ExoPlanet News
An Electronic Newsletter

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Contents

1 Editorial

Welcome to the fifty eighth edition of ExoPlanet News. For the first time I can remember, this month we have no advertisements for conferences, job vacancies or other announcements. I'm sure that regular contributors will rectify that for the next edition! Nonetheless, we do have an excellent selection of abstracts of recent papers and the usual long list of relevant papers seen in the last month's astro-ph listings.

The next edition of the newsletter is planned for early May 2013, so please send anything relevant over the next few weeks 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
The Open University

2 Abstracts of refereed papers

Evolution of Planetary Systems with Time Dependent Stellar Mass Loss

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Monthly Notices of the Royal Astronomical Society, in press, arXiv:1303.3841

Observations indicate that intermediate mass stars, binary stars, and stellar remnants often host planets; a complete explanation of these systems requires an understanding of how planetary orbits evolve as their central stars lose mass. Motivated by these dynamical systems, this paper generalizes in two directions previous studies of orbital evolution in planetary systems with stellar mass loss: [1] Many previous treatments focus on constant mass loss rates and much of this work is carried out numerically. Here we study a class of single planet systems where the stellar mass loss rate is time dependent. The mass loss rate can be increasing or decreasing, but the stellar mass always decreases monotonically. For this class of models, we develop analytic approximations to specify the final orbital elements for planets that remain bound after the epoch of mass loss, and find the conditions required for the planets to become unbound. We also show that for some mass loss functions, planets become unbound only in the asymptotic limit where the stellar mass vanishes. [2] We consider the chaotic evolution for two planet systems with stellar mass loss. Here we focus on a model consisting of analogs of Jupiter, Saturn, and the Sun. By monitoring the divergence of initially similar trajectories through time, we calculate the Lyapunov exponents of the system. This analog solar system is chaotic in the absence of mass loss with Lyapunov time in the range 5 - 10 Myr; we find that the Lyapunov time decreases with increasing stellar mass loss rate, with a nearly linear relationship between the two time scales. Taken together, the results of this paper help provide an explanation for a wide range of dynamical evolution that occurs in solar systems with stellar mass loss.

Download/Website: `http://arxiv.org/abs/1303.3841`

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HST Spectral Mapping of L/T Transition Brown Dwarfs Reveals Cloud Thickness Variations

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The Astrophysical Journal, in press (arXiv:1303.4151)

Most directly imaged giant exoplanets are fainter than brown dwarfs with similar spectra. To explain their relative underluminosity unusually cloudy atmospheres have been proposed. However, with multiple parameters varying between any two objects, it remained difficult to observationally test this idea. We present a new method, sensitive time-resolved Hubble Space Telescope near-infrared spectroscopy, to study two rotating L/T transition brown dwarfs (2M2139 and SIMP0136). The observations provide spatially and spectrally resolved mapping of the cloud decks of the brown dwarfs. The data allow the study of cloud structure variations while other parameters are unchanged. We find that both brown dwarfs display variations of identical nature: J- and H-band brightness variations with minimal color and spectral changes. Our light curve models show that even the simplest surface brightness distributions require at least three elliptical spots. We show that for each source the spectral changes can be reproduced with a linear combination of only two different spectra, i.e. the entire surface is covered by two distinct types of regions. Modeling the color changes and spectral variations together reveal patchy cloud covers consisting of a spatially heterogenous mix of low-brightness, low-temperature thick clouds and brighter, thin and warm clouds. We show that the same thick cloud patches seen in our varying brown dwarf targets, if extended to the entire photosphere, predict near-infrared colors/magnitudes matching the range occupied by the directly imaged exoplanets that are cooler and less luminous than brown dwarfs with similar spectral types. This supports the models in which thick clouds are responsible for the near infrared properties of these ”underluminous” exoplanets.

Download/Website: `http://adsabs.harvard.edu/abs/2013arXiv1303.4151A`

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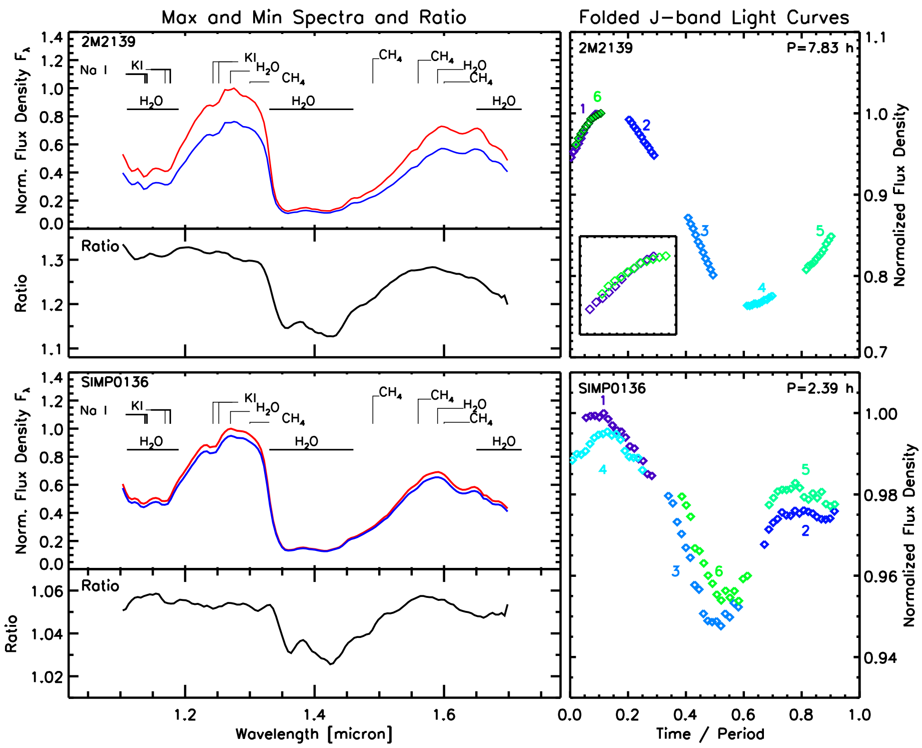

