an important source of systematic errors and uncertainties in the characterization of exoplanets. Most of the techniques used to correct for this activity focus on an ad hoc data reduction.

Aims. We have developed a software for the combined fit of transits and stellar activity features in high-precision long-duration photometry. Our aim is to take advantage of the modelling to derive correct stellar and planetary parameters, even in the case of strong stellar activity.

Methods. We use an analytic approach to model the light curve. The code KSint, modified by adding the evolution of active regions, is implemented into our Bayesian modelling package PASTIS. The code is then applied to the light curve of CoRoT-2. The light curve is divided in segments to reduce the number of free parameters needed by the fit. We perform a Markov chain Monte Carlo analysis in two ways. In the first, we perform a global and independent modelling of each segment of the light curve, transits are not normalized and are fitted together with the activity features, and occulted features are taken into account during the transit fit. In the second, we normalize the transits with a model of the non-occulted activity features, and then we apply a standard transit fit, which does not take the occulted features into account.

Results. Our model recovers the activity features coverage of the stellar surface and different rotation periods for different features. We find variations in the transit parameters of different segments and show that they are likely due to the division applied to the light curve. Neglecting stellar activity or even only bright spots while normalizing the transits yields a $\sim 1.2\sigma$ larger and 2.3σ smaller transit depth, respectively. The stellar density also presents up to 2.5σ differences depending on the normalization technique. Our analysis confirms the inflated radius of the planet $(1.475\pm0.031\,R_{\rm J})$ found by other authors. We show that bright spots should be taken into account when fitting the transits. If a dominance of dark spots over bright ones is assumed, and a fit on a lower envelope of the deepest transits is carried out, overestimating the planet-to-star radius ratio of CoRoT-2 b by almost 3% is likely.

Download/Website: http://www.aanda.org/articles/aa/pdf/forth/aa27699-15.pdf

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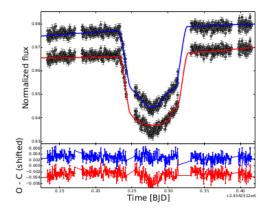


Figure 1: (Bruno et al.) Deepest transit of the light curve. A fit carried out with a model including both dark and bright spots is shown in blue. A fit which uses only dark spots is shown in red (shifted). The residuals are shifted for clarity and use the same colour code.

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The asteroseismic potential of TESS: exoplanet-host stars

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The Astrophysical Journal, in press (arXiv:1608.01138)

New insights on stellar evolution and stellar interiors physics are being made possible by asteroseismology. Throughout the course of the *Kepler* mission, asteroseismology has also played an important role in the characterization of exoplanet-host stars and their planetary systems. The upcoming NASA *Transiting Exoplanet Survey Satellite (TESS)* will be performing a near all-sky survey for planets that transit bright nearby stars. In addition, its excellent photometric precision, combined with its fine time sampling and long intervals of uninterrupted observations, will enable asteroseismology of solar-type and red-giant stars. Here we develop a simple test to estimate the detectability of solar-like oscillations in *TESS* photometry of any given star. Based on an all-sky stellar and planetary synthetic population, we go on to predict the asteroseismic yield of the *TESS* mission, placing emphasis on the yield of exoplanet-host stars for which we expect to detect solar-like oscillations. This is done for both the target stars (observed at a 2-min cadence) and the full-frame-image stars (observed at a 30-min cadence). A similar exercise is also conducted based on a compilation of known host stars. We predict that *TESS* will detect solar-like oscillations in a few dozen target hosts (mainly subgiant stars but also in a smaller number of F dwarfs), in up to 200 low-luminosity red-giant hosts, and in over 100 solar-type and red-giant known hosts, thereby leading to a threefold improvement in the asteroseismic yield of exoplanet-host stars when compared to *Kepler*'s.

Download/Website: http://arxiv.org/abs/1608.01138

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Close-in planetesimal formation by pile-up of drifting pebbles

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Astronomy & Astrophysics, in press (arXiv:1607.05734)

The coherence of planet formation models suffers from the disconnection between the regime of small and large bodies. This is primarily caused by so-called growth barriers: the direct growth of larger bodies is halted at centimetre sized objects and particular conditions are required for the formation of larger, gravitationally bound planetesimals. We aim to connect models of dust evolution and planetesimal formation in order to identify regions of protoplanetary discs that are favourable for the formation of kilometre sized bodies and the first planetary embryos. We combine semi-analytical models of viscous protoplanetary disc evolution, dust growth and drift including backreaction of the dust particles on the gas, and planetesimal formation via the streaming instability into one numerical code. We investigate how planetesimal formation is affected by the mass of the protoplanetary disc, its initial dust

content, and the stickiness of dust aggregates. We find that the dust growth and drift leads to a global redistribution of solids. The pile-up of pebbles in the inner disc provides local conditions where the streaming instability is effective. Planetesimals form in an annulus with its inner edge lying between 0.3 AU and 1 AU and its width ranging from 0.3 AU to 3 AU. The resulting surface density of planetesimals follows a radial profile that is much steeper than the initial disc profile. These results support formation of terrestrial planets in the Solar System from a narrow annulus of planetesimals, what reproduces their peculiar mass ratios.

Download/Website: https://arxiv.org/abs/1607.05734

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The Impact of Non-Uniform Thermal Structure on the Interpretation of Exoplanet Emission Spectra

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The Astrophysical Journal, in press (arXiv:1607.03230)

The determination of atmospheric structure and molecular abundances of planetary atmospheres via spectroscopy involves direct comparisons between models and data. While varying in sophistication, most model-spectra comparisons fundamentally assume "1D" model physics. However, knowledge from general circulation models and of solar system planets suggests that planetary atmospheres are inherently "3D" in their structure and composition. We explore the potential biases resulting from standard "1D" assumptions within a Bayesian atmospheric retrieval framework. Specifically, we show how the assumption of a single 1-dimensional thermal profile can bias our interpretation of the thermal emission spectrum of a hot Jupiter atmosphere that is composed of two thermal profiles. We retrieve upon spectra of unresolved model planets as observed with a combination of HST WFC3+Spitzer IRAC as well as JWST under varying differences in the two thermal profiles. For WFC3+IRAC, there is a significantly biased estimate of CH₄ abundance using a 1D model when the contrast is 80%. For JWST, two thermal profiles are required to adequately interpret the data and estimate the abundances when contrast is greater than 40%. We also apply this preliminary concept to the recent WFC3+IRAC phase curve data of the hot Jupiter WASP-43b. We see similar behavior as present in our simulated data: while the H₂O abundance determination is robust, CH₄ is artificially well-constrained to incorrect values under the 1D assumption. Our work demonstrates the need to evaluate model assumptions in order to extract meaningful constraints from atmospheric spectra and motivates exploration of optimal observational setups.

Download/Website: http://arxiv.org/abs/1607.03230

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Milankovitch Cycles of Terrestrial Planets in Binary Star Systems

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1608.05592)

The habitability of planets in binary star systems depends not only on the radiation environment created by the two stars, but also on the perturbations to planetary orbits and rotation produced by the gravitational field of the binary and neighbouring planets. Habitable planets in binaries may therefore experience significant perturbations in orbit and spin. The direct effects of orbital resonances and secular evolution on the climate of binary planets remain largely unconsidered. We present latitudinal energy balance modelling of exoplanet climates with direct coupling to an N Body integrator and an obliquity evolution model. This allows us to simultaneously investigate the thermal and dynamical evolution of planets orbiting binary stars, and discover gravito-climatic oscillations on dynamical and secular timescales. We investigate the Kepler-47 and Alpha Centauri systems as archetypes of P and S type binary systems respectively. In the first case, Earthlike planets would experience rapid Milankovitch cycles (of order 1000 years) in eccentricity, obliquity and precession, inducing temperature oscillations of similar periods (modulated by other planets in the system). These secular temperature variations have amplitudes similar to those induced on the much shorter timescale of the binary period. In the Alpha Centauri system, the influence of the secondary produces eccentricity variations on 15,000 year timescales. This produces climate oscillations of similar strength to the variation on the orbital timescale of the binary. Phase drifts between eccentricity and obliquity oscillations creates further cycles that are of order 100,000 years in duration, which are further modulated by neighbouring planets.

