ExoPlanet News
An Electronic Newsletter

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Contents

1 Editorial

Welcome to the sixty first edition of ExoPlanet News. In this month's edition, along with the usual selection of interesting abstracts and attractive conference announcements, we have the abstract and link to the white paper submitted to ESA's call for science themes for the L2/L3 mission of its Cosmic Vision program. Vincent Coudé du Foresto points out that it is still possible to register as a support of the mission by visiting the webpage.

I plan to take a break next month, so the next edition of the newsletter is planned for early September 2013. 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

NPOI Observations of the Exoplanet Host kappa Coronae Borealis and Their Implications for the Star's and Planet's Masses and Ages

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Astrophysical Journal Letters, published (2013, 771, L17)

We used the Navy Precision Optical Interferometer to measure the limb-darkened angular diameter of the exoplanet host star κ CrB and obtained a value of 1.543±0.009 mas. We calculated its physical radius (5.06±0.04 $R_\odot$) and used photometric measurements from the literature with our diameter to determine κ CrB's effective temperature (4788±17 K) and luminosity (12.13±0.09 $L_\odot$). We then placed the star on an H-R diagram to ascertain the star's age ($3.42^{+0.32}_{-0.25}$ Gyr) and mass (1.47±0.04 $M_\odot$) using a metallicity of [Fe/H] = +0.15. With this mass, we calculated the system's mass function with the orbital elements from a variety of sources, which produced a range of planetary masses: $m_{\rm p} \sin i$ = 1.61–1.88 $M_{\rm Jup}$. We also updated the extent of the habitable zone for the system using our new temperature.

Transmission spectrum of Earth as a transiting exoplanet from the ultraviolet to the near-infrared

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Astrophysical Journal Letters, in press

Transmission spectroscopy of exoplanets is a tool to characterize rocky planets and explore their habitability. Using the Earth itself as a proxy, we model the atmospheric cross section as a function of wavelength, and show the effect of each atmospheric species, Rayleigh scattering and refraction from 115 to 1000 nm. Clouds do not signigicantly affect this picture because refraction prevents the lowest 12.75 km of the atmosphere, in a transiting geometry for an Earth-Sun analog, to be sampled by a distant observer. We calculate the effective planetary radius for the primary eclipse spectrum of an Earth-like exoplanet around a Sun-like star. Below 200 nm, ultraviolet (UV) O2 absorption increases the effective planetary radius by about 180 km, versus 27 km at 760.3 nm, and 14 km in the near-infrared (NIR) due predom- inantly to refraction. This translates into a 2.6% change in effective planetary radius over the UV-NIR wavelength range, showing that the ultraviolet is an interesting wavelength range for future space missions.

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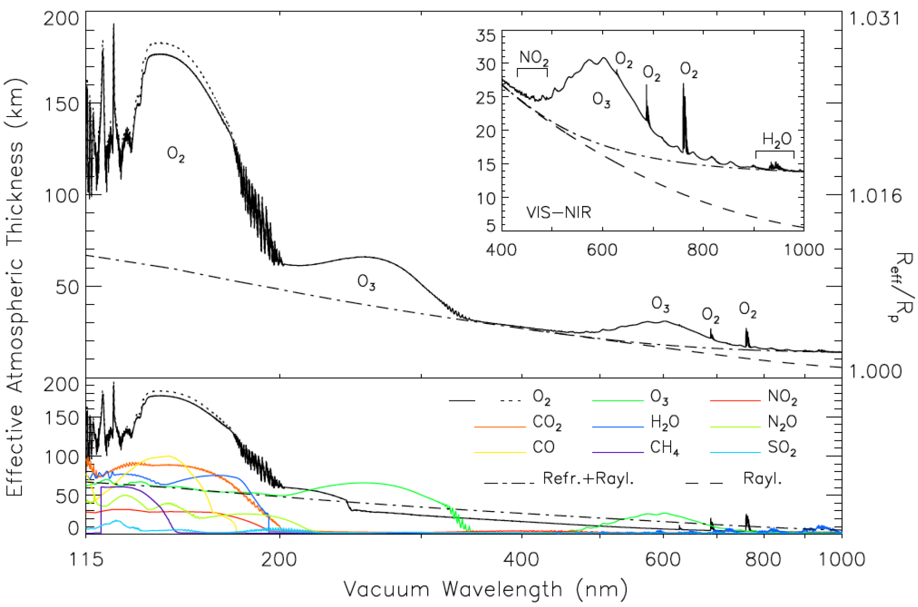

Figure 1: (Betremieux & Kaltenegger) Effective atmospheric thickness and effective planetary radius, Reff (expressed in Earth radii, Rp), of a transiting Earth as a function of wavelength. The upper panel shows the overall spectrum from the UV to the NIR while the small insert panel zooms on the visible and NIR for clarity. Prominent spectral features are identified. The lower panel shows the effect of individual species. In all panels, the solid and short-dashed lines are for solar minimum and solar maximum conditions, respectively. Furthermore, the dot-dashed and dashed lines show the individual contribution of Rayleigh scattering by N_2, O_2, Ar and CO_2, with and without the effect of refraction by these same species, respectively.