Figure 1: (Apai et al.) Spectra at the faintest and brightest stages of the two brown dwarfs show prominent water, potassium, and methane absorption features with similar depths. The ratio of the minimum over maximum spectra (minor panels on left) show variations with weak wavelength-dependence in the continuum and in the potassium, sodium and methane features, but demonstrate lower-amplitude variations in the 1.4 μm water band. The period-folded J-band light curves (right) reveal variations in the surface brightness distributions of these two targets. Red and black colors show data from the first and sixth orbit for 2M2139, which perfectly overlap if a 0.5% flux scaling is allowed, consistent with the photometric stability on a 2σ level. In contrast, SIMP0136 displays light curve evolution over 5 hours present both in the absolute levels and the light curve shape at levels well above our uncertainties.

Spatially Resolved Images of Dust Belt(s) Around the Planet-hosting Subgiant κ CrB

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Monthly Notices of the Royal Astronomical Society, in press, arXiv:1302.7000

We present *Herschel* spatially resolved images of the debris disc orbiting the subgiant κ CrB. Not only are these the first resolved images of a debris disc orbiting a subgiant, but κ CrB is a rare example of an intermediate mass star where a detailed study of the structure of the planetary system can be made, including both planets and planetesimal belt(s). The only way to discover planets around such stars using the radial velocity technique is to observe 'retired' A stars, which are cooler and slower rotators compared to their main-sequence counterparts. A planetary companion has already been detected orbiting the subgiant κ CrB, with revised parameters of $m \sin i = 2.1 M_J$ and $a_{pl} = 2.8$AU (Johnson et al., 2008). We present additional Keck I HIRES radial velocity measurements that provide evidence for a second planetary companion, alongside Keck II AO imaging that places an upper limit on the mass of this companion. Modelling of our *Herschel* images shows that the dust is broadly distributed, but cannot distinguish between a single wide belt (from 20 to 220AU) or two narrow dust belts (at around 40 and 165AU). Given the existence of a second planetary companion beyond $\sim$3AU it is possible that the absence of dust within $\sim$ 20AU is caused by dynamical depletion, although the observations are not inconsistent with depletion of these regions by collisional erosion, which occurs at higher rates closer to the star.

Download/Website: `http://ipag.osug.fr/ bonsora/kappacrb.pdf`

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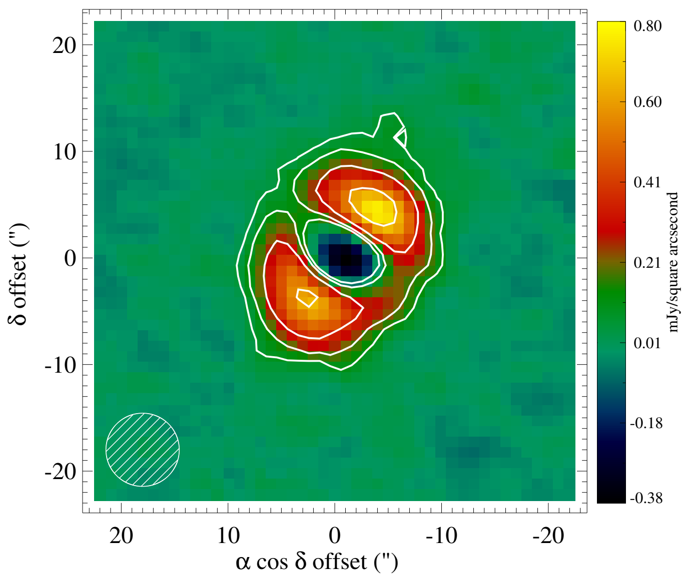

Figure 2: (Bonsor et al.) The resolved 100μm *Herschel* PACS observations of the debris disc orbiting κ CrB, after subtraction of the stellar PSF.

Direct-imaging discovery of a 12–14 Jupiter-mass object orbiting a young binary system of very low-mass stars

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Astronomy & Astrophysics Letters, in press (arXiv:1303.4525)

Though only a handful of extrasolar planets have been discovered via direct-imaging, each of these discoveries had a tremendous impact on our understanding of planetary formation, stellar formation and cool atmosphere physics. Since many of these newly imaged giant planets orbit massive A or even B stars we investigate whether giant planets could be found orbiting low-mass stars at large separations. We have been conducting an adaptive optic imaging survey to search for planetary-mass companions of young M dwarfs in the solar neigbourhood, in order to probe different initial conditions of planetary formation. We report here the direct-imaging discovery of 2MASS J01033563-5515561(AB)b, a 12-14 M_{Jup} companion at a projected separation of 84 AU from a pair of young late-M stars, with which it shares proper motion. We also detected a Keplerian-compatible orbital motion. This young L-type object at the planet/brown dwarf mass boundary is the first ever imaged around a binary system at a separation compatible with formation in a disc.

