ExoPlanet News
An Electronic Newsletter

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Contents

1 Editorial

Here is the 77th edition of ExoPlanet News. The last issue seems like only a couple of weeks ago, yet here's a new edition packed with abstracts, job adverts and meeting announcements. As usual, please share it with your colleagues and encourage them to join the mailing list – or better still submit entries for future editions.

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.

At the beginning of April, I plan to be at the UK Exoplanet Community meeting in Warwick and then we have the Easter weekend, so I won't get chance to compile a newsletter then. Therefore I think it best if the next edition is held back until the beginning of May. I will send out a reminder for content nearer to the time.

Best wishes
Andrew Norton
The Open University

2 Abstracts of refereed papers

Direct evidence for an evolving dust cloud from the exoplanet KIC 12557548 b

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Astrophysical Journal Letters, published (arXiv:1502.04612)

We present simultaneous multi-color optical photometry using ULTRACAM of the transiting exoplanet KIC 12557548 b (also known as KIC 1255 b). This reveals, for the first time, the color dependence of the transit depth. Our g' and z' transits are similar in shape to the average *Kepler* short-cadence profile, and constitute the highest-quality extant coverage of *individual* transits. Our Night 1 transit depths are $0.85 \pm 0.04\%$ in z'; $1.00 \pm 0.03\%$ in g'; and $1.1 \pm 0.3\%$ in u'. We employ a residual-permutation method to assess the impact of correlated noise on the depth difference between the z' and g' bands and calculate the significance of the color dependence at 3.2σ. The Night 1 depths are consistent with dust extinction as observed in the ISM, but require grain sizes comparable to the largest found in the ISM: 0.25–1μm. This provides direct evidence in favor of this object being a disrupting low-mass rocky planet, feeding a transiting dust cloud. On the remaining four nights of observations the object was in a rare shallow-transit phase. If the grain size in the transiting dust cloud changes as the transit depth changes, the extinction efficiency is expected to change in a wavelength- and composition-dependent way. Observing a change in the wavelength-dependent transit depth would offer an unprecedented opportunity to determine the composition of the disintegrating rocky body KIC 12557548 b. We detected four out-of-transit u' band events consistent with stellar flares.

Download/Website: `http://arxiv.org/abs/1502.04612`

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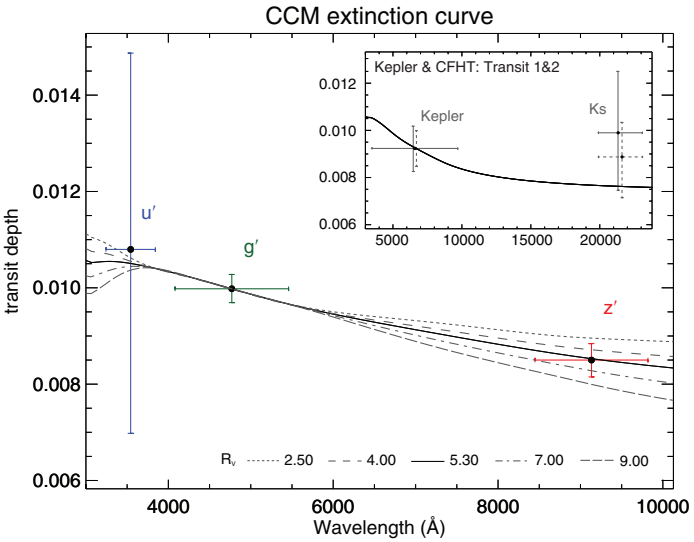

Figure 1: (Bochinski et al.) The Cardelli, Clayton & Mathis (1989) ISM extinction law fitted to our Night 1 transit depths. The fit included two free parameters: E(B-V) and R_V. The best fit values were E(B-V)=0.056 (used throughout) and $R_V = 5.3$ (solid line). Extinction laws for values of R_V ranging between 2.50 and 9.00 are also shown. The inset shows our best fit CCM law and Croll et al. (2014) photometry normalized to the same transit depth; it is consistent with our fit. Croll et al. (2014) Night 2 vertical error bars (dashed lines) have been offset slightly in wavelength for visibility.

KELT-7b: A hot Jupiter transiting a bright V=8.54 rapidly rotating F-star

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The Astronomical Journal, submitted (arXiv:1501.05565)

We report the discovery of KELT-7b, a transiting hot Jupiter with a mass of $1.28 \pm 0.18 M_{\rm J}$, radius of $1.53^{+0.046}_{-0.047} R_{\rm J}$ and an orbital period of 2.7347749 ± 0.0000039 days. The bright host star (HD33643; KELT-7) is an F-star with $V = 8.54$, $T_{\rm eff} = 6789^{+50}_{-49}$ K, $[{\rm Fe/H}] = 0.139^{+0.075}_{-0.081}$, and $\log g = 4.149 \pm 0.019$. It has a mass of $1.535^{+0.066}_{-0.054} M_{\rm sun}$ a radius of $1.732^{+0.043}_{-0.045} R_{\rm sun}$ and is the fifth most massive, fifth hottest, and the ninth brightest star known to host a transiting planet. It is also the brightest star around which KELT has discovered a transiting planet. Thus, KELT-7b is an ideal target for detailed characterization given its relatively low surface gravity, high equilibrium temperature, and bright host star. The rapid rotation of the star ($73 \pm 0.5 {\rm km\,s^{-1}}$) results in a Rossiter-McLaughlin effect with an unusually large amplitude of several hundred ${\rm m\,s^{-1}}$. We find that the orbit normal of the planet is likely to be well-aligned with the stellar spin axis, with a projected spin-orbit alignment of $\lambda = 9.7 \pm 5.2$ degrees. This is currently the second most rapidly rotating star to have a reflex signal (and thus mass determination) due to a planetary companion measured.