The short-lived production of exozodiacal dust in the aftermath of a dynamical instability in planetary systems.

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1306.0592)

Excess emission, associated with warm, dust belts, commonly known as exozodis, has been observed around a third of nearby stars. The high levels of dust required to explain the observations are not generally consistent with steady-state evolution. A common suggestion is that the dust results from the aftermath of a dynamical instability, an event akin to the Solar System's Late Heavy Bombardment. In this work, we use a database of N-body simulations to investigate the aftermath of dynamical instabilities between giant planets in systems with outer planetesimal belts. We find that, whilst there is a significant increase in the mass of material scattered into the inner regions of the planetary system following an instability, this is a short-lived effect. Using the maximum lifetime of this material, we determine that even if every star has a planetary system that goes unstable, there is a very low probability that we observe more than a maximum of 1% of sun-like stars in the aftermath of an instability, and that the fraction of planetary systems currently in the aftermath of an instability is more likely to be limited to $\leq 0.06\%$. This probability increases marginally for younger or higher mass stars. We conclude that the production of warm dust in the aftermath of dynamical instabilities is too short-lived to be the dominant source of the abundantly observed exozodiacal dust.

Download/Website: `http://arxiv.org/abs/1306.0592`

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Mixing and Transport of Short-Lived and Stable Isotopes and Refractory Grains in Protoplanetary Disks

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The Astrophysical Journal, in press

Analyses of primitive meteorites and cometary samples have shown that the solar nebula must have experienced a phase of large-scale outward transport of small refractory grains as well as homogenization of initially spatially heterogeneous short-lived isotopes. The stable oxygen isotopes, however, were able to remain spatially heterogenous at the $\sim$ 6% level. One promising mechanism for achieving these disparate goals is the mixing and transport associated with a marginally gravitationally unstable (MGU) disk, a likely cause of FU Orionis events in young low-mass stars. Several new sets of MGU models are presented that explore mixing and transport in disks with varied masses (0.016 to 0.13 $M_\odot$) around stars with varied masses (0.1 to 1 $M_\odot$) and varied initial Q stability minima (1.8 to 3.1). The results show that MGU disks are able to rapidly (within $\sim 10^4$ yr) achieve large-scale transport and homogenization of initially spatially heterogeneous distributions of disk grains or gas. In addition, the models show that while single-shot injection heterogeneity is reduced to a relatively low level ($\sim$ 1%), as required for early solar system chronometry, continuous injection of the sort associated with the generation of stable oxygen isotope fractionations by UV photolysis leads to a sustained, relatively high level ($\sim$ 10%) of heterogeneity, in agreement with the oxygen isotope data. These models support the suggestion that the protosun may have experienced at least one FU Orionis-like outburst, which produced several of the signatures left behind in primitive chondrites and comets.

Download/Website: `http://www.dtm.ciw.edu/users/boss/ftp/mixtrans.pdf`

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Planetesimal formation via sweep-up growth at the inner edge of dead zones

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Astronomy & Astrophysics, in press (arXiv:1306.3412)

The early stages of planet formation are still not well understood. Coagulation models have revealed numerous obstacles to the dust growth, such as the bouncing, fragmentation and radial drift barriers. We study the interplay between dust coagulation and drift in order to determine the conditions in protoplanetary disk that support the formation of planetesimals. We focus on planetesimal formation via sweep-up and investigate whether it can take place in a realistic protoplanetary disk.

We have developed a new numerical model that resolves spatial distribution of dust in the radial and vertical dimension. The model uses representative particles approach to follow the dust evolution in protoplanetary disk. The coagulation and fragmentation of solids is taken into account using Monte Carlo method. A collision model adopting the mass transfer effect, that can occur for different-sized dust aggregate collisions, is implemented. We focus on a protoplanetary disk including a pressure bump caused by a steep decline of turbulent viscosity around the snow line.

We find that a sharp radial variation of the turbulence strength at the inner edge of dead zone promotes planetesimal formation in several ways. It provides a pressure bump that efficiently prevents the dust from drifting inwards. It also causes a radial variation in the size of aggregates at which growth barriers occur, favoring the growth of large aggregates via sweeping up of small particles. In our model, by employing an ad hoc α viscosity change near the snow line, it is possible to grow planetesimals by incremental growth on timescales of approximately 10^5 years.

Download/Website: `http://arxiv.org/abs/1306.3412`

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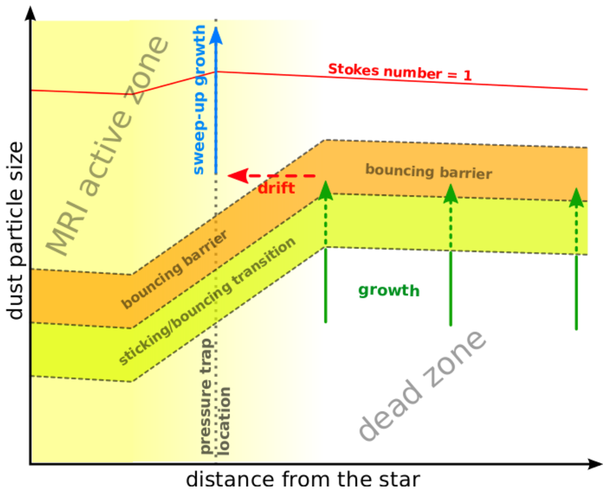

Figure 2: (Drazkowska, Windmark & Dullemond) Sketch of the planetesimal formation via sweep-up growth at the inner edge of a dead zone. Thanks to the radial variation in turbulence efficiency, the bouncing barrier position is shifted in terms of particle size. The dust aggregates can grow to larger sizes in the dead zone than in the MRI active zone. Some of the “big” particles grown in the dead zone can drift inwards through the bouncing regime, to the location of the pressure trap, and continue to grow via sweeping up the small particles halted by the bouncing barrier.