Download/Website: `http://arxiv.org/abs/1303.4525`

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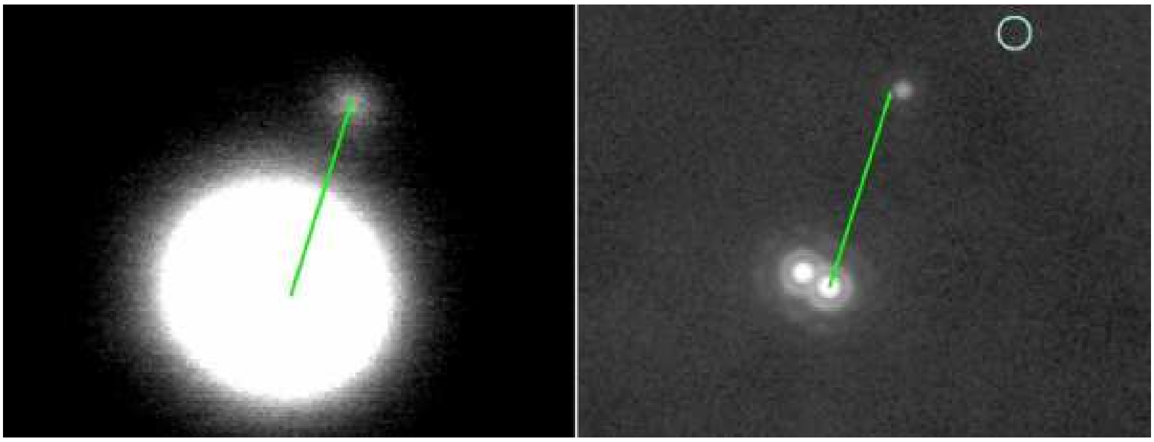

Figure 3: (Delorme et al.) **Left:** 2MASS0103(AB)b in October 2002, with NACO in H-band **Right:** 2MASS0103(AB)b in November 2012, with NACO in L' band. The green arrow shows the position of the companion in 2002. The light-blue circle identifies the expected position of the companion if it had been a background source. The host binary was also resolved in 2002, in H-band, but this is not visible because of the intensity scale used.

Static compression of porous dust aggregates

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Astronomy & Astrophysics, in press (arXiv:1303.3351)

Context: In protoplanetary disks, dust grains coagulate with each other and grow to form aggregates. As these aggregates grow by coagulation, their filling factor ϕ decreases down to $\phi \ll 1$. However, comets, the remnants of these early planetesimals, have $\phi \sim 0.1$. Thus, static compression of porous dust aggregates is important in planetesimal formation. However, the static compression strength has been investigated only for relatively high density aggregates ($\phi > 0.1$).
Aims: We investigate and find the compression strength of highly porous aggregates ($\phi \ll 1$).
Methods: We perform three dimensional N-body simulations of aggregate compression with a particle-particle interaction model. We introduce a new method of static compression: the periodic boundary condition is adopted and the boundaries move with low speed to get closer. The dust aggregate is compressed uniformly and isotropically by themselves over the periodic boundaries.
Results: We empirically derive a formula of the compression strength of highly porous aggregates ($\phi \ll 1$). We check the validity of the compression strength formula for wide ranges of numerical parameters, such as the size of initial aggregates, the boundary speed, the normal damping force, and material. We also compare our results to the previous studies of static compression in the relatively high density region ($\phi > 0.1$) and confirm that our results consistently connect to those in the high density region. The compression strength formula is also derived analytically.

Download/Website: `http://arxiv.org/abs/1303.3351, http://th.nao.ac.jp/MEMBER/kataoka/`

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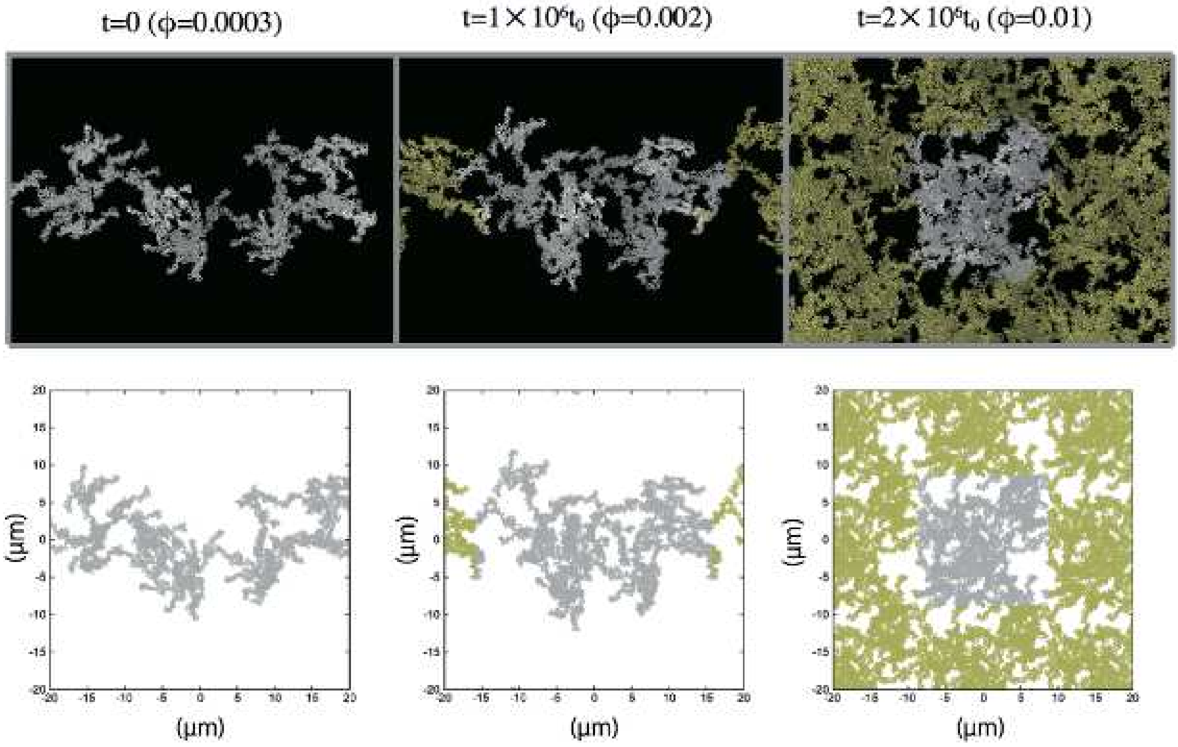

