ExoPlanet News

An Electronic Newsletter

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1 Editorial

Welcome to the thirty-seventh edition of ExoPlanet News. February may have been a short month, but there is no shortage of interesting abstracts and conference announcements in this edition of the newsletter.
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.
The next edition is planned for the beginning of April 2011. Please send anything relevant to exoplanet@open.ac.uk, and it will appear then.

Best wishes
Andrew Norton & Glenn White
The Open University

2 Abstracts of refereed papers

VLT/NACO astrometry of the HR 8799 planetary system: L′-band observations of the three outer planets

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Astronomy & Astrophysics, in press (arXiv:1102.5330)

HR 8799 is so far the only directly imaged multiple exoplanet system. The orbital configuration would, if better known, provide valuable insight into the formation and dynamical evolution of wide-orbit planetary systems. We present L′-band observations or the HR 8799 system obtained with NACO at VLT, adding to the astrometric monitoring of the planets HR 8799 b, c and d. We investigate how well the two simple cases of (i) a circular orbit and (ii) a face-on orbit fit the astrometric data for HR 8799 d over a total time baseline of 2 years. The results indicate that the orbit of HR 8799 d is inclined with respect to our line of sight, and suggest that the orbit is slightly eccentric or non-coplanar with the outer planets and debris disk.

Download/Website: `http://arxiv.org/abs/1102.5330`

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A short-period super-Earth orbiting the M2.5 dwarf GJ 3634. Detection with HARPS velocimetry and transit search with *Spitzer* photometry

X. Bonfils[1,2], *M. Gillon*[2,3], *T. Forveille*[1], *X. Delfosse*[1], *D. Deming*[4], *B.-O. Demory*[5], *C. Lovis*[2], *M. Mayor*[2], *V. Neves*[1,6], *C. Perrier*[1], *N. C. Santos*[6,7], *S. Seager*[5], *S. Udry*[2], *I. Boisse*[6] *& M. Bonnefoy*[1]

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Astronomy & Astrophysics, in press (arxiv:1102.1420)

We report on the detection of GJ 3634b, a super-Earth of mass $m \sin i = 7.0^{+0.9}_{-0.8}\,\mathrm{M}_\oplus$ and period $P = 2.64561 \pm 0.00066$ day. Its host star is a M2.5 dwarf, has a mass of $0.45 \pm 0.05\,\mathrm{M}_\odot$, a radius of 0.43±0.03 $\mathrm{R}_\odot$ and lies 19.8 ± 0.6 pc away from our Sun. The planet is detected after a radial-velocity campaign using the ESO/HARPS spectrograph. GJ 3634b had an *a priori* geometric probability to undergo transit of ∼7% and, if telluric in composition, a non-grazing transit would produce a photometric dip of $<\sim$0.1%. We therefore followed-up upon the RV detection with photometric observations using the 4.5-μm band of the IRAC imager onboard *Spitzer*. Our six-hour long light curve excludes that a transit occurs for 2σ of the probable transit window, decreasing the probability that GJ 3634b undergoes transit to ∼0.5%.

Download/Website: `http://arxiv.org/abs/1102.1420`

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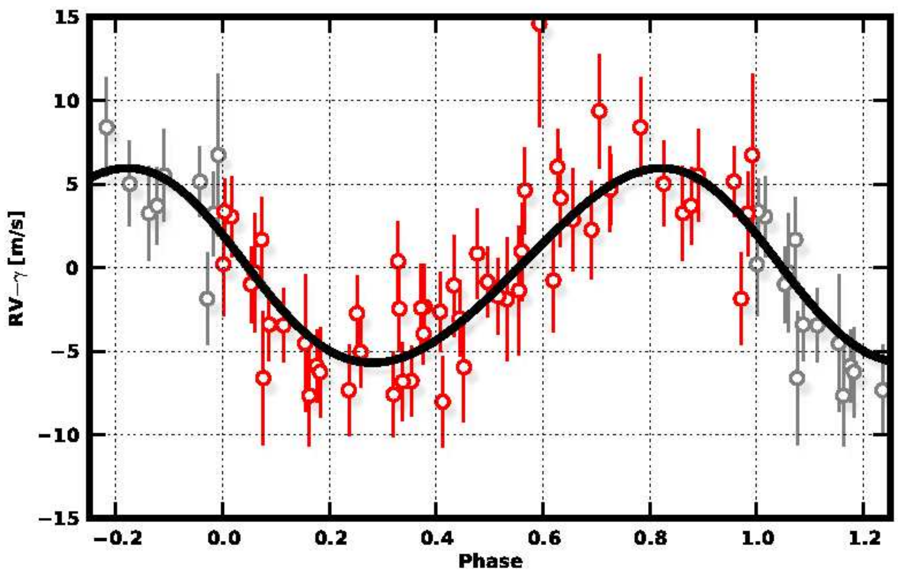

Figure 1: (Bonfils et al.) RVs phase-folded with the planet's orbital period (a long-term drift is subtracted).

Formation of Giant Planets by Disk Instability on Wide Orbits Around Protostars with Varied Masses

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Astrophysical Journal, in press

Doppler surveys have shown that more massive stars have significantly higher frequencies of giant planets inside $\sim$ 3 AU than lower mass stars, consistent with giant planet formation by core accretion. Direct imaging searches have begun to discover significant numbers of giant planet candidates around stars with masses of $\sim$ 1 $M_\odot$ to $\sim$ 2 $M_\odot$ at orbital distances of $\sim$ 20 AU to $\sim$ 120 AU. Given the inability of core accretion to form giant planets at such large distances, gravitational instabilities of the gas disk leading to clump formation have been suggested as the more likely formation mechanism. Here we present five new models of the evolution of disks with inner radii of 20 AU and outer radii of 60 AU, for central protostars with masses of 0.1, 0.5, 1.0, 1.5, and 2.0 $M_\odot$, in order to assess the likelihood of planet formation on wide orbits around stars with varied masses. The disk masses range from 0.028 $M_\odot$ to 0.21 $M_\odot$, with initial Toomre Q stability values ranging from 1.1 in the inner disks to ~ 1.6 in the outer disks. These five models show that disk instability is capable of forming clumps on time scales of $\sim 10^3$ yr that, if they survive for longer times, could form giant planets initially on orbits with semimajor axes of $\sim$ 30 AU to $\sim$ 70 AU and eccenticities of $\sim$ 0 to $\sim$ 0.35, with initial masses of $\sim 1M_{Jup}$ to $\sim 5M_{Jup}$, around solar-type stars, with more protoplanets forming as the mass of the protostar (and protoplanetary disk) are increased. In particular, disk instability appears to be a likely formation mechanism for the HR 8799 gas giant planetary system.

Download/Website: http://www.dtm.ciw.edu/downloads/cat_view/113-dtm/132-alan-boss/133-documents/

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Astrophysical Parameters and Habitable Zone of the Exoplanet Hosting Star GJ 581

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Astrophysical Journal Letters, in press

GJ 581 is an M dwarf host of a multiplanet system. We use long-baseline interferometric measurements from the CHARA Array, coupled with trigonometric parallax information, to directly determine its physical radius to be $0.299 \pm 0.010 R_{\odot}$. Literature photometry data are used to perform spectral energy distribution fitting in order to determine GJ 581's effective surface temperature $T_{\rm EFF} = 3498 \pm 56$ K and its luminosity $L = 0.01205 \pm 0.00024 L_{\odot}$. From these measurements, we recompute the location and extent of the system's habitable zone and conclude that two of the planets orbiting GJ 581, planets d and g, spend all or part of their orbit within or just on the edge of the habitable zone.

Download/Website: `http://adsabs.harvard.edu/abs/2011arXiv1102.0237V`

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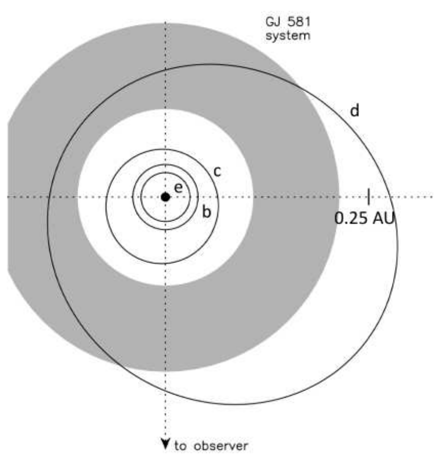

Figure 2: (von Braun et al.) A top-down view of the GJ 581 system. The habitable zone is indicated by the gray shaded region with calculated boundaries of 0.11 and 0.21 AU. Left panel: scenario 1 adopted from Mayor et al. (2009). Planet d spends part of its elliptical orbit in the HZ. Right panel: scenario 2 adopted from Vogt et al. (2010). Planet g spends all its orbits inside the HZ, which planet d orbits right on its outer edge. Planet f (a = 0.758 AU) is not shown for purpose of clarity.

Rotational Variability of Earth's Polar Regions: Implications for Detecting Snowball Planets

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Astrophysical Journal, in press

We have obtained the first time-resolved, disc-integrated observations of Earths poles with the Deep Impact spacecraft as part of the EPOXI Mission of Opportunity. These data mimic what we will see when we point next-generation space telescopes at nearby exoplanets. We use principal component analysis (PCA) and rotational lightcurve inversion to characterize color inhomogeneities and map their spatial distribution from these unusual vantage points, as a complement to the equatorial views presented in Cowan et al. (2009). We also perform the same PCA on a suite of simulated rotational multi-band lightcurves from NASA's Virtual Planetary Laboratory 3D spectral Earth model. This numerical experiment allows us to understand what sorts of surface features PCA can robustly identify. We find that the EPOXI polar observations have similar broadband colors as the equatorial Earth, but with 20–30% greater apparent albedo. This is because the polar observations are most sensitive to mid-latitudes, which tend to be more cloudy than the equatorial latitudes emphasized by the original EPOXI Earth observations. The cloudiness of the mid-latitudes also manifests itself in the form of increased variability at short wavelengths in the polar observations, and as a dominant gray eigencolor in the south polar observation. We construct a simple reflectance model for a snowball Earth. By construction, our model has a higher Bond albedo than the modern Earth; its surface albedo is so high that Rayleigh scattering does not noticeably affect its spectrum. The rotational color variations occur at short wavelengths due to the large contrast between glacier ice and bare land in those wavebands. Thus we find that both the broadband colors and diurnal color variations of such a planet would be easily distinguishable from the modern-day Earth, regardless of viewing angle.