Kepler Microlens Planets and Parallaxes

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Astrophysical Journal Letters, submitted (arXiv:1306.2308)

Kepler's quest for other Earths need not end just yet: it remains capable of characterizing cool Earth-mass planets by microlensing, even given its degraded pointing control. If *Kepler* were pointed at the Galactic Bulge, it could conduct a search for microlensing planets that would be virtually non-overlapping with ground-based surveys. More important, by combining *Kepler* observations with current ground-based surveys, one could measure the "microlens parallax" π_E for a large fraction of the known microlensing events. Such parallax measurements would yield mass and distance determinations for the great majority of microlensing planets, enabling much more precise study of the planet distributions as functions of planet and host mass, planet-host separation, and Galactic position (particularly bulge vs. disk). In addition, rare systems (such as planets orbiting brown dwarfs or black holes) that are presently lost in the noise would be clearly identified. In contrast to *Kepler*'s current primary hunting ground of close-in planets, its microlensing planets would be in the cool outer parts of solar systems, generally beyond the snow line. The same survey would yield a spectacular catalog of brown-dwarf binaries, probe the stellar mass function in a unique way, and still have plenty of time available for asteroseismology targets.

Download/Website: `http://uk.arxiv.org/abs/1306.2308`

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Limits on orbit crossing planetesimals in the resonant multiple planet system, KOI-730

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Monthly Notices of the Royal Astronomical Society, published (2013MNRAS.432.1196M)

A fraction of multiple planet candidate systems discovered from transits by the Kepler mission contain pairs of planet candidates that are in orbital resonance or are spaced slightly too far apart to be in resonance. We focus here on the four planet system, KOI 730, that has planet periods satisfying the ratios 8:6:4:3. By numerically integrating four planets assumed to initially be in a resonant configuration in proximity to an initially exterior cold planetesimal disk, we find that of the order of a Mars mass of planet-orbit-crossing planetesimals is sufficient to pull this system out of resonance. Approximately one Earth mass of planet-orbit-crossing planetesimals increases the interplanetary spacings sufficiently to resemble the multiple planet candidate Kepler systems that lie just outside of resonance. This suggests that the closely spaced mul- tiple planet Kepler systems, host only low mass debris disks or their debris disks have been extremely stable. We find that the planetary inclinations increase as a function of the mass in planetesimals that have crossed the orbits of the planets. If systems are left at zero inclination and in resonant chains after depletion of the gas disk then we would expect a correlation between distance to resonance and mutual planetary in- clinations. This may make it possible to differentiate between dynamical mechanisms that account for the fraction of multiple planet systems just outside of resonance.

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The SEEDS Direct Imaging Survey for Planets and Scattered Dust Emission in Debris Disk Systems

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Astrophysical Journal, in press (arXiv:1306.0581)

Debris disks around young main-sequence stars often have gaps and cavities which for a long time have been interpreted as possibly being caused by planets. In recent years, several giant planet discoveries have been made in systems hosting disks of precisely this nature, further implying that interactions with planets could be a common cause of such disk structures. As part of the SEEDS high-contrast imaging survey, we are surveying a population of debris disk-hosting stars with gaps and cavities implied by their spectral energy distributions, in order to attempt to spatially resolve the disk as well as to detect any planets that may be responsible for the disk structure. Here we report on intermediate results from this survey. Five debris disks have been spatially resolved, and a number of faint point sources have been discovered, most of which have been tested for common proper motion, which in each case has excluded physical companionship with the target stars. From the detection limits of the 50 targets that have been observed, we find that β Pic b-like planets ($\sim$10 $M_{\rm jup}$ planets around G–A-type stars) near the gap edges are less frequent than 15–30%, implying that if giant planets are the dominant cause of these wide (27 AU on average) gaps, they are generally less massive than β Pic b.

Download/Website: `http://arxiv.org/abs/1306.0581`

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Calculating the Habitable Zone of Binary Star Systems I: S-Type Binaries

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The Astrophysical Journal, in press

We have developed a comprehensive methodology for calculating the boundaries of the habitable zone (HZ) of planet-hosting S-type binary star systems. Our approach is general and takes into account the contribution of both stars to the location and extent of the binary HZ with different stellar spectral types. We have studied how the binary eccentricity and stellar energy distribution affect the extent of the habitable zone. Results indicate that in binaries where the combination of mass-ratio and orbital eccentricity allows planet formation around a star of the system to proceed successfully, the effect of a less luminous secondary on the location of the primary's habitable zone is generally negligible. However, when the secondary is more luminous, it can influence the extent of the HZ. We present the details of the derivations of our methodology and discuss its application to the binary HZ around the primary and secondary main sequence star of an FF, MM, and FM binary, as well as two known planet-hosting binaries α Cen AB and HD 196886.