Download/Website: http://arxiv.org/abs/1608.05592

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A self-consistent model for the evolution of the gas produced in the debris disc of β Pictoris

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Monthly Notices of the Royal Astronomical Society, published (2016MNRAS.461..845K)

This paper presents a self-consistent model for the evolution of gas produced in the debris disc of β Pictoris. Our model proposes that atomic carbon and oxygen are created from the photodissociation of CO, which is itself released from volatile-rich bodies in the debris disc due to grain-grain collisions or photodesorption. While the CO lasts less than one orbit, the atomic gas evolves by viscous spreading resulting in an accretion disc inside the parent belt and a decretion disc outside. The temperature, ionisation fraction and population levels of carbon and oxygen are followed with the photodissociation region model Cloudy, which is coupled to a dynamical viscous α model. We present new gas observations of β Pic, of C I observed with APEX and O I observed with Herschel, and show that these along with published C II and CO observations can all be explained with this new model. Our model requires a viscosity $\alpha>0.1$, similar to that found in sufficiently ionised discs of other astronomical objects; we propose that the magnetorotational instability is at play in this highly ionised and dilute medium. This new model can be tested from its predictions for high resolution ALMA observations of C I. We also constrain the water content of the planetesimals in β Pic. The scenario proposed here might be at play in all debris discs and this model could be used more generally on all discs with C, O or CO detections.

Download/Website: http://mnras.oxfordjournals.org/content/461/1/845.full.pdf Contact: gkral@ast.cam.ac.uk

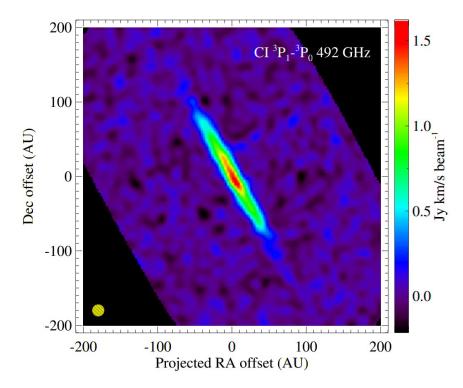


Figure 2: (Kral et al.) Predictions of the C I gas disc around β Pic that will soon be observed with ALMA

The magnetorotational instability in debris-disc gas

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Monthly Notices of the Royal Astronomical Society, published (2016MNRAS.461.1614K)

Debris discs are commonly swathed in gas which can be observed in UV, in fine structure lines in FIR, and in resolved maps of CO emission. Carbon and oxygen are overabundant in such gas, but it is severely depleted in hydrogen. As a consequence, its ionisation fraction is remarkably high, suggesting magnetohydrodynamic (MHD) processes may be important. In particular, the gas may be subject to the magnetorotational instability (MRI), and indeed recent modelling of β Pictoris requires an anomalous viscosity to explain the gas's observed radial structure. In this paper we explore the possibility that the MRI is active in debris-disc gas and responsible for the observed mass transport. We find that non-ideal MHD and dust-gas interactions play a subdominant role, and that linear instability is viable at certain radii. However, owing to low gas densities, the outer parts of the disc could be stabilised by a weak ambient magnetic field, though it is difficult to constrain such a field. Even if the MRI is stabilised by too strong a field, a magnetocentrifugal wind may be launched in its place and this could lead to equivalent (non-turbulent) transport. Numerical simulations of the vertically stratified MRI in conditions appropriate to the debris disc gas should be able to determine the nature of the characteristic behaviour at different radii, and decide on the importance of the MRI (and MHD more generally) on the evolution of these discs.

Download/Website: http://mnras.oxfordjournals.org/content/461/2/1614.full.pdf Contact: qkral@ast.cam.ac.uk

Disk Detective: Discovery of New Circumstellar Disk Candidates through Citizen Science

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The Astrophysical Journal, in press (arXiv:1607.05713)

The Disk Detective citizen science project aims to find new stars with 22 μ m excess emission from circumstellar dust using data from NASA's WISE mission. Initial cuts on the AllWISE catalog provide an input catalog of 277,686 sources. Volunteers then view images of each source online in 10 different bands to identify false-positives (galaxies, background stars, interstellar matter, image artifacts, etc.). Sources that survive this online vetting are followed up

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with spectroscopy on the FLWO Tillinghast telescope. This approach should allow us to unleash the full potential of WISE for finding new debris disks and protoplanetary disks. We announce a first list of 37 new disk candidates discovered by the project, and we describe our vetting and follow-up process. One of these systems appears to contain the first debris disk discovered around a star with a white dwarf companion: HD 74389. We also report four newly discovered classical Be stars (HD 6612, HD 7406, HD 164137, and HD 218546) and a new detection of 22 μ m excess around a previously known debris disk host star, HD 22128.

Download/Website: http://arxiv.org/abs/1607.05713

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Isotopic enrichment of forming planetary systems from supernova pollution

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1608.01435)

Heating by short-lived radioisotopes (SLRs) such as 26 Al and 60 Fe fundamentally shaped the thermal history and interior structure of Solar System planetesimals during the early stages of planetary formation. The subsequent thermo-mechanical evolution, such as internal differentiation or rapid volatile degassing, yields important implications for the final structure, composition and evolution of terrestrial planets. SLR-driven heating in the Solar System is sensitive to the absolute abundance and homogeneity of SLRs within the protoplanetary disk present during the condensation of the first solids. In order to explain the diverse compositions found for extrasolar planets, it is important to understand the distribution of SLRs in active planet formation regions (star clusters) during their first few Myr of evolution. By constraining the range of possible effects, we show how the imprint of SLRs can be extrapolated to exoplanetary systems and derive statistical predictions for the distribution of 26 Al and 60 Fe based on N -body simulations of typical to large clusters ($^{10^3}$ - $^{10^4}$ stars) with a range of initial conditions. We quantify the pollution of protoplanetary disks by supernova ejecta and show that the likelihood of enrichment levels similar to or higher than the Solar System can vary considerably, depending on the cluster morphology. Furthermore, many enriched systems show an excess in radiogenic heating compared to Solar System levels, which implies that the formation and evolution of planetesimals could vary significantly depending on the birth environment of their host stars.

Download/Website: timlichtenberg.net/2016_enrichment.html

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Broad-band spectrophotometry of HAT-P-32 b: Search for a scattering signature in the planetary spectrum

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1608.02346)

Multi-colour broad-band transit observations offer the opportunity to characterise the atmosphere of an extrasolar planet with small- to medium-sized telescopes. One of the most favourable targets is the hot Jupiter HAT-P-32 b. We combined 21 new transit observations of this planet with 36 previously published light curves for a homogeneous analysis of the broad-band transmission spectrum from the Sloan u' band to the Sloan z' band. Our results rule out cloud-free planetary atmosphere models of solar metallicity. Furthermore, a discrepancy at reddest wavelengths to previously published results makes a recent tentative detection of a scattering feature less likely. Instead, the available spectral measurements of HAT-P-32 b favour a completely flat spectrum from the near-UV to the near-IR. A plausible interpretation is a thick cloud cover at high altitudes.

Download/Website: http://arxiv.org/abs/1608.02346

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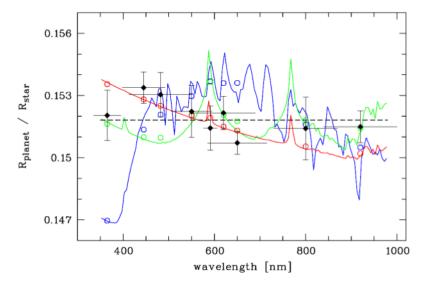


Figure 3: (Mallon et al.) Broad-band transmission spectrum of HAT-P-32 b. The measured values of this work are given in black, horizontal bars show the width of the corresponding filter transmission curve. Overplotted are several planetary atmosphere models of the planet. The colour-coded open circles show the bandpass-integrated theoretical values.

