ExoPlanet News
An Electronic Newsletter

No. 81, September 4th, 2015

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Contents

1 Editorial

After a somewhat longer than normal break, here is the 81st edition of ExoPlanet News containing the usual mix of excellent abstracts, useful announcements and tempting job adverts.

I wanted to take the opportunity to remind readers about the remit of the newsletter. The focus is all things to do with exoplanets – as the website notes this can include (but is not restricted to):

Discoveries and observations of exoplanets,
Protostellar and Debris Disks
Theoretical simulations of planet formation
Exoplanetary atmospheres and interiors
Comparative planetology
Formation and dynamics of planetary systems
Planetary evolution and habitability
Instrumentation and missions
Origin and evolution of life on terrestrial planets
Co-evolution of life, atmospheres and climate
Characterisation of terrestrial exoplanets
Detection of biomarkers

However, I want to avoid including items that are specifically related only to the Solar System, unless there is a link to exoplanet science too. I think broadening the newsletter too much might limit its usefulness. (Of course if someone wishes to start a Solar System newsletter, I'd be happy to pass on the style files!)
Remember that past editions of this newsletter, submission templates and other information can be found at the ExoPlanet News website: http://exoplanet.open.ac.uk. Although note that my updates to the website only become live over-night. So if you want to get the newsletter as soon as it is ready, please subscribe and get it by email on the day it's released.

Best wishes
Andrew Norton
The Open University

2 Abstracts of refereed papers

A statistical search for a population of Exo-Trojans in the Kepler dataset

M. Hippke[1] *& D. Angerhausen*[2]
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The Astrophysical Journal, in press (arXiv:1508.00427)

Trojans are small bodies in planetary Lagrangian points. In our solar system, Jupiter has the largest number of such companions. Their existence is assumed for exoplanetary systems as well, but none has been found so far. We present an analysis by super-stacking $\sim 4 \times 10^4$ *Kepler* planets with a total of $\sim 9 \times 10^5$ transits, searching for an average trojan transit dip. Our result gives an upper limit to the average Trojan transiting area (per planet) corresponding to one body of radius < 460km at 2σ confidence. We find a significant Trojan-like signal in a sub-sample for planets with more (or larger) Trojans for periods $>$**60 days**. Our tentative results can and should be checked with improved data from future missions like *PLATO 2.0*, and can guide planetary formation theories.

Download/Website: `http://arxiv.org/abs/1508.00427`

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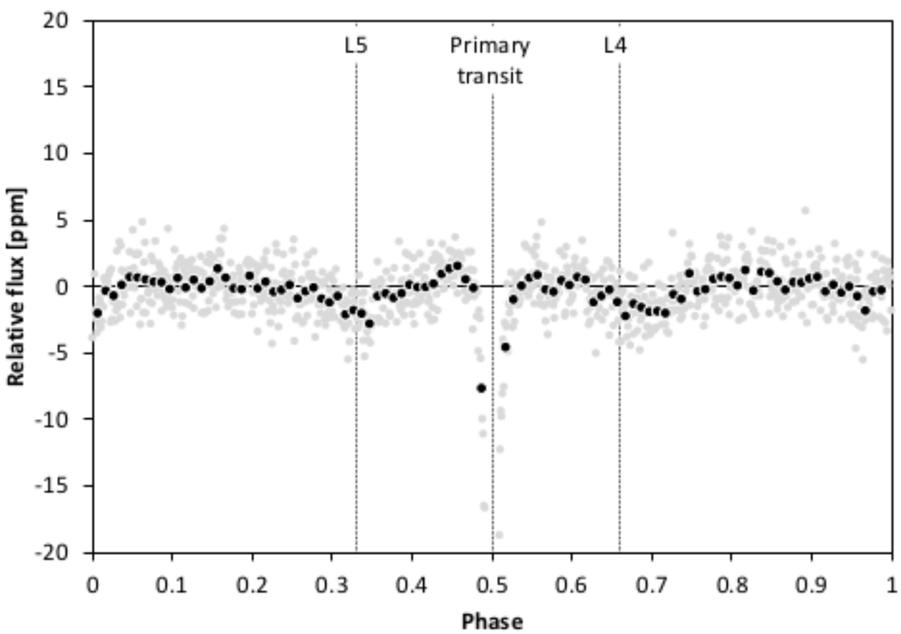

Figure 1: (Hippke & Angerhausen) Sub-sample superstack in normal phase fold, which exhibits a clear dip at both L5 and L4, with a maximum depth of 2ppm (970 km radius equivalent). Gray dots are 1,000 bins over phase space, black dots with error bars (right) are 100 bins for better visibility

A wide binary trigger for white dwarf pollution

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1508.05715)

Metal pollution in white dwarf atmospheres is likely to be a signature of remnant planetary systems. Most explanations for this pollution predict a sharp decrease in the number of polluted systems with white dwarf cooling age. Observations do not confirm this trend, and metal pollution in old (1-5 Gyr) white dwarfs is difficult to explain. We propose an alternative, time-independent mechanism to produce the white dwarf pollution. The orbit of a wide binary companion can be perturbed by Galactic tides, approaching close to the primary star for the *first* time after billions of years of evolution on the white dwarf branch. We show that such a close approach perturbs a planetary system orbiting the white dwarf, scattering planetesimals onto star-grazing orbits, in a manner that could pollute the white dwarf's atmosphere. Our estimates find that this mechanism is likely to contribute to metal pollution, alongside other mechanisms, in up to a few percent of an observed sample of white dwarfs with wide binary companions, independent of white dwarf age. This age independence is the key difference between this wide binary mechanism and others mechanisms suggested in the literature to explain white dwarf pollution. Current observational samples are not large enough to assess whether this mechanism makes a significant contribution to the population of polluted white dwarfs, for which better constraints on the wide binary population are required, such as those that will be obtained in the near future with Gaia.

Download/Website: `http://adsabs.harvard.edu/abs/2015arXiv150805715B`

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Triggering Collapse of the Presolar Dense Cloud Core and Injecting Short-Lived Radioisotopes with a Shock Wave. IV. Effects of Rotational Axis Orientation

Alan P. Boss and Sandra A. Keiser

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The Astrophysical Journal, in press

Both astronomical observations of the interaction of Type II supernova remnants (SNR) with dense interstellar clouds as well as cosmochemical studies of the abundances of daughter products of short-lived radioisotopes (SLRIs) formed by supernova nucleosynthesis support the hypothesis that the Solar Systems SLRIs may have been derived from a supernova. This paper continues a series devoted to examining whether such a shock wave could have triggered the dynamical collapse of a dense, presolar cloud core and simultaneously injected sufficient abundances of SLRIs to explain the cosmochemical evidence. Here we examine the effects of shock waves striking clouds whose spin axes are oriented perpendicular, rather than parallel, to the direction of propagation of the shock front. The models start with 2.2 $M_\odot$ cloud cores and shock speeds of 20 or 40 km s^{-1}. Central protostars and protoplanetary disks form in all models, though with disk spin axes aligned somewhat randomly. The disks derive most of their angular momentum not from the initial cloud rotation, but from the Rayleigh-Taylor fingers that also inject shock wave SLRIs. Injection efficiencies, f_i, the fraction of the incident shock wave material injected into the collapsing cloud core, are 0.04 - 0.1 in these models, similar to when the rotation axis is parallel to the shock propagation direction. Evidently altering the rotation axis orientation has only a minor effect on the outcome, strengthening the case for this scenario as an explanation for the Solar Systems SLRIs.

Download/Website: `https://home.dtm.ciw.edu/users/boss/ftp/triggerIV.pdf`

Contact: `boss@dtm.ciw.edu`

Optical hydrogen absorption consistent with a thin bow shock leading the hot Jupiter HD 189733b

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The Astrophysical Journal, in press, arXiv:1507.05916

Bow shocks are ubiquitous astrophysical phenomena resulting from the supersonic passage of an object through a gas. Recently, pre-transit absorption in UV metal transitions of the hot Jupiter exoplanets HD 189733b and WASP12-b have been interpreted as being caused by material compressed in a planetary bow shock. Here we present a robust detection of a time-resolved pre-transit, as well as in-transit, absorption signature around the hot Jupiter exoplanet HD 189733b using high spectral resolution observations of several hydrogen Balmer lines. The line shape of the pre-transit feature and the shape of the time series absorption provide the strongest constraints on the morphology and physical characteristics of extended structures around an exoplanet. The in-transit measurements confirm the previous exospheric Hα detection although the absorption depth measured here is $\sim$50% lower. The pre-transit absorption feature occurs 125 minutes before the predicted optical transit, a projected linear distance from the planet to the stellar disk of 7.2 R_p. The absorption strength observed in the Balmer lines indicates an optically thick, but physically small, geometry. We model this signal as the early ingress of a planetary bow shock. If the bow shock is mediated by a planetary magnetosphere, the large standoff distance derived from the model suggests a large planetary magnetic field strength of B_{eq}=28 G. Better knowledge of exoplanet magnetic field strengths is crucial to understanding the role these fields play in planetary evolution and the potential development of life on planets in the habitable zone.