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The retrograde orbit of the HAT-P-6b exoplanet

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Astronomy & Astrophysics, in press (arXiv:1101.5009)

We observed with the SOPHIE spectrograph (OHP, France) the transit of the HAT-P-6b exoplanet across its host star. The resulting stellar radial velocities display the Rossiter-McLaughlin anomaly and reveal a retrograde orbit: the planetary orbital spin and the stellar rotational spin point towards approximately opposite directions. A fit to the anomaly measures a sky-projected angle lambda $= 166 \pm 10$ degrees between these two spin axes. All seven known retrograde planets are hot jupiters with masses $M_p < 3M_{Jup}$. About two thirds of the planets in this mass range however are prograde and aligned (lambda ~ 0). By contrast, most of the more massive planets ($M_p > 4M_{Jup}$) are prograde but misaligned. Different mechanisms may therefore be responsible for planetary obliquities above and below $\sim 3.5M_{Jup}$.

Download/Website: `http://lanl.arxiv.org/abs/1101.5009`

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Transit Timing Observations from *Kepler*: I. Statistical Analysis of the First Four Months

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Astrophysical Journal, submitted (arXiv:1102.0544)

The architectures of multiple planet systems can provide valuable constraints on models of planet formation, including orbital migration, and excitation of orbital eccentricities and inclinations. NASA's *Kepler* mission has identified 1235 transiting planet candidates (Borcuki et al. 2011). The method of transit timing variations (TTVs) has already confirmed 7 planets in two planetary systems (Holman et al. 2010; Lissauer et al. 2011a). We perform a transit timing analysis of the *Kepler* planet candidates. We find that at least $\sim$12% of planet candidates currently suitable for TTV analysis show evidence suggestive of TTVs, representing at least $\sim$65 TTV candidates. In all cases, the time span of observations must increase for TTVs to provide strong constraints on planet masses and/or orbits, as expected based on n-body integrations of multiple transiting planet candidate systems (assuming circular and coplanar orbits). We find that the fraction of planet candidates showing TTVs in this data set does not vary significantly with the number of transiting planet candidates per star, suggesting significant mutual inclinations and that many stars with a single transiting planet should host additional non-transiting planets. We anticipate that *Kepler* could confirm (or reject) at least $\sim$12 systems with multiple transiting planet candidates via TTVs. Thus, TTVs will provide a powerful tool for confirming transiting planets and characterizing the orbital dynamics of low-mass planets. If *Kepler* observations were extended to at least six years, then TTVs would provide much more precise constraints on the dynamics of systems with multiple transiting planets and would become sensitive to planets with orbital periods extending into the habitable zone of solar-type stars.

Download/Website: `http://www.astro.ufl.edu/ eford/data/kepler/`

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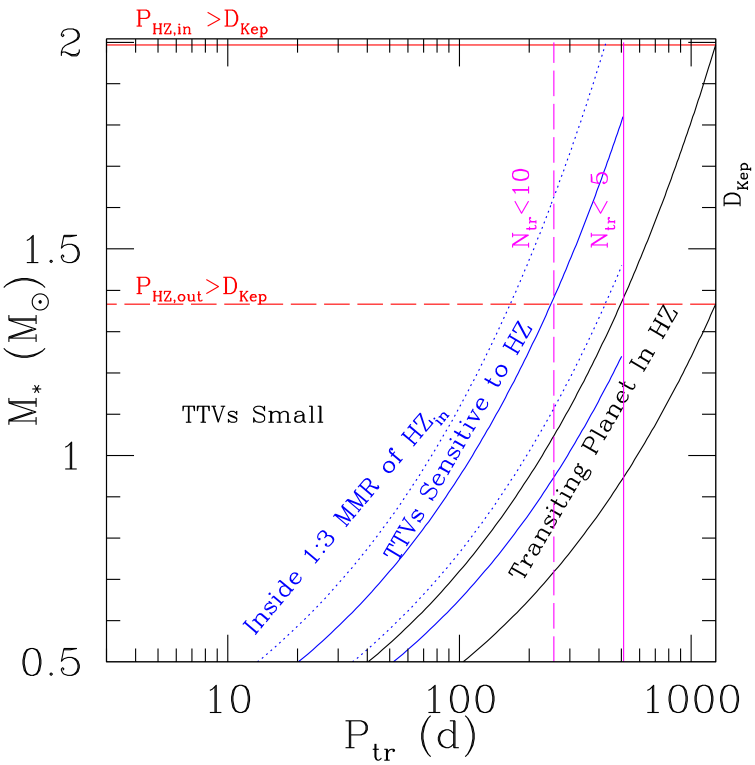

Figure 3: (Ford et al.) Orbital periods and stellar masses for which confirmation of a transiting planet in the habitable zone is practical. The x-axis is the orbital period of a transiting planet ($P_{\rm tr}$), limited by the nominal mission lifetime ($D_{\rm Kep}$ =3.5 years). The black curve approximate the orbital periods corresponding to the inner and outer edge of the habitable zone. The solid (dashed) magenta lines indicate the orbital period beyond which *Kepler* would observe no more than 5 (10) transits during $D_{\rm Kep}$. It would be extremely difficult to interpret TTVs for planets to the right of these curves. The solid (dashed) blue curves indicate the orbital period of a planet near the 1:2 (1:3) MMR with the inner and outer edges of the habitable zone. A second planet significantly to the left of the blue curves will not typically result in detectable TTV signature due to interactions with a planet in the habitable zone. The solid (dashed) line indicates the stelar mass ($M_\star$) above which the orbital period at the inner (outer) edge of the habitable zone exceeds $D_{\rm Kep}$. The most promising prospects for TTVs confirming a planet in the habitable zone involve a system with one transiting planet in the habitable zone (between black curves) and a second transiting planet that is between the blue and black curves.

Steady-state evolution of debris disks around solar-type stars

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1102.4341)

We present an analysis of debris disk data around Solar-type stars (spectral types F0-K5) using the steady-state analytical model of Wyatt et al. (2007). Models are fitted to published data from the FEPS (Meyer et al. 2006) project and various GTO programs obtained with MIPS on the *Spitzer Space Telescope* at 24μm and 70μm, and compared to a previously published analysis of debris disks around A stars using the same evolutionary model. We find that the model reproduces most features found in the data sets, noting that the model disk parameters for solar-type stars are different to those of A stars. Although this could mean that disks around Solar-type stars have different properties from their counterparts around earlier-type stars, it is also possible that the properties of disks around stars of different spectral types appear more different than they are because the blackbody disk radius underestimates the true disk radius by a factor X_r which varies with spectral type. We use results from realistic grain modelling to quantify this effect for solar-type stars and for A stars. Our results imply that planetesimals around solar-type stars are on average larger than around A stars by a factor of a few but that the mass of the disks are lower for disks around FGK stars, as expected. We also suggest that discrepancies between the evolutionary timescales of 24μm statistics predicted by our model and that observed in previous surveys could be explained by the presence of two-component disks in the samples of those surveys, or by transient events being responsible for the $24\mu m$ emission of cold disks beyond a few Myr. Further study of the prevalence of two component disks, and of constraints on X_r, and increasing the size of the sample of detected disks, are important for making progress on interpreting the evolution of disks around solar-type stars.

Download/Website: `http://arxiv.org/abs/1102.4341`

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A variationally computed line list for hot NH3

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1011.1569)

We present 'BYTe', a comprehensive 'hot' line list for the ro-vibrational transitions of ammonia, 14NH3, in its ground electronic state. This line list has been computed variationally using the program suite TROVE, a new spectroscopically-determined potential energy surface and an ab initio dipole moment surface. BYTe, is designed to be used at all temperatures up to 1500K. It comprises 1137650964 transitions in the frequency range from 0 to 12000 cm^{-1}, constructed from 1366519 energy levels below 18000 cm^{-1} having J values below 36. Comparisons with laboratory data confirm the accuracy of the line list which is suitable for modelling a variety of astrophysical problems including the atmospheres of extrasolar planets and brown dwarfs.

Download/Website: `http://arxiv.org/abs/1011.1569`

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Dust ejection from planetary bodies by temperature gradients: Laboratory experiments

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Icarus, in press

Laboratory experiments show that dusty bodies in a gaseous environment eject dust particles if they are illuminated. We find that even more intense dust eruptions occur when the light source is turned off. We attribute this to a compression of gas by thermal creep in response to the changing temperature gradients in the top dust layers. The effect is studied at a light flux of 13 kW/m^2 and 1 mbar ambient pressure. The effect is applicable to protoplanetary disks and Mars. In the inner part of protoplanetary disks, planetes- imals can be eroded especially at the terminator of a rotating body. This leads to the production of dust which can then be transported towards the disk edge or the outer disk regions. The generated dust might constitute a significant fraction of the warm dust observed in extrasolar protoplanetary disks. We estimate erosion rates of about 1 kg s^{-1} for 100 m parent bodies. The dust might also contribute to subse- quent planetary growth in different locations or on existing protoplanets which are large enough not to be susceptible to particle loss by light induced ejection. Due to the ejections, planetesimals and smaller bodies will be accelerated or decelerated and drift outward or inward, respectively. The effect might also explain the entrainment of dust in dust devils on Mars, especially at high altitudes where gas drag alone might not be sufficient.