Figure 4: (Kataoka et al.) Snapshots of the evolution of an aggregate under compression in the case of $N = 16384$. The top three figures are three dimensional visualization. They have the same scale with different time epoch. The white particles are inside a box enclosed by the periodic boundaries. The yellow particles are in neighboring boxes to the box of white particles. For visualization, we do not draw the copies in back and front side of the boundaries but only 8 copies of the white particles across the boundaries. Each bottom figure represents projected positions onto two-dimensional plane of all particles in each corresponding top figure. The gray points in the bottom figures correspond to the positions of the white particles in the top figures and the yellow points correspond to those of the yellow particles in the top figures. Scales are in μm.

Habitable zones around main sequence stars: new estimates

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The Astrophysical Journal, published (2013ApJ...765..131K)

Identifying terrestrial planets in the habitable zones (HZs) of other stars is one of the primary goals of ongoing radial velocity and transit exoplanet surveys and proposed future space missions. Most current estimates of the boundaries of the HZ are based on 1-D, cloud-free, climate model calculations by Kasting et al.(1993). However, this model used band models which were based on older HITRAN and HITEMP line-by-line databases. The inner edge of the HZ in Kasting et al.(1993) model was determined by loss of water, and the outer edge was determined by the maximum greenhouse provided by a CO2 atmosphere. A conservative estimate for the width of the HZ from this model in our Solar system is 0.95-1.67 AU.

Here, an updated 1-D radiative-convective, cloud-free climate model is used to obtain new estimates for HZ widths around F, G, K and M stars. New H2O and CO2 absorption coefficients, derived from the HITRAN 2008 and HITEMP 2010 line-by-line databases, are important improvements to the climate model. According to the new model, the water loss (inner HZ) and maximum greenhouse (outer HZ) limits for our Solar System are at 0.99 AU and 1.70 AU, respectively, suggesting that the present Earth lies near the inner edge. Additional calculations are performed for stars with effective temperatures between 2600 K and 7200 K, and the results are presented in parametric form, making them easy to apply to actual stars. The new model indicates that, near the inner edge of the HZ, there is no clear distinction between runaway greenhouse and water loss limits for stars with $T_{eff} <= 5000$ K which has implications for ongoing planet searches around K and M stars. To assess the potential habitability of extrasolar terrestrial planets, we propose using stellar flux incident on a planet rather than equilibrium temperature. This removes the dependence on planetary (Bond) albedo, which varies depending upon the host star's spectral type. We suggest that conservative estimates of the HZ (water loss and maximum greenhouse limits) should be used for current RV surveys and *Kepler* mission to obtain a lower limit on $\eta_{\oplus}$, so that future flagship missions like *TPF-C* and *Darwin* are not undersized. Our model does not include the radiative effects of clouds; thus, the actual HZ boundaries may extend further in both directions than the estimates just given.

Download/Website: `http://www3.geosc.psu.edu/ ruk15/planets/`

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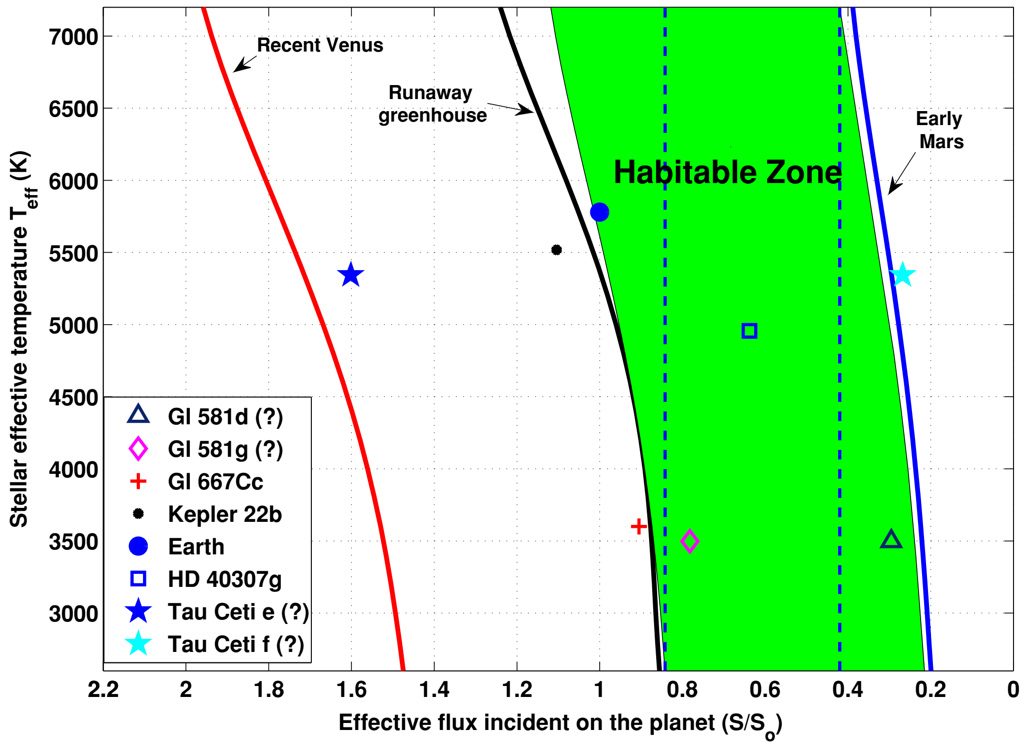

Figure 5: (Kopparapu et al.) Various cloud-free habitable zone (flux) boundaries for stars with different T_{eff}. The boundaries of the green-shaded region are determined by the moist-greenhouse (inner edge, higher flux values) & maximum greenhouse (outer edge, lower flux values). A planet that receives stellar flux bounded by the two dashed vertical lines is in the HZ irrespective of the stellar type. Some of the currently known exoplanets that are thought to be in the HZ by previous studies are also shown. The '?' for Gl 581 and Tau Ceti system of planets imply that there is an ongoing discussion about their existence. For stars with $T_{eff} <= 5000$ K, there is no clear distinction between runaway and moist-greenhouse limit.