Download/Website: `Animation of the transiting bow shock: pwcastro.com/research/`

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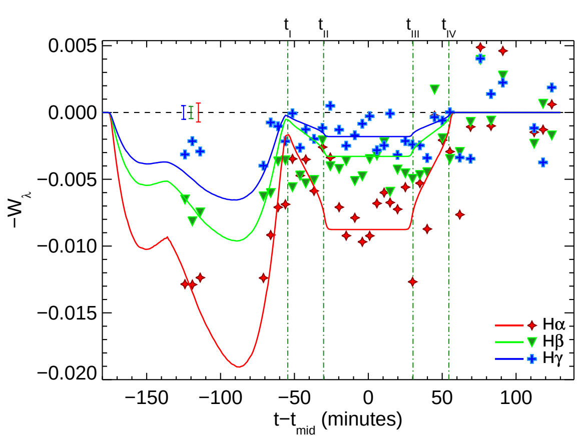

Figure 2: (Cauley et al.) Absorption as a function of time from transit midpoint for a single transit of HD 189733b. First through fourth contact are marked with the vertical green dashed-dotted lines. A sharp decrease in the absorbed flux can be seen from -70 min$< t <$ -40 min. The gap in the data from -115 minutes to -70 minutes was used for telluric standard observations. The absorption does not appear post-transit. The model is shown with solid lines. The uncertainties in the absorbed flux for each individual spectrum are shown in the upper-left. Each bar shows the average of the standard deviations of W_λ obtained from the EMC for each point

A giant comet-like cloud of hydrogen escaping the warm Neptune-mass exoplanet GJ 436b

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Nature, published (2015Natur.522..459E/arXiv:1506.07541)

Exoplanets orbiting close to their parent stars may lose some fraction of their atmospheres because of the extreme irradiation. Atmospheric mass loss primarily affects low-mass exoplanets, leading to the suggestion that hot rocky planets might have begun as Neptune-like, but subsequently lost all of their atmospheres; however, no confident measurements have hitherto been available. The signature of this loss could be observed in the ultraviolet spectrum, when the planet and its escaping atmosphere transit the star, giving rise to deeper and longer transit signatures than in the optical spectrum. Here we report that in the ultraviolet the Neptune-mass exoplanet GJ 436b (also known as Gliese 436b) has transit depths of 56.3 +/- 3.5% (1sigma), far beyond the 0.69% optical transit depth. The ultraviolet transits repeatedly start about two hours before, and end more than three hours after the approximately one hour optical transit, which is substantially different from one previous claim (based on an inaccurate ephemeris). We infer from this that the planet is surrounded and trailed by a large exospheric cloud composed mainly of hydrogen atoms. We estimate a mass-loss rate in the range of about 108-109 grams per second, which is far too small to deplete the atmosphere of a Neptune-like planet in the lifetime of the parent star, but would have been much greater in the past.

Download/Website: `http://adsabs.harvard.edu/abs/2015Natur.522..459E/`

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Radiative braking in the extended exosphere of GJ 436 b

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Astronomy & Astrophysics, in press (arXiv:1508.06634)

The recent detection of a giant exosphere surrounding the warm Neptune GJ 436 b has shed new light on the evaporation of close-in planets, revealing that moderately irradiated, low-mass exoplanets could make exceptional targets for studying this mechanism and its impact on the exoplanet population. Three HST/STIS observations were performed in the Lyman-α line of GJ 436 at different epochs, showing repeatable transits with large depths and extended durations. Here, we study the role played by stellar radiation pressure on the structure of the exosphere and its transmission spectrum. We found that the neutral hydrogen atoms in the exosphere of GJ 436 b are not swept away by radiation pressure as shown to be the case for evaporating hot Jupiters. Instead, the low radiation pressure from the M-dwarf host star only brakes the gravitational fall of the escaping hydrogen toward the star and allows its dispersion within a large volume around the planet, yielding radial velocities up to about -120 $\mathrm{km\,s^{-1}}$ that match the observations. We performed numerical simulations with the EVaporating Exoplanets code (EVE) to study the influence of the escape rate, the planetary wind velocity, and the stellar photoionization. While these parameters are instrumental in shaping the exosphere and yield simulation results in general agreement with the observations, the spectra observed at the different epochs show specific, time-variable features that require additional physics.

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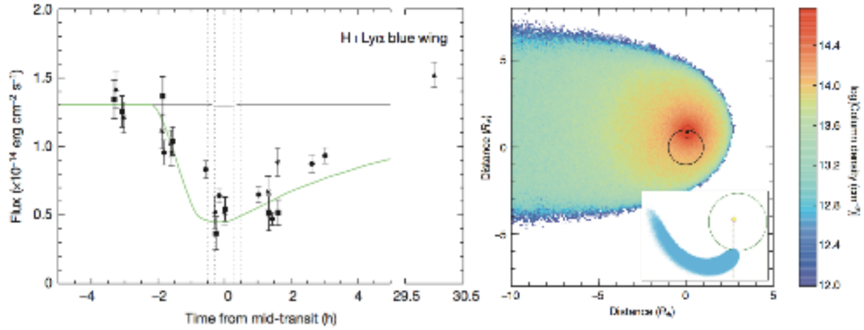

Figure 3: (Ehrenreich et al.) Transit light-curve of the warm-Neptune GJ 436b observed in the Ly-α line (left) and particle simulation showing the exospheric cloud that best reproduces the observations (right). **Left:** Data was obtained at three different epochs at the time of the transit (circles, stars and squares), with one additional measurement near the anti-transit (triangle), and is integrated over the blue wing of the Ly-α line (corresponding to radial velocities of neutral hydrogen atoms from -120 to -40 km s^{-1} in the stellar rest frame). The transit of GJ 436 b exosphere repeatedly begins about 2 h before the optical transit (which is barely visible between the dotted black lines), reaches a maximum depth of 56.2$\pm$3.6% in-transit, and could last for more than $\sim$20 h afterwards. **Right:** GJ 436b is the small black dot grazing the stellar disk (largest black circle). The dotted circle around the planet represents its equivalent Roche radius. The colour of simulation particles denotes the column density of the cloud. The transit of this simulated cloud gives rise to absorption over the blue wing of the Ly-α line as shown by the synthetic green light curve in the left panel. The inset displays a polar view of the giant comet-like cloud trailing the planet.

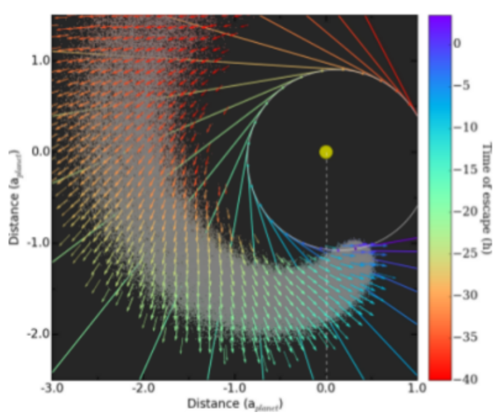

Figure 4: (Bourrier, Ehrenreich & Lecavelier des Etangs) View of GJ 436b exosphere (gray dots) from the perpendicular to the orbital plane, 3.5 h after the optical transit. The white dashed line shows the LOS toward Earth. Arrows display the velocity field of the hydrogen atoms with respect to the star, colored as a function of the time they escaped the atmosphere (counted from the center of the optical transit). In the reduced gravity field from the star, particles move beyond the orbit of the planet. However, radiation pressure does not overcome stellar gravity, and particles are still deviated from the tangent to the orbit at the time of their escape (solid colored lines).

Detection Methods and Relevance of Exoplanetary Magnetic Fields

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Astrophysics and Space Science Library, published (ADS: 2015ASSL..411..213G)

In analogy to the planets of the Solar System, most extrasolar planets are expected to have an intrinsic, internally generated magnetic field. These magnetic fields are believed to influence a number of physical processes, so that planets with and without fields may not behave and evolve the same way, and implications for the planet are manyfold. Clear observational evidence for such fields is however difficult to find, and no unambiguous detection has yet been achieved. Over the past few years, a number of methods have been suggested with which an exoplanetary magnetic field could be detected remotely. Some of these methods could even be used to characterize the planetary magnetic field strength quantitatively. The present work describes the different ways in which a planetary magnetic field may modify the planetary evolution and reviews the different methods that have been suggested to detect these fields. These methods are compared and we evaluate which techniques have the highest potential for future detection of exoplanetary magnetic fields.