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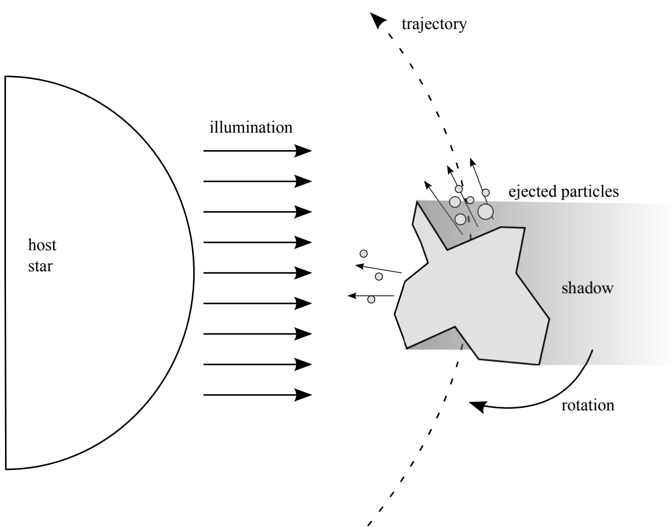

Figure 4: (Kelling et al.)

The extreme physical properties of the CoRoT-7b super-Earth

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Icarus, in press (arXiv:1102.1629)

The search for rocky exoplanets plays an important role in our quest for extra-terrestrial life. Here, we discuss the extreme physical properties possible for the first characterized rocky super-Earth, CoRoT-7b ($R_{pl} = 1.58 \pm 0.10 R_{Earth}$, $M_{pl} = 6.9 \pm 1.2 M_{Earth}$). It is extremely close to its star ($a = 0.0171$ AU $= 4.48 R_{st}$), with its spin and orbital rotation likely synchronized. The comparison of its location in the (M_{pl}, R_{pl}) plane with the predictions of planetary models for different compositions points to an Earth-like composition, even if the error bars of the measured quantities and the partial degeneracy of the models prevent a definitive conclusion. The proximity to its star provides an additional constraint on the model. It implies a high extreme-UV flux and particle wind, and the corresponding efficient erosion of the planetary atmosphere especially for volatile species including water. Consequently, we make the working hypothesis that the planet is rocky with no volatiles in its atmosphere, and derive the physical properties that result. As a consequence, the atmosphere is made of rocky vapours with a very low pressure ($P \leq 1.5$ Pa), no cloud can be sustained, and no thermalisation of the planetary is expected. The dayside is very hot (2474 ± 71 K at the substellar point) while the nightside is very cold (50 to 75 K). The sub-stellar point is as hot as the tungsten filament of an incandescent bulb, resulting in the melting and distillation of silicate rocks and the formation of a lava ocean. These possible feature of CoRoT-7b could be common to many small and hot planets, including the recently discovered Kepler-10b. They define a new class of objects that we propose to name "Lava-ocean planets".

Download/Website: `http://arxiv.org/abs/1102.1629`

Contact: `alain.leger@ias.u-psud.fr`

Architecture and Dynamics of Kepler's Candidate Multiple Transiting Planet Systems

Jack J. Lissauer[1], *Darin Ragozzine*[2], *Daniel C. Fabrycky*[3,4], *Jason H. Steffen*[5], *Eric B. Ford*[6], *Jon M. Jenkins*[1,7], *Avi Shporer*[8,9], *Matthew J. Holman*[2], *Jason F. Rowe*[7], *Elisa V. Quintana*[7], *Natalie M. Batalha*[10], *William J. Borucki*[1], *Stephen T. Bryson*[1], *Douglas A. Caldwell*[7], *David Ciardi*[11] *Edward W. Dunham*[12], *Jonathan J. Fortney*[3], *Thomas N. Gautier, III*[13], *Steve Howell*[1], *David G. Koch*[1], *David W. Latham*[3], *Geoffrey W. Marcy*[14], *Robert C. Morehead*[6], *Dimitar Sasselov*[2]

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Astrophysical Journal, submitted (arXiv 1102.0543)

About one-third of the ∼1200 transiting planet candidates detected in the first four months of Kepler data are members of multiple candidate systems. There are 115 targets with two candidate transiting planets, 45 with three, 8 with four, and one each with five and six. We characterize herein the dynamical properties of these candidate multi-planet systems. The distribution of observed period ratios shows that the vast majority of candidate pairs are neither in nor near low-order mean motion resonances. Nonetheless, there are small but statistically significant excesses of candidate pairs both in resonance and spaced slightly too far apart to be in resonance, particularly near the 2:1 resonance. We find that virtually all candidate systems are stable, as tested by numerical integrations (assuming a nominal mass-radius relationship). Several considerations strongly suggest that the vast majority of these multi-candidate systems are true planetary systems. Using the observed multiplicity frequencies, we find that a single population that matches the higher multiplicities generally underpredicts the number of singly-transiting systems. We provide constraints on the true multiplicity and mutual inclination distribution of the multi-candidate systems, revealing a population of systems with multiple small planets with low (1-5 degree) mutual inclinations. In all, multi-transiting systems from Kepler provide a large and rich dataset that can be used to powerfully test theoretical predictions of the formation and evolution of planetary systems.

Download/Website: `http://arxiv.org/abs/1102.0543`

Contact: `Jack.Lissauer@nasa.gov`

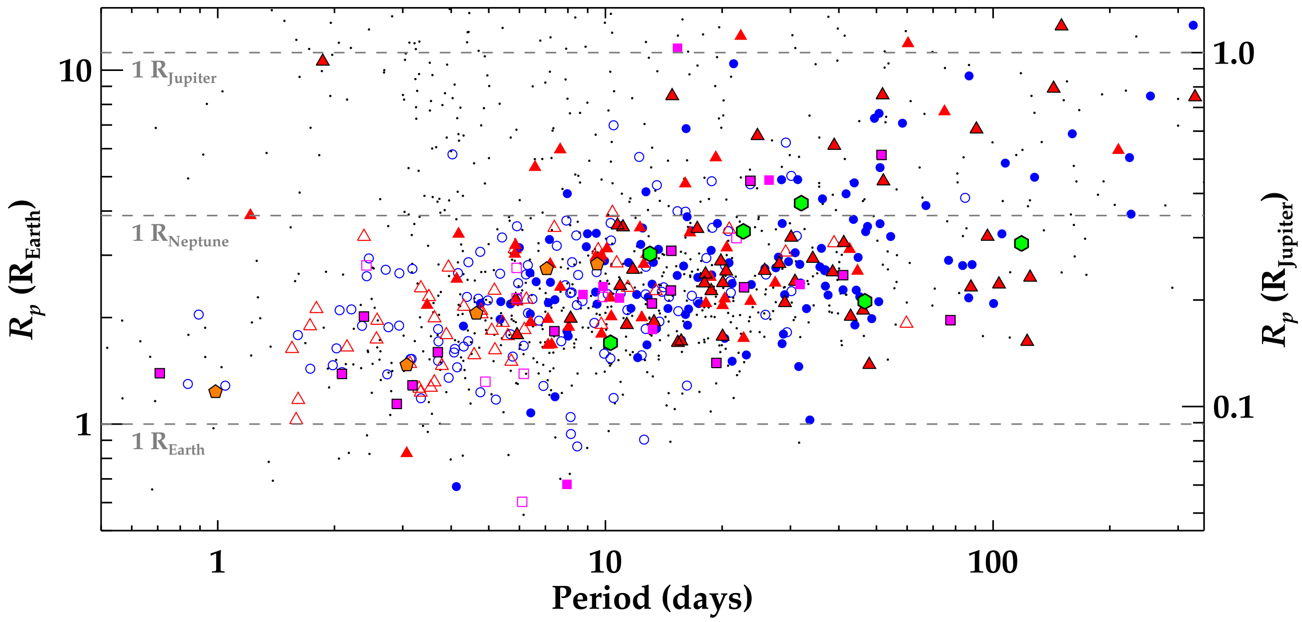

Figure 5: (Lissauer et al.) Planet period vs. radius for all planetary candidates listed in Borucki et al. 2011b. Those planets that are the only candidate for their given star are represented by black dots, those in two-planet systems as blue circles (open for the inner planets, filled for the outer ones), those in three-planet systems as red triangles (open for the inner planets, filled for the middle ones, filled with black borders for the outer ones), those in four planet systems as purple squares (inner and outer members filled with black borders, second members open, third filled), the five candidates of KOI 500 as orange pentagons and the six planets orbiting KOI-157 (Kepler-11) as green hexagons. It is immediately apparent that there is a paucity of giant planets in multi-planet systems; this difference in the size distributions is quantified and discussed by (Latham et al. 2011, in prep.). The upward slope in the lower envelope of these points is caused by the low SNR of small transiting planets with long orbital periods (for which few transits have thus far been observed). Courtesy Samuel Quinn

High-precision photometry of WASP-12 b transits

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Astronomy & Astrophysics, in press (aarXiv:1102.2421)

The transiting extrasolar planet WASP-12 b was found to be one of the most intensely irradiated exoplanets. It is unexpectedly bloated and is losing mass that may accrete into the host star. Our aim was to refine the parameters of this intriguing system and search for signs of transit timing variations. We gathered high-precision light curves for two transits of WASP-12 b. Assuming various limb-darkening laws, we generated best-fitting models and redetermined parameters of the system. Error estimates were derived by the prayer bead method and Monte Carlo simulations. System parameters obtained by us are found to agree with previous studies within one sigma. Use of the non-linear limb-darkening laws results in the best-fitting models. With two new mid-transit times, the ephemeris was refined to $\mathrm{BJD_{TDB}} = (2454508.97682 \pm 0.00020) + (1.09142245 \pm 0.00000033)E$. Interestingly, indications of transit timing variation are detected at the level of 3.4 sigma. This signal can be induced by an additional planet in the system. Simplified numerical simulations shows that a perturber could be a terrestrial-type planet if both planets are in a low-order orbital resonance. However, we emphasise that further observations are needed to confirm variation and to constrain properties of the perturber.