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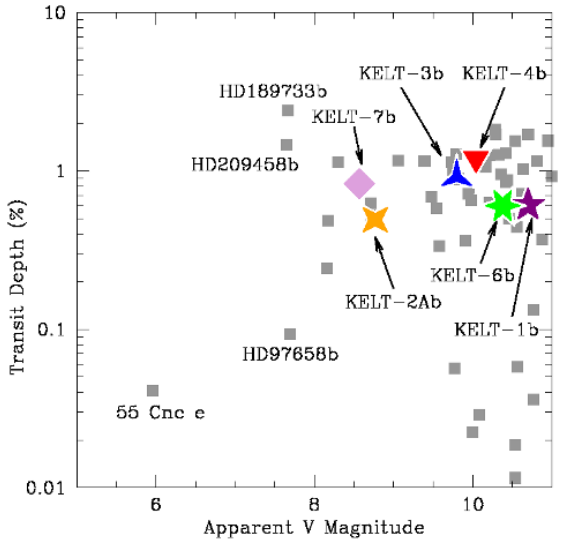

Figure 2: (Bieryla et al.) Transit depth as a function of apparent V magnitude of the host star for a sample of transiting systems with bright ($V \leq 11$) hosts. KELT-7b is shown as a pink diamond. Bright stars with deep transits are generally the best targets for detailed follow-up.

Can Kozai-Lidov cycles explain Kepler-78b?

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Monthly Notices of the Royal Astronomical Society, published (2015MNRAS.448.1729R)

Kepler-78b is one of a growing sample of planets similar, in composition and size, to the Earth. It was first detected with NASA's *Kepler* spacecraft and then characterised in more detail using radial velocity follow-up observations. Not only is its size very similar to that of the Earth ($1.2R_{\oplus}$), it also has a very similar density (5.6 g cm^{-2}). What makes this planet particularly interesting is that it orbits its host star every 8.5 hours, giving it an orbital distance of only 0.0089 au. What we investigate here is whether or not such a planet could have been perturbed into this orbit by an outer companion on an inclined orbit. In this scenario, the outer perturber causes the inner orbit to undergo Kozai-Lidov cycles which, if the periapse comes sufficiently close to the host star, can then lead to the planet being tidally circularised into a close orbit. We find that this process can indeed produce such very-close-in planets within the age of the host star ($\sim 600 - 900$ Myr), but it is more likely to find such ultra-short-period planets around slightly older stars (> 1 Gyr). However, given the size of the *Kepler* sample and the likely binarity, our results suggest that Kepler-78b may indeed have been perturbed into its current orbit by an outer stellar companion The likelihood of this happening, however, is low enough that other processes - such as planet-planet scattering - could also be responsible.

Download/Website: `http://adsabs.harvard.edu/abs/2015MNRAS.448.1729R`

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Kepler-447b: a hot-Jupiter with an extremely grazing transit

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Astronomy & Astrophysics, (arXiv:1502.03267)

We present the radial velocity confirmation of the extrasolar planet Kepler-447b, initially detected as a candidate by the *Kepler* mission. In this work, we analyze its transit signal and the radial velocity data obtained with the Calar Alto Fiber-fed Echelle spectrograph (CAFE). By simultaneously modeling both datasets, we obtain the orbital and physical properties of the system. According to our results, Kepler-447b is a Jupiter-mass planet ($M_p = 1.37^{+0.48}_{-0.46}\ M_{\rm Jup}$), with an estimated radius of $R_p = 1.65^{+0.59}_{-0.56}\ R_{\rm Jup}$ (uncertainties provided in this work are 3σ unless specified). This translates into a sub-Jupiter density. The planet revolves every ~ 7.8 days in a slightly eccentric orbit ($e = 0.123^{+0.037}_{-0.036}$) around a G8V star with detected activity in the *Kepler* light curve. Kepler-447b transits its host with a large impact parameter ($b = 1.076^{+0.112}_{-0.086}$), being one of the few planetary grazing transits confirmed so far and the first in the *Kepler* large crop of exoplanets. We estimate that only around $\sim 20\%$ of the projected planet disk occults the stellar disk. The relatively large uncertainties in the planet radius are due to the large impact parameter and short duration of the transit. Planets with such an extremely large impact parameter can be used to detect and analyze interesting configurations such as additional perturbing bodies, stellar pulsations, rotation of a non-spherical planet, or polar spot-crossing events. All these scenarios would periodically modify the transit properties (depth, duration, and time of mid-transit), what could be detectable with sufficient accurate photometry. Short-cadence photometric data (at the 1 minute level) would help in the search for these exotic configurations in grazing planetary transits like that of Kepler-447b.

Download/Website: `http://arxiv.org/abs/1502.03267`

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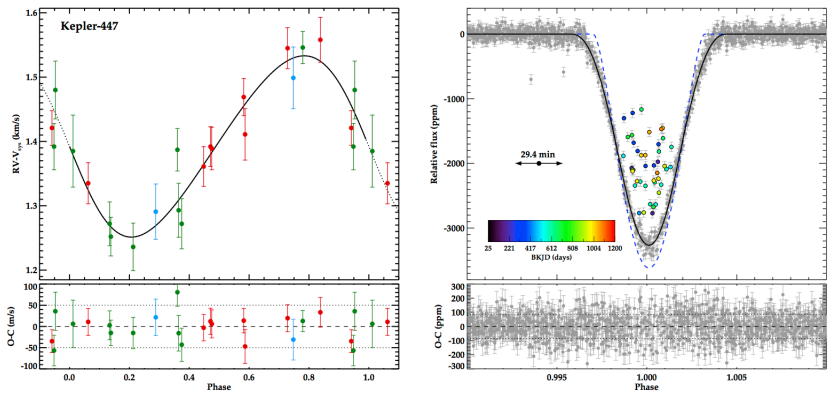

Figure 3: (Lillo-Box et al.) **Left panel:** Phase-folded radial velocity data obtained with CAFE/Calar Alto. The black line shows the best fit model. The lower left panel shows the residuals of the model fit, having a rms of 31 m/s. **Right panel:** transit fitting of Kepler-447b. We mark in color the outliers of the transit that have been removed from the fitting process (mostly due to the misidentification of cosmic rays by the *Kepler* pipeline). The final fitted model is represented by the solid black line, while the unbinned model is presented as a blue dashed line. The bottom panel shows the residuals of the fit, with a rms of 101 ppm.