A revised estimate of the occurrence rate of terrestrial planets in the habitable zones around kepler M-dwarfs

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Astrophysical Journal, accepted, arxiv:1303.2649

Because of their large numbers, low mass stars may be the most abundant planet hosts in our Galaxy. Furthermore, terrestrial planets in the habitable zones (HZs) around M-dwarfs can potentially be characterized in the near future and hence may be the first such planets to be studied. Recently Dressing & Charbonneau(2013) used *Kepler* data and calculated the frequency of terrestrial planets in the HZ of cool stars to be $0.15^{+0.13}_{-0.06}$ per star for Earth-size planets ($0.5 - 1.4\ R_\oplus$). However, this estimate was derived using the Kasting et al.(1993) HZ limits, which were not valid for stars with effective temperatures lower than 3700 K. Here we update their result using new HZ limits from Kopparapu et al.(2013) for stars with effective temperatures between 2600 K and 7200 K, which includes the cool M stars in the *Kepler* target list. The new habitable zone boundaries increase the number of planet candidates in the habitable zone. Assuming Earth-size planets as $0.5 - 1.4\ R_\oplus$, when we reanalyze their results, we obtain a terrestrial planet frequency of $0.48^{+0.12}_{-0.24}$ and $0.53^{+0.08}_{-0.17}$ planets per M-dwarf star for conservative and optimistic limits of the HZ boundaries, respectively. Assuming Earth-size planets as $0.5 - 2\ R_\oplus$, the frequency increases to $0.51^{+0.10}_{-0.20}$ per star for the conservative estimate and to $0.61^{+0.07}_{-0.15}$ per star for the optimistic estimate. Within uncertainties, our optimistic estimates are in agreement with a similar optimistic estimate from the radial velocity survey of M-dwarfs ($0.41^{+0.54}_{-0.13}$, Bonfils et al.(2011)). So, the potential for finding Earth-like planets around M stars may be higher than previously reported.

Download/Website: http://arxiv.org/abs/1303.2649

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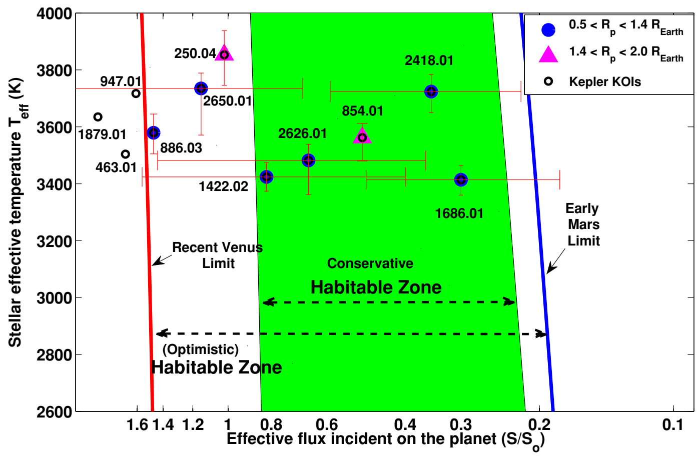

Figure 6: (Kopparapu) Incident stellar flux on a planet as a function of stellar effective temperature, T_{eff}. The green shaded region is the conservative HZ. The optimistic HZ limits are recent Venus (solid red curve) and Early Mars (solid blue curve). Two of the terrestrial-size KOIs (1422.02 and 2626.01) that are in the Dressing & Charbonneau(2013) HZ are also shown.

Characterization of potentially habitable planets: Retrieval of atmospheric and planetary properties from emission spectra

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Astronomy & Astrophysics, vol. 551, id. A120, doi:10.1051/0004-6361/201220009 (arXiv:1301.0217)

The search for atmospheric signatures to establish planetary habitability and the presence of life might be possible in the future. We want to quantify the accuracy of retrieved atmospheric parameters which might be obtained from infrared emission spectroscopy. We use synthetic observations of hypothetical habitable planets, constructed with a parametrized atmosphere model, a high-resolution radiative transfer model and a simplified noise model. Classic statistical tools such as chi2 statistics and least-square fits were used to analyze the simulated observations. When adopting the design of currently planned or proposed exoplanet characterization missions, we find that emission spectroscopy could provide weak limits on surface conditions of terrestrial planets, hence their potential habitability. However, these mission designs are unlikely to allow to characterize the composition of the atmosphere of a habitable planet, even though CO2 is detected. Upon increasing the signal-to-noise ratios by about a factor of 2-5 (depending on spectral resolution) compared to current mission designs, the CO2 content could be characterized to within two orders of magnitude. The detection of the O3 biosignature remains marginal. The atmospheric temperature structure could not be constrained. Therefore, a full atmospheric characterization seems to be beyond the capabilities of such missions when using only emission spectroscopy during secondary eclipse or target visits. Other methods such as transmission spectroscopy or orbital photometry are probably needed in order to give additional constraints and break degeneracies.