Download/Website: `http://arxiv.org/abs/1102.2421`

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Exoplanet transmission spectroscopy: accounting for the eccentricity and the longitude of periastron

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Astronomy & Astrophysics, in press (arXiv:1102.0464)

CONTEXT. A planet transiting in front of the disk of its parent star offers the opportunity to study the compositional properties of its atmosphere by means of the analysis of the stellar light that is filtered by the planetary atmospheric layers. Several studies have so far placed useful constraints on planetary atmospheric properties with this technique, and for the case of HD209458b even the radial velocity of the planet during the transit event has been reconstructed. This opens up a new range of possibilities. AIMS. In this contribution we highlight the importance to account for the orbital eccentricity and the longitude of periastron of the planetary orbit to accurately interpret the measured planetary radial velocity during the transit. METHODS. We calculate the radial velocity of a transiting planet in an eccentric orbit. RESULTS. Given the higher orbital speed of planets with respect to their stellar companions, even small eccentricities can result in detectable blue or redshift radial velocity offsets during the transit with respect to the systemic velocity, the exact value of which also depends on the longitude of the periastron of the planetary orbit. For a hot-jupiter planet, an eccentricity of only e=0.01 can produce a radial velocity offset on the order of the km/s. CONCLUSIONS. We propose an alternative interpretation of the recently claimed radial velocity blueshift ($\sim$ 2 km/s) of the planetary spectral lines of HD209458b, which implies that the orbit of this system is not exactly circular. In this case, the longitude of the periastron of the stellar orbit is most likely confined in the first quadrant (and that of the planet in the third quadrant). We highlight that transmission spectroscopy allows us not only to study the compositional properties of planetary atmospheres, but also to refine planetary orbital parameters, and that any conclusion regarding the presence of windflows on planetary surfaces coming from transmission spectroscopy measurements requires precisely known orbital parameters from RV.

Download/Website: `http://arxiv.org/abs/1102.0464`

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The GROUSE project II: Detection of the Ks-band secondary eclipse of exoplanet HAT-P-1b

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Astronomy & Astrophysics, in press

Context. Only recently it has become possible to measure the thermal emission from hot-Jupiters at near-Infrared wavelengths using ground-based telescopes, by secondary eclipse observations. This allows the planet flux to be probed around the peak of its spectral energy distribution, which is vital for the understanding of its energy budget. *Aims.* The aim of the reported work is to measure the eclipse depth of the planet HAT-P-1b at 2.2μm. This planet is an interesting case, since the amount of stellar irradiation it receives falls in between that of the two best studied systems (HD209458 and HD189733), and it has been suggested to have a weak thermal inversion layer. *Methods.* We have used the LIRIS instrument on the William Herschel Telescope (WHT) to observe the secondary eclipse of HAT-P-1b in the K_s-band, as part of our Ground-based secondary eclipse (GROUSE) project. The observations were done in staring mode, while significantly defocusing the telescope to avoid saturation on the K=8.4 star. With an average cadence of 2.5 seconds, we collected 6520 frames during one night. *Results.* The eclipse is detected at the 4-σ level, the measured depth being 0.109$\pm$0.025%. The uncertainties are dominated by residual systematic effects, as estimated from different reduction/analysis procedures. The measured depth corresponds to a brightness temperature of 2136^{+150}_{170} K. This brightness temperature is significantly higher than those derived from longer wavelengths, making it difficult to fit all available data points with a plausible atmospheric model. However, it may be that we underestimate the true uncertainties of our measurements, since it is notoriously difficult to assign precise statistical significance to a result when systematic effects are important.

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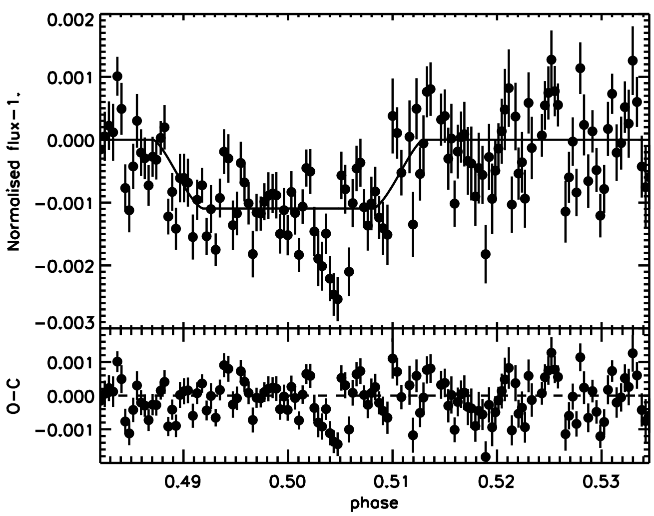

Figure 6: (De Mooij et al.) The lightcurve for the secondary eclipse of HAT-P-1b corrected for systematic effects binned by 41 points. Overplotted is our best fitting eclipse model.

Electrostatic Barrier Against Dust Growth in Protoplanetary Disks. I. Classifying the Evolution of Size Distribution

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Astrophysical Journal, in press (arXiv:1009.3199)

Collisional growth of submicron-sized dust grains into macroscopic aggregates is the first step of planet formation in protoplanetary disks. These grains are expected to carry nonzero negative charges in the weakly ionized disks, but its effect on their collisional growth has not been fully understood so far. In this paper, we investigate how the charging affects the evolution of the dust size distribution properly taking into account the charging mechanism in a weakly ionized gas as well as porosity evolution through low-energy collisions. To clarify the role of the size distribution, we divide our analysis into two steps. First, we analyze the collisional growth of charged aggregates assuming a monodisperse (i.e., narrow) size distribution. We show that the monodisperse growth stalls due to the electrostatic repulsion when a certain condition is met, as is already expected in the previous work. Second, we numerically simulate dust coagulation using Smoluchowski's method to see how the outcome changes when the size distribution is allowed to freely evolve. We find that, under certain conditions, the dust undergoes bimodal growth where only a limited number of aggregates continue to grow carrying the major part of the dust mass in the system. This occurs because remaining small aggregates efficiently sweep up free electrons to prevent the larger aggregates from being strongly charged. We obtain a set of simple criteria that allows us to predict how the size distribution evolves for a given condition. In Paper II, we apply these criteria to dust growth in protoplanetary disks.

Download/Website: `http://arxiv.org/abs/1009.3199`

Electrostatic Barrier Against Dust Growth in Protoplanetary Disks. II. Measuring the Size of the "Frozen" Zone

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[2] Department of Physics, Nagoya University, Aichi 464-8602, Japan
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Astrophysical Journal, in press (arXiv:1009.3101)

Coagulation of submicron-sized dust grains into porous aggregates is the initial step of dust evolution in protoplanetary disks. Recently, it has been pointed out that negative charging of dust in the weakly ionized disks could significantly slow down the coagulation process. In this paper, we apply the growth criteria obtained in Paper I to finding out a location ("frozen" zone) where the charging stalls dust growth at the fractal growth stage. For low-turbulence disks, we find that the frozen zone can cover the major part of the disks at a few to 100 AU from the central star. The maximum mass of the aggregates is approximately 10^{-7} g at 1 AU and as small as a few monomer masses at 100 AU. Strong turbulence can significantly reduce the size of the frozen zone, but such turbulence will cause the fragmentation of macroscopic aggregates at later stages. We examine a possibility that complete freezeout of dust evolution in low-turbulence disks could be prevented by global transport of dust in the disks. Our simple estimation shows that global dust transport can lead to the supply of macroscopic aggregates and the removal of frozen aggregates on a timescale of 10^6 yr. This overturns the usual understanding that tiny dust particles get depleted on much shorter timescales unless collisional fragmentation is effective. The frozen zone together with global dust transport might explain "slow" ($\sim 10^6$ yr) dust evolution suggested by infrared observation of T Tauri stars and by radioactive dating of chondrites.

Download/Website: `http://arxiv.org/abs/1009.3101`

Contact: `okuzumi@nagoya-u.jp`

Potential biosignatures in super-Earth atmospheres I. Spectral appearance of super-Earths around M dwarfs

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Astronomy & Astrophysics, in press (arXiv: 1102.0867v2)

Atmospheric temperature and mixing ratio profiles of terrestrial planets vary with the spectral energy flux distribution for different types of M-dwarf stars and the planetary gravity. We investigate the resulting effects on the spectral appearance of molecular absorption bands, which are relevant as indicators for potential planetary habitability during primary and secondary eclipse for transiting terrestrial planets with Earth-like biomass emissions. Atmospheric profiles are computed using a plane-parallel, 1D climate model coupled with a chemistry model. We then calculate simulated spectra using a line-by-line radiative transfer model.

We find that emission spectra during secondary eclipse show increasing absorption of methane, water, and ozone for planets orbiting quiet M0-M3 dwarfs and the active M-type star AD Leo compared with solar-type central stars. However, for planets orbiting very cool and quiet M dwarfs (M4 to M7), increasing temperatures in the mid-atmosphere lead to reduced absorption signals, which impedes the detection of molecules in these scenarios. Transmission spectra during primary eclipse show strong absorption features of CH_4, N_2O and H_2O for planets orbiting quiet M0-M7 stars and AD Leo. The N_2O absorption of an Earth-sized planet orbiting a quiet M7 star can even be as strong as the CO_2 signal. However, ozone absorption decreases for planets orbiting these cool central stars owing to chemical effects in the atmosphere. To investigate the effect on the spectroscopic detection of absorption bands with potential future satellite missions, we compute signal-to-noise-ratios (SNR) for a James Webb Space Telescope (JWST)-like aperture telescope.