Searching for signatures of planet formation in stars with circumstellar debris discs

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Astronomy & Astrophysics, Accepted for publication: arXiv:1502.07100

Context. Tentative correlations between the presence of dusty circumstellar debris discs and low-mass planets have been recently presented. In parallel, detailed chemical abundance studies have reported different trends between samples of planet and non-planet hosts. Whether these chemical differences are indeed related to the presence of planets is still strongly debated.
Aims. We aim to test whether solar-type stars with debris discs show any chemical peculiarity that could be related to the planet formation process.
Methods. We determine in a homogeneous way the metallicity, [Fe/H], and abundances of individual elements of a sample of 251 stars including stars with known debris discs, stars harbouring simultaneously debris discs and planets, stars hosting exclusively planets, and a comparison sample of stars without known discs nor planets. High resolution échelle spectra (R$\sim$ 57000) from 2-3 m class telescopes are used. Our methodology includes the calculation of the fundamental stellar parameters ($T_{\rm eff}$, $\log g$, microturbulent velocity, and metallicity) by applying the iron ionisation and equilibrium conditions to several isolated Fe I and Fe II lines, as well as, individual abundances of C, O, Na, Mg, Al, Si, S, Ca, Sc, Sc, Ti, V, Cr, Mn, Co, Ni, Cu, and Zn.
Results. No significant differences have been found in metallicity, individual abundances or abundance-condensation temperature trends between stars with debris discs and stars with neither debris nor planets. Stars with debris discs and planets have the same metallicity behaviour as stars hosting planets, and they also show a similar <[X/Fe]>-$T_{\rm C}$ trend. Different behaviour in the <[X/Fe]>-$T_{\rm C}$ trends is found between the samples of stars without planets and the samples of planet hosts. In particular, when considering only refractory elements, negative slopes are shown in cool giant planet hosts, whilst positive ones are shown in stars hosting low-mass planets. The statistical significance of the derived slopes is however low, a fact that can be due to the wide range of stellar parameters of our samples. Stars hosting exclusively close-in giant planets behave in a different way, showing higher metallicities and positive <[X/Fe]>-$T_{\rm C}$ slope. A search for correlations between the <[X/Fe]>-$T_{\rm C}$ slopes and the stellar properties reveals a moderate but significant correlation with the stellar radius and as well as a weak correlation with the stellar age, which remain even if Galactic chemical evolution effects are considered. No correlation between the <[X/Fe]>-$T_{\rm C}$ slopes and the disc/planet properties are found.
Conclusions. The fact that stars with debris discs and stars with low-mass planets do not show neither metal enhancement nor a different <[X/Fe]>-$T_{\rm C}$ trend might indicate a correlation between the presence of debris discs and the presence of low-mass planets. We extend results from previous works based mainly in solar analogues which reported differences in the <[X/Fe]>-$T_{\rm C}$ trends between planet hosts and non hosts to a wider range of parameters. However, these differences tend to be present only when the star hosts a cool distant planet and not in stars hosting exclusively low-mass planets. The interpretation of these differences as a signature of planetary formation should be considered with caution since moderate correlations between the $T_{\rm C}$ slopes with the stellar radius and the stellar age are found, suggesting that an evolutionary effect might be at work.

Download/Website: `http://arxiv.org/abs/1502.07100`

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On the gap-opening criterion of migrating planets in protoplanetary disks

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The Astrophysical Journal, in press (arXiv:1502.06597)

We perform two-dimensional hydrodynamical simulations to quantitatively explore the torque balance criterion for gap-opening (as formulated by Crida et al. 2006) in a variety of disks when considering a migrating planet. We find that even when the criterion is satisfied, there are instances when planets still do not open gaps. We stress that gap-opening is not only dependent on whether a planet has the ability to open a gap, but whether it can do so *quickly* enough. This can be expressed as an additional condition on the gap-opening timescale, $t_{\rm gap}$, versus the crossing time, $t_{\rm cross}$, i.e. the time it takes the planet to cross the region which it is carving out. While this point has been briefly made in the previous literature, our results quantify it for a range of protoplanetary disk properties and planetary masses, demonstrating how crucial it is for gap-opening. This additional condition has important implications for the survival of planets formed by core accretion in low mass disks as well as giant planets or brown dwarfs formed by gravitational instability in massive disks. It is particularly important for planets with *intermediate* masses susceptible to Type III-like migration. For some observed transition disks or disks with gaps, we expect that estimates on the potential planet masses based on the torque balance gap-opening criterion alone may not be sufficient. With consideration of this additional timescale criterion theoretical studies may find a reduced planet survivability or that planets may migrate further inwards before opening a gap.

Download/Website: `http://arxiv.org/abs/1502.06597`

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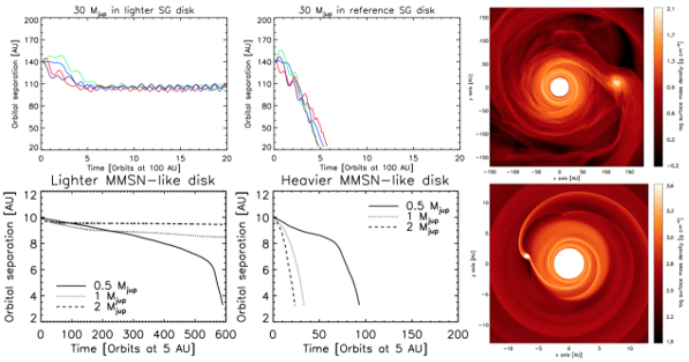

Figure 4: (Malik et al.) Top left and middle: Evolution of the orbital separation of a migrating 30 $M_{\rm Jup}$ companion in a massive gravitationally unstable disk. When increasing the disk mass gap-opening becomes harder (left to middle panel), while the torque balance criterion of Crida et al. 2006 predicts gaps in both cases. In the reference disk the companion simply lacks the time to open a gap as it migrates inwards too rapidly. Bottom left and middle: The same phenomenon is observable in MMSN-like disks with migrating 0.5, 1 and 2 $M_{\rm Jup}$ planets. The 2 $M_{\rm Jup}$ planet succeeds at gap clearing in our lighter MMSN-like disk but does not in the heavier disk, though the torque balance criterion predicts that gap-opening is independent of disk mass. Right: Surface density contours of the migrating 30 $M_{\rm Jup}$ companion (top) and 2 $M_{\rm Jup}$ planet (bottom) during a migration with no gap-openings.

The companion candidate near Fomalhaut - a background neutron star?