Download/Website: `http://link.springer.com/chapter/10.1007%2F978-3-319-09749-7_11`

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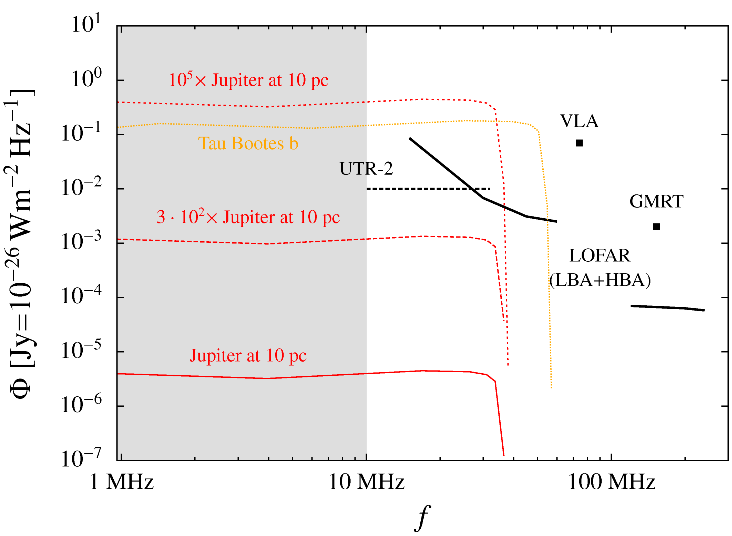

Figure 5: (Griessmeier) Example for predicted radio flux, compared to the approximate detection limits of modern low-frequency radio telescopes (based on Griessmeier et al. 2011). The emission is detectable by a telescope when it is above the instrument's detection limit

Galactic cosmic rays on extrasolar Earth-like planets: I. Cosmic ray flux

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Astronomy & Astrophysics, published (arXiv:1509.00735)

Context: Theoretical arguments indicate that close-in terrestial exoplanets may have weak magnetic fields, especially in the case of planets more massive than Earth (super-Earths). Planetary magnetic fields, however, constitute one of the shielding layers that protect the planet against cosmic-ray particles. In particular, a weak magnetic field results in a high flux of Galactic cosmic rays that extends to the top of the planetary atmosphere.
Aims: We wish to quantify the flux of Galactic cosmic rays to an exoplanetary atmosphere as a function of the particle energy and of the planetary magnetic moment.
Methods: We numerically analyzed the propagation of Galactic cosmic-ray particles through planetary magnetospheres. We evaluated the efficiency of magnetospheric shielding as a function of the particle energy (in the range 16 MeV $\leq$ E $\leq$ 524 GeV) and as a function of the planetary magnetic field strength (in the range 0 $M_{\oplus} \leq$ M $\leq$ 10 $M_{\oplus}$). Combined with the flux outside the planetary magnetosphere, this gives the cosmic-ray energy spectrum at the top of the planetary atmosphere as a function of the planetary magnetic moment.
Results: We find that the particle flux to the planetary atmosphere can be increased by more than three orders of magnitude in the absence of a protecting magnetic field. For a weakly magnetized planet ($\mathcal{M} = 0.05\,\mathcal{M}_{\oplus}$), only particles with energies below 512 MeV are at least partially shielded. For a planet with a magnetic moment similar to that of Earth, this limit increases to to 32 GeV, whereas for a strongly magnetized planet ($\mathcal{M} = 10.0\,\mathcal{M}_{\oplus}$), partial shielding extends up to 200 GeV. Over the parameter range we studied, strong shielding does not occur for weakly magnetized planets. For a planet with a magnetic moment similar to that of Earth, particles with energies below 512 MeV are strongly shielded, and for strongly magnetized planets, this limit increases to 10 GeV.
Conclusions: We find that magnetic shielding strongly controls the number of cosmic-ray particles reaching the planetary atmosphere. The implications of this increased particle flux are discussed in a companion article.

Download/Website: `http://www.aanda.org/articles/aa/abs/2015/09/aa25451-14/aa25451-14.html`

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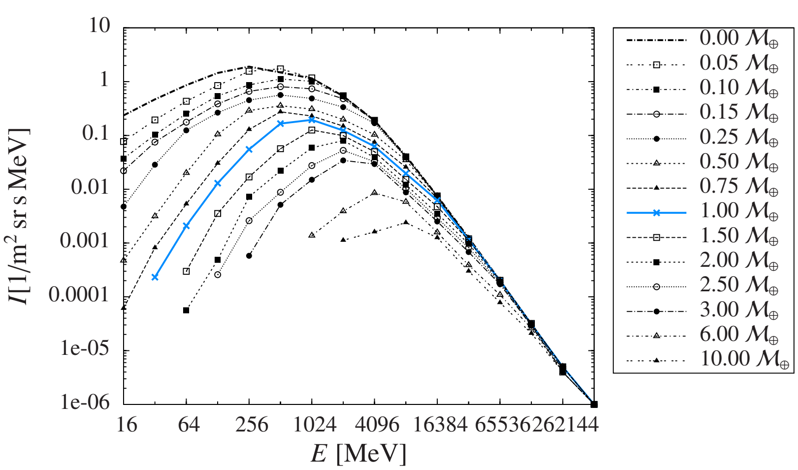

Figure 6: (Griessmeier et al.) Cosmic-ray flux at the top of the atmosphere $I(R, \mathcal{M})$ as a function of particle energy and planetary magnetic moment. Dash-dotted line: an unmagnetized planet ($\mathcal{M}$) = 0). Blue line: a planet with a magnetic moment identical to that of the Earth ($\mathcal{M} = 1.0\,\mathcal{M}_{\oplus}$).

Millimeter-wave polarization of protoplanetary disks due to dust scattering

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The Astrophysical Journal, in press (arXiv:1504.04812)

We present a new method to constrain the grain size in protoplanetary disks with polarization observations at millimeter wavelengths. If dust grains are grown to the size comparable to the wavelengths, the dust grains are expected to have a large scattering opacity and thus the continuum emission is expected to be polarized due to self-scattering. We perform 3D radiative transfer calculations to estimate the polarization degree for the protoplanetary disks having radial Gaussian-like dust surface density distributions, which have been recently discovered. The maximum grain size is set to be $100\ \mu\mathrm{m}$ and the observing wavelength to be 870 $\mu\mathrm{m}$. We find that the polarization degree is as high as 2.5% with a subarcsec spatial resolution, which is likely to be detected with near-future ALMA observations. The emission is polarized due to scattering of anisotropic continuum emission. The map of the polarization degree shows a double peaked distribution and the polarization vectors are in the radial direction in the inner ring and in the azimuthal direction in the outer ring. We also find the wavelength dependence of the polarization degree: the polarization degree is the highest if dust grains have a maximum size of $a_{\max} \sim \lambda/2\pi$, where λ is the observing wavelength. Hence, multi-wave and spatially resolved polarization observations toward protoplanetary disks enable us to put a constraint on the grain size. The constraint on the grain size from polarization observations is independent of or may be even stronger than that from the opacity index.

Download/Website: `http://arxiv.org/abs/1504.04812`

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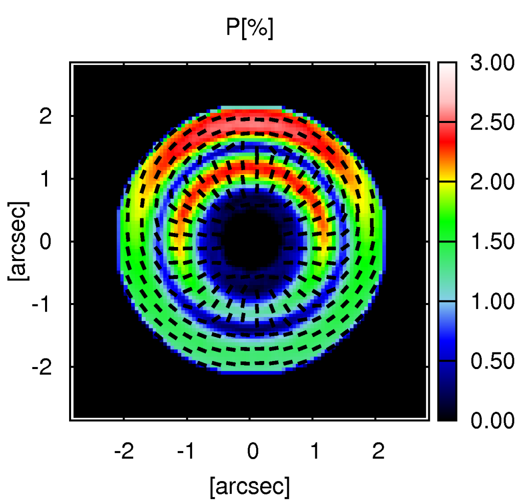

Figure 7: (Kataoka et al.) The polarization degree overlaid with polarization vectors in the case of the lopsided protoplanetary disk.

Searching for gas giant planets on Solar System scales - A NACO/APP L'-band survey of A- and F-type Main Sequence stars

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1508.00565)

We report the results of a direct imaging survey of A- and F-type main sequence stars searching for giant planets. A/F stars are often the targets of surveys, as they are thought to have more massive giant planets relative to solar-type stars. However, most imaging is only sensitive to orbital separations > 30 AU, where it has been demonstrated that giant planets are rare. In this survey, we take advantage of the high-contrast capabilities of the Apodizing Phase Plate coronagraph on NACO at the Very Large Telescope. Combined with optimized principal component analysis post-processing, we are sensitive to planetary-mass companions (2 to 12 $M_{\rm Jup}$) at Solar System scales ($\leq$30 AU). We obtained data on 13 stars in L'-band and detected one new companion as part of this survey: an M6.0 ± 0.5 dwarf companion around HD 984. We re-detect low-mass companions around HD 12894 and HD 20385, both reported shortly after the completion of this survey. We use Monte Carlo simulations to determine new constraints on the low-mass ($<$80 $M_{\rm Jup}$) companion frequency, as a function of mass and separation. Assuming solar-type planet mass and separation distributions, normalized to the planet frequency appropriate for A-stars, and the observed companion mass-ratio distribution for stellar companions extrapolated to planetary masses, we derive a truncation radius for the planetary mass companion surface density of $<$135 AU at 95% confidence.

Download/Website: `http://arxiv.org/abs/1508.00565`

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Discovery of a low-mass companion to the F7V star HD 984

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1507.08291)

We report the discovery of a low-mass companion to the nearby (d = 47 pc) F7V star HD 984. The companion is detected 0.19" away from its host star in the L' band with the Apodizing Phase Plate on NaCo/VLT and was recovered by L'-band non-coronagraphic imaging data taken a few days later. We confirm the companion is co-moving with the star with SINFONI integral field spectrograph $H + K$ data. We present the first published data obtained with SINFONI in pupil-tracking mode. HD 984 has been argued to be a kinematic member of the 30 Myr-old Columba group, and its HR diagram position is not altogether inconsistent with being a ZAMS star of this age. By consolidating different age indicators, including isochronal age, coronal X-ray emission, and stellar rotation, we independently estimate a main sequence age of 115 ± 85 Myr (95% CL) which does not rely on this kinematic association. The mass of directly imaged companions are usually inferred from theoretical evolutionary tracks, which are highly dependent on the age of the star. Based on the age extrema, we demonstrate that with our photometric data alone, the companion's mass is highly uncertain: between 33 and 96 M$_{\rm Jup}$ (0.03-0.09 M$_{\odot}$) using the COND evolutionary models. We compare the companion's SINFONI spectrum with field dwarf spectra to break

this degeneracy. Based on the slope and shape of the spectrum in the H-band, we conclude that the companion is an M6.0 ± 0.5 dwarf. The age of the system is not further constrained by the companion, as M dwarfs are poorly fit on low-mass evolutionary tracks. This discovery emphasizes the importance of obtaining a spectrum to spectral type companions around F-stars.