Download/Website: `http://arxiv.org/abs/1306.2889`

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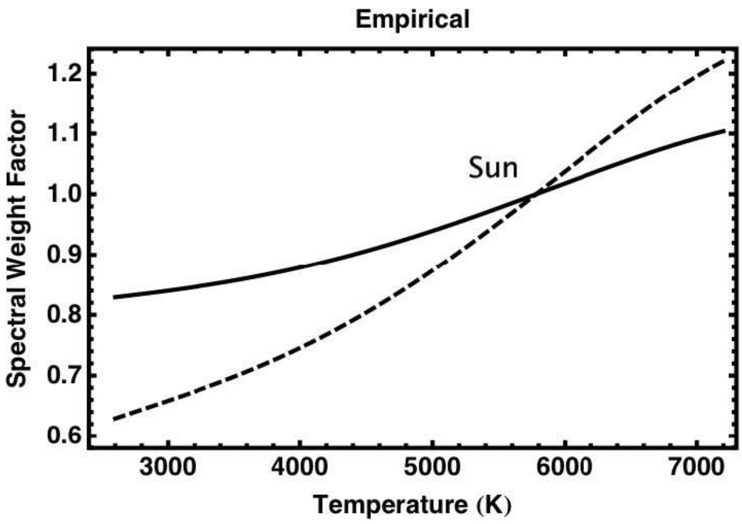

Figure 3: (Kaltenegger & Haghighipour) Spectral weight factor $W(f, T)$ as a function of stellar effective temperature for the empirical (bottom) HZs. The solid line corresponds to the inner and the dashed line corresponds to the outer boundaries of HZ. We have normalized $W(f, T)$ to its solar value, indicated on the graphs.

Calculating the Habitable Zone of Binary Star Systems II: P-Type Binaries

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The Astrophysical Journal, in press

We have developed a comprehensive methodology for calculating the cir- cumbinary HZ in planet-hosting P-type binary star systems. We present a general formalism for determining the contribution of each star of the binary to the total flux received at the top of the atmosphere of an Earth-like planet, and use the Suns HZ to calculate the locations of the inner and outer boundaries of the HZ around a binary star system. We apply our calculations to the Keplers currently known circumbinary planetary system and show the combined stellar flux that determines the boundaries of their HZs. We also show that the HZ in P-type systems is dynamic and depending on the luminosity of the binary stars, their spectral types, and the binary eccentricity, its boundaries vary as the stars of the binary undergo their orbital motion. We present the details of our calculations and discuss the implications of the results.

Download/Website: `http://arxiv.org/abs/1306.2890`

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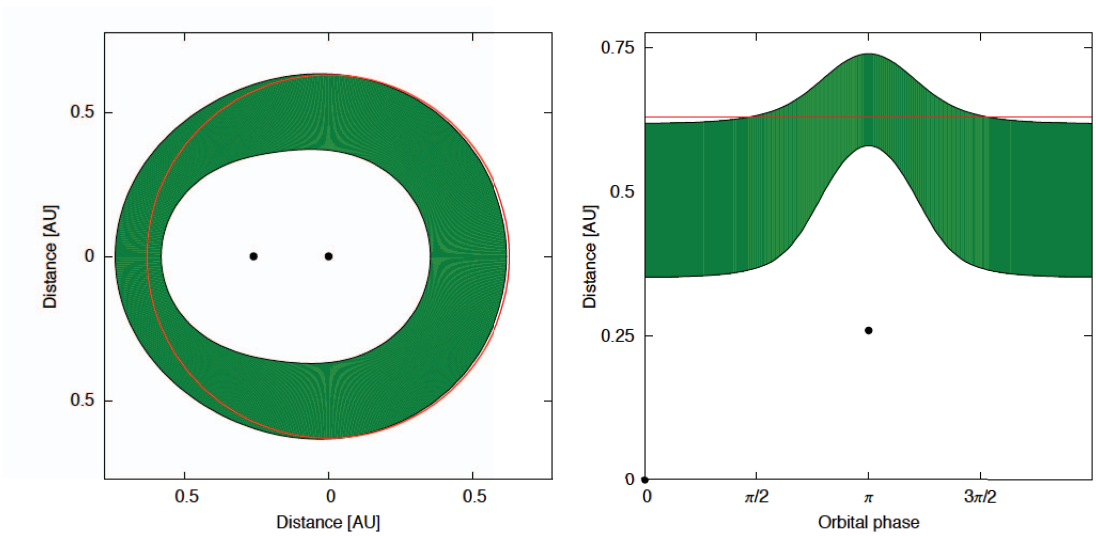

Figure 4: (Haghighipour & Kaltenegger) Snapshots of the radial variations of the narrow HZ around the Kepler 16 binary system.