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Monthly Notices Royal Astronomical Society, in press, online 5 Feb 2015

The directly detected planetary mass companion candidate close to the young, nearby star Fomalhaut is a subject of intense discussion. While the detection of common proper motion led to the interpretation as Jovian-mass companion, later non-detections in the infrared raised doubts. Recent astrometric measurements indicate a belt crossing or highly eccentric orbit for the object, if a companion, making the planetary interpretation potentially even more problematic.
In this study we discuss the possibility of Fomalhaut b being a background object with a high proper motion. By analysing the available photometric and astrometric data of the object, we show that they are fully consistent with a neutron star: Neutron stars are faint, hot (blue), and fast moving. Neutron stars with an effective temperature of the whole surface area being 112,000 K to 126,500 K (with small to negligible extinction) at a distance of roughly 11 pc (best fit) would be consistent with all observables, namely with the photometric detections in the optical, with the upper limits in the infrared and X-rays, as well as with the astrometry (consistent with a distances of 11 pc or more and high proper motion as typical for neutron stars) as well as with non-detection of pulsation (not beamed). We consider the probability of finding an unrelated object or even a neutron star nearby and mostly co-aligned in proper motion with Fomalhaut A and come to the conclusion that this is definitely well possible.

Download/Website: `http://mnras.oxfordjournals.org/content/448/1/376.full?keytype=ref&ijkey=iMudISCDvwEzSrc`

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Constraining the orbits of sub-stellar companions imaged over short orbital arcs

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MNRAS, in press (arXiv: 1502.01834)

Imaging a star's companion at multiple epochs over a short orbital arc provides only four of the six coordinates required for a unique orbital solution. Probability distributions of possible solutions are commonly generated by Monte Carlo (MCMC) analysis, but these are biased by priors and may not probe the full parameter space. We suggest alternative methods to characterise possible orbits, which compliment the MCMC technique. Firstly the allowed ranges of orbital elements are prior-independent, and we provide means to calculate these ranges without numerical analyses. Hence several interesting constraints (including whether a companion even can be bound, its minimum possible semi-major axis and its minimum eccentricity) may be quickly computed using our relations as soon as orbital motion is detected. We also suggest an alternative to posterior probability distributions as a means to present possible orbital elements, namely contour plots of elements as functions of line of sight coordinates. These plots are prior-independent, readily show degeneracies between elements and allow readers to extract orbital solutions themselves. This approach is particularly useful when there are other constraints on the geometry, for example if a companion's orbit is assumed to be aligned with a disc. As examples we apply our methods to several imaged sub-stellar companions including Fomalhaut b, and for the latter object we show how different origin hypotheses affect its possible orbital solutions. We also examine visual companions of A- and G-type main sequence stars in the Washington Double Star Catalogue, and show that $>\sim 50$ per cent must be unbound.

Download/Website: `http://arxiv.org/abs/1502.01834`

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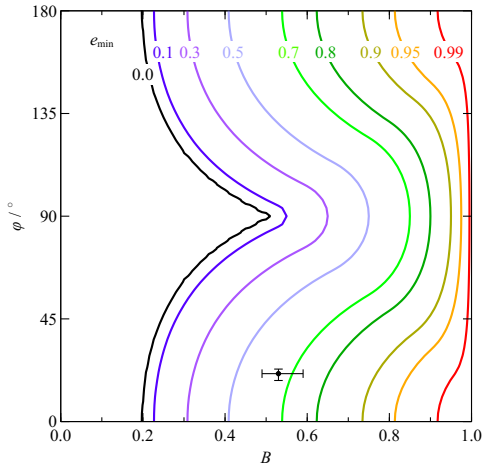

Figure 5: (Pearce, Wyatt & Kennedy) The minimum possible eccentricity of a general imaged companion, as determined by its sky plane coordinates. Here φ is the angle between the companion's relative position and instantaneous velocity on the sky, and B is a combination of sky plane values. Note that φ and B are measurable quantities, and do not depend on the companion's unknown line of sight coordinates. This plot is completely general, and the point shows B and φ for Fomalhaut b as an example.

The properties of XO-5b and WASP-82b redetermined using new high-precision transit photometry and global data analyses

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Acta Astron., in press (arXiv:1412.0451)

This paper presents new transit photometry from the Isaac Newton Telescope of two transiting exoplanetary systems, XO-5 and WASP-82. In each case the new transit light curve is more precise than any other of that system previously published. The new data are analysed alongside previously-published photometry and radial velocities, resulting in an improved orbital ephemeris and a refined set of system parameters in each case. The observational baseline of XO-5 is extended by very nearly four years, resulting in a determination of the orbital period of XO-5b to a precision of just 50 ms. The mass and radius of XO-5b are 1.19 ± 0.03 and 1.14 ± 0.03 times those of Jupiter, respectively. The light curve of WASP-82 is only the second published for this system. The planetary mass is $1.25 \pm 0.05 M_{\rm Jup}$, and the radius is $1.71 \pm 0.08 M_{\rm Jup}$.

Download/Website: `http://arxiv.org/abs/1412.0451`

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Stellar Parameters for HD 69830, a Nearby Star with Three Neptune Mass Planets and an Asteroid Belt

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[6] NASA Exoplanet Science Institute, California Institute of Technology, MC 100-22, Pasadena, CA 91125

The Astrophysical Journal, published 2015ApJ...800..115T

We used the CHARA Array to directly measure the angular diameter of HD 69830, home to three Neptune mass planets and an asteroid belt. Our measurement of 0.674+/-0.014 milli-arcseconds for the limb-darkened angular diameter of this star leads to a physical radius of R_* = 0.9058+/-0.0190 R_{sun} and luminosity of L_* = 0.622+/-0.014 L_{sun} when combined with a fit to the spectral energy distribution of the star. Placing these observed values on an Hertzsprung-Russel (HR) diagram along with stellar evolution isochrones produces an age of 10.6+/-4 Gyr and mass of 0.863+/-0.043 M_{sun}. We use archival optical echelle spectra of HD 69830 along with an iterative spectral fitting technique to measure the iron abundance ([Fe/H]=$-$0.04+/-0.03), effective temperature (5385+/-44 K) and surface gravity ($\log g$ = 4.49+/-0.06). We use these new values for the temperature and luminosity to calculate a more precise age of 7.5+/-3 Gyr. Applying the values of stellar luminosity and radius to recent models on the optimistic location of the habitable zone produces a range of 0.61-1.44 AU; partially outside the orbit of the furthest known planet (d) around HD 69830. Finally, we estimate the snow line at a distance of 1.95+/-0.19 AU, which is outside the orbit of all three planets and its asteroid belt.