Biofluorescent Worlds: Biological fluorescence as a temporal biosignature for flare star worlds

J.T. O'Malley-James, L. Kaltenegger

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The Astrophysical Journal, submitted (arXiv:1608.06930)

Habitability for planets orbiting active stars has been questioned. Especially, planets in the Habitable Zone (HZ) of M-stars, like our closest star Proxima Centauri, experience temporal high-ultraviolet (UV) radiation. The high fraction of M-stars (75%) within the solar neighborhood, the high occurrence rate of rocky planets around M-stars, and the favorable contrast ratio between the star and a potentially habitable rocky planet, makes such planets interesting targets for upcoming observations, especially the close-by planet Proxima-b. During M-star flares, the UV flux on a HZ planet can increase by up to two orders of magnitude. High UV radiation is harmful to life and can cause cell and DNA damage. Common UV protection methods (e.g. living underground, or underwater) would make a biosphere harder to detect. However, photoprotective biofluorescence, "up-shifting" UV to longer, safer wavelengths (a proposed UV protection mechanism for some corals), would increase the detectability of biota and even uncover normally hidden biospheres during a flare. Such biofluorescence could be observable as a temporal biosignature for planets around UV-active stars. We model temporal biofluorescence as a biosignature for an exoplanet biosphere exposed to such conditions, based on planets in M-star HZs. We use fluorescing coral proteins to model biofluorescence, comparing observable spectra, and colors, to vegetation and fluorescent minerals. Our planetary models assume a present-day Earth atmosphere and explore the effect of varying cloud coverage and land:ocean fractions. UV flare-induced biofluorescence could be remotely detectable, comparable in strength to vegetation on Earth. On planets in the HZ of M-stars, biofluorescence could be a temporary biosignature, distinguishable from fluorescing minerals and vegetation.

Download/Website: http://arxiv.org/abs/1608.06930

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A Steeper than Linear Disk Mass-Stellar Mass Scaling Relation

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The Astrophysical Journal, in press (arXiv:1608.03621)

The disk mass is among the most important input parameter for every planet formation model to determine the number and masses of the planets that can form. We present an ALMA 887 micron survey of the disk population around objects from ~ 2 to $0.03~M_{\odot}$ in the nearby ~ 2 Myr-old Chamaeleon I star-forming region. We detect thermal dust emission from 66 out of 93 disks, spatially resolve 34 of them, and identify two disks with large dust cavities of

about 45 AU in radius. Assuming isothermal and optically thin emission, we convert the 887 micron flux densities into dust disk masses, hereafter $M_{\rm dust}$. We find that the $M_{\rm dust}-M_*$ relation is steeper than linear and of the form $M_{\rm dust} \propto (M_*)^{1.3-1.9}$, where the range in the power law index reflects two extremes of the possible relation between the average dust temperature and stellar luminosity. By re-analyzing all millimeter data available for nearby regions in a self-consistent way, we show that the 1-3 Myr-old regions of Taurus, Lupus, and Chamaeleon I share the same $M_{\rm dust}-M_*$ relation, while the 10 Myr-old Upper Sco association has a steeper relation. Theoretical models of grain growth, drift, and fragmentation reproduce this trend and suggest that disks are in the fragmentation-limited regime. In this regime millimeter grains will be located closer in around lower-mass stars, a prediction that can be tested with deeper and higher spatial resolution ALMA observations.

Download/Website: http://arxiv.org/abs/1608.03621

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Could Cirrus Clouds Have Warmed Early Mars?

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Icarus, in press (arXiv:1608.03891)

The presence of the ancient valley networks on Mars indicates that the climate at 3.8 Ga was warm enough to allow substantial liquid water to flow on the martian surface for extended periods of time. However, the mechanism for producing this warming continues to be debated. One hypothesis is that Mars could have been kept warm by global cirrus cloud decks in a CO2-H2O atmosphere containing at least 0.25 bar of CO2 (Urata and Toon, 2013). Initial warming from some other process, e.g., impacts, would be required to make this model work. Those results were generated using the CAM 3-D global climate model. Here, we use a single-column radiative-convective climate model to further investigate the cirrus cloud warming hypothesis. Our calculations indicate that cirrus cloud decks could have produced global mean surface temperatures above freezing, but only if cirrus cloud cover approaches 75 - 100% and if other cloud properties (e.g., height, optical depth, particle size) are chosen favorably. However, at more realistic cirrus cloud fractions, or if cloud parameters are not optimal, cirrus clouds do not provide the necessary warming, suggesting that other greenhouse mechanisms are needed.

Download/Website: http://arxiv.org/abs/1608.03891

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The mass of planet GJ 676A b from ground-based astrometry: A planetary system with two mature gas giants suitable for direct imaging

J. Sahlmann¹, P. F. Lazorenko², D. Ségransan³, N. Astudillo-Defru³, X. Bonfils⁴, X. Delfosse⁴, T. Forveille⁴, J. Hagelberg⁵, G. Lo Curto⁶, F. Pepe³, D. Queloz^{3,7}, S. Udry³, N. T. Zimmerman⁸

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Astronomy & Astrophysics, in press (arXiv:1608.00918)

The star GJ 676A is an M0 dwarf hosting both gas-giant and super-Earth-type planets that were discovered with radial-velocity measurements. Using FORS2/VLT, we obtained position measurements of the star in the plane of the sky that tightly constrain its astrometric reflex motion caused by the super-Jupiter planet 'b' in a 1052-day orbit. This allows us to determine the mass of this planet to be $M_{\rm b}=6.7^{+1.8}_{-1.5}\,M_{\rm J}$, which is ~40 % higher than the minimum mass inferred from the radial-velocity orbit. Using new HARPS radial-velocity measurements, we improve upon the orbital parameters of the inner low-mass planets 'd' and 'e' and we determine the orbital period of the outer giant planet 'c' to be $P_{\rm c}=7340$ days under the assumption of a circular orbit. The preliminary minimum mass of planet 'c' is $M_{\rm c} \sin i = 6.8\,M_{\rm J}$ with an upper limit of ~39 $M_{\rm J}$ that we set using NACO/VLT high-contrast imaging. We also determine precise parallaxes and relative proper motions for both GJ 676A and its wide M3 companion GJ 676B. Although the system is probably quite mature, the masses and projected separations (~0.1"-0.4") of planets 'b' and 'c' make them promising targets for direct imaging with future instruments in space and on extremely large telescopes. In particular, we estimate that GJ 676A b and GJ 676A c are promising targets for directly detecting their reflected light with the WFIRST space mission. Our study demonstrates the synergy of radial-velocity and astrometric surveys that is necessary to identify the best targets for such a mission.

Download/Website: http://arxiv.org/abs/1608.00918

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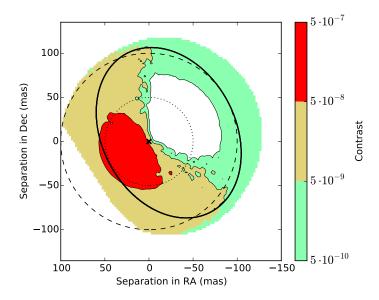


Figure 4: (Sahlmann et al.) Relative position and estimated reflected-light contrast of GJ 676A b in the WFIRST blue channel projected onto the sky plane for an albedo of 0.5. Dashed and dotted circles indicate separations of 50 and 100 milli-arcsecond, respectively, from the host star marked with a cross. Contrast contours are shown for the ensemble of orbital solutions drawn from the MCMC posterior distribution and the solid line shows the relative orbit corresponding to the best-fit solution. At the maximum separation of 110 milli-arcsecond we estimated a contrast of $2.6 \cdot 10^{-9}$, which improves to $\sim 5 \cdot 10^{-7}$ at smaller separations.

Tracing Slow Winds From T Tauri Stars via Low Velocity Forbidden Line Emission

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The Astrophysical Journal, in press(arXiv:1608.06992)

Using Keck/HIRES spectra ($\Delta v \sim 7$ km/s) we analyze forbidden lines of [O I] 6300 Å, [O I] 5577 Å and [S II] 6731 Å from 33 T Tauri stars covering a range of disk evolutionary stages. After removing a high velocity component (HVC) associated with microjets, we study the properties of the low velocity component (LVC). The LVC can be attributed to slow disk winds that could be magnetically (MHD) or thermally (photoevaporative) driven. Both of these winds play an important role in the evolution and dispersal of protoplanetary material. LVC emission is seen in all 30 stars with detected [O I] but only in 2 out of eight with detected [S II], so our analysis is largely based on the properties of the [O I] LVC. The LVC itself is resolved into broad (BC) and narrow (NC) kinematic components. Both components are found over a wide range of accretion rates and their luminosity is correlated with the accretion luminosity, but the NC is proportionately stronger than the BC in transition disks. The FWHM of both the BC and NC correlates with disk inclination, consistent with Keplerian broadening from radii of 0.05 to 0.5 AU and 0.5 to 5AU, respectively. The velocity centroids of the BC suggest formation in an MHD disk wind, with the largest blueshifts found in sources with closer to face-on orientations. The velocity centroids of the NC however, show no dependence on disk inclination. The origin of this component is less clear and the evidence for photoevaporation is not conclusive.