Water Planets in the Habitable Zone: Atmospheric Chemistry, Observable Features, and the case of Kepler-62e and -62f

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Astrophysical Journal Letters, in press

Planets composed of large quantities of water that reside in the habitable zone are expected to have distinct geophysics and geochemistry of their surfaces and atmospheres. We explore these properties motivated by two key questions: whether such planets could provide habitable conditions and whether they exhibit discernable spectral features that distinguish a water planet from a rocky Earth-like planet. We show that the recently discovered planets Kepler-62e and -62f are the first viable candidates for habitable zone water planet. We use these planets as test cases for discussing those differences in detail. We generate atmospheric spectral models and find that potentially habitable water planets show a distinctive spectral fingerprint in transit depending on their position in the habitable zone.

Download/Website: `http://arxiv.org/abs/1304.5058`

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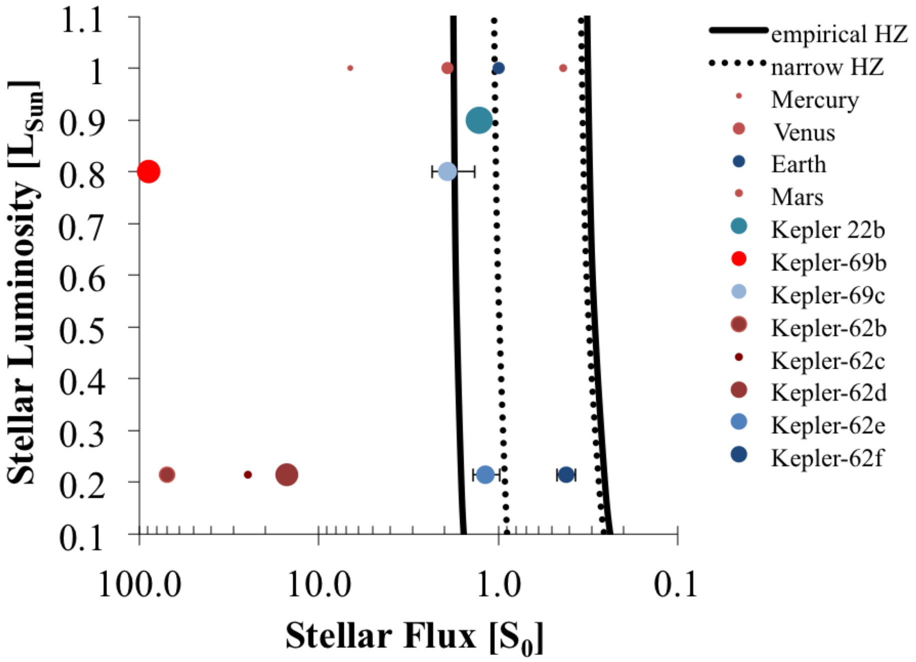

Figure 5: (Kaltenegger, Sasselov & Rugheimer) Comparison of known transiting exoplanets with measured radii less than 2.5 R_{Earth} in the HZ to the Solar System planets. The sizes of the circles indicate the relative sizes of the planets to each other. The dashed and the solid lines indicate the edges of the narrow and effective HZ, respectively.

Herschel's "Cold Debris Disks": Background Galaxies or Quiescent Rims of Planetary Systems?

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The Astrophysical Journal, in press (arXiv:1306.2855)

Infrared excesses associated with debris disk host stars detected so far, peak at wavelengths around $\sim 100\mu$m or shorter. However, six out of 31 excess sources studied in the *Herschel* Open Time Key Programme, DUNES, have been seen to show significant – and in some cases extended – excess emission at 160μm, which is larger than the 100μm excess. This excess emission has been attributed to circumstellar dust and has been suggested to stem from debris disks colder than those known previously. Since the excess emission of the cold disk candidates is extremely weak, challenging even the unrivaled sensitivity of *Herschel*, it is prudent to carefully consider whether some or even all of them may represent unrelated galactic or extragalactic emission, or even instrumental noise. We re-address these issues using several distinct methods and conclude that it is highly unlikely that none of the candidates represents a true circumstellar disk. For true disks, both the dust temperatures inferred from the spectral energy distributions and the disk radii estimated from the images suggest that the dust is nearly as cold as a blackbody. This requires the grains to be larger than $\sim 100\mu$m, even if they are rich in ices or are composed of any other material with a low absorption in the visible. The dearth of small grains is puzzling, since collisional models of debris disks predict that grains of all sizes down to several times the radiation pressure blowout limit should be present. We explore several conceivable scenarios: transport-dominated disks, disks of low dynamical excitation, and disks of unstirred primordial macroscopic grains. Our qualitative analysis and collisional simulations rule out the first two of these scenarios, but show the feasibility of the third one. We show that such disks can indeed survive for gigayears, largely preserving the primordial size distribution. They should be composed of macroscopic solids larger than millimeters, but smaller than a few kilometers in size. If larger planetesimals were present, they would stir the disk, triggering a collisional cascade and thus causing production of small debris, which is not seen. Thus planetesimal formation, at least in the outer regions of the systems, has stopped before "cometary" or "asteroidal" sizes were reached.