Download/Website: `http://arxiv.org/abs/1507.08291`

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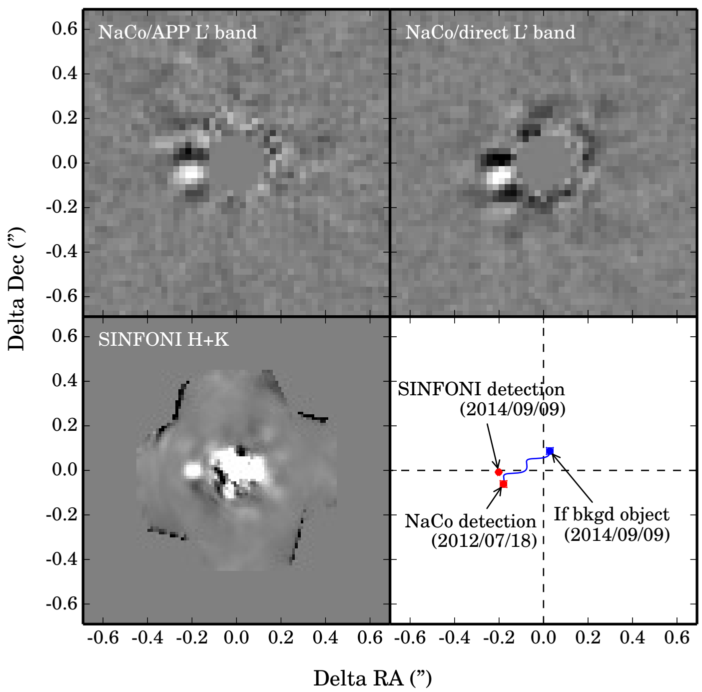

Figure 8: (Meshkat et al.) Top-left: Final PCA processed image of HD 984 APP hemisphere 1 data with North facing up. Twenty principal components were used to model the stellar PSF in this image. Top-right: Final PCA processed image of HD 984 from direct imaging data with North facing up. Six principal components were used to model the stellar PSF. Bottom-left: Collapsed $H+K$ SINFONI IFS data cubes processed with CADI, with North facing up. All three images are displayed in the same color scale. Bottom-right: The position of the companion is plotted as red points for both the VLT/NaCo dataset epoch (UT 2012 July 18) and the VLT/SINFONI epoch (UT 2014 September 9). The blue point is the position of the companion if it were a background source at the time of the VLT/SINFONI dataset epoch (UT 2014 September 9). Error bars are included for all points.

Survival of Planets Around Shrinking Stellar Binaries

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Proceedings of the National Academy of Sciences of the United States of America, published (doi:10.1073/pnas.1505671112/arXiv:1505.05514)

The discovery of transiting circumbinary planets by the *Kepler* mission suggests that planets can form efficiently around binary stars. None of the stellar binaries currently known to host planets has a period shorter than 7 days, despite the large number of eclipsing binaries found in the Kepler target list with periods shorter than a few days. These compact binaries are believed to have evolved from wider orbits into their current configurations via the so-called Lidov-Kozai migration mechanism, in which gravitational perturbations from a distant tertiary companion induce large-amplitude eccentricity oscillations in the binary, followed by orbital decay and circularization due to tidal dissipation in the stars. Here we explore the orbital evolution of planets around binaries undergoing orbital decay by this mechanism. We show that planets may survive and become misaligned from their host binary, or may develop erratic behavior in eccentricity, resulting in their consumption by the stars or ejection from the system as the binary decays. Our results suggest that circumbinary planets around compact binaries could still exist, and we offer predictions as to what their orbital configurations should be like.

Download/Website: `http://www.pnas.org/content/112/30/9264.abstract`

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Decoupling of a giant planet from its disk in an inclined binary system

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Astronomy & Astrophysics, in press (arXiv:1508.06198)

We explore the dynamical evolution of a planet embedded in a disk surrounding a star part of a binary system where the orbital plane of the binary is significantly tilted respect to the initial disk plane. Our aim is to test whether the planet remains within the disk and continues to migrate towards the star in a Type I/II mode in spite of the secular perturbations of the companion star. This would explain observed exoplanets with significant inclination respect to the equatorial plane of their host star. We have used two different SPH codes, VINE and PHANTOM, to model the evolution of a system star+disk+planet and companion star with time. After an initial coupled evolution, the inclination of the disk and that of the planet begin to differ significantly. The period of oscillation of the disk inclination, respect to the initial plane, is shorter than that of the planet which evolves independently after about 10^4 yr following a perturbed N–body behavior. However, the planet keeps migrating towards the star because during its orbital motion it crosses the disk plane and the friction with the gas causes angular momentum loss. Disk and planet in a significantly inclined binary system are not dynamically coupled for small binary separations but evolve almost independently. The planet abandons the disk and, due to the onset of a significant mutual inclination, it interacts with the gas only when its orbit intersects the disk plane. The drift of the planet towards the star is not due to type I/II with the planet embedded in the disk but to the friction with the gas during the disk crossing.

Download/Website: `http://arxiv.org/abs/1508.06198`

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Double-ringed debris discs could be the work of eccentric planets: explaining the strange morphology of HD 107146

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Monthly Notices of the Royal Astronomical Society, in press (arXiv: 1507.04367)

We investigate the general interaction between an eccentric planet and a coplanar debris disc of the same mass, using analytical theory and n-body simulations. Such an interaction could result from a planet-planet scattering or merging event. We show that when the planet mass is comparable to that of the disc, the former is often circularised with little change to its semimajor axis. The secular effect of such a planet can cause debris to apsidally *anti*-align with the planet's orbit (the opposite of what may be naïvely expected), leading to the counter-intuitive result that a low-mass planet may clear a larger region of debris than a higher-mass body would. The interaction generally results in a double-ringed debris disc, which is comparable to those observed in HD 107146 and HD 92945. As an example we apply our results to HD 107146, and show that the disc's morphology and surface brightness profile can be well-reproduced if the disc is interacting with an eccentric planet of comparable mass ($\sim 10-100$ Earth masses). This hypothetical planet had a pre-interaction semimajor axis of 30 or 40 au (similar to its present-day value) and an eccentricity of 0.4 or 0.5 (which would since have reduced to ~ 0.1). Thus the planet (if it exists) presently resides near the inner edge of the disc, rather than between the two debris peaks as may otherwise be expected.

Download/Website: `http://arxiv.org/abs/1507.04367`

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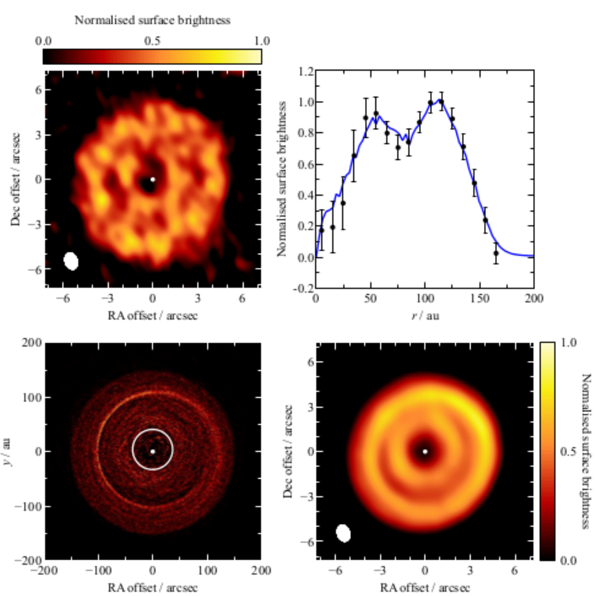

Figure 9: (Pearce & Wyatt) ALMA observations of HD 107146, along with our best-fitting simulation. Top left: ALMA 1.25mm continuum image (Ricci et al. 2015). The white ellipse represents the beam size and orientation. Top right: points show the normalised, radially-averaged surface brightness profile of the disc as observed by ALMA, measured using elliptical apertures. The solid line is the profile from our best-fitting n-body simulation, at the time (19 Myr after the start of the interaction) of the best fit; the two agree with a reduced χ^2 value of 0.4. Bottom left: positions of debris particles in the best-fitting n-body simulation at 19 Myr. The $x-y$ plane is the initial disc midplane, with planet pericentre initially pointing along the x axis. The white point is the star, and the white ellipse the planet's orbit. Bottom right: simulated ALMA image of the n-body disc. The particles have been scaled for emission, the image rotated, and smoothed with a 2D Gaussian representing the ALMA beam (white oval). Compare this to the ALMA observation in the top left, noting that we have not added noise and hence our image is smoother.