Download/Website: `http://arxiv.org/abs/1102.0867`

Contact: `Heike.Rauer@dlr.de`

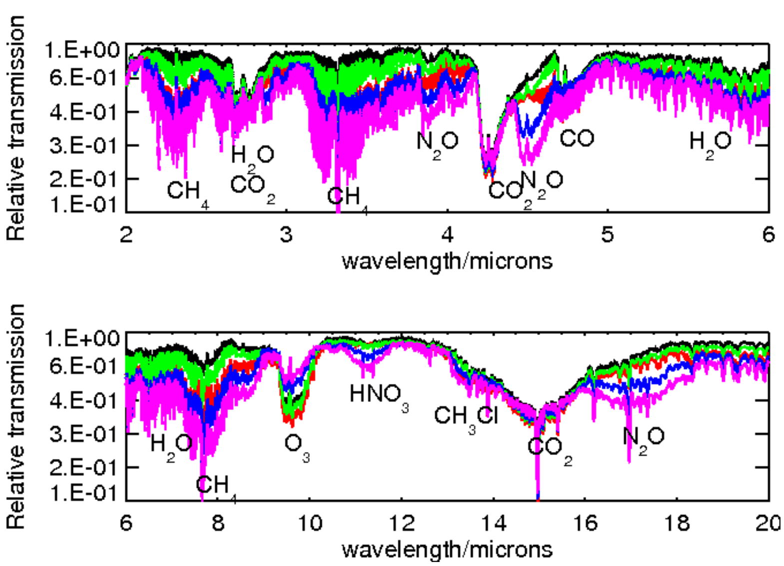

Figure 7: (Rauer et al.) Comparison of atmospheric transmission of a 1g Earth-like planet around the Sun (black), AD Leo (red), M0 (green), M5 (blue), and M7 (magenta) dwarf stars.

Spectral signatures of disk eccentricity in young binary systems: I. Circumprimary case

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Astronomy & Astrophysics, in press (arXiv:1101.1820)

Context. Star formation occurs via fragmentation of molecular clouds, which means that the majority of stars born are members of binary systems. There is growing evidence that planets might form in circumprimary disks of medium-separation ($\leq 50\,\mathrm{AU}$) binaries. The tidal forces caused by the secondary generally act to distort the originally circular circumprimary disk to an eccentric one. Since the disk eccentricity might play a major role in planet formation, it is of great importance to understand how it evolves.
Aims. We investigate disk eccentricity evolution to reveal its dependence on the physical parameters of the binary system and the protoplanetary disk. To infer the disk eccentricity from high-resolution near-IR spectroscopy, we calculate the fundamental band ($4.7\,\mu\mathrm{m}$) emission lines of the CO molecule emerging from the atmosphere of the eccentric disk.
Methods. We model circumprimary disk evolution under the gravitational perturbation of the orbiting secondary using a 2D grid-based hydrodynamical code, assuming α-type viscosity. The hydrodynamical results are combined with our semianalytical spectral code to calculate the CO molecular line profiles. Our thermal disk model is based on the double-layer disk model approximation. We assume LTE and canonical dust and gas properties for the circumprimary disk.
Results. We find that the orbital velocity distribution of the gas parcels differs significantly from the circular Keplerian fashion. The line profiles are double-peaked and asymmetric in shape. The magnitude of asymmetry is insensitive to the binary mass ratio, the magnitude of viscosity (α), and the disk mass. In contrast, the disk eccentricity, thus the magnitude of the line profile asymmetry, is influenced significantly by the binary eccentricity and the disk geometrical thickness.
Conclusions. We demonstrate that the disk eccentricity profile in the planet-forming region can be determined by fitting the high-resolution CO line profile asymmetry using a simple 2D spectral model that accounts for the velocity distortions caused by the disk eccentricity. Thus, with our novel approach the disk eccentricity can be inferred from high-resolution near-IR spectroscopy data acquired prior to the era of high angular resolution optical (ELT) or radio (ALMA, E-VLA) direct-imaging. By determining the disk eccentricity in medium-separation young binaries, we might be able to constrain the planet formation theories.

Download/Website: `http://arxiv.org/abs/1101.1820`

Contact: `regaly@konkoly.hu`

3 Conference announcements

Exploring Strange New Worlds: From Giant Planets to Super Earths

Chas Beichman[1], *Malcolm Fridlund*[2], *Dawn Gelino*[1], *Jeff Hall*[3], *Conference Chairs*

[1] NASA Exoplanet Science Institute, 770 South WIlson Ave., Pasadena, CA
[2] European Space Agency, ESTEC, P. O. Box 299, Noordwijk, The Netherlands
[3] Lowell Observatory, 1400 West Mars Hill Rd., Flagstaff, AZ

Flagstaff, Arizona, May 1–6, 2011

The NASA Exoplanet Exploration Program and the NASA Exoplanet Science Institute are co-hosting the 6th in a series of international scientific conferences on the topic of present and future observations of exoplanets from space. The conference will present state-of-the art results from the Spitzer and Hubble Space Telescopes, the Kepler and CoRoT transit missions, as well as relevant ground-based facilities. Noted theoreticians will provide perspective and interpretation of the observational results of the physical characterization of planets ranging in size from gas and icy giants, super Earths, and (ultimately) Earth analogs. Speakers will emphasize how exoplanet observations help us understand the formation and evolution of objects in our own Solar System.

Speakers will also look toward the future with a focus on the exoplanet observations using the James Webb Space Telescope (JWST) and ESA's GAIA astrometric mission. Speakers from the four JWST instrument teams will address the capabilities of JWST for coronagraphy and transit follow-up. The conference will end with discussions of the missions and technologies endorsed by the Astro2010 Decadal Review such as micro-lensing opportunities with NASA's WFIRST and ESA's EUCLID projects and a large optical/UV telescope. Similar discussions will be held on plans of other space agencies.

Important Dates

- Mar. 7, 2011: Abstract submission deadline
- Mar. 15, 2011: Early registration ends/deadline to purchase tickets for Wed. trips and Grand Canyon day trip
- Mar. 31, 2011: Final announcement with final agenda including poster/contributed talk decisions
- Apr. 2, 2011: Hotel reservation deadline for conference rate and final announcement
- Apr. 22, 2011: Deadline for submitting electronic posters
- May 1-6, 2011: Conference at High Country Conference Center, Flagstaff, AZ

Download/Website: `http://nexsci.caltech.edu/conferences/Flagstaff`
Contact: `StrangeNewWorlds@ipac.caltech.edu`

Royal Society Discussion meeting on ”Water in the Gas Phase”

Jonathan Tennyson

Department of Physics and Astronomy, University College London, Gower St, London WC1E 6BT, UK

The Kavli Centre, UK, 13-14 June 2011

Royal Society Discussion meeting on ”Water in the Gas Phase” 13 – 14 June 2011, at the Kavli Centre, UK Speakers include Dr France Allard and Dr Giovanna Tinetti.

Download/Website: `http://royalsociety.org/events/water-gas-phase/`
Contact: `j.tennyson@ucl.ac.uk`

2011 Sagan Summer Workshop: Exploring Exoplanets with Microlensing

C. Brinkworth
NASA Exoplanet Science Institute, California Institute of Technology, Pasadena, CA, USA

Pasadena, CA, July 25–29, 2011

The 2011 Sagan Exoplanet Summer Workshop: "Exploring Exoplanets with Microlensing", will take place on the Caltech campus July 25 - 29, 2011. The workshop is intended for graduate students and postdocs interested in learning more about the microlensing technique, however all interested parties are welcome to attend. A preliminary list of topics to be covered includes:

- History of Microlensing Theory, Detection, and Follow-up Teams
- Introduction to Microlensing Photometric Techniques
- HST/AO Data Reduction
- Modeling of Microlensing Data
- Extracting the Physical Parameters of Planetary Events
- Null Results and Detection Efficiency
- Future Prospects and Challenges of Microlensing

The workshop will include hands-on group projects to give participants direct experience with the microlensing technique. Attendees will also have the opportunity to present brief summaries of their research. Financial assistance for travel and accommodations will be available for successful applicants.

Important Dates

- March 4: deadline for students and postdocs to apply on-line for limited financial assistance to attend the workshop
- June 7: Early on-line registration ends
- June 22: Hotel Registration deadline to be eligible for group rate
- July 1: POP/Poster Submission deadline
- July 8: On-line registration closed
- July 24: Sagan Exoplanet Summer Workshop Opening Reception
- July 25-29: 2011 Sagan Exoplanet Summer Workshop

Download/Website: `http://nexsci.caltech.edu/workshop/2011`
Contact: `sagan_workshop@ipac.caltech.edu`

4 Jobs and Positions

Three Postdoctoral Positions in Exoplanet Research

Prof. Eric Gaidos
University of Hawaii at Manoa, Honolulu, Hawaii, USA

University of Hawaii, Starting date: August 1, 2011

1. Searches for exoplanets: The successful applicant to this position will contribute to the spectroscopic and photometric characterization of nearby M dwarf stars as targets for planet searches, a Doppler/transit search for exoplanets around cool stars, and characterization of transiting planets using Mauna Kea and other observatories. *Requirements*: Ph.D. in physics, astrophysics, or astronomy, and previous observing experience; experience with detector and instrument hardware also desirable.

2. Exoplanet interiors: The successful application will apply geophysical numerical modeling tools to investigate one or more aspects of the interiors of ”rocky” exoplanets: e.g. tidal dissipation and orbital dynamics, subsolidus convection and melting, the exchange of volatiles between the interior and surface, and cooling of metal cores and magnetodynamo operation. *Requirements*: Ph.D. in a relevant field (planetary science, geology, geophysics), and strong numerical modeling skills.