Download/Website: `http://arxiv.org/abs/1306.2855`

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

The metallicity signature of evolved stars with planets

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Astronomy & Astrophysics, published (2013A&A554A84M)

Context: Currently, the core accretion model has its strongest observational evidence on the chemical signature of mostly main sequence stars with planets. *Aims:* We aim to test whether the well-established correlation between the metallicity of the star and the presence of giant planets found for main sequence stars still holds for the evolved and generally more massive giant and subgiant stars. Although several attempts have been made so far, the results are not conclusive since they are based on small or inhomogeneous samples. *Methods:* We determine in a homogeneous way the metallicity and individual abundances of a large sample of evolved stars, with and without known planetary companions, and discuss their metallicity distribution and trends. Our methodology is based on the analysis of high-resolution échelle spectra ($R \geq 67000$) from 2-3 meter class telescopes. It includes the calculation of the fundamental stellar parameters ($T_{\rm eff}$, $\log g$, microturbulent velocity, and metallicity) by applying iron ionisation and excitation equilibrium conditions to several isolated Fe I and Fe II lines, as well as, calculating individual abundances of different elements such as Na, Mg, Si, Ca, Ti, Cr, Co, or Ni. *Results:* The metallicity distributions show that giant stars hosting planets are not preferentially metal-rich because they have similar abundance patterns to giant stars without known planetary companions. We have found, however, a very strong relation between the metallicity distribution and the stellar mass within this sample. We show that while the less massive giant stars with planets ($M_\star \leq 1.5\ M_\odot$) are not metal rich, the metallicity of the sample of massive ($M_\star > 1.5\ M_\odot$), young (age < 2 Gyr) giant stars with planets is higher than that of a similar sample of stars without planets. Regarding other chemical elements, giant stars with and without planets in the mass domain $M_\star \leq 1.5\ M_\odot$ show similar abundance patterns. However, planet and non-planet hosts with masses $M_\star > 1.5\ M_\odot$ show differences in the abundances of some elements, specially Na, Co, and Ni. In addition, we find the sample of subgiant stars with planets to be metal rich, showing similar metallicities to main-sequence planet hosts. *Conclusions:* While the metallicity distribution of planet-hosting subgiant stars and giant stars with stellar masses $M_\star > 1.5\ M_\odot$ fits well in the predictions of current core-accretion models, the fact that giant planet hosts in the mass domain $M_\star \leq 1.5\ M_\odot$ do not show metal enrichment is difficult to explain. Given that these stars have similar stellar parameters to subgiants and main-sequence planet hosts, the lack of the metal-rich signature in low-mass giants could be explained by a pollution scenario in the main sequence that gets erased as the star becomes fully convective. However, there is no physical reason why it should play a role for giants with masses $M_\star \leq 1.5\ M_\odot$ yet not be observed for giants with $M_\star > 1.5\ M_\odot$.

Download/Website: `http://dx.doi.org/10.1051/0004-6361/201321082`

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The effects of M dwarf magnetic fields on potentially habitable planets

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Astronomy & Astrophysics, in press (arXiv:1306.4789)

We investigate the effect on potentially-habitable Earth-like planets of the magnetic fields of M dwarf (dM) stars. Such fields can reduce the size of planetary magnetospheres to such an extent that a significant fraction of the planet's atmosphere may be exposed to erosion by the stellar wind. We use the sample of 15 active dM stars, for which surface magnetic field maps have been reconstructed, to determine the magnetic pressure at the planet's orbit

and hence the *minimum* size of its magnetosphere, which would only be increased by considering the stellar wind. Our method provides a fast means to assess which planets are most affected by the stellar magnetic field, which can be used as a first study to be followed by more sophisticated models. We show that hypothetical Earth-like planets with similar terrestrial magnetisation (~ 1 G) orbiting at the inner (outer) edge of the habitable zone of these stars would present magnetospheres that extend at most up to 6 (11.7) planetary radii. With the exception of a couple of cases, to be able to sustain an Earth-sized magnetosphere, the terrestrial planet would either (1) need to orbit significantly farther out than the traditional limits of the habitable zone; or else, (2) if it were orbiting within the habitable zone, it would require a minimum magnetic field ranging from a few G to up to a few thousand G. By assuming a magnetospheric size that is more appropriate for the young-Earth (3.4 Gyr ago), the required planetary magnetic fields are one order of magnitude smaller. However, in this case, the polar cap area of the planet that is unprotected from transport of particles to/from interplanetary space is twice larger. At present, we do not know what would be the minimum area of the planetary surface that could be exposed and would still not affect the potential for formation and development of life in a planet. As the star ages and its rotation rate and magnetic field reduce, the interplanetary magnetic pressure decreases and the magnetosphere of planets should become larger. Using an empirically-derived rotation-activity/magnetism relation, we provide an analytical expression to estimate the minimum stellar rotation period for which an Earth-analogue in the habitable zone could sustain an Earth-sized magnetosphere. We find that the required rotation rate of the early- and mid-dM stars (with periods > 37 – 202 days) is slower than the solar one, and even slower for the late-dM stars (> 63 – 263 days). Planets orbiting in the habitable zone of dM stars rotating faster than this have smaller magnetospheric sizes than the Earth's. As many late-dM stars are fast rotators, conditions for terrestrial planets to harbour Earth-sized magnetospheres are more easily achieved for planets orbiting slowly rotating early- and mid-dM stars.