Contact: `at876@msstate.edu`

Water contents of Earth-mass planets around M dwarfs

F. Tian[1], *S. Ida*[2]

[1] Ministry of Education Key Laboratory for Earth System Modeling, Center for Earth System Science, Tsinghua University, Beijing 100084, China

[2] Earth-Life Science Institute, Tokyo Institute of Technology, Tokyo 152-8550, Japan

Nature Geoscience, published (DOI: 10.1038/NGEO2372)

Efforts to identify habitable extrasolar planets have focused on systems around M dwarfs, faint stars with less than half the solar mass. Habitable planets around M dwarfs are thought to be more plentiful and easier to detect than those orbiting Sun-like G dwarfs. However, unlike G dwarfs, M dwarfs experience a prolonged decline in luminosity early in their history, leading to an inward migration of the habitable zone to where planets may have lost their water through dissociation and hydrodynamic escape.Water-poor planets, such as Venus, are considered uninhabitable. In contrast, planets with too much water (¿1 wt%) would lack continents5, leading to climate instability6 and nutrient limitation problems7. Here we combine a numerical planet population synthesis model with a model for water loss to show that the evolution of stellar luminosity leads to two types of planets of Earth-like mass (0.1 to 10 Earth masses) in the habitable zones around M dwarfs: ocean planets without continents, and desert planets, on which there are orders of magnitude less surface water than on Earth. According to our simulations, Earth-mass planets with Earth-like water contents are rare around M dwarfs and occur 10–100 times less frequently than around G dwarfs.We suggest that stars close to the size of the Sun should be the primary targets for detecting Earth-like planets.

Download/Website: DOI: 10.1038/NGEO2372

Contact: tianfengco@mail.tsinghua.edu.cn

3 Jobs and Positions

Postdoctoral Position on Exoplanet Atmospheric Characterization

Dr Luca Fossati

Space Research Institute, Austrian Academy of Sciences, Graz, Austria

Space Research Institute, Austrian Academy of Sciences, Graz, Austria, Deadline: 31st March 2015; start date: after 1st July 2015

The institute invites applications for a postdoctoral researcher position at the Space Research Institute (IWF, Graz) in Austria to join the newly established exoplanet group led by Dr Luca Fossati. The group concentrates on multi-wavelength observational characterization of exoplanet atmospheres in the context of future space missions, such as CHEOPS and PLATO.

The applicant must hold a PhD in physics, geophysics, astrophysics, or a related field. Preference will be given to candidates with experience in the analysis of data for the observational characterization of exoplanet atmospheres by means of space- and/or ground-based transit observations.

The appointment begins as early as 1 July 2015 and will be initially for two years (extension up to a total of five years is possible, depending on performance). Salary will be Grade IV/2 according to the scale of the Austrian Academy of Sciences (39,689 Euro per year or higher).

Applications include 1) curriculum vitae, 2) list of publications, 3) statement of the applicant's past and current research experience (max 3 pages), 4) academic certificates, and 5) names of two persons, who are willing to send

letters of recommendation. Applications should be sent electronically via email to luca.fossati@oeaw.ac.at in PDF format. The closing date of applications is March 31, 2015.

The Austrian Academy of Sciences is an equal opportunity employer.

For more information contact Dr Luca Fossati (luca.fossati@oeaw.ac.at).

Contact: luca.fossati@oeaw.ac.at

Post-doctoral fellowship for PLATO

Claudia Dreyer
PLATO Project

Paris Observatory, July 2015

A two-years post-doctoral fellowship, with a possible extension for a third year, is open at the Paris Observatory. The position is expected to start on 2015 July with some flexibility. The work will concern the scientific preparation of the stellar part of core program of the PLATO mission. The candidate must have some expertise in stellar modelling and asteroseismology. He (she) will work with the Meudon team in charge of the workpackage WP120 (Stellar Science). WP120 has the responsibility of specifying the methods and procedures to characterize the stars of the core program (FGK main sequence stars, in particular planet host stars) using the Plato data and insuring that the accuracy of this characterization meets the mission specifications.

The fellowship will be devoted to several stellar and seismic studies specifically designed to consolidate the definition assessment studies. In particular, during the definition and then implementation phases, the post-doc will have:

- to identify and manage hare and hound exercices and simulations that are necessary to provide an estimation of the accuracy of the stellar characterization using the expected Plato data quality.
- to work on some of the most important biases due an improper physical description in stellar models in order to improve the accuracy of the stellar characterization

Expressions of interest should be sent to M.J. Goupil (marie-jo.goupil@obspm.fr) and K. Belkacem (kevin.belkacem@obspm.fr) before 2015 March 30th.

Contact: marie-jo.goupil@obspm.fr and kevin.belkacem@obspm.fr

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

Prof. Ray Jayawardhana

Toronto, Canada, 2015

Applications are invited for one or two postdoctoral fellowships at York University in Toronto. The successful candidate(s) 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. On-going 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. Start

date is negotiable, but summer or fall 2015 is preferred. 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 are accepted until the position is filled, and those received before 2015 May 1 will receive full consideration. Early expressions of interest and inquiries are welcome, and should be made to rayjay@yorku.ca

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

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

Postdoctoral Position in Astrophysics: The formation and evolution of mean-motion resonances in planetary systems

Prof. Ewa Szuszkiewicz
Institute of Physics and CASA*, University of Szczecin, Wielkopolska 15, 70-451 Szczecin, Poland

Institute of Physics and CASA, position available immediately*

A three-year postdoctoral position funded by the Polish National Science Centre through a grant MAESTRO, led by Prof. Ewa Szuszkiewicz, is available immediately at the Astronomy and Astrophysics Group of the Faculty of Mathematics and Physics of the University of Szczecin, Szczecin, Poland. The appointment may be renewed for additional two years, subject to availability of funding. A successful completion of the five-year period may lead to a permanent position. The selected candidate will join the team of Prof. Szuszkiewicz working on the project "The formation and evolution of mean-motion resonances in planetary systems" and will have the possibility of participating in international schools and conferences. Short visits at the University of Toruń and at the DAMTP, University of Cambridge, are also planned. The salary is competitive.

High-quality candidates are sought with a strong background in astrophysics and numerical simulations. Previous experience in hydrodynamical and magnetohydrodynamical astrophysical calculations is required. Familiarity with $N-$body techniques is desirable. Eligible candidates must hold a PhD degree or equivalent by the starting date of the position.