3. Exoplanet atmospheres: The successful applicant will develop and apply models of the formation of a rocky/icy planet within a primordial disk, the acquisition of a gaseous hydrogen-helium atmosphere, and the potential loss of that atmosphere to space, leading to predictions for the NASA Kepler mission, James Webb Space Telescope and ground-based observations. *Requirements*: Ph.D. in astrophysics, planetary science, or geophysics and strong numerical modeling skills.

Each postdoc will interact with other investigators in an interdisciplinary environment, and be encouraged to demonstrate leadership in a particular specialty. Each position is initially for one year, with a second year depending on research performance, and a third year depending on performance and funding. Each position offers an annual stipend of $51,600 and the opportunity to live in Honolulu, the topranked U.S. city in the 2010 Mercer Quality of Living Survey. Starting date: August 1, 2011 (negotiable). To apply, send a 2-page CV, including publication list, and names and contact information of 2 references.

Contact: `gaidos@hawaii.edu`

Theoretical molecular physics: Calculation of molecular line lists – Postdoctoral Research Associates

Jonathan Tennyson
Department of Physics and Astronomy, University College London, Gower St, London WC1E 6BT

London, Closing date for applications: Friday 25 March 2011

Applications are invited for two postdoctoral positions to work with Prof Jonathan Tennyson as part of a major new project aimed at calculating extensive line list as input for spectroscopic models of the atmospheres of extrasolar planets (and other hot bodies). The openings are for:

1. A 3-year position for some one to work on high accuracy electronic structure calculations of key molecular species;

2. A 2-year (possibly extendable) position to work on nuclear motion calculations and line lists of polyatomic molecules.

Note: there are two PhD studentships also available with this project.
(see http://www.ucl.ac.uk/phys/amopp/studentships/tennyson)

Informal enquiries can be made to Prof Jonathan Tennyson, Department of Physics and Astronomy, University College London, Gower St, London WC1E 6BT. Telephone: (+44) 20 7679 7155

See: https://atsv7.wcn.co.uk/search_engine/
jobs.cgi?owner=5041391&ownertype=fair&jcode=1176998&vt_template=965&adminview=1
for further information and the application procedure.

Download/Website: `http://www.ucl.ac.uk/phys/amopp/studentships/tennyson`

Contact: `j.tennyson@ucl.ac.uk`

5 Announcements

Planets in Binary Star Systems

N. Haghighipour
Institute for Astronomy and NASA Astrobiology Institute, University of Hawaii, USA

Astrophysics and Space Science Library 366, Springer Publishing

The detection of a giant planet around the primary of the *moderately close* spectroscopic binary γ Cephei in 2003 marked the beginning of a new era in theoretical and observational research on extrasolar planets. During the past few years, several of such planet-hosting binaries have been discovered, and many efforts have been made to understand planet-formation in these systems. This book presents the first comprehensive review of observational and theoretical research on planets in binaries. The first half of the book focuses on the observational evidence for the birthplace of planets in binary systems, and techniques of detecting planets in and around dual-stars. The second half discusses the status of theoretical research on the formation of planets in binaries, from planetesimals, to planetary embryos, and ultimately to giant and terrestrial planets. The last chapter presents a complete review of the dynamics of planets in binary star systems and the possibility of habitable planet formation in these environments.

Content

Chapter 1: Disks Around Young Binary Stars
(Lisa Prato and Alycia J. Weinberger)

Chapter 2: Probing the Impact of Stellar Duplicity on Planet Occurrence with Spectroscopic and Imaging Observations (Anne Eggenberger and Stephane Udry)

Chapter 3: The Detection of Extrasolar Planets Using Precise Stellar Radial Velocities
(Artie P. Hatzes, William D. Cochran, and Michael Endl)

Chapter 4: Observational Techniques for Detecting Planets in Binary Systems
(Matthew W. Muterspaugh, Maciej Konacki, Benjamin F. Lane, and Eric Pfahl)

Chapter 5: The SARG Planet Search
(S. Desidera, R. Gratton, M. Endl, A.F. Martinez Fiorenzano, M. Barbieri, R. Claudi, R. Cosentino, S. Scuderi, and M. Bonavita)

Chapter 6: Early Evolution of Planets in Binaries: PlanetDisk Interaction
(Willy Kley and Richard P. Nelson)

Chapter 7: Dynamics and Planet Formation in/Around Binaries
(Francesco Marzari, Philippe Thébault, Steve Kortenkamp, and Hans Scholl)

Chapter 8: Gravitational Instability in Binary Protoplanetary Disks
(Lucio Mayer, Alan Boss, and Andrew F. Nelson)

Chapter 9: N-Body Integrators for Planets in Binary Star Systems
(John E. Chambers)

Chapter 10: Terrestrial Planet Formation in Binary Star Systems
(Elisa V. Quintana and Jack J. Lissauer)

Chapter 11: Planetary Dynamics and Habitable Planet Formation in Binary Star Systems
(Nader Haghighipour, Rudolf Dvorak, and Elke Pilat-Lohinger)

Contact: `nader@ifa.hawaii.edu`

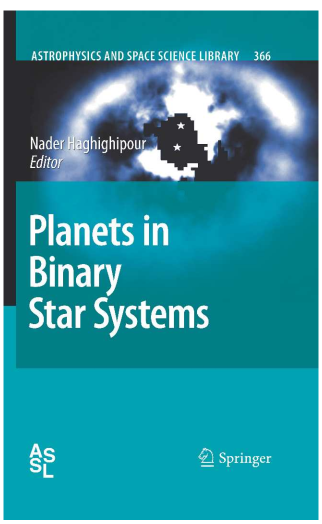

Figure 8: (Haghighipour) The book "Planets in Binary Star Systems" provides a comprehensive technical review of the current state of research on the formation, detection, and possible habitability of planets in and around binary stars.

Transiting Exoplanets

Carole A. Haswell
The Open University

Cambridge University Press, published July 2010

For the first time, the methods used in the detection and characterisation of exoplanets are presented in a textbook for advanced undergraduates. From determining the atmospheric properties of transiting exoplanets to measuring the planetary orbits alignment with the stellar spin, students will learn how these methods have reinvigorated theories of planet formation and evolution.

Table of Contents

1. Our Solar System from afar
2. Exoplanet discoveries by the transit method
3. What the transit light curve tells us
4. The exoplanet population
5. Transmission spectroscopy and the Rossiter-McLaughlin effect
6. Secondary eclipses and phase variations
7. Transit timing variations and orbital dynamics
8. Brave new worlds

Paperback; ISBN: 978-0521139380; 336 pages; full colour throughout; £35.00.

Download/Website: `http://www.cambridge.org/features/astrophysics/default.htm`

Contact: `c.a.haswell@open.ac.uk`

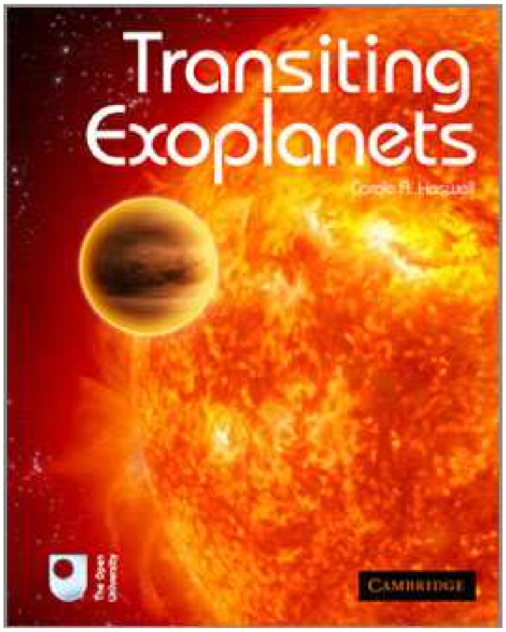

Figure 9: (Haswell) The book “Transiting Exoplanets” presents the methods used in the detection and characterisation of exoplanets.

An Introduction to Star Formation

Derek Ward-Thompson & Anthony P. Whitworth
Cardiff University

Cambridge University Press, published February 2011

Guiding the reader through all the stages that lead to the formation of a star such as our Sun, this advanced textbook provides students with a complete overview of star formation. It examines the underlying physical processes that govern the evolution from a molecular cloud core to a main-sequence star, and focuses on the formation of solar-mass stars. Each chapter combines theory and observation, helping readers to connect with and understand the theory behind star formation. Beginning with an explanation of the interstellar medium and molecular clouds as sites of star formation, subsequent chapters address the building of typical stars and the formation of high-mass stars, concluding with a discussion of the by-products and consequences of star formation. This is a unique, self-contained text with sufficient background information for self-study, and is ideal for students and professional researchers alike.

Table of Contents

Hardback; ISBN: 9780521630306; 228 pages; 81 b/w illus.; Dimensions: 247 x 174 mm; Weight: 0.6 kg; Available from February 2011; £40.00.