Download/Website: `http://arxiv.org/abs/1306.4789`

Contact: `Aline.Vidotto@st-andrews.ac.uk`

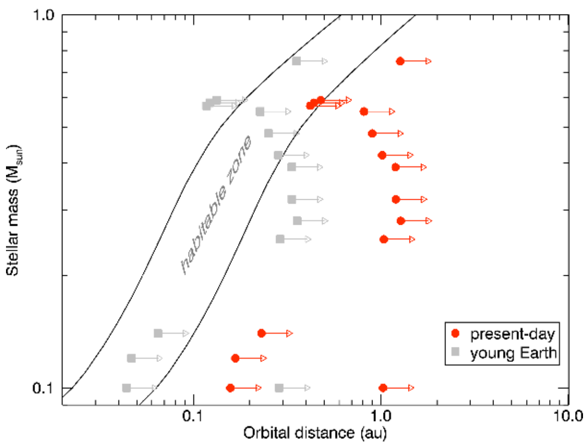

Figure 6: (Vidotto et al.) The minimum orbital distance which an Earth-like planet orbiting the stars in our sample would be able to sustain the present-day (red circles) and the young (3.4 Gyr ago, grey squares) Earth's magnetospheric size, assuming it has the same magnetic field as the Earth. We use the sample of 15 active stars, for which large-scale surface magnetic field maps have been reconstructed, to determine the magnetic pressure at the planet's orbit and hence the minimum extent of its magnetosphere. Planets orbiting at a closer orbital radius would experience a larger stellar magnetic pressure, which could reduce the size of the planet's magnetosphere significantly, exposing therefore the planet's atmosphere to erosion by the stellar wind. For reference, we show the inner/outer edge of the HZ for 1 Gyr-old low-mass stars (solid lines).

3 Conference announcements

Exoclimes III: The diversity of planetary atmospheres

S. Aigrain, I. Baraffe, N. Cowan, J. Harrington, K. Heng, R. Pierrehumbert, F. Pont, A. Shwoman, D. Sing

Davos Congress Center, 9–14 February 2014

The objective of this meeting is to bring together Earth, Solar System and Exoplanet atmosphere specialists to discuss recent results and the way ahead. The general emphasis is on comparative planetology, with each specialty bringing a different angle to the study of planetary atmospheres.

Main topics:
Earth – *atmosphere, oceans, interior, paleo-climates, generalizations to exoplanets*
Solar System – *Venus, Mars and Titan, gas giants: atmospheres, clouds, circulation models*
Gas-rich and rock/ice exoplanets – *atmospheres, spectral and evolutionary models, climate models*
Brown dwarfs and directly imaged exoplanets – *observations, spectral and evolutionary models, clouds, the L-T transition, temporal variability*

Invited review talks:
Dorian Abbot – *Paleo-climates*
Travis Barman – *Model brown dwarf spectra*
Linda Elkins-Tanton – *Interior-atmosphere interactions*
Yohai Kaspi – *Jupiter*
Kristen Menou – *Exoplanet circulation models*
Julianne Moses – *Photochemistry*
Tamara Rogers – *Magneto-hydrodynamics*
Paul Tackley – *Earths interior dynamics*
Daniel Apai – *Brown dwarf observations*
Jean-Michel Desert – *Exoplanet observations*
Jonathan Fortney – *Model exoplanet spectra*
Heather Knutson – *Exoplanet observations*
Jonathan Mitchell – *Titan*
Ray Pierrehumbert – *Exotic atmospheres*
Tapio Schneider – *Climate dynamics*

There will also be space for contributed talks and posters. Ample time will be built into the program for discussion and interactions.

Application / Abstract submission open now! The number of participants is limited by the venue. If necessary, participants will be selected by the SOC to ensure a balance of scientific topics. To apply, submit an abstract by **15 September 2013**. Participants will be notified of the SOC's decision by 15 October 2013 and registration is open until 1 November 2013. A limited number of travel grants is available for those requiring financial support.

Download/Website: `http://exoclimes.org/`

Contact: `See contact form on website`

PLATO 2.0 Science Workshop: 2nd announcement

H. Rauer [1] *M. Goupil* [2] *A. Heras* [3] *G. Piotto* [4] *D. Pollacco* [5] *S. Udry* [6]

[1] DLR, Germany
[2] Observatoire de Paris, France
[3] ESA/ESTeC
[4] University of Padova, Italy
[5] University of Warwick, United Kingdom
[6] University of Geneve, Switzerland

ESTEC, Noordwijk, The Netherlands, 29 – 31 July 2013

PLATO 2.0 is an ESA M3 candidate mission in the Cosmic Vision Programme and has been designed and optimized from the outset specifically to detect habitable zone rocky sized planets around bright solar type stars. Not only are these host stars suitable for planetary confirmation and follow-up studies, but they are ideal for asteroseismology studies whose impact has been proven from the CoRoT and Kepler missions. Thus PLATO 2.0 will produce catalogues of accurate parameters of terrestrial planets and planetary systems. It will be the first large-scale survey determining the ages of its detected planetary systems from their host stars. PLATO 2.0 data will be vital to test and develop planetary formation and evolution models and to address planetary science questions via its large numbers of accurate bulk planet parameters in systems of all kinds. As a result of the many hundred thousands of stars observed, PLATO 2.0 has furthermore a large complementary and legacy science program, from stellar to galactic science. The workshop shall examine the impact that PLATO will make on all areas of exoplanet, stellar, and legacy science areas.

