ExoPlanet News
An Electronic Newsletter

No. 53, October 1st, 2012

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1 Editorial

Welcome to the fifty third edition of ExoPlanet News. As usual, this month's newsletter contains a wide selection of abstracts reporting the latest discoveries in the field of exoplanet science.
If any readers have suggestions for other types of content that they would like to see included in the newsletter, please let the editors know.
The next edition of the newsletter is planned for the beginning of November 2012. Please send anything relevant to exoplanet@open.ac.uk, and it will appear then. 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.

Best wishes
Andrew Norton & Glenn White
The Open University

2 Abstracts of refereed papers

Stellar companions to exoplanet host stars: Lucky Imaging of transiting planet hosts

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1209.4087)

Observed properties of stars and planets in binary/multiple star systems provide clues to planet formation and evolution. We extended our survey for visual stellar companions to the hosts of transiting exoplanets by 21 stars, using the Lucky Imaging technique with the two AstraLux instruments: AstraLux Norte at the Calar Alto 2.2-m telescope, and AstraLux Sur at the ESO 3.5-m New Technology Telescope at La Silla. Typically a sensitivity to companions of magnitude difference $\Delta z' \approx 4$ is achieved at angular separation $\rho = 0.5''$ and $\Delta z' > 6$ for $\rho = 1''$. We present observations of two previously unknown binary candidate companions, to the transiting planet host stars HAT-P-8 and WASP-12, and derive photometric and astrometric properties of the companion candidates. The common proper motions of the previously discovered companion candidates with the exoplanet host stars TrES-4 and WASP-2 are confirmed from follow-up observations. A Bayesian statistical analysis of 31 transiting exoplanet host stars observed with AstraLux suggests that the companion star fraction of planet hosts is not significantly different from that of solar-type field stars, but that the binary separation is on average larger for planet host stars.

Download/Website: `http://arxiv.org/abs/1209.4087`

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Hint of a transiting extended atmosphere on 55 Cancri b

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Astronomy & Astrophysics, accepted

The naked-eye star 55 Cancri hosts a planetary system with five known planets, including a hot super-Earth (55 Cnc e) extremely close to its star and a farther out giant planet (55 Cnc b), found in milder irradiation conditions with respect to other known hot Jupiters. This system raises important questions on the evolution of atmospheres for close-in exoplanets, and the dependence with planetary mass and irradiation. These questions can be addressed by Lyman-α transit observations of the extended hydrogen planetary atmospheres, complemented by contemporaneous measurements of the stellar X-ray flux. In fact, planet 'e' has been detected in transit, suggesting the system is seen nearly edge-on. Yet, planet 'b' has not been observed in transit so far. Here, we report on *Hubble Space Telescope* STIS Lyα and *Chandra* ACIS-S X-ray observations of 55 Cnc. These simultaneous observations cover two transits of 55 Cnc e and two inferior conjunctions of 55 Cnc b. They reveal the star as a bright Lyα target and a variable X-ray source. While no significant signal is detected during the transits of 55 Cnc e, we detect a surprising Lyα absorption of $7.5 \pm 1.8\%$ ($4.2\ \sigma$) at inferior conjunctions of 55 Cnc b. The absorption is only detected over the range of Doppler velocities where the stellar radiation repels hydrogen atoms towards the observer. We calculate a false-alarm probability of 4.4%, which takes into account the a-priori unknown transit parameters. This result suggests the possibility that 55 Cnc b has an extended upper HI atmosphere, which undergoes partial transits when the planet grazes the stellar disc. If confirmed, it would show that planets cooler than hot Jupiters can also have extended atmospheres.

Download/Website: `http://ipag.osug.fr/~dehrenre/articles/preprint55cnc.pdf`

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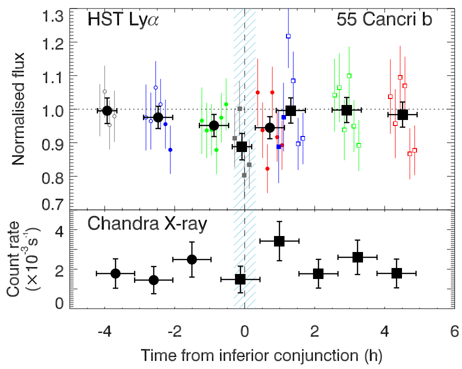

Figure 1: (Ehrenreich et al.) *Top.* Lyman-α light curve integrated between 1 215.36 and 1 215.67 Å or between -76.5 and $0\ km\ s^{-1}$. The exposures from visits 1 (small circles) and 2 (small squares) have been phase-folded around the period of 55 Cnc b. The different colours (grey, blue, green, red) correspond to the four orbits in each visit. Exposures considered in and out of transit are differenciated by filled and empty symbols, respectively. The large black symbols (circles for visit 1, squares for visit 2) are the flux averages per orbit. The sky-blue hatched region shows the $\pm$19-min uncertainty on the inferior conjunction time. *Bottom. Chandra* X-ray count rate integrated over $\sim$ 1-h bins.