Download/Website: http://arxiv.org/abs/1608.06992

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The Magellan PFS Planet Search Program: Radial Velocity and Stellar Abundance Analyses of the 360 AU, Metal-Poor Binary "Twins" HD 133131A & B

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The Astronomical Journal, in press (arXiv:1608.06216)

We present a new precision radial velocity (RV) dataset that reveals multiple planets orbiting the stars in the \sim 360 AU, G2+G2 "twin" binary HD 133131AB. Our 6 years of high-resolution echelle observations from MIKE and 5 years from PFS on the Magellan telescopes indicate the presence of two eccentric planets around HD 133131A with minimum masses of 1.43 ± 0.03 and 0.63 ± 0.15 $\mathcal{M}_{\rm J}$ at 1.44 ± 0.005 and 4.79 ± 0.92 AU, respectively. Additional PFS observations of HD 133131B spanning 5 years indicate the presence of one eccentric planet of minimum mass 2.50 ± 0.05 $\mathcal{M}_{\rm J}$ at 6.40 ± 0.59 AU, making it one of the longest period planets detected with RV to date. These planets are the first to be reported primarily based on data taken with PFS on Magellan, demonstrating the instrument's precision and the advantage of long-baseline RV observations. We perform a differential analysis between the Sun and each star, and between the stars themselves, to derive stellar parameters and measure a suite of 21 abundances across a wide range of condensation temperatures. The host stars are old (likely \sim 9.5 Gyr) and metal-poor ([Fe/H] \sim -0.30), and we detect a \sim 0.03 dex depletion in refractory elements in HD 133131A versus B (with standard errors \sim 0.017). This detection and analysis adds to a small but growing sample of binary "twin" exoplanet host stars with precise abundances measured, and represents the most metal-poor and likely oldest in that sample. Overall, the planets around HD 133131A and B fall in an unexpected regime in planet mass-host star metallicity space and will serve as an important benchmark for the study of long period giant planets.

Download/Website: http://arxiv.org/abs/1608.06216

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Direct imaging discovery of a Jovian exoplanet within a triple star system

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Science, published (ADS-Bibcode 2016Sci...353..673W)

Direct imaging allows for the detection and characterization of exoplanets via their thermal emission. We report the discovery via imaging of a young Jovian planet in a triple star system and characterize its atmospheric properties through near-infrared spectroscopy. The semi-major axis of the planet is closer relative to that of its hierarchical triple star system than for any known exoplanet within a stellar binary or triple, making HD 131399 dynamically unlike any other known system. The location of HD 131399Ab on a wide orbit in a triple system demonstrates that massive planets may be found on long and possibly unstable orbits in multi-star systems. HD 131399Ab is one of the lowest mass (4+/-1 MJup) and coldest (850+/-50 K) exoplanets to have been directly imaged.

Download/Website: http://arxiv.org/abs/1607.02525

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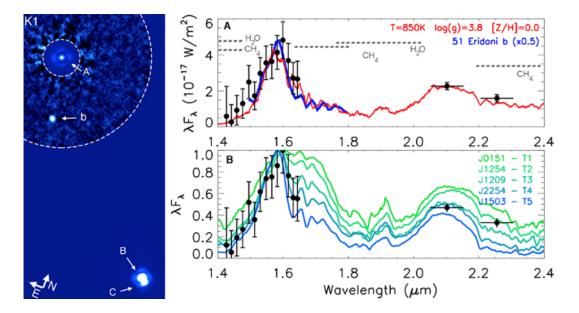


Figure 5: (Wagner et al.) Left: VLT/SPHERE K1-band image of HD131399ABC with the ADI-processed region around star A indicated (dashed). Top: Near-infrared spectrum of HD 131399Ab (black) alongside the best-fit BT-Settl model atmosphere in red, with Teff = 850 K and log(g) = 3.8 cm/s2, showing water and methane absorption and the spectrum of the T-type exoplanet 51 Eri b (blue). Bottom: Normalized spectra of HD 131399Ab and standard field brown dwarfs. The objects? labels correspond to the 2MASS object designations (J2000 hours and minutes of right ascension) and the spectral type.

3 Conference announcements

The Third Workshop on Extremely Precise Radial Velocities (EPRV III)

Jason T. Wright, Sharon X. Wang

The Pennsylvania State University, University Park, PA, USA

The Pennsylvania State University, during the week of August 7-13, 2017

This workshop is for teams around the world to share techniques for advancing precise radial velocity work towards 10 cm/s precision in coming years. Building on the success of the first two workshops at Penn State in 2010 and Yale in 2015, the focus on this workshop will be on the performance of the next generation of precise Doppler instruments, including hardware, statistical techniques for signal extraction and interpretation, and stellar jitter modeling and mitigation.

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Planet Formation and Evolution 2017

Alexander Krivov

Astrophysical Institute and University Observatory, Friedrich Schiller University, Schillergaesschen 2-3, 07745 Jena, Germany

25 – 27 September 2017,

FIRST ANNOUNCEMENT

Dear Colleagues,

In the tradition of the very successful workshops on "Planet Formation and Evolution", we are pleased to announce the 11th workshop in this series: "PLANET FORMATION AND EVOLUTION 2017". The workshop will take place at Friedrich Schiller University in Jena during 25 – 27 September 2017.

Following the spirit of the previous very stimulating meetings, the goal of this workshop is to provide a common platform for scientists working in the fields of star and planet formation, protoplanetary and debris discs, exoplanets, the Solar System, astrobiology, and planetary research in general. Most importantly, this workshop is aimed at stimulating and intensifying the dialogue between researchers using various approaches - observations, theory, and laboratory studies. In particular, students and postdocs are encouraged to present their results and to use the opportunity to learn more about the main questions and most recent results in adjacent fields.

Registration and abstract submission will open in early 2017.

Please, feel free to forward this email to potentially interested colleagues.

With best regards,

Alexander Krivov, on behalf of the SOC and LOC

Download/Website: http://www.astro.uni-jena.de/ pfe2017

Contact: pfe2017@uni-jena.de

The 21st International Microlensing Conference: Ushering in the New Age of Microlensing from Space

C. Henderson

California Institute of Technology, Pasadena, CA, USA

Pasadena, CA, January 31 – February 3, 2017

We happily invite the exoplanet community to the 21st International Microlensing Conference entitled "Ushering in the New Age of Microlensing from Space." The field of gravitational microlensing is burgeoning, in particular due to the success of several space-based missions. We will highlight breaking results from K2's Campaign 9 (K2C9), a combined ground- and space-based microlensing survey, as well as progress in Spitzer's program of obtaining "satellite parallaxes." Talks on ground-based surveys and advances in theory will also be featured prominently. Finally, we will have a number of talks on the revolutionary promise of the WFIRST mission for exoplanet science, which was recently approved to enter Phase A. Together these endeavors provide invaluable insight into topics such as the Galactic distribution of exoplanets, the abundance of free-floating planets, and the demographics of cold exoplanets.

The three-day conference will be preceded by a free half-day workshop the afternoon of January 31 at Caltech. This workshop will feature a series of microlensing talks introducing the mathematical formalism, observational methodology, and recent results of gravitational microlensing searches for exoplanets. Special emphasis will be given to the demographic questions addressed by space satellite programs, including *Spitzer*, *K2C9*, and *WFIRST*. This workshop is recommended for those new to the field of microlensing and will help set the stage for synthesizing the content of the remainder of the conference. We thus encourage anyone interested in the microlensing technique to join us on the afternoon of January 31, 2017 for this free session, regardless of planned conference attendance.

Important Dates

- November 3, 2016: Travel Forecast Closing Date for NASA Attendees (NCTS Number 25666-17)
- December 1, 2016: Early Registration and Abstract Submission Deadline
- January 6, 2017: Hotel Reservation Deadline at the Pasadena Sheraton
- January 23, 2017: Late Registration Deadline
- January 31, 2017: 1/2 day Microlensing Workshop at Caltech
- February 1-3, 2017: 21st International Conference on Microlensing at the Pasadena Sheraton

 ${\it Download/Website:} \verb| http://nexsci.caltech.edu/conferences/2017/microlensing/\\$

Contact: mlens2017@ipac.caltech.edu

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4 Jobs and positions

Associate Professor in Physical Climate Science

Prof. Ray Pierrehumbert University of Oxford

University of Oxford, Department of Physics, in association with Somerville College, Closing date: 28 Sept. 2016

The Department of Physics seeks to appoint an Associate Professor in Physical Climate Science. The successful candidate will also be offered a tutorial Fellowship at Somerville College, under arrangements described in the further particulars. This appointment is part of a University-wide initiative in Earth and Planetary Climate. We seek to appoint a candidate who can build a research program on atmospheric processes related to the University's expanding programs related to exoplanets, Solar System planets and deep-time Earth paleoclimate. Applications are solicited from candidates with track records of innovative research in any pertinent area of atmospheric physics, including (but not limited to) planetary fluid dynamics, atmospheric modeling, radiative transfer, cloud processes or atmospheric chemistry.