Download/Website: `http://www.cambridge.org/gb/knowledge/isbn/item5744226/?site_locale=en_GB`

Contact: `Derek.Ward-Thompson@astro.cf.ac.uk`

Transit Analysis Package (TAP and autoKep): IDL Graphical User Interfaces for Extrasolar Planet Transit Photometry

J. Zachary Gazak[1], *John A. Johnson*[2,3], *John Tonry*[1], *Jason Eastman*[4], *Andrew W. Mann*[1], *Eric Agol*[5]
[1] Institute for Astronomy, University of Hawai'i, 2680 Woodlawn Dr, Honolulu, HI 96822
[2] Department of Astrophysics, California Institute of Technology, MC 249-17, Pasadena, CA 91125
[3] NASA Exoplanet Science Institute (NExScI)
[4] The Ohio State University, Columbus, OH 43210
[5] Department of Astronomy, Box 351580, University of Washington, Seattle, WA 98195

astro-ph, in press (arXiv:1102.1036)

We present an IDL graphical user interface-driven software package designed for the analysis of extrasolar planet transit light curves. The Transit Analysis Package (TAP) software uses Markov Chain Monte Carlo (MCMC) techniques to fit light curves using the analytic model of Mandel and Agol (2002). The package incorporates a wavelet based likelihood function developed by Carter and Winn (2009) which allows the MCMC to assess parameter uncertainties more robustly than classic χ^2 methods by parameterizing uncorrelated "white" and correlated "red" noise. The software is able to simultaneously analyze multiple transits observed in different conditions (instrument, filter,

weather, etc). The graphical interface allows for the simple execution and interpretation of Bayesian MCMC analysis tailored to a user's specific data set and has been thoroughly tested on ground-based and Kepler photometry. AutoKep provides a similar GUI for the preparation of Kepler MAST archive data for analysis by TAP or any other analysis software.

Download/Website: `http://www.ifa.hawaii.edu/users/zgazak/IfA/TAP.html`

Contact: `zgazak@ifa.hawaii.edu`

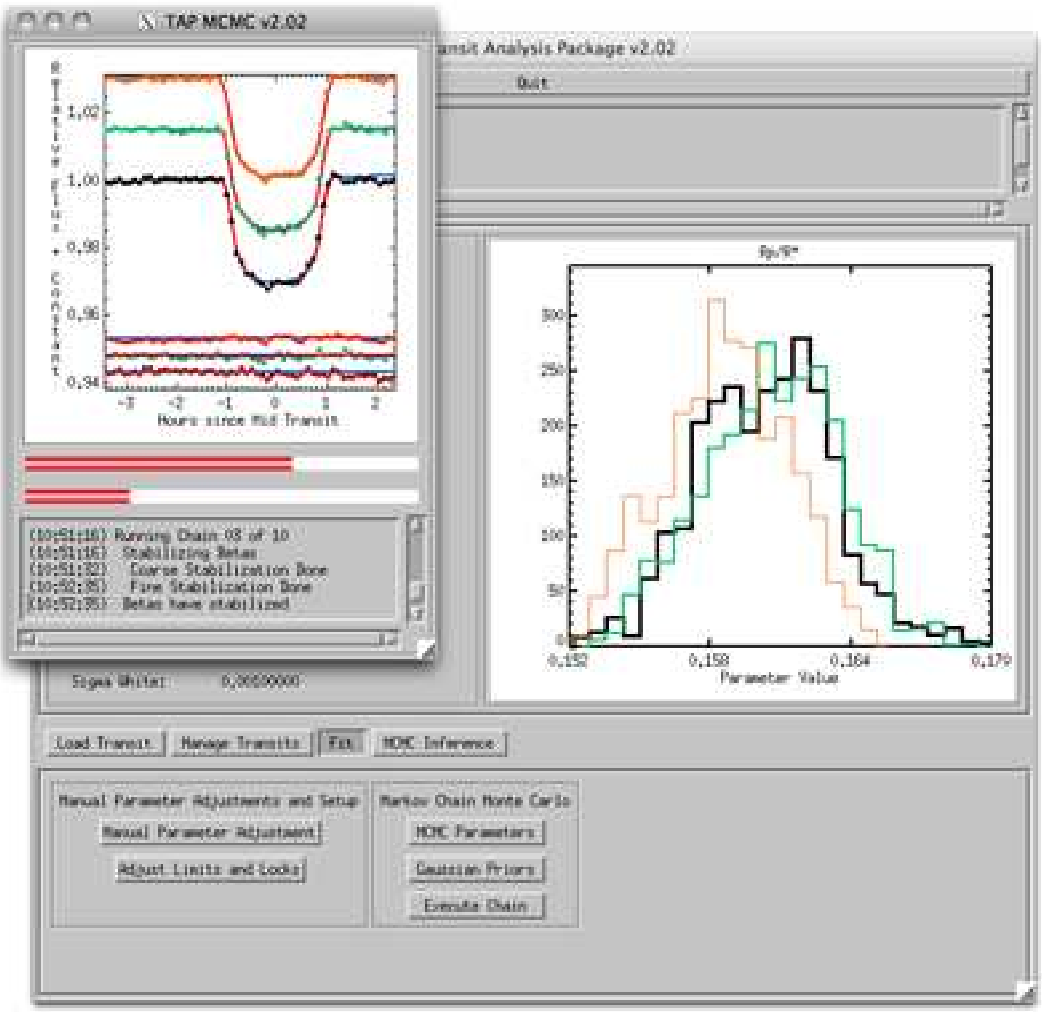

Figure 10: (Gazak et al.)

2011B NASA Keck Call – proposals due March 17, 2011

NASA
Exoplanet Science Institute (NExScI) at Caltech

NExScI Caltech, All proposals due on 17 March 2011 at 4 pm PDT

NASA is soliciting proposals to use the Keck Telescopes for the 2011B observing semester (August 2011 - January 2012). NASA intends the use of the Keck telescopes to be highly strategic in support of on-going missions and/or high priority, long term science goals. NASA Keck time is open to *PIs at U.S.-based institutions* to explore a wide range of disciplines including exoplanets and solar system topics, galactic and extragalactic topics, cosmology and high energy astrophysics. This semester and continuing into future semesters, there is limited time available for observations of targets based on public Kepler data or data obtained through the Kepler Guest Observer programs. In addition, the call for CoRoT Key Science has been extended to semester 2012B.

Proposals are also sought in the following discipline areas:
(1) investigations in support of EXOPLANET EXPLORATION science goals and missions;
(2) investigations of our own SOLAR SYSTEM;
(3) investigations in support of COSMIC ORIGINS science goals and missions;
(4) investigations in support of PHYSICS OF THE COSMOS science goals and missions;
and (5) direct MISSION SUPPORT.

The proposal process is being handled by the NASA Exoplanet Science Institute (NExScI) at Caltech and all proposals are due on 17 March 2011 at 4 pm PDT.

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 2011. If you see any that we missed, please let us know and we'll include them in the next issue.

Exoplanets

astro-ph/1102.0063: **Disequilibrium Carbon, Oxygen, and Nitrogen Chemistry in the Atmospheres of HD 189733b and HD 209458b** by *Julianne I. Moses, Channon Visscher, Jonathan J. Fortney et al.*

astro-ph/1102.0237: **Astrophysical Parameters and Habitable Zone of the Exoplanet Hosting Star GJ 581** by *Kaspar von Braun, Tabetha S. Boyajian, Stephen R. Kane et al.*

astro-ph/1102.0274: **Resolving the Sin(I) degeneracy in Low-Mass Multi-Planet Systems** by *Konstantin Batygin, Gregory Laughlin*

astro-ph/1102.0311: **Accretion of a Terrestrial-Like Minor Planet by a White Dwarf** by *Carl Melis, J. Farihi, P. Dufour et al.*

astro-ph/1102.0464: **Exoplanets transmission spectroscopy: accounting for eccentricity and longitude of periastron. Superwinds in the upper atmosphere of HD209458b?** by *M. Montalto, N. C. Santos, I. Boisse et al.*

astro-ph/1102.0499: **Exoplanets around G-K Giants** by *M.P. Dollinger, A.P. Hatzes, L. Pasquini et al.*

astro-ph/1102.0500: **A Planet of an A-Star: HD15082b** by *E.W. Guenther, A.C. Cameron, B. Smalley et al.*