The Faculty of Mathematics and Physics of the University of Szczecin offers an excellent environment for performing cutting-edge research in astronomy and astrophysics. The Astronomy and Astrophysics Group participates in the projects ASTROGRID-PL (devoted to the formation of an integrated IT platform dedicated to astronomical research), and POLFAR (POlish Low Frequency Array). The Faculty of Mathematics and Physics has also very good computational facilities including a HPC cluster equipped with CPUs and GPUs.

Interested applicants should send as soon as possible a cover letter accompanied with a CV and a brief statement of past research and research interests to Prof. Szuszkiewicz at the e-mail address: szusz@feynman.fiz.univ.szczecin.pl. They should also include the e-mail addresses of 3-4 referees willing to write a letter of reference on their behalf. Applications will be reviewed until the position is filled.

Enquiries about the postdoctoral position and the project should be sent to Prof. Ewa Szuszkiewicz at szusz@feynman.fiz.univ.szczecin.pl

Contact: `szusz@feynman.fiz.univ.szczecin.pl`

PhD Position: Exploring Exoplanets with CHEOPS-K2-TESS Synergies

Dr. Christophe Lovis, Prof. Stéphane Udry
Geneva Observatory, University of Geneva, 51 ch. des Maillettes, CH-1290 Versoix, Switzerland

University of Geneva, no later than October 2015

Applications are invited for a PhD position in exoplanet detection and characterization at the Department of Astronomy, University of Geneva. The thesis subject will be centered on the synergies between three major space missions dedicated to exoplanets: CHEOPS, K2, and TESS. The successful candidate will acquire a solid expertise in high-precision space-based photometry, transit search techniques, and transit lightcurve analysis. He/she will apply these skills to ongoing K2 data to search for super-Earths and mini-Neptunes transiting bright stars, and assess their potential for follow-up by the CHEOPS mission. The successful applicant will also develop tools to process TESS data in a timely manner, in view of an efficient follow-up by CHEOPS. He/she will contribute to the construction of the CHEOPS target list, and help in constraining the nature and diversity of the observed super-Earths and mini-Neptunes. The position is funded by the Swiss "PlanetS" National Centre of Competence in Research, which connects Swiss institutions active in planetary sciences and offers a vibrant research environment.

Requirements: Master in Astrophysics / Physics / Mathematics.

Start: The starting date of the position is negotiable, and could start as early as May 2015 but no later than October 2015.

Duration: The position is funded for 4 years.

Salary: A Swiss salary for a PhD candidate is about 50,000 CHF a year.

How to apply: Interested applicants should contact the project leaders, and send within a single pdf file 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. Complete applications received by April 1st, 2015, will receive full consideration. Past this date, applications will be considered depending on availability.

Download/Website: `http://www.exoplanets.ch/`

Contact: `Christophe.Lovis@unige.ch, Stephane.Udry@unige.ch`

Doctoral students in Astronomy and Astrophysics – Formation of asteroids and exoplanets

Anders Johansen
Lund University, Sweden

Lund University, 2015

Research on the formation of planetary systems is in rapid development, fuelled by the wealth of new observational data and the advent of more and more powerful supercomputers. Funding has been obtained to hire three PhD students in theoretical and computational astrophysics at Lund University.
The PhD students will work within the subjects: (1) the formation of super-Earths and gas-giant planets, (2) the formation and orbital evolution of asteroids and their impact history on Earth, and (3) spontaneous particle clumping and planetesimal formation. Together with the other group members, currently 3 postdocs and 5 PhD students, the new PhD students will work in an inspiring environment towards the common goal of understanding the formation of planetary systems around the Sun and other stars.

Candidates should send a curriculum vitae and a brief statement of research interest. The application should also include the names, telephone numbers and e-mail addresses of two persons who have agreed to serve as a reference for the applicant. Note that reference letters should not be sent to us in connection with the application; we will contact the reference persons when required.
The application deadline is 22 May 2015.

Download/Website: `http://www.astro.lu.se/vacancies/`

Contact: `anders@astro.lu.se`

4 Conference announcements

CHEOPS Science Workshop #3

D. Barrado[1], J. Lillo-Box[1], M. Morales[1], E. Pallé[2], I. Ribas[3], R. Alonso[2] D. Queloz[14], the CHEOPS Science Team.
[1] Centro de Astrobiología (INTA-CSIC), Madrid, SPAIN
[2] Instituto de Astrofísica de Canarias, La Laguna, SPAIN
[3] Institut de Ciències de l'Espai (CSIC-IEEC), Barcelona, SPAIN
[4] Cavendish Laboratory, Cambridge, UK

The CHEOPS Science Workshop #3 seeks to bring together a large community of researchers interested in the preparation and exploitation of the CHEOPS mission. CHEOPS will be the first mission dedicated to search for transits by means of ultrahigh precision photometry on bright stars already known to host planets. The launch is planned in late 2017. Participants are invited to proposed contributed talks on all scientific aspects relevant for CHEOPS including synergies with other facilities. The workshop will be held in central Madrid, Spain, in June 17-19, 2015, very close to cultural heart of the city, at the headquarters of the Spanish Centre for Industrial Technological Development (CDTI). The program envisages invited talks, oral contributions and posters. There will be time for discussions.
The meeting is open to everyone.

LOC:
D. Barrado (chair), J. Lillo-Box, M. Morales, E. Pall, I. Ribas, R. Alonso.

SOC:
Didier Queloz and CHEOPS Science team.

Important dates:
Registration is open now.
April 1st, 2015: Abstract submission deadline

Download/Website: `http://www.iac.es/congreso/cheops2015/`

Contact: `cheops2015@iac.es`

Reminder: abstract submission deadline for IAP Colloquium 2015

Jean-Pierre Maillard, Chair of the LOC
Institut d'Astrophysique de Paris, Paris, France

Paris, 29 June - 3 July 2015

Dear colleagues,
The deadline, March 15th, 2015, for submitting an abstract to the 31st IAP Colloquium "From super-Earths to brown dwarfs: Who's Who?" to be held in Paris from June 29th to July 3rd, 2015, is approaching. The scientific topics of this conference to mark the 20th anniversary of the detection of the first exoplanet will focus on the extreme diversity in mass, density, nature, position, orbit and multiplicity of the almost 2000 objects currently identified through:

- the problems of the transition between the typical classes of planets found between Earth-mass planets to brown dwarfs,
- the confrontation of the models of planet formation in this context,
- the examination of the various methods of planet characterization.