EXOFAST: A fast exoplanetary fitting suite in IDL

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PASP, Submitted (arXiv:1206.5798)

We present EXOFAST, a fast, robust suite of routines written in IDL which is designed to fit exoplanetary transits and radial velocity variations simultaneously or separately, and characterize the parameter uncertainties and covariances with a Differential Evolution Markov Chain Monte Carlo method. We describe how our code self-consistently incorporates both data sets to simultaneously derive stellar parameters along with the transit and RV parameters, resulting in more self-consistent results on an example fit of the discovery data of HAT-P-3b that is well-mixed in under two minutes on a standard desktop computer. We describe in detail how our code works and outline ways in which the code can be extended to include additional effects or generalized for the characterization of other data sets – including non-planetary data sets. We discuss the pros and cons of several common ways to parameterize eccentricity, highlight a subtle mistake in the implementation of MCMC that could bias the inferred eccentricity of intrinsically circular orbits to significantly non-zero results, discuss a problem with IDL's built-in random number generator in its application to large MCMC fits, and derive a method to analytically fit the linear and quadratic limb darkening coefficients of a planetary transit. Finally, we explain how we achieved improved accuracy and over a factor of 100 improvement in the execution time of the transit model calculation. Our entire source code, along with an easy-to-use online interface for several basic features of our transit and radial velocity fitting, are available online at http://astroutils.astronomy.ohio-state.edu/exofast.

Download/Website: `http://astroutils.astronomy.ohio-state.edu/exofast/`

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On the origin of elemental abundances in the terrestrial planets

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Icarus, accepted for publication (arXiv: 1209.3635)

The abundances of elements in the Earth and the terrestrial planets provide the initial conditions for life and clues as to the history and formation of the Solar System. We follow the pioneering work of Bond et al. (2010) and combine circumstellar disk models, chemical equilibrium calculations and dynamical simulations of planet formation to study the bulk composition of rocky planets. We use condensation sequence calculations to estimate the initial abundance of solids in the circumstellar disk with properties determined from time dependent theoretical models. We combine this with dynamical simulations of planetesimal growth that trace the solids during the planet formation process and which include the effects of gravitational and hydrodynamical mixing. We calculate the elemental abundances in the resulting rocky planets and explore how these vary with the choice of disk model and the initial conditions within the Solar Nebula.
Although certain characteristics of the terrestrial planets in the Solar System could be reproduced, none of our models could reproduce the abundance properties of all the planets. We found that the choice of the initial planetesimal disk mass and of the disk model has a significant effect on composition gradients. Disk models that give higher pressure and temperature result in larger variations in the bulk chemical compositions of the resulting planets due to inhomogeneities in the element abundance profiles and due to the different source regions of the planets in the dynamical simulations. We observed a trend that massive planets and planets with relatively small semi-major axes are more sensitive to these variations than smaller planets at larger radial distance. Only these large variations in the

simulated chemical abundances can potentially explain the diverse bulk composition of the Solar System planets, whereas Mercury's bulk composition can not be reproduced in our approach.

Download/Website: http://arxiv.org/abs/1209.3635

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Near-UV Absorption, Chromospheric Activity, and Star-Planet Interactions in the WASP-12 system.

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Astrophysical Journal, in press

Extended gas clouds have been previously detected surrounding the brightest known close-in hot Jupiter exoplanets, HD 209458 b and HD 189733 b; we observed the distant but more extreme close-in hot Jupiter system, WASP-12, with HST. Near-UV (NUV) transits up to three times deeper than the optical transit of WASP-12 b reveal extensive diffuse gas, extending well beyond the Roche lobe. The distribution of absorbing gas varies between visits. The deepest NUV transits are at wavelength ranges with strong photospheric absorption, implying the absorbing gas may have temperature and composition similar to the stellar photosphere. Our spectra reveal significantly enhanced absorption (greater than 3σ below the median) at $\sim$ 200 individual wavelengths on each of two HST visits; 65 of these wavelengths are consistent between the two visits, using a strict criterion for velocity matching which excludes matches with velocity shifts exceeding $\sim 20\,\mathrm{km\,s^{-1}}$. Excess transit depths are robustly detected throughout the inner wings of the Mg2 resonance lines independently on both HST visits. We detected absorption in Fe2 2586Å, the heaviest species yet detected in an exoplanet transit. The Mg2 line cores have zero flux, emission cores exhibited by every other observed star of similar age and spectral type are conspicuously absent. WASP-12 probably produces normal Mg2 profiles, but the inner portions of these strong resonance lines are likely affected by extrinsic absorption. The required Mg^+ column is an order of magnitude greater than expected from the ISM, though we cannot completely dismiss that possibility. A more plausible source of absorption is gas lost by WASP-12 b. We show that planetary mass loss can produce the required column. Our Visit 2 NUV light curves show evidence for a stellar flare. We show that some of the possible transit detections in resonance lines of rare elements may be due instead to non-resonant transitions in common species. We present optical observations and update the transit ephemeris.

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Planetesimal Formation in Self-Gravitating Discs

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Monthly Notices of the Royal Astronomical Society, in press/published (arXiv 1207.4677)

We study particle dynamics in local two-dimensional simulations of self-gravitating accretion discs with a simple cooling law. It is well known that the structure which arises in the gaseous component of the disc due to a gravitational instability can have a significant effect on the evolution of dust particles. Previous results using global simulations indicate that spiral density waves are highly efficient at collecting dust particles, creating significant local over-densities which may be able to undergo gravitational collapse. We expand on these findings, using a range of cooling times to mimic the conditions at a large range of radii within the disc. We use the PENCIL code to solve the 2D local shearing sheet equations for gas on a fixed grid together with the equations of motion for solids coupled to the gas solely through aerodynamic drag force. We find that spiral density waves can create significant enhancements in the surface density of solids, equivalent to $1-10$cm sized particles in a typical self-gravitating disc around a $\sim 1M_\odot$ star, causing it to reach concentrations several orders of magnitude larger than the particles mean surface density (Figure 1). We also study the velocity dispersion of the particles, finding that the spiral structure can result in the particle velocities becoming highly ordered, having a narrow velocity dispersion. This implies low relative velocities between particles, which in turn suggests that collisions are typically low energy, lessening the likelihood of grain destruction. Both these findings suggest that the density waves that arise due to gravitational instabilities in the early stages of star formation provide excellent sites for the formation of large, planetesimal-sized objects.