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Stars Don't Eat Their Young Migrating Planets – Empirical Constraints On Planet Migration Halting Mechanisms

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The Astrophysical Journal, in press (arXiv 1112.1595)

The discovery of "hot Jupiters" very close to their parent stars confirmed that Jovian planets migrate inward via several potential mechanisms. We present empirical constraints on planet migration halting mechanisms. We compute model density functions of close-in exoplanets in the orbital semi-major axis – stellar mass plane to represent planet migration that is halted via several mechanisms, including the interior 1:2 resonance with the magnetospheric disk truncation radius, the interior 1:2 resonance with the dust sublimation radius, and several scenarios for tidal halting. The models differ in the predicted power law dependence of the exoplanet orbital semi-major axis as a function stellar mass, and thus we also include a power law model with the exponent as a free parameter. We use a Bayesian analysis to assess the model success in reproducing empirical distributions of confirmed exoplanets and Kepler candidates that orbit interior to 0.1 AU. Our results confirm a correlation of the halting distance with stellar mass. Tidal halting provides the best fit to the empirical distribution of confirmed Jovian exoplanets at a statistically robust level, consistent with the Kozai mechanism and the spin-orbit misalignment of a substantial fraction of hot Jupiters. We can rule out migration halting at the interior 1:2 resonances with the magnetospheric disk truncation radius and the interior 1:2 resonance with the dust disk sublimation radius, a uniform random distribution, and a distribution with no dependence on stellar mass. Note, our results do not rule out Type II migration, but rather eliminate the role of a circumstellar disk in stopping exoplanet migration. For Kepler candidates, which have a more restricted range in stellar mass compared to confirmed planets, we are unable to discern between the tidal dissipation and magnetospheric disk truncation braking mechanisms at a statistically significant level. The power law model favors exponents in the range of 0.38–0.9. This is larger than that predicted for tidal halting (0.23–0.33), which suggests that additional physics may be missing in the tidal halting theory.

Download/Website: `http://adsabs.harvard.edu/abs/2011arXiv1112.1595P`

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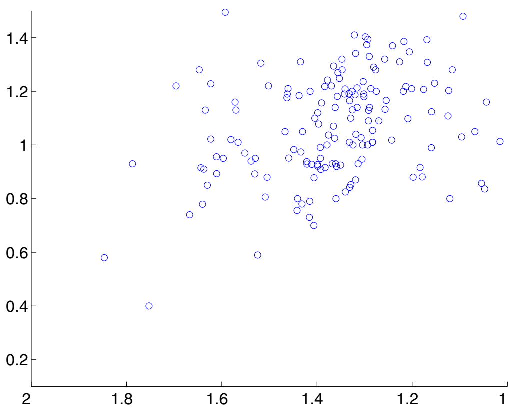

Figure 7: (Plavchan & Bilinski) Empirical distribution of confirmed hot Jupiters within 0.1 AU from the NASA Exoplanet Archive, with the log of the exoplanet semi-major axis on the horizontal axis, and the host stellar mass on the vertical axis. The distribution favors a model distribution for tidal orbital circularization as opposed to migration halting interior to the magnetospheric accretion radius for a primordial disk.

Planet Hunters: A Transiting Circumbinary Planet in a Quadruple Star System

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The Astrophysical Journal, in press/accepted (arXiv:1205.6769)

We report the discovery and confirmation of a transiting circumbinary planet (PH1b) around KIC 4862625, an eclipsing binary in the *Kepler* field. The planet was discovered by volunteers searching the first six Quarters of publicly available *Kepler* data as part of the Planet Hunters citizen science project. Transits of the planet across the larger and brighter of the eclipsing stars are detectable by visual inspection every ∼137 days, with seven transits identified in Quarters 1-11. The physical and orbital parameters of both the host stars and planet were obtained via a photometric-dynamical model, simultaneously fitting both the measured radial velocities and the *Kepler* light curve of KIC 4862625. The 6.18 ± 0.17 $R_\oplus$ planet orbits outside the 20-day orbit of an eclipsing binary consisting of an F dwarf (1.734 ± 0.044 $R_\odot$, 1.528 ± 0.087 $M_\odot$) and M dwarf (0.378 ± 0.023 $R_\odot$, 0.408 ± 0.024 $M_\odot$). For the planet, we find an upper mass limit of 169 $M_\oplus$ (0.531 Jupiter masses) at the 99.7% confidence level. With a radius and mass less than that of Jupiter, PH1b is well within the planetary regime. Outside the planet's orbit, at ∼1000 AU, a previously unknown visual binary has been identified that is likely bound to the planetary system, making this the first known case of a quadruple star system with a transiting planet.

Download/Website: `http://arxiv.org/abs/1205.6769`

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WASP-71b: a bloated hot Jupiter in a 2.9-day, prograde orbit around an evolved F8 star

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Astronomy & Astrophysics, in press (arXiv:1211.3045)

We report the discovery by the WASP transit survey of a highly-irradiated, massive ($2.242 \pm 0.080\ M_{\rm Jup}$) planet which transits a bright ($V = 10.6$), evolved F8 star every 2.9 days. The planet, WASP-71b, is larger than Jupiter ($1.46 \pm 0.13\ R_{\rm Jup}$), but less dense ($0.71 \pm 0.16\ \rho_{\rm Jup}$). We also report spectroscopic observations made during transit with the CORALIE spectrograph, which allow us to make a highly-significant detection of the Rossiter-McLaughlin effect. We determine the sky-projected angle between the stellar-spin and planetary-orbit axes to be $\lambda = 20.1 \pm 9.7$ degrees, i.e. the system is 'aligned', according to the widely-used alignment criteria that systems are regarded as misaligned only when λ is measured to be greater than 10 degrees with 3-σ confidence. WASP-71, with an effective temperature of 6059 ± 98 K, therefore fits the previously observed pattern that only stars hotter than 6250 K are host to planets in misaligned orbits. We emphasise, however, that λ is merely the sky-projected obliquity angle; we are unable to determine whether the stellar-spin and planetary-orbit axes are misaligned along the line-of-sight. With a mass of $1.56 \pm 0.07\ M_{\odot}$, WASP-71 was previously hotter than 6250 K, and therefore might have been significantly misaligned in the past. If so, the planetary orbit has been realigned, presumably through tidal interactions with the cooling star's growing convective zone.