Planetesimal formation in self-gravitating discs – dust trapping by vortices

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1508.02879)

The mechanism through which meter-sized boulders grow to km-sized planetesimals in protoplanetary discs is a subject of active research, since it is critical for planet formation. To avoid spiralling into the protostar due to aerodynamic drag, objects must rapidly grow from cm-sized pebbles, which are tightly coupled to the gas, to large boulders of 1-100m in diameter. It is already well known that over-densities in the gaseous component of the disc provide potential sites for the collection of solids, and that significant density structures in the gaseous component of the disc (e.g., spiral density waves) can trap solids efficiently enough for the solid component of the disc to undergo further gravitational collapse due to their own self-gravity. In this work, we employ the PENCIL CODE to conduct local shearing sheet simulations of massive self-gravitating protoplanetary discs, to study the effect of anticyclonic transient vortices, or eddies, on the evolution of solids in these discs. We find that these types of structures are extremely efficient at concentrating small and intermediate-sized dust particles with friction times comparable to, or less than, the local orbital period of the disc. This can lead to significant over-densities in the solid component of the disc, with density enhancements comparable to, and even higher, than those within spiral density waves; increasing the rate of gravitational collapse of solids into bound structures.

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Disc fragmentation rarely forms planetary-mass objects

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1508.06528)

It is now reasonably clear that disc fragmentation can only operate in the outer parts of protostellar discs ($r > 50$ au). It is also expected that any object that forms via disc fragmentation will have an initial mass greater than that of Jupiter. However, whether or not such a process actually operates, or can play a significant role in the formation of planetary-mass objects, is still unclear. We do have a few examples of directly imaged objects that may have formed in this way, but we have yet to constrain how often disc fragmentation may actually form such objects. What we want to consider here is whether or not we can constrain the likely population of planetary-mass objects formed via disc fragmentation by considering how a population of objects at large radii ($a > 50$) au - if they do exist - would evolve under perturbations from more distant stellar companions. We find that there is a specific region of parameter space to which such objects would be scattered and show that the known exoplanets in that region have properties more consistent with that of the bulk exoplanet population, than with having been formed via disc fragmentation at large radii. Along with the scarcity of directly-imaged objects at large radii, our results provide a similar, but independent, constraint on the frequency of objects formed via disc fragmentation.

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Spitzer Parallax of OGLE-2015-BLG-0966: A Cold Neptune in the Galactic Disk

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The Astrophysical Journal, submitted (arXiv:1508.07027)

We report the detection of a Cold Neptune $m_{\rm planet} = 21 \pm 2\, M_\oplus$ orbiting a $0.38\, M_\odot$ M dwarf lying 2.5–3.3 kpc toward the Galactic center as part of a campaign combining ground-based and *Spitzer* observations to measure the Galactic distribution of planets. This is the first time that the complex real-time protocols described by Yee et al. 2015, which aim to maximize planet sensitivity while maintaining sample integrity, have been carried out in practice. Multiple survey and follow-up teams successfully combined their efforts within the framework of these protocols to detect this planet. This is the second planet in the *Spitzer* Galactic distribution sample. Both are in the near-to-mid disk and clearly not in the Galactic bulge.

Download/Website: `http://arxiv.org/abs/1508.07027`

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Prospects for detecting decreasing exoplanet frequency with main sequence age using PLATO

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1507.04272)

The space mission PLATO will usher in a new era of exoplanetary science by expanding our current inventory of transiting systems and constraining host star ages, which are currently highly uncertain. This capability might allow PLATO to detect changes in planetary system architecture with time, particularly because planetary scattering due to Lagrange instability may be triggered long after the system was formed. Here, we utilize previously published instability timescale prescriptions to determine PLATO's capability to detect a trend of decreasing planet frequency with age for systems with equal-mass planets. For two-planet systems, our results demonstrate that PLATO may detect a trend for planet masses which are at least as massive as super-Earths. For systems with three or more planets, we link their initial compactness to potentially detectable frequency trends in order to aid future investigations when these populations will be better characterized.

Download/Website: `http://arxiv.org/abs/1507.04272`

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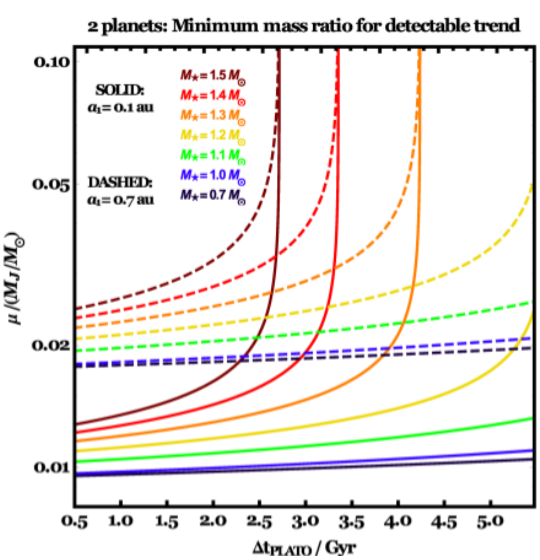

Figure 10: (Veras et al.) The minimum planet-star mass ratio μ for which PLATO can detect a decreasing trend of planet frequency versus time for packed, Hill-stable two-planet systems. The x-axis refers to the (variable) magnitude of the stellar age constraints PLATO may provide. If ages are constrained to within 1 Gyr, then a trend should be detectable for planets at least as massive as $10^{-2} M_{\rm J}$.

3 Jobs and Positions

Research Fellow

Nathan Mayne
University of Exeter, UK

University of Exeter, United Kingdom., Flexible start date from 01/10/15 to 01/04/16

The Leverhulme Trust has agreed to fund a 3 year position at the University of Exeter on a project working with Nathan Mayne. This Research Fellow post has a starting salary of 33,242 (negotiable dependent on experience and qualifications), and significant HPC resources and funding for international/national travel will also be available to the candidate. The starting date is flexible but must be before the 1st April 2016.
The project will entail developing a flexible and idealised cloud scheme to be coupled to a 3D general circulation model (GCM), and subsequent comparison with observations of Brown Dwarfs. This work will involve collaboration with Prof. Daniel Apai (Univ. of Arizona), Dr James Manners (UK Met Office) and Prof. Isabelle Baraffe (Univ. of Exeter). The programme will also be supported by two PhD researchers, and fits within the wider research programme, directed by Nathan Mayne, to model a range of planetary and substellar atmospheres with the UK Met Office GCM. The applicant will have the flexibility to contribute across this programme, and be involved in supervision of projects within it if they wish.
We encourage applicants with experience in atmospheric/dynamical modelling and the treatment of clouds across a range of astrophysical and meteorological environments, or specific experience in the interpretation of observations of Brown Dwarfs.
For more information please contact Nathan Mayne via email (nathan@astro.ex.ac.uk), or telephone (+441392726244).

Contact: `nathan@astro.ex.ac.uk`

Postdoctoral Fellowship in Exo-Planets, Brown Dwarfs and Young Stars

Prof. Ray Jayawardhana
York University, Toronto, Canada

Toronto, Canada, 2016

Applications are invited for a postdoctoral fellowship at York University in Toronto. The successful candidate will work with Professor Ray Jayawardhana and his collaborators on observational and analytical studies of extra-solar planets, brown dwarfs and young stars, and will be encouraged to pursue independent research on related topics. Ongoing and recent projects include photometric and spectroscopic studies of extra-solar planets, high-contrast imaging searches for sub-stellar companions around young stars, investigations of brown dwarf variability and multiplicity, and the SONYC (Substellar Objects in Nearby Young Clusters) ultra-deep survey, using data from VLT, Subaru, Gemini, Keck, CFHT, Kepler, and other major observatories. The position is for two years, with extension to a third year possible, and comes with a competitive salary and funds for research expenses. Applicants should send their curriculum vitae, a description of research interests and plans and a list of publications,and should arrange for three letters of recommendation to be sent directly to marlene@yorku.ca. All materials should be submitted electronically. Applications received before 2014 December 1 will receive full consideration. Early expressions of interest and inquiries are welcome, and should be directed to rayjay@yorku.ca. Start date is flexible, ideally between January-September 2016.

Download/Website: `http://www.physics.yorku.ca/`

Contact: `marlene@yorku.ca; rayjay@yorku.ca`

2016 NASA Sagan Fellowship Program

Dr. Dawn M. Gelino
NASA Exoplanet Science Institute

Any US host institution, Applications Due: Nov. 5, 2015, 4 pm PST

The NASA Exoplanet Science Institute announces the 2016 Sagan Postdoctoral Fellowship Program and solicits applications for fellowships to begin in the fall of 2016.

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 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, 2013, 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 5, 2015. Offers will be made before February 1, 2016, and new appointments are expected to begin on or about September 1, 2016.

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

PhD position: Composition of Mercury's Exosphere

Peter Wurz
Physics Insitute, University of Bern, Switzerland

University of Bern, 1 January 2016

The upcoming BepiColombo mission of ESA to the planet Mercury will allow us to directly measure the chemical composition of its atmosphere, which consists mostly of particles that are ejected from the surface, with the STROFIO mass spectrometer of the ELENA experiment. Currently, the chemical composition of surface is poorly known. However, the chemical composition of the surfaces holds clues for the origin and evolution of planet Mercury, the planet closest to the Sun.
The goal of this PhD position is threefold: i) to formulate a detailed mathematical (numerical) description of the STROFIO instrument, i.e., the so-called instrument function; ii) predict and optimise the expected STROFIO signal by combining the instrument function and the Mercury exosphere model of the group; iii) improve and extend the existing Mercury exosphere numerical model using data from the MESSENGER mission of NASA.
The PhD student will be part of the ELENA team of the BepiColombo mission, participate in the international team meetings, and will closely collaborate with the colleagues at SwRI, TX, USA.
We are looking for a talented and motivated person who enjoys development of scientific algorithms and their implementation in software in the field of planetary science. Prior programming skills are necessary, experience

with IDL would be of advantage but is not required. Salary is according to regulations by the Swiss National Science Foundation.
Interested applicants should send their curriculum (including professional experience), a one page motivation letter, the contact details of up to three reference persons, and the grades obtained at the Master level to Prof. Peter Wurz (peter.wurz@space.unibe.ch). Applications should be sent until end of September 2015. The starting date of the position is January 2016, but is negotiable.