The University of Oxford is an equal-opportunity employer

Download/Website: www.ox.ac.uk/about/jobs/academic/index/ac21844j/ and www.recruit.ox.ac.uk/pls/hrisliverecruit/erq_jobspec_version_4.jobspec?p_id=124196

Contact: pcs2016@physics.ox.ac.uk

Postdoc position on observational explorations of exoplanet atmospheres

Ignas Snellen

Leiden Observatory, Leiden University, Postbus 9513, 2300RA Leiden, The Netherlands

Leiden Observatory, September 2017

A 2+1 year postdoctoral position funded through the ERC Adv grant of Ignas Snellen will become available at Leiden Observatory in the Netherlands. Research in Snellen's group focuses on the characterization of extra-solar planets using a variety of observational methods - in particular the high-dispersion spectroscopy technique. We search for an outstanding and ambitious observational astronomer who is keen to acquire the necessary skills and tools, and who will help to lead us to future directions in exoplanet atmospheric research.

Leiden Observatory, founded in 1633, is the oldest university astronomy department in the world. With about 25 faculty, over 40 postdoctoral associates and about 75 PhD students it is the largest astronomy department in the Netherlands. Leiden is a charming university town with an international flair. Most Leiden researchers have an international background. English is the common language.

The appointment will be for 2+1 years. The position comes with a competitive salary and full benefits. The successful candidate must have a PhD by the starting date.

Further details may be obtained from Prof. Ignas Snellen (snellen@strw.leidenuniv.nl)

Applicants should submit via email to snellen@strw.leidenuniv.nl: - a curriculum vitae - publication list

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- a brief statement of research experience and interests, and how they see their role in Snellen's group.

- names of three referees

The deadline is October 15, 2016.

Download/Website: http://www.strw.leidenuniv.nl/ snellen/

Contact: snellen@strw.leidenuniv.nl

Postdoctoral researcher in observational studies of exoplanets

Prof. Brice-Olivier Demory

Center for Space and Habitability, University of Bern, Switzerland

University of Bern, Applications due October 31st, 2016.

Applications are invited for a Postdoctoral position at the Centre for Space and Habitability (CSH, http://csh.unibe.ch) of the University of Bern.

The successful applicant will work as a member of a research team led by Prof. Brice-Olivier Demory on the search and characterisation of exoplanets using observational and statistical tools. The Postdoctoral researcher will be expected to conduct competitive research programmes in exoplanets and will be involved in the science operations of a new ground-based observatory focusing on the search for transiting exoplanets (50% negotiable time commitment). A high-degree of interaction with the CSH members is also expected, notably with the research groups focusing on atmosphere modelling and planetary formation.

Candidates with previous expertise in exoplanet observations and/or ground-based telescope operations are strongly encouraged to apply.

Salary and duration of appointment will be commensurate with experience. Starting salaries are between 85,000 and 95,000 CHF, with an initial appointment of 2 years. The position comes with a 6,000 CHF annual research budget. Applications are invited from all nationalities and should consist of 1) a CV, 2) a research proposal (3 pages), 3) a summary of past achievements (1 page) and 4) a publication list. Materials should be sent electronically in a single pdf file to brice.demory@csh.unibe.ch. In addition, 3 reference letters should be sent to the same address by the referees themselves before the deadline.

Applications received by October, 31st 2016 will receive full consideration.

Download/Website: http://csh.unibe.ch
Contact: brice.demory@csh.unibe.ch

2017 NASA Sagan Fellowship Program

Dr. Dawn M. Gelino
NASA Exoplanet Science Institute

NASA Exoplanet Science Institute, Applications Due: Nov. 3, 2016, 4 pm PDT

The NASA Exoplanet Science Institute announces the 2017 Sagan Postdoctoral Fellowship Program and solicits applications for fellowships to begin in the fall of 2017.

The Sagan Fellowships support outstanding recent postdoctoral scientists to conduct independent research that is broadly related to the science goals of the NASA Exoplanet Exploration program. The primary goal of missions

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within this program is to discover and characterize planetary systems and Earth-like planets around nearby stars.

The proposed research may be theoretical, observational, or instrumental. This program is open to applicants of any nationality who have earned (or will have earned) their doctoral degrees on or after January 1, 2014, in astronomy, physics, or related disciplines. The fellowships are tenable at U.S. host institutions of the fellows' choice, subject to a maximum of one new fellow per host institution per year. 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.

The Announcement of Opportunity, which includes detailed program policies and application instructions is available at the web site listed below. Applicants must follow the instructions given in this Announcement. Inquiries about the Sagan Fellowships may be directed to saganfellowship@ipac.caltech.edu.

The deadline for applications and letters of reference is Thursday, November 3, 2016. Offers will be made before February 1, 2017, and new appointments are expected to begin on or about September 1, 2017.

Download/Website: http://nexsci.caltech.edu/sagan/fellowship.shtml Contact: saganfellowship@ipac.caltech.edu

PhD positions: International Max Planck Research School for Solar System Science at the University of Göttingen

S. Schuh, IMPRS Scientific Coordinator

¹ Max-Planck-Institut für Sonnensystemforschung, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany

² in collaboration with Georg-August-University of Göttingen, Germany

Location: Göttingen, Date: Review of applications begins on 15 November 2016 for starting dates in 2017

The Solar System School invites applications for PhD positions in Solar System Science.

The International Max Planck Research School for Solar System Science at the University of Göttingen ("Solar System School") offers a research-oriented doctoral program covering the physical aspects of Solar system science. It is jointly run by the Max Planck Institute for Solar System Research (MPS) and the University of Göttingen. Research at the MPS covers three main research areas: "Sun and Heliosphere", "Solar and Stellar Interiors" and "Planets and Comets". The open PhD projects also include several topics in extra-solar planet research.

Solar System School students collaborate with leading scientists in these fields and graduates are awarded a doctoral degree from the renowned University of Göttingen or, if they choose, another university.

The Solar System School is open to students from all countries and offers an international three-year PhD program in an exceptional research environment with state-of-the-art facilities on the Göttingen Campus. Successful applicants will be offered a three-year doctoral support contract as well as postdoc wrap-up funding.

The language of the structured graduate program is English, with complimentary German language courses offered (optional). The program includes an inspiring curriculum of scientific lectures and seminars as well as advanced training workshops and provides relocation costs and travel funds to attend international conferences.

Applicants to the Solar System School should have a keen interest in Solar system science and a record of academic excellence. They must have, or must be about to obtain, an M.Sc. degree or equivalent in physics or a related field,

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including a written Masters thesis, and must document a good command of the English language.

Review of applications for a starting date of September 2017 will begin on 15 November 2016, but other starting times are also negotiable. The positions are awarded on a competitive basis.

The Solar System School is committed to diversity. The MPS is an equal opportunity employer and places particular emphasis on providing career opportunities for women. Applications of handicapped persons are encouraged and will be favored in case of comparable qualifications.

Applications should be submitted online through the application portal, following the instructions at http://www.mps.mpg.de/phd/applynow

Download/Website: http://www.solar-system-school.de

Contact: info@solar-system-school.de

5 Announcements

2017A NASA Keck Call for General Observing Proposals

Dr. Dawn M. Gelino
NASA Exoplanet Science Institute

NASA Exoplanet Science Institute, Proposals Due: September 15 at 4 pm PDT

NASA is soliciting proposals to use the Keck Telescopes for the 2017A observing semester (Feb. 1 to July 31, 2017). Complete call information is available on the website below and all proposals are due by **15 September 2016 at 4 pm PDT**.

The opportunity to propose as a Principal Investigator for NASA time on the Keck Telescopes is open to all U.S.-based astronomers (a U.S.-based astronomer has his/her principal affiliation at a U.S. institution). *Investigators from institutions outside of the U.S. may participate as Co-Investigators*.