Download/Website: `http://arxiv.org/abs/1207.4677`

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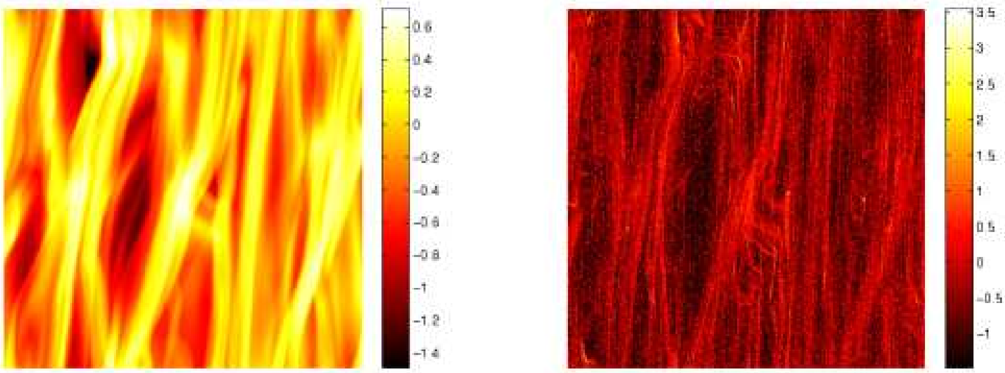

Figure 2: (Gibbons et al.) Logarithmic surface density of gas (left) and dust particles (right) once the disc has reached a quasi-steady state (after 30 orbital periods) at an orbital radius of $\sim$ 50AU. We see that the dust particles tend to be captured most effectively in the density structures within the gas, reaching local density enhancements of ~ 100 times the average particle density.

Colors of extreme exoEarth environments

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Astrobiology, in press (arXiv:1209.4098)

Context. The search for extrasolar planets has already detected rocky planets and several planetary candidates with minimum masses that are consistent with rocky planets in the Habitable Zone of their host stars. A low-resolution spectrum in the form of a color-color diagram of an exoplanet is likely to be one of the first post-detection quantities to be measured for the case of direct detection.
Aims. In this paper, we explore potentially detectable surface features on rocky exoplanets and their connection to and importance as a habitat for extremophiles, as known on Earth. Extremophiles provide us with the minimum known envelope of environmental limits for life on our planet.
Methods. The color of a planet reveals information on its properties, especially for surface features of rocky planets with clear atmospheres. We use filter photometry in the visible as a first step in the characterization of rocky exoplanets to prioritize targets for follow up spectroscopy.
Results. Many surface environments on Earth have characteristic albedos and occupy a different color space in the visible waveband (0.4 $\mu m - 0.9\ \mu m$) that can be distinguished remotely. These detectable surface features can be linked to the extreme niches that support extremophiles on Earth and provides a link between geomicrobiology and observational astronomy. This paper explores how filter photometry can serve as a first step in characterizing Earth-like exoplanets for an aerobic as well as an anaerobic atmosphere thereby prioritizing targets to search for atmospheric biosignatures.

Download/Website: `http://arxiv.org/abs/1209.4098`

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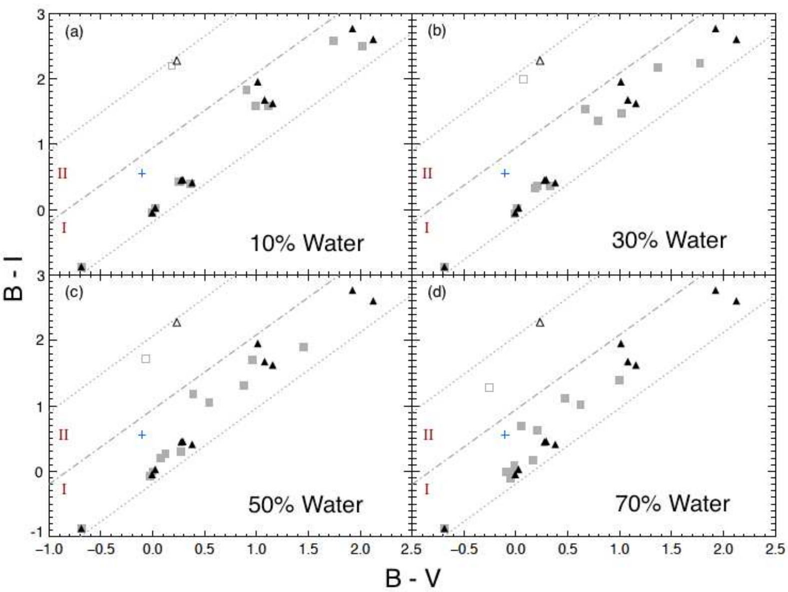

Figure 3: (Hegde & Kaltenegger) Color-color diagrams for mixed surfaces. Filled triangles represent a planet completely covered by a particular surface. Filled squares denote the case when the planet is (a) 90%, (b) 70%, (c) 50% and (d) 30% covered by a particular surface with the rest being liquid water. Trees are shown as non-filled triangles (complete coverage) and squares as reference to other VRE studies. Blue data point represents Present-day Earth. Region I defines the area of extreme Earth surfaces, region II includes surface vegetation for non-extreme forms of life.