Download/Website: `http://space.unibe.ch/en.html`

Contact: `peter.wurz@space.unibe.ch`

Postdoctoral position on debris disks

Prof. Alexander Krivov
Astrophysical Institute and University Observatory Jena, Schillergässchen 2–3, 07745 Jena, Germany

Jena, Germany, January 2016 at the latest

The Astrophysical Institute and University Observatory (AIU) of the Friedrich Schiller University, Jena, Germany, is seeking candidates for a postdoctoral position.
The position is to work in the Research Unit FOR 2285 “Debris Disks in Planetary Systems”, newly established by the German Research Foundation (DFG). The successful candidate will join the theory group at the AIU and will work for the Research Unit’s project P3 “Origin of the warm and hot dust and planetary system architecture”. The project goals are to obtain improved statistics for the occurrence rate and parameters of warm and hot dust disks, to work out plausible scenarios for the origin of the observed warm and hot dust, to derive constraints on planetesimals and planets and the overall architecture of the systems, and to make suggestions for future observational tests. The postdoc will benefit from close collaboration with other projects of the Research Unit running in Jena, Braunschweig, Hamburg, and Kiel.

The position is for three years and can start at any time, but no later than in **early 2016**. The salary is standard for postdoc positions in Germany (TV-L E-13 of the German federal public service scale) and includes a number of social and family-related benefits.

The applicants should have a strong educational record and hold a doctoral degree or equivalent in physics or astronomy. Previous experience with astronomical research, preferrably with debris disk and/or exoplanet studies, would be a strong advantage.

Applications as a single PDF document should include a CV, a brief statement of research interests, and three names of reference. All applications received by **September 30, 2015** will be given full consideration.

The Friedrich Schiller University is an equal opportunity employer and explicitely encourages women to apply. Disabled persons with equal aptitude, competence and qualification will be given preference.

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

Contact: `krivov@astro.uni-jena.de`

Two graduate student positions on debris disks

Prof. Alexander Krivov and Dr. Torsten Löhne
Astrophysical Institute and University Observatory Jena, Schillergässchen 2–3, 07745 Jena, Germany

Jena, Germany, January 2016 at the latest

The Astrophysical Institute and University Observatory (AIU) of the Friedrich Schiller University, Jena, Germany, is seeking candidates for two graduate student positions.
The positions are to work in the Research Unit FOR 2285 "Debris Disks in Planetary Systems", newly established by the German Research Foundation (DFG). The successful candidates will join the theory group at the AIU and will work for one of the following two projects.

In the first project (P1, A. Krivov, "Collisional modeling of resolved debris disks"), we plan to extend our knowledge of planetary systems harboring debris disks with the help of state-of-the-art collisional models. Such modeling is a powerful tool to decipher information encrypted in the observed dust and to connect the dust to its parent bodies, directly unobservable planetesimals. Constraints can be placed on locations and masses of planetesimal belts, their size and radial distribution, degree of dynamical excitation, material properties, etc. The graduate student is expected to refine our collisional code, incorporate recent advances from theory and laboratory work, and use the code to study a suite of resolved debris disks.

The second project (P2, T. Löhne, "Sculpturing of debris disks by planets and companions") aims at modelling of observed asymmetries in debris disks. Common disk features include, for instance, sharp radial boundaries, eccentric offsets, and azimuthal asymmetry. All these are signposts of underlying perturbations that shape the disks. A variety of possible mechanisms have been put forward to explain these phenomena. Many involve the gravitational influence of suggested but yet unseen planets and companions. To study this fascinating connection, the graduate student will combine the dynamical treatment (that describes these perturbations) with the collisional treatment (that describe the dust production) to construct a single numerical model.

Both students will work in close collaboration with other projects of the Research Unit that will provide key ingredients for the collisional models and calculation of observables. They will greatly benefit from the expertise available in the Unit, in general, and our group, in particular.

The positions are for three years and can start at any time, but no later than in **the early 2016**. The salary is standard for graduate student positions in Germany (1/2 TV-L E-13 of the German federal public service scale) and includes a number of social and family-related benefits.

The applicants should have a strong educational record and hold a Masters' degree or equivalent in physics or astronomy. Previous experience with numerics and astronomical research, preferrably with debris disk and/or exoplanet studies, would be an advantage.

Applications as a single PDF document should include a CV, a brief statement of research interests, and two names of reference. All applications received by **September 30, 2015** will be given full consideration.

The Friedrich Schiller University is an equal opportunity employer and explicitely encourages women to apply. Disabled persons with equal aptitude, competence and qualification will be given preference.

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

Contact: `krivov@astro.uni-jena.de, tloehne@astro.uni-jena.de`

4 Conference announcements

The Astrophysics of Planetary Habitability

Manuel Güdel
University of Vienna, Department of Astrophysics, Türkenschanzstrasse 17, A-1180 Vienna, Austria

University of Vienna, Austria, 8 February – 12 February 2016

With a continuously increasing number of discovered exoplanets, research is shifting from pure detection to characterization of planets. The rapidly improving quality of observing tools and the success of space-based observations of exoplanets are driving detection and characterization toward ever smaller planets; several rocky planets have already been detected in or near habitable zones around their host stars.
Exoplanetary studies are increasingly confronted with questions on habitable conditions. These conditions are determined by various astrophysical factors such as stellar high-energy radiation, particle winds, magnetic fields, accreting small bodies, planetary collisions, and planetary system dynamics.
This conference addresses astrophysical factors and processes that are pivotal for the formation, sustainability, and evolution of habitable conditions on planets from the era of planet formation in disks to the end of the main sequence life of the host star.

The conference will consist of invited and contributed talks, and will offer ample opportunities for poster presentations. A social program will be offered, including a visit to a monastery, a reception at the Vienna University Observatory, a visit to the Natural History Museum (meteorite collection), and a conference dinner at the town hall. For further details please visit our website mentioned below.

Registration and abstract submission will be opened in September 2015.

Download/Website: `http://habitability.univie.ac.at`
Contact: `habitability@univie.ac.at`

K2 Sci Con: Featuring Exoplanets and Astrophysics from K2, Kepler, and Tess

R. Street
Las Cumbres Observatory Global Telescope Network (LCOGT), Santa Barbara, CA, USA

Santa Barbara, CA, November 2-5, 2015

Registration and abstract submission are now open for the K2 Science Conference (K2SciCon) which will be held at the Fess Parker Hotel in Santa Barbara, CA from November 2-5.

Hosted by the LCOGT, K2SciCon will celebrate the science from the first year of the K2 mission. All K2 users are welcome to present early scientific results from all areas of research, from our own Solar System and exoplanets, to young stars and distant galaxies. We will hear updates on the mission and discuss the latest in data processing techniques. We also encourage contributions on results from the Kepler prime mission and the future TESS mission.

Please note that **September 18** is the deadline for early registration, abstract submission, as well as the hotel reservation deadline to get the special conference rate.

Download/Website: `http://lcogt.net/k2scicon/`
Contact: `k2scicon-loc@lcogt.net`

5 Announcements

Fizeau exchange visitors program in optical interferometry – call for applications

European Interferometry Initiative
Opticon, EU

www.european-interferometry.eu, application deadline: Sep. 15

The Fizeau exchange visitors program in optical interferometry funds (travel and accommodation) visits of researchers to an institute of his/her choice (within the European Community) to perform collaborative work and training on one of the active topics of the European Interferometry Initiative. The visits will typically last for one month, and strengthen the network of astronomers engaged in technical, scientific and training work on optical/infrared interferometry. The program is open for all levels of astronomers (Ph.D. students to tenured staff), non-EU based missions will only be funded if considered essential by the Fizeau Committee. Applicants are strongly encouraged to seek also partial support from their home or host institutions.

The deadline for applications is September 15 for visits starting in November 2015.

Further informations and application forms can be found at: www.european-interferometry.eu
The program is funded by OPTICON/FP7.

Please distribute this message also to potentially interested colleagues outside of your community!

Looking forward to your applications,
Josef Hron & Laszlo Mosoni
(for the European Interferometry Initiative)

Download/Website: `http://www.european-interferometry.eu`

Contact: `fizeau@european-interferometry.eu`

2016A NASA Keck Call for General Observing Proposals

Dr. Dawn M. Gelino
NASA Exoplanet Science Institute

Keck Observatory, Proposals Due: September 17, 2015 at 4 pm PDT

NASA is soliciting proposals to use the Keck Telescopes for the 2016A observing semester (Feb. 1- July 31, 2016). Complete call information is available on the website below and all proposals are due by **17 September 2015 at 4 pm PDT**.