NASA intends the use of the Keck telescopes to be highly strategic in support of on-going space missions and/or high priority, long-term science goals. Proposals are sought in the following discipline areas: (1) investigations in support of EXOPLANET EXPLORATION science goals and missions; (2) investigations of our own SOLAR SYSTEM; (3) investigations in support of COSMIC ORIGINS science goals and missions; and (4) investigations in support of PHYSICS OF THE COSMOS science goals and missions. Direct mission support proposals in any of these scientific areas are also encouraged.

Highlights for 2017A

• Time Domain Astronomy: Observers now have the ability to propose both cadence (Time Domain Astronomy, TDA) and Target of Opportunity (ToO) programs following the policies outlined here (ToO policies) and here (TDA/cadence policies). For Semester 2017A, four Keck partners (UC, Caltech, UH, and NASA) have agreed that TAC-approved ToO/TDA projects may interrupt observers at any of the four institutions. Each TAC can award up to a combined total of six ToO/TDA observations which interrupt any of the other institutions. If you are considering submitting a ToO or cadence observing proposal, check the proposal call website for more information. PIs may ask for their time to be designated as uninterruptable, i.e. as exempt from ToO or cadence interrupts. Note that programs scheduled as half-nights or smaller will not be interrupted. It is anticipated that interruption-free time will be rarely granted.

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• Information on strategic grading has been updated for 2017A. Please check the proposal call website for more information.

- Letters for Mission Support proposals must be requested from NASA HQ by September 1, two weeks before submission deadline.
- Check the WMKO instrument page for the list of available instruments and for telescope observing limits.

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

Contact: KeckCFP@ipac.caltech.edu

The Starchive: An Open Access, Open Source Stellar Archive

Angelle Tanner
Mississippi State University

Mississippi State University, 31 August 2016

Historically, astronomers have utilized a piecemeal set of archives such as SIMBAD, Vizier, the Washington Double Star Catalog, various exoplanet encyclopedias and electronic tables from the literature to cobble together stellar and planetary parameters. These resources can be tedious to use when trying to assemble large amounts of data for samples of hundreds of potential planet search targets. We also need better resources for downloading adaptive optics images and published spectra to help confirm new discoveries and find ideal target stars. With so much data being produced by the stellar and exoplanet community we have funding to create the Starchive - an open access, open source stellar archive. While we will highly regulate and constantly validate the data being placed into our archive the open nature of its design is intended to allow the database to be updated quickly and have a level of versatility which is necessary in today's fast moving, big data exoplanet community.

With the backend database and the frontend web user interface nearing completion, we are now soliciting data sets of reduced (LOCI, KLIP or none) high contrast images and infrared, optical and UV spectra of all stars within 25pc, all young stars within 100pc, brown dwarfs and circumstellar disk host stars. The Starchive crew is currently assembling a massive compilation of meta-data on all of these targets. Future Starchive users will be able to add recently acquired meta-data themselves. All contributed data sets will be advertised in a monthly (or weekly) newsletter and on the main web page. There will also be rules/suggestions/reminders given on how to properly cite contributed datasets. High contrast images can be accompanied with your favorite contrast curves to also be displayed on the results page for each star. We plan to extract and uniformly re-reduce data from the public archives if the community asks for it. For further questions please contact, Angelle Tanner (angelle.tanner@gmail.com). Thank you!

Download/Website: starchive.org
Contact: angelle.tanner@gmail.com

6 As seen on astro-ph

The following list contains all the entries relating to exoplanets that we spotted on astro-ph during June 2016. If you see any that we missedm please let us know and we'll include them in the next issue.

July 2016

- astro-ph/1607.00006: HATS-31b Through HATS-35b: Five Transiting Hot Jupiters Discovered by the HAT-South Survey by M. de Val-Borro, et al.
- astro-ph/1607.00007: Three Temperate Neptunes Orbiting Nearby Stars by Benjamin J. Fulton, et al.
- astro-ph/1607.00012: The slow spin of the young sub-stellar companion GQ Lupi b and its orbital configuration by *Henriette Schwarz et al.*
- astro-ph/1607.00304: Public Naming of Planets and Planetary Satellites by T. Montmerle, et al.
- astro-ph/1607.00322: HATS-19b, HATS-20b, HATS-21b: Three Transiting Hot-Saturns Discovered by the HATSouth Survey by W. Bhatti, et al.
- astro-ph/1607.00409: VULCAN: an Open-Source, Validated Chemical Kinetics Python Code for Exoplanetary Atmospheres by Shang-Min Tsai, et al.
- astro-ph/1607.00440: The SERENDIP III 70 cm Search for Extraterrestrial Intelligence by Stuart Bowyer, et al.
- astro-ph/1607.00524: EVEREST: Pixel Level Decorrelation of K2 Light curves by Rodrigo Luger, et al.
- astro-ph/1607.00628 : On the orbital evolution of a pair of giant planets in mean motion resonance by Q. André, J.C.B. Papaloizou
- astro-ph/1607.00688: HATS-22b, HATS-23b and HATS-24b: Three new transiting Super-Jupiters from the HATSouth Project by *Joao Bento, et al.*
- astro-ph/1607.00774: **WASP-92b, WASP-93b and WASP-118b: Three new transiting close-in giant planets** by *K. L. Hay, et al.*
- astro-ph/1607.01357: A Herschel view of protoplanetary disks in the s Ori cluster by Karina Maucó, et al.
- astro-ph/1607.01397 : White dwarf pollution by planets in stellar binaries by Adrian S. Hamers, Simon F. Portegies Zwart
- astro-ph/1607.01755: **KELT-11b: A Highly Inflated Sub-Saturn Exoplanet Transiting the V=8 Subgiant HD** 93396 by *Joshua Pepper, et al.*
- astro-ph/1607.01777: Tracking Neptune's Migration History through High-Perihelion Resonant Trans-Neptunian Objects by Nathan A. Kaib, Scott S. Sheppard
- astro-ph/1607.01894: First results of the Kourovka Planet Search: discovery of transiting exoplanet candidates in the first three target fields by *Artem Y. Burdanov, et al.*
- astro-ph/1607.02339: New planetary and EB candidates from Campaigns 1-6 of the K2 mission by S.C.C. Barros, O. Demangeon, M. Deleuil
- astro-ph/1607.02341: Discovery of WASP-113b and WASP-114b, two inflated hot-Jupiters with contrasting densities by S. C. C. Barros et al.
- astro-ph/1607.02513: **ALMA Observations of the Debris Disk of Solar Analogue Tau Ceti** by *Meredith A. MacGregor, et al.*
- astro-ph/1607.02525 : **Direct Imaging Discovery of a Jovian Exoplanet Within a Triple Star System** by *Kevin Wagner, et al.*
- astro-ph/1607.03029: **Investigating the free-floating planet mass by Euclid observations** by *Lindita Hamolli, et al.*
- astro-ph/1607.03038 : **94 Ceti: a triple star with a planet and dust disc** by *J. Wiegert, V. Faramaz, F. Cruz-Saenz de Miera*
- astro-ph/1607.03090 : **Effects of Proxima Centauri on Planet Formation in Alpha Centauri** by R. Worth, S. Sigurdsson