Exomoon habitability constrained by energy flux and orbital stability

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Astronomy & Astrophysics, in press (arXiv: 1209.0050)

Detecting massive satellites of extrasolar planets has now become feasible, which leads us naturally to questions about their habitability. Here I present constraints on exomoon habitability by stellar plus planetary illumination, tidal heating, eclipses, and orbital stability. Moons in low-mass stellar systems must orbit their planet very closely to remain bound, which puts them at risk of strong tidal heating. As a working hypothesis, orbital stability is assumed if the moon's orbital period is less than 1/9 of the planet's orbital period. I first describe the effect of eclipses on the orbit-averaged stellar illumination of satellites, then I calculate the average energy flux at the top of the atmosphere. Habitability is defined by a scaling relation at which a moon loses its water by the runaway greenhouse process. Due to eclipses, a satellite in a close orbit can experience a reduction in orbit-averaged stellar flux by up to about $6\,\%$. The smaller the semi-major axis and the lower the inclination of the moon's orbit, the stronger the reduction. I find a lower mass limit of $\sim\ 0.2\,M_{\odot}$ for exomoon host stars to avoid the runaway greenhouse effect. Precise estimates depend on the satellite's orbital eccentricity. Deleterious effects on exomoon habitability may occur up to $0.5\,M_{\odot}$. Although the habitable zone lies close to low-mass stars, which allows for many transits of planet-moon binaries within a given observation cycle, resources should not be spent to trace habitable satellites around them. Gravitational perturbations by the star, another planet, or another satellite induce eccentricities that likely make any moon uninhabitable. Estimates for individual systems require dynamical simulations that include perturbations among all bodies and tidal heating in the satellite.

Download/Website: `http://arxiv.org/abs/1209.0050`

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Figure 4: (Heller) The image shows a hypothetical Earth-sized exomoon in a Europa-wide orbit about the Neptune-sized planet Kepler-22b, which has recently been detected in the habitable zone about a Sun-like star.

Exomoon habitability constrained by illumination and tidal heating

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Astrobiology, in press (http://arxiv.org/abs/1209.5323)

The detection of moons orbiting extrasolar planets ("exomoons") has now become feasible. Once discovered in the circumstellar habitable zone, questions about their habitability will emerge. Exomoons are likely to be tidally locked to their planet, and hence experience days much shorter than their orbital period around the star, and have seasons all of which works in favor of habitability. These satellites can receive more illumination per area than their host planets, as the planet reflects stellar light and emits thermal photons. On the contrary, eclipses can significantly alter local climates on exomoons by reducing stellar illumination. In addition to radiative heating, tidal heating can be very large on exomoons, possibly even large enough for sterilization. We identify combinations of physical and orbital parameters for which radiative and tidal heating are strong enough to trigger a runaway greenhouse. By analogy with the circumstellar habitable zone, these constraints define a circum-planetary "habitable edge". We apply our model to hypothetical moons around the recently discovered exoplanet Kepler-22b and the giant planet candidate KOI211.01 and describe, for the first time, the orbits of habitable exomoons. If either planet hosted a satellite at a distance greater than ten planetary radii, then this could indicate the presence of a habitable moon.

Download/Website: `http://www.aip.de/People/RHeller`

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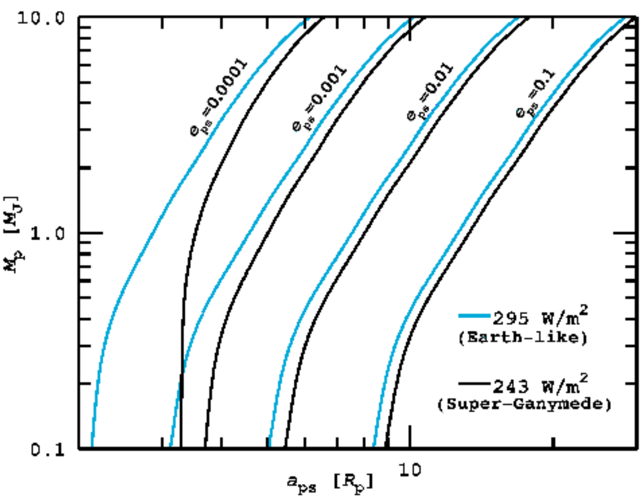

Figure 5: (Heller & Barnes) The "Habitable edge" of extrasolar moons. Abscissa gives semi-major axis of the planet-satellite orbit (in units of planetary radii), ordinate indicates mass of the planet. Contours present the innermost orbits to prevent a runaway greenhouse process of an Earth-like (blue lines) and a Super-Ganymede (10 $M_{\rm Gan}$, black lines) exomoon. Their host planet is at 1 AU from a Sun-like star. Habitable edges for four different orbital eccentricities $e_{\rm ps}$ of the moons' orbits are shown. The larger $e_{\rm ps}$, the stronger tidal heating and the more distant from the planet will the critical flux be reached.