The format of the conference will consist of invited talks, contributed papers and poster papers. The list of invited speakers is available on the website of the colloquium.
Early registration is encouraged as the number of participants will be limited approximately to 120. Students who wish to be considered for a IAP grant have to send a letter of motivation. For more details, to register, to submit an abstract, go to the website.
We are looking forward to see you in Paris. On behalf of the Local Organizing Committee

Jean-Pierre Maillard (chair), Arnaud Cassan, Guillaume Hébrard

Download/Website: `http://www.iap.fr/col2015/`
Contact: `conferenceIAP2015@iap.fr`

2015 Sagan Summer Workshop: Exoplanetary System Demographics: Theory and Observation

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

Pasadena, CA, July 27-31, 2015

Registration for the 2015 Sagan Exoplanet Summer Workshop on "Exoplanetary System Demographics: Theory and Observation" hosted by the NASA Exoplanet Science Institute (NExScI) is now available. The workshop will take place on the Caltech campus July 27 - 31, 2015. The workshop is intended for graduate students and postdocs, however all interested parties are welcome to attend. There is no registration fee for the workshop and attendance will be capped at 150 attendees.

The 2015 Sagan Summer Workshop will explore exoplanetary systems through the combined lens of theory and observations. Several observational techniques have now detected and characterized exoplanets, resulting in a large population of known systems. Theoretical models, meanwhile, can synthesize populations of planetary systems as a function of the input physics. Differences between the predicted and the observed distributions of planets provide strong constraints on the physical processes that determine how planetary systems form and evolve, ruling out some old theories while suggesting new ones. Leaders in the field will summarize the current state of the art in exoplanet observations and planet formation theory. Observations needed to discriminate between competing theories will be discussed and compared against the expected improvements in exoplanet detection limits.

We have very limited funding for financial assistance to cover local expenses (e.g. shared hotel room, meals), however, this year we are not able to provide any airfare support. The on-line application for financial support is available on the workshop website. Each application must be accompanied by an advisor's letter of support that specifically addresses financial need. Attendees who are awarded lodging support will be asked to share a hotel room at the workshop hotel.

Attendees will participate in hands-on exercises in which population synthesis models are tuned to match observations. Attendees will also have the opportunity to present their own work through short presentations (research

POPs) and posters.

Important Dates

- February 5, 2015: On-line Registration and Financial Support application period open
- March 5, 2015: Financial Support application due
- March 30, 2015: Financial Support decisions announced via email
- April 6, 2015: POP/Poster/Talk submission period open
- July 10, 2015: On-line Registration closed; final agenda posted
- July 27-31, 2015: Sagan Exoplanet Summer Workshop

Download/Website: `http://nexsci.caltech.edu/workshop/2015`
Contact: `sagan_workshop@ipac.caltech.edu`

2nd Announcement of the ExoMol conference: Spectroscopy of Exoplanets, 24 – 26 July 2015

Jonathan Tennyson[1]*, France Allard*[2]*, Attila Császár*[3]*, Sergey Yurchenko*[1]*, Laura McKemmish*[1]*, Giovanna Tinetti*[1]
[1] Department of Physics & Astronomy, University College London, Gower Street, London, UK
[2] CRAL-ENS, 46, Allée d'Italie, Lyon Cedex 07, France
[3] Eötvös University, Pázmány Péter sétány 1/A, H-1117 Budapest, Hungary

Cumberland Lodge, The Great Park Windsor, Berkshire, SL4 2HP, UK, 24 - 27 July 2015

Registration is now open for the 2nd ExoMol conference "Spectroscopy of Exoplanets", which will be held at Cumberland Lodge near to London. The conference will begin in the morning on 24 July and running through to the evening of 26 July 2015 (departing after breakfast the following day), see `http://www.cumberlandlodge.ac.uk/`.
Cumberland Lodge is a 17th Century house located in Great Windsor Park. It offers easy access to Heathrow and is close to Windsor Castle, which is the oldest and largest occupied castle in the world and the official residence of Her Majesty the Queen. We would aim to visit the castle during the course of the conference. You may like to look at the Cumberland Lodge website: `http://www.cumberlandlodge.ac.uk/`
The provisional programme includes sessions on: Spectroscopy of atmospheres of exoplanets; Molecules in stellar and Galactic context; Sources of opacity data (theoretical and laboratory); Characterising exoplanetary atmospheres; Observational issues; Chemistry and structure of exoplanets as well as Quiz, Windsor Castle Visit, and Karaoke.
Invited speakers are:

- Peter Bernath (ODU, USA)
- Vincent Boudon (Dijon, France)
- Adam Burrows (Princeton, USA)
- Iouli Gordon (Harvard, USA)
- Nikku Madhusudhan (Cambridge, UK)
- Thomas Masseron (Cambridge, UK)

- Amanda Ross (Lyon, France)
- Franck Selsis, (Université Bordeaux)
- Ingo Walman (UCL, UK)

We have gaps for 20 minute talks and posters if you want to present work.
You will find further details including: a registration form, details of payments and abstract submissions on the Conference website.
We very much hope that you will be able to attend the conference.

Download/Website: `http://www.exomol.com/conference/2015/`

Contact: `Sergey Yurchenko: s.yurchenko@ucl.ac.uk`

Vingt ans de recherches sur les exoplanétes

Daniel Rouan
LESIA - Observatoire de Paris

Académie des sciences, Institut de France, Paris, 31 March 2015

- Daniel ROUAN: Introduction : détection des exoplanètes et bilan des propriétés statistiques
- Michel MAYOR: 20 ans après la découverte de la première exoplanète 51 Peg b , bilan et perspectives de la détection par les vitesses radiales
- Magali DELEUIL: Les transits planétaires ou un autre regard sur les exoplanètes
- Anne-Marie LAGRANGE: Détection directe des exoplanètes
- Jacques LASKAR: Dynamique des systèmes planétaires extra solaires
- Willy BENZ: La formation des planètes 20 ans aprs la découverte de 51 Peg b
- Gilles CHABRIER: Composition et structure interne des exoplanètes
- Franck SELSIS: Chercher des signatures de vie dans les atmosphères d'exoplanètes

Download/Website: `http://www.academie-sciences.fr/activite/conf/debat_310315.pdf`

Contact: `daniel.rouan@obspm.fr`

XXIX IAU General Assembly Focus Meeting 13: Brightness Variations of the Sun and Sun-like Stars

Natalie Krivova on behalf of the SOC
Max-Planck-Institut fur Sonnensystemforschung, Germany

Honolulu, Hawaii, 5-6 August 2015

The Focus meeting will address the following key topics:

- Measurements of solar irradiance variability.
- Stellar variability on rotational time scales; Kepler and Corot measurements.
- Stellar variability on activity cycle time scales; ground based observations.