Download/Website: `http://arxiv.org/abs/1211.3045`

Contact: `amss@camk.edu.pl`

Molecular line emission from a protoplanetary disk irradiated externally by a nearby massive star

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Astrophysical Journal Letters, published (2013ApJ...766L..23W)

Star formation often occurs within or nearby stellar clusters. Irradiation by nearby massive stars can photoevaporate protoplanetary disks around young stars (so-called proplyds) which raises questions regarding the ability of planet formation to take place in these environments. We investigate the two-dimensional physical and chemical structure of a protoplanetary disk surrounding a low-mass (T Tauri) star which is irradiated by a nearby massive O-type star to determine the survivability and observability of molecules in proplyds. Compared with an isolated star-disk system, the gas temperature ranges from a factor of a few (in the disk midplane) to around two orders of magnitude (in the disk surface) higher in the irradiated disk. Although the UV flux in the outer disk, in particular, is several orders of magnitude higher, the surface density of the disk is sufficient for effective shielding of the disk midplane so that the disk remains predominantly molecular in nature. We also find that non-volatile molecules, such as HCN and H_2O, are able to freeze out onto dust grains in the disk midplane so that the formation of icy planetesimals, e.g., comets, may also be possible in proplyds. We have calculated the molecular line emission from the disk assuming LTE and determined that multiple transitions of atomic carbon, CO (and isotopologues, ^{13}CO and $C^{18}O$), HCO^+, CN, and HCN may be observable with ALMA, allowing characterization of the gas column density, temperature, and optical depth in proplyds at the distance of Orion ($\approx$400 pc).

Download/Website: `http://arxiv.org/pdf/1303.4903v1.pdf`

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3 As seen on astro-ph

The following list contains all the entries relating to exoplanets that we spotted on astro-ph during March 2013. If you see any that we missed, please let us know and we'll include them in the next issue.

astro-ph/1303.0052: **Identification of Background False Positives from Kepler Data** by *Stephen T. Bryson, et al.*
astro-ph/1303.0227: **All Six Planets Known to Orbit Kepler-11 Have Low Densities** by *Jack J. Lissauer, et al.*
astro-ph/1303.0254: **WASP-80b: a gas giant transiting a cool dwarf** by *Amaury H. M. J. Triaud, et al.*
astro-ph/1303.0255: **Measuring Transit Signal Recovery in the Kepler Pipeline I: Individual Events** by *Jessie L. Christiansen, et al.*
astro-ph/1303.0293: **Thermal Processes Governing Hot-Jupiter Radii** by *David S. Spiegel, Adam Burrows*
astro-ph/1303.0307: **Star-planet interactions and selection effects from planet detection methods** by *K. Poppenhaeger, J.H.M.M. Schmitt*
astro-ph/1303.0858: **Confirmation of Hot Jupiter Kepler-41b via Phase Curve Analysis** by *Elisa V. Quintana, et al.*
astro-ph/1303.0864: **Tidal damping of the mutual inclination in hierachical systems** by *A.C.M. Correia, et al.*
astro-ph/1303.0973: **The secondary eclipses of WASP-19b as seen by the ASTEP 400 telescope from Antarctica** by *L. Abe, et al.*
astro-ph/1303.1094: **Ground-based Transit Spectroscopy of the Hot-Jupiter WASP-19b in the Near-Infrared** by *Jacob L. Bean, et al.*

astro-ph/1303.1100: **Transmitting signals over interstellar distances: Three approaches compared in the context of the Drake equation** by *Luc Arnold*

astro-ph/1303.1184: **A Giant Planet beyond the Snow Line in Microlensing Event OGLE-2011-BLG-0251** by *N. Kains, et al.*

astro-ph/1303.1275: **The APACHE Project** by *A. Sozzetti, et al.*

astro-ph/1303.1726: **The carbon-to-oxygen ratio in stars with planets** by *Poul Erik Nissen*

astro-ph/1303.2150: **The Mass of KOI-94d and a Relation for Planet Radius, Mass, and Incident Flux** by *Lauren M. Weiss, et al.*

astro-ph/1303.2206: **The extrasolar planet Gliese 581 d: a potentially habitable planet? (Corrigendum to astro-ph:1009.5814)** by *P. von Paris, et al.*

astro-ph/1303.2573: **New approach for modeling of transiting exoplanets for arbitrary limb-darkening law** by *D. Kjurkchieva, et al.*

astro-ph/1303.2627: **Reconnaissance of the HR 8799 Exosolar System I: Near IR Spectroscopy** by *B. R. Oppenheimer, et al.*

astro-ph/1303.2649: **A revised estimate of the occurrence rate of terrestrial planets in the habitable zones around kepler m-dwarfs** by *Ravi kumar Kopparapu*

astro-ph/1303.2655: **Ice Lines in Circumbinary Protoplanetary Disks** by *Christian Clanton*

astro-ph/1303.2692: **The HCN-Water Ratio in the Planet Formation Region of Disks** by *Joan R. Najita et al.*

astro-ph/1303.3013: **The Radius Distribution of Small Planets Around Cool Stars** by *Timothy D. Morton, Jonathan J. Swift*