On the convergence of the critical cooling timescale for the fragmentation of self-gravitating discs

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1209.1107)

We carry out simulations of gravitationally unstable discs using a Smoothed Particle Hydrodynamics (SPH) code and a grid-based hydrodynamics code, FARGO, to understand the previous non-convergent results reported by Meru & Bate (2011a). We obtain evidence that convergence with increasing resolution occurs with both SPH and FARGO and in both cases we find that the critical cooling timescale is larger than previously thought. We show that SPH has a first-order convergence rate while FARGO converges with a second-order rate. We show that the convergence of the critical cooling timescale for fragmentation depends largely on the numerical viscosity employed in both SPH and FARGO. With SPH, particle velocity dispersion may also play a role. We show that reducing the dissipation from the numerical viscosity leads to larger values of the critical cooling time at a given resolution. For SPH, we find that the effect of the dissipation due to the numerical viscosity is somewhat larger than had previously been appreciated. In particular, we show that using a quadratic term in the SPH artificial viscosity ($\beta_{\rm SPH}$) that is too low appears to lead to excess dissipation in gravitationally unstable discs, which may affect any results that sensitively depend on the thermodynamics, such as disc fragmentation. We show that the two codes converge to values of the critical cooling timescale, $\beta_{\rm crit} > 20$ (for a ratio of specific heats of $\gamma = 5/3$), and perhaps even as large as $\beta_{\rm crit} \approx 30$. These are approximately $3 - 5$ times larger than has been found by most previous studies. This is equivalent to a maximum gravitational stress that a disc can withstand without fragmenting of $\alpha_{\rm GI,crit} \approx 0.013 - 0.02$, which is much smaller than the values typically used in the literature. It is therefore easier for self-gravitating discs to fragment than has been concluded from most past studies.

Download/Website: `http://arxiv.org/abs/1209.1107`

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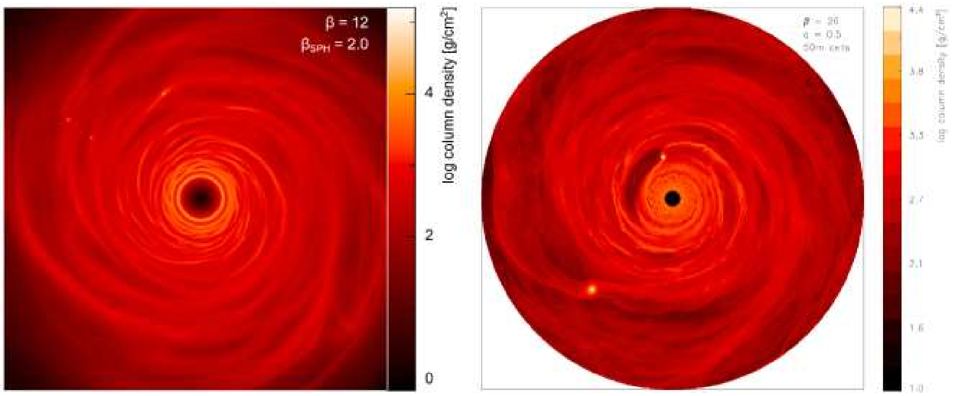

Figure 6: (Meru & Bate) Surface mass density rendered image of discs modelled using SPH (left panel) and FARGO (right panel). The left image shows a disc modelled with 2 million particles, with SPH artificial viscosity parameters of $(\alpha_{\rm SPH}, \beta_{\rm SPH}) = (0.1, 2.0)$, and a cooling timescale, $\beta = 12$. The right image shows a disc modelled using 50 million grid cells, with an artificial viscosity parameter, $q = 0.5$, and a cooling timescale, $\beta = 26$. Both images show fragmentation despite the cooling timescale being larger than previously thought was necessary for fragments to form.

Tidal evolution of close-in giant planets: Evidence of type II migration?

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Monthly Notices of the Royal Astronomical Society, published (2012MNRAS.425.2567R)

It is well accepted that 'hot Jupiters' and other short-period planets did not form *in situ*, as the temperature in the protoplanetary disc at the radius at which they now orbit would have been too high for planet formation to have occurred. These planets, instead, form at larger radii and then move into the region in which they now orbit. The exact process that leads to the formation of these close-in planets is, however, unclear and it seems that there may be more than one mechanism that can produce these short-period systems. Dynamical interactions in multiple-planet systems can scatter planets into highly eccentric orbits which, if the pericentre is sufficiently close to the parent star, can be tidally circularised by tidal interactions between the planet and star. Furthermore, systems with distant planetary or stellar companions can undergo Kozai cycles which can result in a planet orbiting very close to its parent star. However, the most developed model for the origin of short period planets is one in which the planet exchanges angular momentum with the surrounding protoplanetary disc and spirals in towards the central star. In the case of 'hot Jupiters', the planet is expected to open a gap in the disc and migrate in, what is known as, the Type II regime. If this is the dominant mechanism for producing 'hot Jupiters' then we would expect the currect properties of observed close-in giant planets to be consistent with an initial population resulting from Type II migration followed by evolution due to tidal interactions with the central star. We consider initial distributions that are consistent with Type II migration and find that after tidal evolution, the final distributions can be consistent with that observed. Our results suggest that a modest initial pile-up at $a \sim 0.05$ au is required and that the initial eccentricity distribution must peak at $e \sim 0$. We also suggest that if higher-mass close-in exoplanets preferentially have higher eccentricities than lower-mass exoplanets, this difference is primordial and is not due to subsequent evolution.