- Physical mechanisms and models of solar and stellar brightness variability.
- The photometric signature of magnetic activity: darker or brighter?
- Is the Sun a solar-type variable?
- Constraining dynamo models using solar and stellar variability records.
- Influence of solar and stellar variability on Earth and other planets.
- Stellar variability as a limiting factor for detectability of extra-solar planets.

Agenda:

- Session 1: Observing solar and stellar variability.
- Session 2: The solar-stellar connection.
- Session 3: Modelling solar and stellar variability.
- Session 4: The impact of solar and stellar variability on their environment.

Invited speakers confirmed to date include Suzanne Aigrain, Gibor Basri, Fabienne Bastien, Benjamin Beeck, Paul Charbonneau, Rim Fares, Edward Guinan, Heidi Korhonen, Dibyendu Nandi, Steven Saar, Sami Solanki, Tom Woods.

Scientific Organizing Committee: Gibor Basri (co-chair), Arnab Rai Choudhuri, Jie Jiang, Philip Judge (co-chair), Greg Kopp, Natalie Krivova (co-chair), Stephen Marsden, Katalin Olah, Pascal Petit, Alexander Shapiro (co-chair), Yvonne Unruh

The deadline for abstract submission is March 18, 2015.

Please visit http://astronomy2015.org/abstracts for abstract submission and further information.
The official website of the Focus meeting is http://astronomy2015.org/focus_meeting_13

Download/Website: `http:www2.mps.mpg.de/projects/sun-climate/iau_fm13.html`

5 Announcements

Fizeau exchange visitors program in optical interferometry – call for applications

European Interferometry Initiative

www.european-interferometry.eu, application deadline: Mar. 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 March 15. Fellowships can be awarded for missions starting in May 2015.

NOTE: a special Fizeau call will be issued in late April for financial support requests for the VLTI school 2015 in Cologne: http://www.astro.uni-koeln.de/vltischool2015
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`

2015B NASA Keck Call for General Observing Proposals

Dr. Dawn M. Gelino
NASA Exoplanet Science Institute

Proposals Due: March 19, 2015, 4 pm PDT

NASA is soliciting proposals for the use of the two 10m W. M. Keck Telescopes for the 2015B observing semester (Aug. 1, 2015 - Jan. 31, 2016). Complete call information is available on the website below and all proposals are due by **19 March 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. NASA Keck time is open to a wide range of disciplines and proposals are sought in the following 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.

The proposal process is being handled by the NASA Exoplanet Science Institute (NExScI) at Caltech.

Selected Highlights for 2015B (see call website for complete information)

1. In order to support installation and testing of the new Keck II laser, the Keck II LGS AO system will be unavailable for science in semester 2015B between Oct. 7, 2015 and Jan. 31, 2016. The Keck II NGS AO system will be available for science throughout semester 2015B. In semester 2016A, the Keck II LGS AO system will be available for shared-risk science beginning on April 1, 2016
2. NIRSPEC will be unavailable for science beginning in August 2015 and continuing until mid-Spetember 2015 for routine servicing.

3. OSIRIS will be unavailable for science beginning in December 2015 and continuing through February 2016 for the first of two detector upgrades.

4. Check the WMKO instrument page. Note that NASA will not accept shared risk proposals for the NIRIS instrument for semester 2015B.

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 February 2015. If you see any that we missed, please let us know and we'll include them in the next issue.

astro-ph/1502.00004 : **Characterizing Transiting Planet Atmospheres through 2025** by *N.B. Cowan, et al.*
astro-ph/1502.00576 : **High-energy irradiation and mass loss rates of hot Jupiters in the solar neighborhood** by *M. Salz, et al.*
astro-ph/1502.00806 : **Exoplanets: Gaia and the importance of ground based spectroscopy follow-up** by *L. Benamati, et al.*
astro-ph/1502.01160 : **Critical core mass for enriched envelopes: the role of H2O condensation** by *J. Venturini, et al.*
astro-ph/1502.01398 : **Constraint on Additional Planets in Planetary Systems Discovered through the Channel of High-magnification Gravitational Microlensing Events** by *I.-G. Shin, et al.*
astro-ph/1502.01834 : **Constraining the orbits of sub-stellar companions imaged over short orbital arcs** by *Tim D. Pearce, Mark C. Wyatt, Grant M. Kennedy*
astro-ph/1502.01952 : **Asynchronous rotation of Earth-mass planets in the habitable zone of lower-mass stars** by *Jeremy Leconte, et al.*
astro-ph/1502.02035 : **Discovery of Resolved Debris Disk Around HD 131835** by *Li-Wei Hung, et al.*
astro-ph/1502.02038 : **Planetary Candidates Observed by Kepler VI: Planet Sample from Q1-Q16 (47 Months)** by *F. Mullally, et al.*
astro-ph/1502.02040 : **The Pseudo-zodi Problem for Edge-on Planetary Systems** by *Christopher C. Stark, Marc J. Kuchner, Andrew Lincowski*
astro-ph/1502.02132 : **Jupiter as an exoplanet: UV to NIR transmission spectrum reveals hazes, a Na layer and possibly stratospheric H2O-ice clouds** by *P. Montanes-Rodriguez, et al.*
astro-ph/1502.02315 : **The dynamical structure of HR 8799's inner debris disk** by *Bruna Contro, et al.*
astro-ph/1502.02662 : **One-armed spirals in locally isothermal, radially structured self-gravitating discs** by *Min-Kai Lin*
astro-ph/1502.02937 : **Planetary Systems and the Formation of Habitable Planets** by *Rudolf Dvorak, et al.*
astro-ph/1502.03092 : **Improving Signal to Noise in the Direct Imaging of Exoplanets and Circumstellar Disks** by *Zahed Wahhaj, et al.*
astro-ph/1502.03267 : **Kepler-447b: a hot-Jupiter with an extremely grazing transit** by *J. Lillo-Box, et al.*
astro-ph/1502.03270 : **Convection and Mixing in Giant Planet Evolution** by *Allona Vazan, et al.*
astro-ph/1502.03441 : **Refined Properties of the HD 130322 Planetary System** by *Natalie R. Hinkel, et al.*
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