- astro-ph/1607.03095: An anthropic prediction for the prevalence of waterworlds by Fergus Simpson
- astro-ph/1607.03134: Can stellar activity make a planet seem misaligned? by M. Oshagh, et al.
- astro-ph/1607.03230: The Impact of Non-Uniform Thermal Structure on the Interpretation of Exoplanet Emission Spectra by *Y. Katherina Feng, et al.*
- astro-ph/1607.03267: OGLE-2012-BLG-0950Lb: The Possible First Planet Mass Measurement from Only Microlens Parallax and Lens Flux by N. Koshimoto, et al.
- astro-ph/1607.03489: Exoplanet transits enable high-resolution spectroscopy across spatially resolved stellar surfaces by *Dainis Dravins*, et al.
- astro-ph/1607.03512: **KELT-17b:** A hot-Jupiter transiting an A-star in a misaligned orbit detected with **Doppler tomography** by *George Zhou, et al.*
- astro-ph/1607.03632: The HADES RV Programme with HARPS-N@TNG GJ 3998: An early M-dwarf hosting a system of Super-Earths by L. Affer, et al.
- astro-ph/1607.03680: Modelling systematics of ground-based transit photometry I. Implications on transit timing variations by *C. von Essen, et al.*
- astro-ph/1607.03684: The origin of the excess transit absorption in the HD 189733 system: planet or star? by J.R. Barnes, et al.
- astro-ph/1607.03695 : Gas and dust around A-type stars at tens of Myr:signatures of cometary breakup by J.S. Greaves, et al.
- astro-ph/1607.03701: Ionization and Dust Charging in Protoplanetary Disks by A.V. Ivlev, V.V. Akimkin, P. Caselli
- astro-ph/1607.03754: Herschel Observations of Dusty Debris Disks by Laura Vican, et al.
- astro-ph/1607.03757: Imaging the water-snow line during a protostellar outburst by Lucas A. Cieza, et al.
- astro-ph/1607.03906: Predictions of the atmospheric composition of GJ 1132b by Laura Schaefer, et al.
- astro-ph/1607.03919: Instability of mass transfer in a planet-star system by Shi Jia, H.C. Spruit
- astro-ph/1607.03937 : **Dynamics of Stellar Spin Driven by Planets Undergoing Lidov-Kozai Migration: Paths to Spin-Orbit Misalignment** by *Natalia I. Storch, Dong Lai, Kassandra R. Anderson*
- astro-ph/1607.03980: HR 8799: The Benchmark Directly-Imaged Planetary System by Thayne Currie
- astro-ph/1607.03999 : **Spin-orbit Misalignment as a Driver of the Kepler Dichotomy** by *Christopher Spalding, Konstantin Batygin*
- astro-ph/1607.04062: The Effects of Consistent Chemical Kinetics Calculations on the Pressure-Temperature Profiles and Emission Spectra of Hot Jupiters by *Benjamin Drummond, et al.*
- astro-ph/1607.04207: **SETI Observations of Exoplanets with the Allen Telescope Array** by G.R. Harp, et al.
- astro-ph/1607.04260: **Effects of Bulk Composition on The Atmospheric Dynamics on Close-in Exoplanets** by *Xi Zhang, Adam P. Showman*
- astro-ph/1607.04280: Constraining the Movement of the Spiral Features and the Locations of Planetary Bodies within the AB Aur System by Jamie R. Lomax, et al.
- astro-ph/1607.04282: The unseen planets of double belt debris disk systems by Andrew Shannon et al.
- astro-ph/1607.04891: **Planetary engulfment as a trigger for white dwarf pollution** by *Cristobal Petrovich, Diego J. Munoz*
- astro-ph/1607.04919 : OGLE-2016-BLG-0596Lb: High-Mass Planet From High-Magnification Pure-Survey Microlensing Event by *P. Mróz, et al.*
- astro-ph/1607.05248: Two Small Planets Transiting HD 3167 by Andrew Vanderburg, et al.
- astro-ph/1607.05255: **Surveying the Inner Solar System with an Infrared Space Telescope** by *Marc W. Buie, Harold J. Reitsema, Roger P. Linfield*
- astro-ph/1607.05263: **197 Candidates and 104 Validated Planets in K2's First Five Fields** by *Ian J.M. Cross-field, et al.*
- astro-ph/1607.05272: The Orbit and Transit Prospects for β Pictoris b constrained with One Milliarcsecond Astrometry by Jason J. Wang, et al.
- astro-ph/1607.05535: THOR: A New and Flexible Global Circulation Model to Explore Planetary Atmo-

- spheres by Joao M. Mendonca, et al.
- astro-ph/1607.05713: Disk Detective: Discovery of New Circumstellar Disk Candidates through Citizen Science by Marc J. Kuchner, et al.
- astro-ph/1607.05734 : Close-in planetesimal formation by pile-up of drifting pebbles by Joanna Drazkowska, Yann Alibert, Ben Moore
- astro-ph/1607.06007: Thermal Infrared Imaging and Atmospheric Modeling of VHS J125601.92-125723.9 b: Evidence for Moderately Thick Clouds and Equilibrium Carbon Chemistry in a Hierarchical Triple System by Evan A. Rich, et al.
- astro-ph/1607.06485: Precision velocimetry planet hunting with PARAS: Current performance and lessons to inform future extreme precision radial velocity instruments by *Arpita Roy, et al.*
- astro-ph/1607.06487 : Radial Velocity Fitting Challenge. I. Simulating the data set including realistic stellar radial-velocity signals by *X. Dumusque*
- astro-ph/1607.06496: **High contrast imaging of exoplanets on ELTs using a super-Nyquist wavefront control scheme** by *Benjamin L. Gerard, Christian Marois*
- astro-ph/1607.06710: Setting the volatile composition of (exo)planet-building material. Does chemical evolution in disk midplanes matter? by Christian Eistrup, Catherine Walsh, Ewine F. van Dishoeck
- astro-ph/1607.06798 : **Apocenter glow in eccentric debris disks: implications for Fomalhaut and** ϵ **Eridani** by *Margaret Pan, Erika R. Nesvold, Marc J. Kuchner*
- astro-ph/1607.06810: Another one grinds the dust: Variability of the planetary debris disc at the white dwarf SDSS J104341.53+085558.2 by *Christopher J. Manser, et al.*
- astro-ph/1607.06869: Fragmentation of protoplanetary disks around M-dwarfs by I. Backus, T. Quinn
- astro-ph/1607.06874: Polarized Scattering and Biosignatures in Exoplanetary Atmospheres by S.V. Berdyugina
- astro-ph/1607.06892 : **MASSIVE: A Bayesian analysis of giant planet populations around low-mass stars** by *J. Lannier, et al.*
- astro-ph/1607.07237: Regaining the FORS: making optical ground-based transmission spectroscopy of exoplanets with VLT+FORS2 possible again by *Henri M.J. Boffin, et al.*
- astro-ph/1607.07540: A Dynamical Analysis of the Kepler-80 System of Five Transiting Planets by Mariah G. MacDonald, et al.
- astro-ph/1607.07859: From Dense Hot Jupiter to Low Density Neptune: The Discovery of WASP-127b, WASP-136b and WASP-138b by *K.W.F. Lam, et al.*
- astro-ph/1607.07922: Relation between Brown Dwarfs and Exoplanets by Lauren Melissa Flor Torres, et al.
- astro-ph/1607.08080 : Glimpses of stellar surfaces. II. Origins of the photometric modulations and timing variations of KOI-1452 by *P. Ioannidis, J.H.M.M. Schmitt*
- astro-ph/1607.08147: **Influence of Stellar Flares on the Chemical Composition of Exoplanets and Spectra** by *Olivia Venot, et al.*
- astro-ph/1607.08170 : The Stability of Tidal Equilibrium for Hierarchical Star-Planet-Moon Systems by Fred C. Adams, Anthony M. Bloch
- astro-ph/1607.08237: The population of long-period transiting exoplanets by Daniel Foreman-Mackey, et al.
- astro-ph/1607.08239: The International Deep Planet Survey II: The frequency of directly imaged giant exoplanets with stellar mass by *Raphael Galicher*, et al.
- astro-ph/1607.08250: **Dust traps as planetary birthsites: basics and vortex formation** by *James E. Owen, Juna A. Kollmeier*
- $astro-ph/1607.08417: \textbf{Wavelet-based filter methods to detect small transiting planets in stellar light curves} \ \ by \\ \textit{Sascha Grziwa, Martin Ptzold}$
- astro-ph/1607.08630 : **Outer-planet scattering can gently tilt an inner planetary system** by *Pierre Gratia, Daniel Fabrycky*
- astro-ph/1607.08818: An Opportunistic Search for ExtraTerrestrial Intelligence (SETI) with the Murchison Widefield Array by S.J. Tingay, et al.