Download/Website: `http://www.roe.ac.uk/~wkmr`

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Bright low mass eclipsing binary candidates observed by STEREO

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Monthly Notices of the Royal Astronomical Society, in press, arXiv1209.2014

Observations from the Heliospheric Imagers (HI-1) on both the *STEREO* spacecraft have been analysed to search for bright low mass eclipsing binaries (EBs) and potential brown dwarf transits and to determine the radii of the companions. A total of 9 EB candidates have been found, ranging in brightness from $V = 6.59$ mag to $V = 11.3$ mag, where the radius of the companion appears to be less than $0.4R_{\odot}$, with a diverse range of host temperatures, from 4074 K to 6925 K. Both components of one candidate, BD-07 3648, appear to be less than $0.4R_{\odot}$ and this represents a particularly interesting system for further study. The shapes of the eclipses in some cases are not clear enough to be certain they are total and the corresponding radii found should therefore be considered as lower limits. The EBs reported in this paper have either been newly found by the present analysis, or previously reported to be eclipsing by our earlier *STEREO*/HI-1 results. One of the new objects has subsequently been confirmed using archival SuperWASP data. This study was made possible by using an improved matched filter extraction algorithm, which is described in this paper.

Download/Website: `http://arxiv.org/abs/1209.2014`

Contact: `k.t.wraight@open.ac.uk`

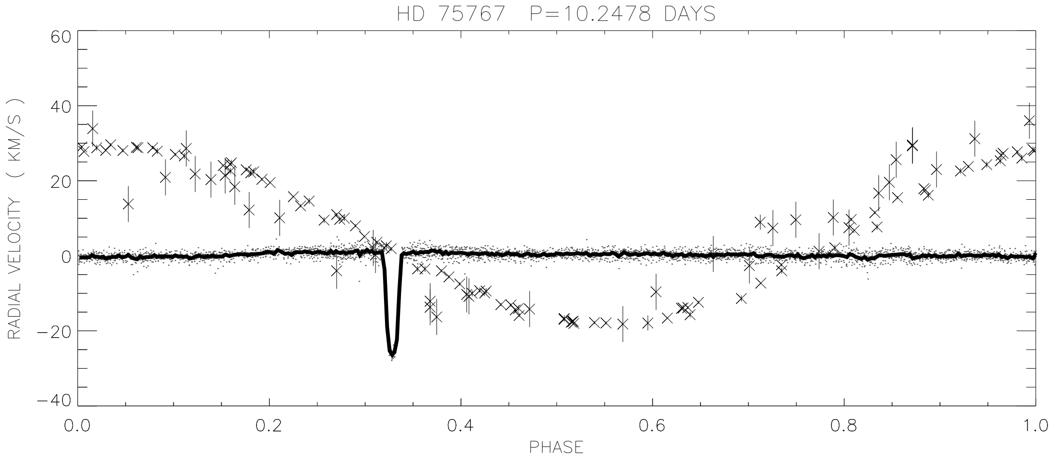

Figure 7: (Wraight et al.) Radial velocity data of HD 75767 collected from Griffin (1991) and Fuhrmann et al. (2005) with the phase-folded lightcurve of STEREO/HI-1 overlaid in phase and set to 0 km/s. The errors on the RV data points are the rms residuals given in Griffin (1991) and as specified for each data point from Fuhrmann et al. (2005). The larger errors are from photographic observations originating in Sanford (1931).

3 Jobs and Positions

Postdoctoral Research Assistant in Advanced Data Analysis for Exoplanets

S. Aigrain[1], *S. Roberts*[2]
[1] Sub-department of Astrophysics, Department of Physics, University of Oxford, UK
[2] Pattern Recognition and Machine Learning Group, Department of Engineering Science, University of Oxford, UK

Oxford, April 2013 (or soon thereafter)

We are seeking to recruit a postdoctoral research assistant to work on Bayesian methods for the analysis of a range of exoplanet datasets at the University of Oxford. This appointment is part of a new collaborative research project between the groups of Dr S. Aigrain (Astrophysics) and Prof S. Roberts (Pattern Recognition and Machine Learning), funded by the Leverhulme Trust. The overal goal of the project is to produce a toolbox of robust and scalable algorithms inspired by the latest developments in the machine learning literature, but specifically designed to model exoplanet signals. The research assistant will help develop models for planetary signals combined with irregular or quasi-periodic variability, and non-parametric instrumental systematics models. These will be used to improve the detectability of small planets in the presence of stellar activity, and the characterization of their bulk and atmospheric properties.
This appointment is for 2 years initially commencing 1 April 2013 or soon thereafter, with the possibility of extension by one more year subject to satisfactory performance and funding. The successful candidate will hold a PhD in astrophysics, statistics, or a directly related field, have excellent computational skills, and be highly motivated and keen to engage with both theoretical and practical aspects of the project. Only applications received by midday on Friday 30th November 2012 can be considered. For further particulars and information on how to apply, see URL below. For further enquiries contact Dr S. Aigrain or Prof S. Roberts (email addresses below).

Download/Website: `https://www.recruit.ox.ac.uk/pls/hrisliverecruit/erq_jobspec_version_4.jobspec?p_id=104576`

Contact: `s.aigrain1@physics.ox.ac.uk, sjrob@robots.ox.ac.uk`

EChO instrument modelling scientist

Vincent Coudé du Foresto
LESIA – Paris Observatory

Greater Paris area, Jan. 1st, 2013 or earlier if possible

A postdoc-level position is open for an instrument modelling scientist to work on the study of the EChO space mission (Exoplanet Characterization Observatory). Details are to be found at this URL : http://www.obspm.fr/postes/ECHO-2013.pdf .