astro-ph/1102.0501: **Planets around Extreme Horizontal Branch Stars** by *E. Bear, N. Soker*
astro-ph/1102.0503: **A Planetary Companion around a Metal-Poor Star with Extragalactic Origin** by *J. Setiawan, R. Klement, T. Henning et al.*
astro-ph/1102.0506: **Latest Results from the DODO Survey: Imaging Planets around White Dwarfs** by *E. Hogan, M.R. Burleigh, F.J. Clarke*
astro-ph/1102.0507: **Searching for Planets with White Dwarf Pulsations: Spurious Detections** by *J. Dalessio, J.L. Provencal, H.S. Shipman*
astro-ph/1102.0508: **The Planets around the Post-Common Envelope Binary NN Serpentis** by *F.V. Hessman, K. Beuermann, S. Dreizler et al.*
astro-ph/1102.0512: **Study of Planetary Systems around Giant Stars** by *M.I. Jones, J.S. Jenkins, P. Rojo*
astro-ph/1102.0513: **Towards a New Prescription for the Tidal Capture of Planets, Brown Dwarfs and Stellar Companions** by *N. Madappatt Alikutty, O. De Marco, J. Nordhaus et al.*
astro-ph/1102.0515: **Identifying A Stars in the CoRoT Fields IRa01, LRa01 and LRa02** by *D. Sebastian, E.W. Guenther*
astro-ph/1102.0541: **Characteristics of planetary candidates observed by Kepler, II: Analysis of the first four months of data** by *William J. Borucki, David G. Koch, Gibor Basri et al.*
astro-ph/1102.0543: **Architecture and Dynamics of Kepler's Candidate Multiple Transiting Planet Systems** by *Jack J. Lissauer, Darin Ragozzine, Daniel C. Fabrycky et al.*
astro-ph/1102.0544: **Transit Timing Observations from Kepler: I. Statistical Analysis of the First Four Months** by *Eric B. Ford, Jason F. Rowe, Daniel C. Fabrycky et al.*
astro-ph/1102.0547: **The Distribution of Transit Durations for Kepler Planet Candidates and Implications for their Orbital Eccentricities** by *Althea V. Moorhead, Eric B. Ford, Robert C. Morehead et al.*
astro-ph/1102.0555: **The atmospheres of the hot-Jupiters Kepler-5b and Kepler-6b observed during occultations with Warm-Spitzer and Kepler** by *Jean-Michel Desert, David Charbonneau, Jonathan J. Fortney et al.*
astro-ph/1102.0558: **MOA-2009-BLG-387Lb: A massive planet orbiting an M dwarf** by *Virginie Batista, A. Gould, S. Dieters et al.*
astro-ph/1102.0562: **KOI-126: A Triply-Eclipsing Hierarchical Triple with Two Low-Mass Stars** by *Joshua A. Carter, Daniel C. Fabrycky, Darin Ragozzine et al.*
astro-ph/1102.0605: **KEPLER's First Rocky Planet: Kepler-10b** by *Natalie M. Batalha, William J. Borucki, Stephen T. Bryson et al.*
astro-ph/1102.0857: **Internal wave breaking and the fate of planets around solar-type stars** by *A. J. Barker, G. I. Ogilvie*
astro-ph/1102.0867: **Potential Biosignatures in Super-Earth Atmospheres** by *H. Rauer, S. Gebauer, P. v. Paris et al.*
astro-ph/1102.1108: **The Steppenwolf: A proposal for a habitable planet in interstellar space** by *Dorian S. Abbot, Eric R. Switzer*
astro-ph/1102.1109: **Kepler planet candidates consistent with core accretion** by *Andrew Gould, Jason Eastman*
astro-ph/1102.1375: **WASP-39b: a highly inflated Saturn-mass planet orbiting a late G-type star** by *F. Faedi, S. C. C. Barros, D. R. Anderson et al.*
astro-ph/1102.1420: **A short-period super-Earth orbiting the M2.5 dwarf GJ3634. Detection with Harps velocimetry and transit search with Spitzer photometry** by *X. Bonfils, M. Gillon, T. Forveille et al.*
astro-ph/1102.1559: **Transit Variability in Bow Shock-Hosting Planets** by *A. A. Vidotto, M. Jardine, Ch. Helling*
astro-ph/1102.1629: **The extreme physical properties of the CoRoT-7b super-Earth** by *A. Leger, O. Grasset, B. Fegley et al.*
astro-ph/1102.2192: **Time evolution and rotation of starspots on CoRoT-2 from the modelling of transit photometry** by *Adriana Silva-Valio, A. F. Lanza*
astro-ph/1102.2211: **Transformation of Trojans into Quasi-Satellites During Planetary Migration and Their Subsequent Close-Encounters with the Host Planet** by *Stephen J. Kortenkamp, Emily C. S. Joseph*

astro-ph/1102.2262: **Misaligned And Alien Planets From Explosive Death Of Stars** by *Shlomo Dado, Arnon Dar, Erez Ribak*

astro-ph/1102.2299: **Origin of lithium enrichment in K giants** by *Yerra Bharat Kumar, Bacham E. Reddy, David L. Lambert*

astro-ph/1102.2421: **High-precision photometry of WASP-12 b transits** by *G.Maciejewski, R.Errmann, St.Raetz et al.*

astro-ph/1102.2737: **Magnetosphere-ionosphere coupling at Jupiter-like exoplanets with internal plasma sources: implications for detectability of auroral radio emissions** by *J. D. Nichols*

astro-ph/1102.2830: **Astrophysical Ionizing Radiation and the Earth: A Brief Review and Census of Intermittent Intense Sources** by *Adrian L. Melott, Brian C. Thomas*

astro-ph/1102.3187: **Tidal Evolution of Close-in Extrasolar Planets: High Stellar Q from New Theoretical Models** by *Kaloyan Penev, Dimitar Sasselov*

astro-ph/1102.3314: **Bayesian re-analysis of the radial velocities of Gliese 581. Evidence in favour of only four planetary companions** by *Mikko Tuomi*

astro-ph/1102.3336: **Inflated hot Jupiters from merger events** by *E.L. Martin, H.C. Spruit*

astro-ph/1102.3372: **HD 5388 b is a 69 M_{Jup} companion instead of a planet** by *Johannes Sahlmann, Christophe Lovis, Didier Queloz*

astro-ph/1102.3470: **Five New Transit Epochs of the Exoplanet OGLE-TR-111b** by *Sergio Hoyer, Patricio Rojo, Mercedes Lopez-Morales et al.*

astro-ph/1102.3625: **Colors of a Second Earth II: Effects of Clouds on Photometric Characterization of Earth-like Exoplanets** by *Yuka Fujii, Hajime Kawahara, Yasushi Suto et al.*

astro-ph/1102.3691: **Direct Imaging Constraints on the Putative Exoplanet 14 Her c** by *Timothy J. Rodigas, Jared R. Males, Philip M. Hinz et al.*

astro-ph/1102.3914: **Observational Constraints on Companions inside of 10 AU in the HR 8799 Planetary System** by *Sasha Hinkley, John M. Carpenter, Michael J. Ireland et al.*

astro-ph/1102.3926: **Habitability of the Goldilocks Planet Gliese 581g: Results from Geodynamic Models** by *W. von Bloh, M. Cuntz, S. Franck et al.*

astro-ph/1102.4125: **The Dynamics of Stellar Coronae Harboring Hot-jupiters II. A Space Weather Event on A Hot-jupiter** by *O. Cohen, V.L. Kashyap, J.J. Drake et al.*

astro-ph/1102.4146: **Theory of planet formation and comparison with observation: Formation of the planetary mass-radius relationship** by *C. Mordasini, Y. Alibert, W. Benz et al.*

astro-ph/1102.4198: **Clues on the importance of comets in the origin and evolution of the atmospheres of Titan and Earth** by *Josep M. Trigo-Rodriguez, F. Javier Martin-Torres*

astro-ph/1102.4297: **Hot Super Earths: Tidally Downsized hot jupiters? The hot jupiter around the metal poor star explained** by *Sergei Nayakshin*

astro-ph/1102.4345: **Rotational Variability of Earth's Polar Regions: Implications for Detecting Snowball Planets** by *Nicolas B. Cowan, Tyler Robinson, Timothy A. Livengood et al.*

astro-ph/1102.4438: **New approaches to the exploration: planet Mars and bacterial life** by *Giuseppe Galletta, Giulio Bertoloni, Maurizio D'Alessandro*

astro-ph/1102.4647: **The role of planets in shaping planetary nebulae** by *Orsola De Marco, Noam Soker*

astro-ph/1102.4989: **Characterizing the atmospheres of transiting rocky planets around late type dwarfs** by *E. Palle, M. R. Zapatero Osorio, A. Garca Munoz*

astro-ph/1102.5089: **Model atmospheres for massive gas giants with thick clouds: Application to the HR 8799 planets and predictions for future detections** by *Nikku Madhusudhan, Adam Burrows, Thayne Currie et al.*

astro-ph/1102.5330: **VLT/NACO astrometry of the HR8799 planetary system. L'-band observations of the three outer planets** by *C. Bergfors, W. Brandner, M. Janson et al.*

Disks

astro-ph/1102.0833: **Binary Formation in Planetesimal Disks I. Equal Mass Planetesimals** by *Junko K. Daisaka, Junichiro Makino, Hiroshi Daisaka*
astro-ph/1102.0857: **Three-dimensional simulations of internal wave breaking and the fate of planets around solar-type stars** by *A. J. Barker*
astro-ph/1102.1430: **Using Kuiper Belt Binaries to Constrain Neptune's Migration History** by *Ruth A. Murray-Clay, Hilke E. Schlichting*
astro-ph/1102.1983: **Gas and Dust Toward DG Tau B and VV CrA** by *Andrew J. Kruger, Matthew J. Richter, John S. Carr et al.*
astro-ph/1102.2103: **Orbital Migration Models under Test** by *Willy Kley*
astro-ph/1102.3185: **Dynamical effects of stellar mass loss on a Kuiper-like belt** by *Amy Bonsor, Alexander Mustill, Mark Wyatt*
astro-ph/1102.4408: **Direct Imaging of Fine Structures in Giant Planet Forming Regions of the Protoplanetary Disk around AB Aurigae** by *J. Hashimoto, M. Tamura, T. Muto et al.*
astro-ph/1102.4555: **Formation of Giant Planets by Disk Instability on Wide Orbits Around Protostars with Varied Masses** by *Alan P. Boss*
astro-ph/1102.4620: **On the Formation of Planetesimals via Secular Gravitational Instabilities with Turbulent Stirring** by *Andrew N. Youdin*
astro-ph/1102.4982: **A companion candidate in the gap of the T Cha transitional disk** by *N. Huelamo, S. Lacour, P. Tuthill et al.*

Instrumentation and Techniques

astro-ph/1102.0721: **SEREN - A new SPH code for star and planet formation simulations** by *D. A. Hubber, C. P. Batty, A. McLeod et al.*
astro-ph/1102.1036: **Transit Analysis Package (TAP and autoKep): IDL Graphical User Interfaces for Extrasolar Planet Transit Photometry** by *J. Zachary Gazak, John A. Johnson, John Tonry et al.*
astro-ph/1102.2248: **Micro-pixel accuracy centroid displacement estimation and detector calibration** by *Chengxing Zhai, Mike Shao, Renaud Goullioud et al.*
astro-ph/1102.2319: **Global stellar variability study in the field-of-view of the Kepler satellite** by *J. Debosscher, J. Blomme, C. Aerts et al.*
astro-ph/1102.3197: **Laboratory comparison of coronagraphic concepts under dynamical seeing and high-order adaptive optics correction** by *P. Martinez, E. Aller-Carpentier, M. Kasper et al.*
astro-ph/1102.4549: **Fitting Astronomical Data** by *Andre Le Floch*
astro-ph/1102.5248: **First results from the MIT Optical Rapid Imaging System (MORIS) on the IRTF: a stellar occultation by Pluto and a transit by exoplanet XO-2b** by *A. A. S. Gulbis, S.J. Bus, J. L. Elliot et al.*