August 2016

astro-ph/1608.00043: **Onset of oligarchic growth and implication for accretion histories of dwarf planets** by *Ryuji Morishima*

- astro-ph/1608.00056: **Spitzer Phase Curve Constraints for WASP-43b at 3.6 and 4.5 microns** by *Kevin B. Stevenson, et al.*
- astro-ph/1608.00459: A PSF-based approach to Kepler/K2 data. II. Exoplanet candidates in Praesepe (M 44) by M. Libralato, et al.
- astro-ph/1608.00549: **Spectroscopic Evolution of Disintegrating Planetesimals: Minutes to Months Variability** in the Circumstellar Gas Associated with WD 1145+017 by *Seth Redfield, et al.*
- astro-ph/1608.00573 : The Influence of Magnetic Field Geometry on the Formation of Close-in Exoplanets by *Jacob B. Simon*
- astro-ph/1608.00575: The Robo-AO KOI Survey: laser adaptive optics imaging of every Kepler exoplanet candidate by Carl Ziegler, et al.
- astro-ph/1608.00578: Planet Formation Imager: science vision and key requirements by S. Kraus, et al.
- astro-ph/1608.00593: Post main sequence evolution of icy minor planets: Implications for water retention and white dwarf pollution by *Uri Malamud*, *Hagai B. Perets*
- astro-ph/1608.00618: **KELT-16b:** A highly irradiated, ultra-short period hot Jupiter nearing tidal disruption by *Thomas E. Oberst, et al.*
- $astro-ph/1608.00620: \textbf{A Catalog of Kepler Habitable Zone Exoplanet Candidates} \ \ \textit{by Stephen R. Kane, et al.}$
- astro-ph/1608.00670: Modelling the Inner Debris Disc of HR 8799 by B. Contro, et al.
- astro-ph/1608.00706: Was Venus the First Habitable World of our Solar System? by Michael J. Way, et al.
- astro-ph/1608.00745: Affordable echelle spectroscopy of the eccentric HAT-P-2, WASP-14 and XO-3 plane-tary systems with a sub-meter-class telescope by *Z. Garai, et al.*
- astro-ph/1608.00746: Contamination from a nearby star cannot explain the anomalous transmission spectrum of the ultra-short period giant planet WASP-103b by John Southworth, Daniel F. Evans
- astro-ph/1608.00764: New prospects for observing and cataloguing exoplanets in well detached binaries by *R. Schwarz, et al.*
- astro-ph/1608.00784: Eclipse timing variations to detect possible Trojan planets in binary systems by *R. Schwarz, et al.*
- astro-ph/1608.00918: The mass of planet GJ676A b from ground-based astrometry: A planetary system with two mature gas giants suitable for direct imaging by J. Sahlmann, et al.
- astro-ph/1608.00963: Precise radial velocities of giant stars IX. HD 59686 Ab: a massive circumstellar planet orbiting a giant star in a 13.6 au eccentric binary system by Mauricio Ortiz, et al.
- astro-ph/1608.01165 : EPIC 211391664b: A 32-M? Neptune-sized planet in a 10-day orbit transiting an F8 star by Oscar Barragán, et al.
- astro-ph/1608.01295: **High-temperature miscibility of iron and rock during terrestrial planet formation** by Sean M Wahl, Burkhard Militzer
- astro-ph/1608.01315: Grand challenges in protoplanetary disc modelling by Thomas J. Haworth, et al.
- astro-ph/1608.01334: Prospects for detecting the Rossiter-McLaughlin effect of Earth-like planets: the test case of TRAPPIST-1b and c by Ryan Cloutier, Amaury H.M.J Triaud
- astro-ph/1608.01435 : **Isotopic enrichment of forming planetary systems from supernova pollution** by *Tim Lichtenberg, Richard J. Parker, Michael R. Meyer*
- astro-ph/1608.01768: **Uncovering Circumbinary Planetary Architectural Properties from Selection Biases** by *Gongjie Li, Matthew J. Holman, Molei Tao*
- astro-ph/1608.01778: Extrasolar giant magnetospheric response to steady-state stellar wind pressure at 10, 5, 1, and 0.2 AU by Matt A. Tilley, Erika M. Harnett, Robert M. Winglee
- astro-ph/1608.01780: A Substellar Companion to Pleiades HII 3441 by Mihoko Konishi, et al.
- astro-ph/1608.01855: **Disentangling planetary and stellar activity features in the CoRoT-2 light curve** by G. Bruno, et al.

astro-ph/1608.02001: **Orbital alignment and starspot properties in the WASP-52 planetary system** by *L. Mancini, et al.*

- astro-ph/1608.02346: **Broad-band spectrophotometry of HAT-P-32 b: Search for a scattering signature in the planetary spectrum** by *M. Mallonn, et al.*
- astro-ph/1608.02536: Geostrophic wind induced by latitudinal variation in gravitational acceleration on oblate planets by Jacob Haqq-Misra, et al.u
- astro-ph/1608.02590: Resolving Close Encounters: Stability in the HD 5319 and HD 7924 Planetary Systems by Stephen R. Kane
- astro-ph/1608.02945: A planet in an 840-d orbit around a Kepler main-sequence A star found from phase modulation of its pulsations by Simon J. Murphy, Timothy R. Bedding, Hiromoto Shibahashi
- astro-ph/1608.03095 : **Orbital obliquities of transiting planets from starspot occultations** by *John Southworth, Luigi Mancini*
- astro-ph/1608.03147: Spirals in protoplanetary disks from photon travel time by M. Kama, et al.
- astro-ph/1608.03239 : **Effects of inclined star-disk encounter on protoplanetary disk size** by *Asmita Bhandare, Andreas Breslau, Susanne Pfalzner*
- astro-ph/1608.03484 : **Secular and tidal evolution of circumbinary systems** by *Alexandre C. M. Correia, Gwenael Boue, Jacques Laskar*
- astro-ph/1608.03592 : **Prompt planetesimal formation beyond the snow line** by *Philip J. Armitage, Josh A. Eisner, Jacob B. Simon*
- astro-ph/1608.03597: Very Low-Mass Stellar and Substellar Companions to Solar-like Stars From MAR-VELS VI: A Giant Planet and a Brown Dwarf Candidate in a Close Binary System HD 87646 by Bo Ma, et al.
- astro-ph/1608.03621: A Steeper than Linear Disk Mass-Stellar Mass Scaling Relation by *I. Pascucci, et al.* astro-ph/1608.03627: The Orbit and Mass of the Third Planet in the Kepler-56 System by *Oderah Justin Otor, et al.*
- astro-ph/1608.03629: Search for substellar-mass companions and asymmetries in their parent discs by *M. Willson, et al.*
- astro-ph/1608.03718: Tidal Heating of Young Super-Earth Atmospheres by Sivan Ginzburg, Re'em Sari
- astro-ph/1608.03833: Stellar magnetism, winds and their effects on planetary environments by A. A. Vidotto
- astro-ph/1608.03891: Could Cirrus Clouds Have Warmed Early Mars? by R.M. Ramirez, J.F. Kasting
- astro-ph/1608.04225: WASP-86b and WASP-102b: super-dense versus bloated planets by F. Faedi, et al.
- astro-ph/1608.04714 : **KELT-12b:** A P 5 Day, Highly Inflated Hot Jupiter Transiting a Mildly Evolved Hot Star by Daniel J. Stevens, et al.
- astro-ph/1608.04760: **K2 Discovers a Busy Bee: An Unusual Transiting Neptune Found in the Beehive Cluster** by *Christian Obermeier, et al.*
- astro-ph/1608.05123 : **Signatures of Young Planets in the Continuum Emission From Protostellar Disks** by *Andrea Isella, Neal Turner*
- astro-ph/1608.05410 : **Rocky Planet Formation: Quick and Neat** by *Scott J. Kenyon, Joan R. Najita, Benjamin C. Bromley*
- astro-ph/1608.05592: Milankovitch Cycles of Terrestrial Planets in Binary Star Systems by Duncan H Forgan astro-ph/1608.06087: Developing Ecospheres on Transiently Habitable Planets: The Genesis Project by Claudius Gros
- astro-ph/1608.06216: The Magellan PFS Planet Search Program: Radial Velocity and Stellar Abundance Analyses of the 360 AU, Metal-Poor Binary "Twins" HD 133131A & B by Johanna K. Teske et al.
- astro-ph/1608.06263: A detection of the secondary eclipse of Qatar-1b in the Ks-band by *Patricia Cruz, et al.* astro-ph/1608.06291: Proxima Centauri as a Benchmark for Stellar Activity Indicators in the Near Infrared by *Paul Robertson, et al.*
- astro-ph/1608.06300: **Perturbation of Compact Planetary Systems by Distant Giant Planets** by *B.M.S. Hansen* astro-ph/1608.06660: **Discovery of a Substellar Companion to the Nearby Debris Disk Host HR 2562** by

- Quinn M. Konopacky, et al.
- astro-ph/1608.06702: **New indexing and surface temperature analysis of exoplanets** by *J.M. Kashyap, S.B. Gudennavar, M. Safonova*
- astro-ph/1608.06719: Search for exoplanets and brown dwarfs with VLBI by K. Katarzynski, M. Gawronski, K. Gozdziewski
- astro-ph/1608.06772: Impacts of stellar evolution and dynamics on the habitable zone: The role of rotation and magnetic activity by Florian Gallet, et al.
- astro-ph/1608.06813: The habitability of Proxima Centauri b. I. Irradiation, rotation and volatile inventory from formation to the present by Ignasi Ribas, et al.
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