The opportunity to propose as Principal Investigators for NASA time on the Keck Telescopes is open to all U.S.-based astronomers (a U.S.-based astronomer has 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 2016A:

- NASA is soliciting large Key Strategic Mission Support proposals in 2016A.
- Note the updated 2014 NASA Science Plan to be used for the strategic relevance section of your proposal. (Please see the website below to download this document.)
- Check the WMKO instrument page for telescope observing limits and the current list of available instruments.
  - a) In order to support installation and testing of the new Keck II laser, the Keck II LGS AO system will be unavailable for science through mid-April, 2016A. The Keck II NGS AO system will be available for science throughout semester 2016A. The Keck II LGS AO system will be available for shared-risk science from mid-April 2016 onward.
  - b) OSIRIS will be unavailable for science through early March 2016 for the spec detector upgrades.
  - c) NIRSPEC (NIRSPAO) will be unavailable for four weeks in March 2016 in order to conduct a routine servicing mission to remove ice from the dewar window.

Key Dates:

- September 3
  - Key Strategic Mission Support intent emails to NExScI
  - Key Strategic Mission Support letter inquiries to NASA HQ
  - General Mission Support letter inquiries to NASA HQ
- September 17
  - All proposals and supporting letters due to NExScI

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

Contact: `KeckCFP@ipac.caltech.edu`

6 As seen on astro-ph

The following list contains all the entries relating to exoplanets that we spotted on astro-ph during July & August 2015. If you see any that we missed, please let us know and we'll include them in the next issue.

July 2015

astro-ph/1507.00777 : **Characterizing Rocky and Gaseous Exoplanets with 2-meter Class Space-based Coronagraphs: General Considerations** by *Tyler D. Robinson, Karl R. Stapelfeldt, Mark S. Marley*
astro-ph/1507.01024 : **HATS-7b: A Hot Super Neptune Transiting a Quiet K Dwarf Star** by *G.A.Bakos et al.*
astro-ph/1507.01254 : **Constraints on the substellar companions in wide orbits around the Barnard's Star from CanariCam mid-infrared imaging** by *B. Gauza, et al.*
astro-ph/1507.01343 : **Elemental ratios in stars vs planets** by *Amaury Thiabaud, et al.*
astro-ph/1507.01609 : **WASP-14 b: Transit Timing analysis of 19 light curves** by *St. Raetz, et al.*

astro-ph/1507.01642 : **The Epsilon Eridani System Resolved by Millimeter Interferometry** by *Meredith A. MacGregor, et al.*

astro-ph/1507.01727 : **The unstable CO2 feedback cycle on ocean planets** by *D. Kitzmann, et al.*

astro-ph/1507.01866 : **First exoplanet transit observation with the Stratospheric Observatory for Infrared Astronomy: Confirmation of Rayleigh scattering in HD 189733 b with HIPO** by *Daniel Angerhausen, et al.*

astro-ph/1507.01935 : **Far-infrared signatures and inner hole sizes of protoplanetary discs undergoing inside-out dust dispersal** by *Barbara Ercolano et al.*

astro-ph/1507.01938 : **A Lucky Imaging search for stellar companions to transiting planet host stars** by *Maria Wöllert, et al.*

astro-ph/1507.01944 : **Carbon Dioxide in Exoplanetary Atmospheres: Rarely Dominant Compared to Carbon Monoxide and Water** by *Kevin Heng, James R. Lyons*

astro-ph/1507.02060 : **Analysis of the exoplanet containing system Kepler 91** by *Edwin Budding, et al.*

astro-ph/1507.02107 : **Refraction in planetary atmospheres: improved analytical expressions and comparison with a new ray-tracing algorithm** by *Yan Betremieux, Lisa Kaltenegger*

astro-ph/1507.02388 : **A Venus-Mass Planet Orbiting a Brown Dwarf: Missing Link between Planets and Moons** by *A. Udalski, et al.*

astro-ph/1507.02655 : **Transiting Exoplanet Simulations with the James Webb Space Telescope** by *Natasha Batalha, et al.*

astro-ph/1507.02661 : **Detection and Characterization of Extrasolar Planets through Mean-Motion Resonances: Simulations of Hypothetical Debris Disks** by *Maryam Tabeshian, Paul Wiegert*

astro-ph/1507.02823 : **Sensitivity of Biosignatures on Earth-like Planets orbiting in the Habitable Zone of Cool M-Dwarf Stars to varying Stellar UV Radiation and Surface Biomass Emissions** by *John Lee Grenfell, et al.*

astro-ph/1507.03014 : **Near-IR Polarized Scattered Light Imagery of the DoAr 28 Transitional Disk** by *Evan A. Rich, et al.*

astro-ph/1507.03557 : **The Metallicities of Stars With and Without Transiting Planets** by *Lars A. Buchhave, David W. Latham*

astro-ph/1507.03587 : **Optical imaging polarimetry of the LkCa 15 protoplanetary disk with SPHERE ZIMPOL** by *Christian Thalmann, et al.*

astro-ph/1507.03588 : **A Ground-Based Albedo Upper Limit for HD 189733b from Polarimetry** by *Sloane J. Wiktorowicz et al.*

astro-ph/1507.03596 : **Observational Signatures of Planets in Protoplanetary Disks II: Spiral Arms Observed in Scattered Light Imaging Can be Induced by Planets** by *Ruobing Dong et al.*

astro-ph/1507.03599 : **The Structure of Spiral Shocks Excited by Planetary-mass Companions** by *Zhaohuan Zhu, et al.*

astro-ph/1507.03966 : **Observations of Exoplanet Atmospheres** by *Ian J. M. Crossfield*

astro-ph/1507.03998 : **The Solar Twin Planet Search II. A Jupiter twin around a solar twin** by *M. Bedell, et al.*

astro-ph/1507.04117 : **Activity and Magnetic Field Structure of the Sun-Like Planet Hosting Star HD 1237** by *J. D. Alvarado-Gómez, et al.*

astro-ph/1507.04272 : **Prospects for detecting decreasing exoplanet frequency with main sequence age using PLATO** by *Dimitri Veras, et al.*

astro-ph/1507.04367 : **Double-ringed debris discs could be the work of eccentric planets: explaining the strange morphology of HD 107146** by *Tim Pearce, Mark Wyatt*

astro-ph/1507.04677 : **Atmospheric Escape by Magnetically Driven Wind from Gaseous Planets II –Effects of Magnetic Diffusion–** by *Yuki A. Tanaka, Takeru K. Suzuki, Shu-ichiro Inutsuka*

astro-ph/1507.04751 : **Mercury-T: A new code to study tidally evolving multi-planet systems. Applications to Kepler-62** by *Emeline Bolmont, et al.*

astro-ph/1507.04756 : **Tracing the Ingredients for a Habitable Earth from Interstellar Space through Planet Formation** by *Edwin A. Bergin, et al.*

astro-ph/1507.04975 : **Infrared study of transitional disks in Ophiuchus with Herschel** by *Isabel Rebollido, et al.*

astro-ph/1507.05097 : **Measuring Transit Signal Recovery in the Kepler Pipeline II: Detection Efficiency as Calculated in One Year of Data** by *Jessie L. Christiansen, et al.*

astro-ph/1507.05209 : **The growth of planets by pebble accretion in evolving protoplanetary discs** by *Bertram Bitsch, Michiel Lambrechts, Anders Johansen*

astro-ph/1507.05361 : **KMT-2015-1b: a Giant Planet Orbiting a Low-mass Dwarf Host Star Discovered by a New High-cadence Microlensing Survey with a Global Telescope Network** by *K.-H. Hwang, et al.*

astro-ph/1507.05499 : **Toroidal vortices and the conglomeration of dust into rings in protoplanetary discs** by *Pablo Loren-Aguilar, Matthew R. Bate*

astro-ph/1507.05614 : **Statistical Signatures of Panspermia in Exoplanet Surveys** by *Henry W. Lin, Abraham Loeb*

astro-ph/1507.05916 : **Optical hydrogen absorption consistent with a thin bow shock leading the hot Jupiter HD 189733b** by *P. Wilson Cauley, et al.*

astro-ph/1507.05963 : **A temperature inversion in WASP-33b? Large Binocular Telescope occultation data confirm significant thermal flux at short wavelengths** by *C. von Essen, et al.*

astro-ph/1507.06051 : **The Weihai Observatory search for close-in planets orbiting giant stars** by *Robert A. Wittenmyer, et al.*

astro-ph/1507.06155 : **A homogeneous analysis of disks around brown dwarfs** by *Y. Liu, et al.*

astro-ph/1507.06293 : **Earth Similarity Index with two free parameters** by *Suresh Chandra, Subas Nepal, Mohit K. Sharma*

astro-ph/1507.06300 : **A Quantitative Criterion for Defining Planets** by *Jean-Luc Margot*

astro-ph/1507.06719 : **On planet formation in HL Tau** by *Giovanni Dipierro, et al.*

astro-ph/1507.06723 : **Discovery and Validation of Kepler-452b: A 1.6-Re Super Earth Exoplanet in the Habitable Zone of a G2 Star** by *Jon M. Jenkins, et al.*

astro-ph/1507.06982 : **Limits on Planet Formation Around Young Pulsars and Implications for Supernova Fallback Disks** by *Matthew Kerr, et al.*

astro-ph/1507.06998 : **Modelling circumbinary protoplanetary disks: I. Fluid simulations of the Kepler-16 and 34 systems** by *S. Lines, et al.*

astro-ph/1507.07383 : **Equilibrium rotation of semiliquid exoplanets and satellites** by *Valeri V. Makarov*