Download/Website: `http://www.obspm.fr/postes/ECHO-2013.pdf`

Contact: `vincent.foresto@obspm.fr`

2013 NASA Sagan Fellowship Program

Dr. Dawn M. Gelino
NASA Exoplanet Science Institute

Applications Due: Nov. 1, 2012, Start Date: Fall 2013

The NASA Exoplanet Science Institute announces the 2013 Sagan Postdoctoral Fellowship Program and solicits applications for fellowships to begin in the Fall of 2013.
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 area. 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, 2010, 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: http://nexsci.caltech.edu/sagan/fellowship.shtml
Applicants must follow the instructions given in this Announcement. Applications must be submitted electronically through the above website. Inquiries about the Sagan Fellowships may be directed to saganfellowship@ipac.caltech.edu
The deadline for both applications and letters of reference is Thursday, November 1, 2012. Offers will be made before February 1, 2013 and new appointments are expected to begin on or about September 1, 2013.

Download/Website: `nexsci.caltech.edu/sagan/fellowship.shtml`

Contact: `saganfellowship@ipac.caltech.edu`

Associate Professor in Astrophysics, Stockholm

Garrelt Mellema
Department of Astronomy, Stockholm University, Stockholm, Sweden

Department of Astronomy, Stockholm University, Deadline for applications: November 20, 2012

The department of Astronomy at Stockholm University announces an Associate Professor position in Astrophysics, with the subject area including theoretical or observational studies for the formation of stars and planetary systems, as well as exoplanets. Deadline for application: Nov 20, 2012.
Approximately 50 people are actively working at the Department of Astronomy, Stockholm University. The activities include research, education and outreach. The research span over a wide range of subjects, from the sun, exoplanets, the formation and death of stars, and galaxies to the distant and early universe. Through the Swedish memberships in ESO and ESA there is access to world class observational facilities.
Fluency in the Swedish language is not a requirement. However, some undergraduate teaching at the department is in Swedish. If the candidate who is hired is not fluent in Swedish, he or she will be given opportunity to learn the language during the first few years.
For more information, see the web link given below or contact the department's director Göran Östlin at the mail address given below.
Please note that all applications have to be submitted through the Stockholm University web-based application form.

Download/Website: `http://www.astro.su.se/english/about-us/vacancies`

Contact: `ostlin@astro.su.se`

4 Announcements

Fizeau exchange visitors program in optical interferometry - call for applications

European Interferometry Initiative

www.european-interferometry.eu, application deadline: Sept. 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). Applicants are strongly encouraged to seek also partial support from their home or host institutions.

The deadline for applications is October 15. Fellowships can be awarded for missions starting in January 2013, pending contractual procedures in FP7.
Further informations and application forms can be found at: www.european-interferometry.eu
The program is funded by OPTICON/FP7.

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`

5 As seen on astro-ph

The following list contains all the entries relating to exoplanets that we spotted on astro-ph during September 2012. If you see any that we missed, please let us know and we'll include them in the next issue.

astro-ph/1209.0013: **From dust to planetesimals: an improved model for collisional growth in protoplanetary disks** by *Pascale Garaud et al.*

astro-ph/1209.0050: **Exomoon habitability constrained by energy flux and orbital stability** by *René Heller*

astro-ph/1209.0101: **The Spin Effect on Planetary Radial Velocimetry of Exoplanets** by *Hajime Kawahara*

astro-ph/1209.0591: **FUV and X-ray irradiated protoplanetary disks: a grid of models II - Gas diagnostic line emission** by *Giambattista Aresu, et al.*

astro-ph/1209.0608: **A Dynamical Analysis of the Proposed Circumbinary HW Virginis Planetary System** by *J. Horner, et al.*

astro-ph/1209.0779: **The dispersal of protoplanetary disks around binary stars** by *Richard Alexander*

astro-ph/1209.0981: **The Periodic Spectroscopic Variability of FU Orionis** by *Stacie L. Powell, et al.*

astro-ph/1209.1107: **On the convergence of the critical cooling timescale for the fragmentation of self-gravitating discs** by *Farzana Meru, Matthew R. Bate*

astro-ph/1209.1187: **A planetary companion around the K giant eps Corona Borealis** by *Byeong-Cheol Lee, et al.*

astro-ph/1209.1296: **Candidates for detecting exoplanetary radio emissions generated by magnetosphere-ionosphere coupling** by *J. D. Nichols*

astro-ph/1209.1320: **Effects of Dynamical Evolution of Giant Planets on Survival of Terrestrial Planets** by *Soko Matsumura, Shigeru Ida, Makiko Nagasawa*

astro-ph/1209.1580: **Spin-orbit coupling for tidally evolving super-Earths** by *Adrin Rodrguez, et al.*

astro-ph/1209.1615: **Applicability Limitations of a Popular Formula for the Tidal Torque** by *Michael Efroimsky, Valeri V. Makarov*

astro-ph/1209.1616: **No pseudosynchronous rotation for terrestrial planets and moons** by *Valeri V. Makarov, Michael Efroimsky*

astro-ph/1209.1686: **The Habitable-Zone Planet Finder: A Stabilized Fiber-Fed NIR Spectrograph for the Hobby-Eberly Telescope** by *Suvrath Mahadevan, et al.*