astro-ph/1303.3131: **Detection of CO absorption in the atmosphere of the hot Jupiter HD 189733b** by *Florian Rodler, Martin Kurster, John R. Barnes*

astro-ph/1303.3280: **Detection of Carbon Monoxide and Water Absorption Lines in an Exoplanet Atmosphere** by *Quinn M. Konopacky, et al.*

astro-ph/1303.3336: **Observing Strategies for the Detection of Jupiter Analogs** by *Robert A. Wittenmyer, et al.*

astro-ph/1303.3361: **Structure, equation of state, diffusion and viscosity of warm dense Fe under the conditions of giant planet core** by *Jiayu Dai, et al.*

astro-ph/1303.3418: **The metallicity signature of evolved stars with planets** by *J. Maldonado, E. Villaver, C. Eiroa*

astro-ph/1303.3886: **Secondary Eclipse Photometry of the Exoplanet WASP-5b with Warm Spitzer** by *Nathan J. Baskin, et al.*

astro-ph/1303.3841: **Evolution of Planetary Systems with Time Dependent Stellar Mass Loss** by *Fred C. Adams, Kassandra R. Anderson, Anthony M. Bloch*

astro-ph/1303.3888: **Efficiency in Collisionless Growth of Planetesimals** by *Andrew Shannon, Yanqin Wu, Yoram Lithwick*

astro-ph/1303.3890: **After Runaway: The Trans-Hill Stage of Planetesimal Growth** by *Yoram Lithwick*

astro-ph/1303.3899: **Kepler planets: a tale of evaporation** by *James E. Owen, Yanqin Wu*

astro-ph/1303.3905: **Chemistry of Impact-Generated Silicate Melt-Vapor Debris Disks** by *Channon Visscher, Bruce Fegley, Jr*

astro-ph/1303.4123: **Extending the Planetary Mass Function to Earth Mass by Microlensing at Moderately High Magnification** by *Fumio Abe, et al.*

astro-ph/1303.4151: **HST Spectral Mapping of L/T Transition Brown Dwarfs Reveals Cloud Thickness Variations** by *Daniel Apai, et al.*

astro-ph/1303.4232: **Hubble Space Telescope detection of oxygen in the atmosphere of exoplanet HD189733b** by *Lotfi Ben-Jaffel, Gilda Ballester*

astro-ph/1303.4535: **Follow-up photometry of TrES-3** by *M. Vanko, et al.*

astro-ph/1303.4596: **Warm Spitzer Occultation Photometry of WASP-26b at 3.6μm and 4.5μm** by *D.P. Mahtani, et al.*

astro-ph/1303.4598: **Influence of the circumbinary disk gravity on planetesimal accumulation in the Kepler**

16 system by *Francesco Marzari, et al.*

astro-ph/1303.4735: **Host Star Properties and Transit Exclusion for the HD 38529 Planetary System** by *Gregory W. Henry, et al.*

astro-ph/1303.4738: **Identification of transitional disks in Chamaeleon with Herschel** by *A. Ribas, et al.*

astro-ph/1303.4903: **Molecular line emission from a protoplanetary disk irradiated externally by a nearby massive star** by *Catherine Walsh, T. J. Millar, Hideko Nomura*

astro-ph/1303.5468: **WASP-8b: Characterization of a Cool and Eccentric Exoplanet with Spitzer** by *Patricio Cubillos et al.*

astro-ph/1303.5649: **Analysis of spin-orbit alignment in the WASP-32, WASP-38, and HAT-P-27/WASP-40 systems** by *D. J. A. Brown, et al.*

astro-ph/1303.5906: **Probing Dust Settling in Proto-planetary Disks with ALMA** by *Y. Boehler, et al.*

astro-ph/1303.5937: **Habitability and Multistability in Earth-like Planets** by *Valerio Lucarini, et al.*

astro-ph/1303.6062: **Early Dynamical Instabilities in the Giant Planet Systems** by *Elena Lega, Alessandro Morbidelli, David Nesvorny*

astro-ph/1303.6442: **Statistical Properties of Brown Dwarf Companions: Implications for Different Formation Mechanisms** by *Bo Ma, Jian Ge*

astro-ph/1303.6499 (cross-list from astro-ph.SR) : **Vertical settling and radial segregation of large dust grains in the circumstellar disk of the Butterfly Star** by *Christian Grafe, et al.*

astro-ph/1303.6639 : **Turbulence Induced Collision Velocities and Rates between Different Sized Dust Grains** by *Alexander Hubbard*

astro-ph/1303.6645 : **S-Type and P-Type Habitability in Stellar Binary Systems: A Comprehensive Approach. I. Method and Applications** by *Manfred Cuntz*

astro-ph/1303.6736 : **A Mechanism of Exciting Planetary Inclination and Eccentricity through a Residual Gas Disk** by *Yuan-Yuan Chen, et al.*

astro-ph/1303.6743 : **Solubility of Iron in Metallic Hydrogen and Stability of Dense Cores in Giant Planets** by *Sean Wahl, Hugh F. Wilson, Burkhard Militzer*

astro-ph/1303.6783 : **Space based microlensing planet searches** by *J.P. Beaulieu, P. Tisserand, V. Batista*

astro-ph/1303.6804 : **Potential Biosignatures in Super-Earth Atmospheres II. Photochemical Responses** by *J. L. Grenfell, et al.*

astro-ph/1303.6957 : **WFIRST Planet Masses from Microlens Parallax** by *J.C. Yee*

astro-ph/1303.7079 : **3D climate modeling of close-in land planets: Circulation patterns, climate moist bistability and habitability** by *Jeremy Leconte, et al.*