astro-ph/1507.07578 : **High Precision Photometry for K2 Campaign 1** by *Chelsea X. Huang, et al.*

astro-ph/1507.07913 : **Know the Star, Know the Planet. V. Characterization of the Stellar Companion to the Exoplanet Host HD 177830** by *Lewis C. Roberts Jr., et al.*

astro-ph/1507.07933 : **Curveballs in protoplanetary disks - the effect of the Magnus force on planet formation** by *John C. Forbes*

astro-ph/1507.07967 : **A hot Jupiter for breakfast? — Early stellar ingestion of planets may be common** by *Titos Matsakos, Arieh Königl*

astro-ph/1507.08070 : **Using the chromatic Rossiter-McLaughlin effect to probe the broadband signature in the optical transmission spectrum of HD 189733b** by *E. Di Gloria, I. A. G. Snellen, S. Albrecht*

astro-ph/1507.08081 : **Constraining planet structure from stellar chemistry: the cases of CoRoT-7, Kepler-10, and Kepler-93** by *N. C. Santos, et al.*

astro-ph/1507.08125 : **HD 80606: Searching the chemical signature of planet formation** by *C. Saffe, M. Flores, A. Buccino*

astro-ph/1507.08215 : **Building massive compact planetesimal disks from the accretion of pebbles** by *John Moriarty, Debra Fischer*

astro-ph/1507.08256 : **Two Transiting Earth-size Planets Near Resonance Orbiting a Nearby Cool Star** by *Erik A. Petigura, et al.*

astro-ph/1507.08285 : **batman: BAsic Transit Model cAlculatioN in Python** by *Laura Kreidberg*

astro-ph/1507.08291 : **Discovery of a Low-Mass Companion to the F7V star HD 984** by *T. Meshkat, et al.*

astro-ph/1507.08530 : **Observational Signatures of Self-Destructive Civilisations** by *Adam Stevens, Duncan Forgan, Jack O'Malley-James*

astro-ph/1507.08532 : **The HARPS-N Rocky Planet Search I. HD219134b: A transiting rocky planet in a multi-planet system at 6.5 pc from the Sun** by *F. Motalebi, et al.*

astro-ph/1507.08544 : **The molecular composition of the planet-forming regions of protoplanetary disks across the luminosity regime** by *Catherine Walsh, Hideko Nomura, Ewine F. van Dishoeck*

astro-ph/1507.08661 : **Confirmation of the Planetary Microlensing Signal and Star and Planet Mass Determinations for Event OGLE-2005-BLG-169** by *D.P. Bennett, et al.*

astro-ph/1507.08667 : **Eccentric Jupiters via Disk-Planet Interactions** by *Paul C. Duffell, Eugene Chiang*

astro-ph/1507.08809 : **Eccentricity Evolution Through Accretion of Protoplanets** by *Yuji Matsumoto, Makiko Nagasawa, Shigeru Ida*

astro-ph/1507.08902 : **Grain size constraints on HL Tau with polarization signature** by *Akimasa Kataoka, et al.*

astro-ph/1507.08914 : **Confirmation of the OGLE-2005-BLG-169 planet signature and characteristics with lens-source proper motion detection** by *V. Batista, et al.*

August 2015

astro-ph/1508.00321 : **CHEOPS performance for exomoons: The detectability of exomoons by using optimal decision algorithm** by *A.E. Simon, et al.*

astro-ph/1508.00419 : **Connecting the dots II: Phase changes in the climate dynamics of tidally locked terrestrial exoplanets** by *Ludmila Carone, Rony Keppens, Leen Decin*

astro-ph/1508.00426 : **Theory for planetary exospheres: III. Radiation pressure effect on the Circular Restricted Three Body Problem and its implication on planetary atmospheres** by *Arnaud Beth, et al.*

astro-ph/1508.00427 : **A statistical search for a population of Exo-Trojans in the Kepler dataset** by *Michael Hippke, Daniel Angerhausen*

astro-ph/1508.00565 : **Searching for gas giant planets on Solar System scales - A NACO/APP L'-band survey of A- and F-type Main Sequence stars** by *T. Meshkat, et al.*

astro-ph/1508.00584 : **Dust and Gas in the disc of HL Tauri: Surface density, dust settling, and dust-to-gas ratio** by *Christophe Pinte, et al.*

astro-ph/1508.00880 : **Planetary Evaporation and the Dynamics of Planet Wind/Stellar Wind Bow Shocks** by *A. Frank, et al.*

astro-ph/1508.00899 : **High Order Harmonics in Light Curves of Kepler Planets** by *Caden Armstrong, Hanno Rein*

astro-ph/1508.00902 : **Spitzer Secondary Eclipse Observations of Five Cool Gas Giant Planets and Empirical Trends in Cool Planet Emission Spectra** by *Joshua A. Kammer, et al.*

astro-ph/1508.00903 : **Vortex Formation and Evolution in Planet Harboring Disks under Thermal Relaxation** by *A. Lobo Gomes, et al.*

astro-ph/1508.00917 : **Chaos in Terrestrial Planet Formation** by *Volker Hoffmann, et al.*

astro-ph/1508.00931 : **The Solar System as an Exoplanetary System** by *Rebecca G. Martin, Mario Livio*

astro-ph/1508.00977 : **Warm Debris Disks Produced by Giant Impacts During Terrestrial Planet Formation** by *H. Genda, H. Kobayashi, E. Kokubo*

astro-ph/1508.00904 : **Magnetically driven accretion in protoplanetary discs** by *Jacob B. Simon, et al.*

astro-ph/1508.01196 : **The migration of gas giant planets in gravitationally unstable discs** by *Dimitris Stamatellos*

astro-ph/1508.01202 : **On The History and Future of Cosmic Planet Formation** by *Peter Behroozi, Molly Peeples*

astro-ph/1508.01593 : **The dynamical fate of planetary systems in young star clusters** by *Xiaochen Zheng, M.B.N. Kouwenhoven, Long Wang*
astro-ph/1508.02365 : **Magnetic Origins of the Stellar Mass-Obliquity Correlation in Planetary Systems** by *Christopher Spalding, Konstantin Batygin*
astro-ph/1508.02395 : **Characterizing the Atmospheres of the HR8799 Planets with HST/WFC3** by *Abhijith Rajan, et al.*
astro-ph/1508.02398 : **Measurement of the Nodal Precession of WASP-33 b via Doppler Tomography** by *Marshall C. Johnson, et al.*
astro-ph/1508.02411 : **WASP-47: A Hot Jupiter System with Two Additional Planets Discovered by K2** by *Juliette C. Becker, et al.*
astro-ph/1508.02763 : **Orbital decay of hot Jupiters due to nonlinear tidal dissipation within solar-type hosts** by *Reed Essick, Nevin N. Weinberg*
astro-ph/1508.02764 : **Gravity and Zonal Flows of Giant Planets: From the Euler Equation to the Thermal Wind Equation** by *Hao Cao, David J. Stevenson*
astro-ph/1508.02791 : **Inside-Out Planet Formation. III. Planet-disk interaction at the dead zone inner boundary** by *Xiao Hu et al.*
astro-ph/1508.02879 : **Planetesimal formation in self-gravitating discs – dust trapping by vortices** by *P.G. Gibbons, G.R. Mamatsashvili, W.K.M. Rice*
astro-ph/1508.02911 : **Exoplanet Transmission Spectroscopy using KMOS** by *Hannu Parviainen, et al.*
astro-ph/1508.03084 : **Discovery and spectroscopy of the young Jovian planet 51 Eri b with the Gemini Planet Imager** by *B. Macintosh, et al.*
astro-ph/1508.03241 : **The effects of a magnetic field on planetary migration in laminar and turbulent discs** by *M.L. Comins, et al.*
astro-ph/1508.03336 : **Planet Sensitivity from Combined Ground- and Space-based Microlensing Observations** by *Wei Zhu, et al.*
astro-ph/1508.04434 : **Synthesizing Exoplanet Demographics: A Single Population of Long-Period Planetary Companions to M Dwarfs Consistent with Microlensing, Radial Velocity, and Direct Imaging Surveys** by *Christian Clanton, B. Scott Gaudi*
astro-ph/1508.04443 : **Scattered light images of spiral arms in marginally gravitationally unstable discs with an embedded planet** by *A. Pohl, et al.*
astro-ph/1508.04500 : **Defocused Observations of Selected Exoplanet Transits with T100 in TUBITAK National Observatory of Turkey (TUG)** by *Ozgur Basturk, et al.*
astro-ph/1508.04646 : **Tides Alone Cannot Explain Kepler Planets Close to 2:1 MMR** by *Ari Silburt, Hanno Rein*
astro-ph/1508.04765 : **Gemini Planet Imager Observations of the AU Microscopii Debris Disk: Asymmetries within One Arcsecond** by *Jason J. Wang, et al.*
astro-ph/1508.04769 : **Precise radial velocities of giant stars VIII. Testing for the presence of planets with CRIRES Infrared Radial Velocities** by *Trifon Trifonov, et al.*
astro-ph/1508.04787 : **β Pictoris' inner disk in polarized light and new orbital parameters for β Pictoris b** by *Maxwell A. Millar-Blanchaer, et al.*
astro-ph/1508.05473 : **Resolution Dependence of Disruptive Collisions between Planetesimals in the Gravity Regime** by *H. Genda, et al.*
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