astro-ph/1209.1833: **An Analytic Radiative-Convective Model for Planetary Atmospheres** by *Tyler D. Robinson, David C. Catling*

astro-ph/1209.2129: **The collapse of protoplanetary clumps formed through disc instability: 3D simulations of the pre-dissociation phase** by *M. Galvagni, et al.*

astro-ph/1209.2136: **Can habitable planets form in clustered environments?** by *M. de Juan Ovelar, et al.*

astro-ph/1209.2412: **C/O ratio as a Dimension for Characterizing Exoplanetary Atmospheres** by *Nikku Madhusudhan*

astro-ph/1209.2435: **Internal Gravity Waves Modulate the Apparent Misalignment of Exoplanets around Hot Stars** by *T.M. Rogers, D.N.C. Lin, H.H.B. Lau*

astro-ph/1209.2704: **Development of a New, Precise Near-infrared Doppler Wavelength Reference: A Fiber Fabry-Perot Interferometer** by *Samuel Halverson, et al.*

astro-ph/1209.2728: **Pulsation Frequencies and Modes of Giant Exoplanets** by *Bastien Le Bihan, Adam Burrows*

astro-ph/1209.2753: **Linear and nonlinear evolution of the vertical shear instability in accretion discs** by *Richard P. Nelson, Oliver Gressel, Orkan M. Umurhan*

astro-ph/1209.2906: **Optical fiber modal noise in the 0.8 to 1.5 micron region and implications for near infrared precision radial velocity measurements** by *Keegan McCoy, et al.*

astro-ph/1209.2985: **An Analytic Model for Rotational Modulations in the Photometry of Spotted Stars** by *David M. Kipping*

astro-ph/1209.3014 : **New Techniques for High-Contrast Imaging with ADI: the ACORNS-ADI SEEDS Data Reduction Pipeline** by *Timothy D. Brandt, et al.*
astro-ph/1209.3154: **The impact of red noise in radial velocity planet searches: Only three planets orbiting GJ581?** by *Roman V. Baluev*
astro-ph/1209.3772: **The Structure of Pre-transitional Protoplanetary Disks I: Radiative Transfer Modeling of the Disk+Cavity in the PDS 70 system** by *Ruobing Dong, et al.*
astro-ph/1209.3780: **The Mineralogy and Structure of the Inner Debris Disk of β Pictoris** by *Dan Li, Charles M. Telesco, Christopher M. Wright*
astro-ph/1209.3969: **Planet Signatures in Collisionally Active Debris Discs: scattered light images** by *Philippe Thebault, Quentin Kral, Steve Ertel*
astro-ph/1209.4098: **Colors of extreme exoEarth environments** by *Siddharth Hegde, Lisa Kaltenegger*
astro-ph/1209.4358: **Planet-Disk interaction in 3D: the importance of buoyancy waves** by *Zhaohuan Zhu, James M. Stone, Roman R. Rafikov*
astro-ph/1209.4362: **Planet-Planet Eclipse and the Rossiter-McLaughlin Effect of a Multiple Transiting System: Joint Analysis of the Subaru Spectroscopy and the Kepler Photometry** by *Teruyuki Hirano, et al.*
astro-ph/1209.4418: **On the Direct Imaging of Tidally Heated Exomoons** by *Mary Anne Peters, Edwin L. Turner*
astro-ph/1209.4422: **A Common Proper Motion Stellar Companion to HAT-P-7** by *Norio Narita, et al.*
astro-ph/1209.4087: **Stellar companions to exoplanet host stars: Lucky Imaging of transiting planet hosts** by *Carolina Bergfors, et al.*
astro-ph/1209.4815: **Detection of Neptune-size planetary candidates with CoRoT data. Comparison with the planet occurrence rate derived from Kepler** by *Aldo S. Bonomo, et al.*
astro-ph/1209.4843: **Orbital evolution of a planet on an inclined orbit interacting with a disc** by *Jean Teyssandier, Caroline Terquem, John C. B. Papaloizou*
astro-ph/1209.5125: **The Compositional Diversity of Extrasolar Terrestrial Planets: II. Migration Simulations** by *Jade C. Carter-Bond, David P. O'Brien, Sean N. Raymond*
astro-ph/1209.5323: **Exomoon habitability constrained by illumination and tidal heating** by *René Heller, Rory Barnes*
astro-ph/1209.5397: **From Dust to Planetesimals: Criteria for Gravitational Instability of Small Particles in Gas** by *Ji-Ming Shi, Eugene Chiang*
astro-ph/1209.5671: **Probing dynamical processes in the planet forming region with dust mineralogy** by *M. K. McClure, et al.*
astro-ph/1209.5724: **Q in Other Solar Systems** by *Aristotle Socrates, Boaz Katz, Subo Dong*
astro-ph/1209.5921: **How fast do Jupiters grow? Signatures of the snowline and growth rate in the distribution of gas giant planets** by *Ken Rice, Matthew T. Penny, Keith Horne*
astro-ph/1209.6272: **Exploring the α-enhancement of metal-poor planet-hosting stars. The Kepler + HARPS samples** by *V. Zh. Adibekyan, et al.*
astro-ph/1209.6515: **A stringent upper limit to 18cm radio emission from the extrasolar planet system tau Bootis** by *A. Stroe, I. A. G. Snellen, H. J. A. Rottgering*