Deadline for submission of abstracts: **28 June 2013**
Deadline for registration: **12 July 2013**

Confirmed invited speakers

- Roi Alonso, Instituto de Astrofsica de Canarias, Spain
- Willy Benz, University of Bern, Switzerland
- Franois Bouchy, Institut d'Astrophysique de Paris, France
- Matteo Brogi, Leiden Observatory, The Netherlands
- Bill Chaplin, University of Birmingham, UK
- Marc Antoine Dupret, Universit de Lige, Belgium
- Saskia Hekker, Astronomical Institute Anton Pannekoek, The Netherlands
- Jon Jenkins, SETI Institute, US
- Willy Kley, Universität Tübingen, Germany
- Helmut Lammer, Austrian Academy of Sciences, Austria
- Nuccio Lanza, INAF OACT, Italy
- Andrea Miglio, University of Birmingham, UK
- Christoph Mordasini, MPIA, Germany
- Isabella Pagano, INAF - OACT, Italy
- Heike Rauer, DLR, Germany
- Roberto Silvotti, INAF-OATO, Italy
- Stephane Udry, Observatoire de Genève, Switzerland

Download/Website: `http://sci.esa.int/plato`
Contact: `plato2013@rssd.esa.int`

Exoplanets and Disks: Their Formation and Diversity II

SOC chair: Motohide Tamura[1,2], *LOC chair: Nagayoshi Ohashii*[3]
[1] The University of Tokyo , Tokyo, Japan
[2] National Astronomical Observatory of Japan(NAOJ), Tokyo, Japan
[2] Subaru Telescope, NAOJ, Hilo, Hawaii, USA

Kona, The Big Island of Hawaii, USA, 8–12, December, 2013

Protoplanetary disks around young stars are the sites of planetary formation. Their detailed information has been obtained by recent high spatial resolution infrared and optical observations from both ground and space, and wide varieties of disk morphology and disk composition are uncovered. At longer wavelengths, ALMA has started its early science operation and will explore physical and chemical processing of gas and dust components in the disks. This diversity of disk properties is certainly the ”seeds” for the well known diversity of more than 800 exoplanets so far detected. Therefore, deep understanding of the link between the protoplanetary disks and exoplanets is becoming more and more important. New coronagraphs on the 8-m class telescopes such as Subaru/HiCIAO/AO188 (the SEEDS project) and Gemini/NICI are currently exploring these areas, and Subaru/SCExAO, Gemini/GPI, and VLT/SPHERE will come very soon. Besides observations, both theoretical simulations for planet formation and theories and laboratory experiments for dust formation/evolution also play crucial roles for the interpretation of the link. In addition to the above direct explorations of giant exoplanets and disks, more interests are now concentrating on detection of extrasolar terrestrial planets. In order to promote the discussion of the diversity of disks and exoplanets among related researchers, we would like to host an international workshop. This conference is the second one covering the similar topic held in 2009 (hosted by NAOJ). This is also recognized as the 5th of the Subaru International Conference Series. Researchers in the fields of protoplanetary/debris disks, exoplanets, dust, and related instrumentation are encouraged to attend. We expect more than 100 people attending.

1. Direct imaging of disks/exoplanets
2. Spectroscopy of disks/exoplanets
3. Various approaches toward earth-like planet detection
4. Theory for planet formation
5. Theory and simulation of exoplanet atmospheres
6. Dust formation and evolution in disks
7. Current/future instrumentation for direct observations

Download/Website: `http://exoplanets.astron.s.u-tokyo.ac.jp/SubaruConf13/index.html`

Contact: `subaruconf2013_loc@exoplanets.astron.s.u-tokyo.ac.jp`

Exoplanets and brown dwarfs: mind the gap

Ben Burningham
University of Hertfordshire

University of Hertfordshire, 2 – 5 September 2013

We are pleased to announce that registration is open for ”Exoplanets and brown dwarfs: mind the gap”, to be held at the University of Hertfordshire on 2-5 September 2013.

This year represents a milestone of sorts as the 18th anniversary of the first discoveries of both planets around Sun-like stars and brown dwarfs. The last 18 years have seen the study of these fascinating objects flourish into diverse and exciting astronomical fields. However, as these scientific siblings reach adulthood, there is a danger of missed opportunities as they drift apart.

The aim of this meeting is to bring the exoplanet and brown dwarf communities together to explore common science questions, share exciting results, and foster collaboration to overcome shared challenges.

Please see our webpage for outline session headings, details of our (medieval) conference banquet at historic Hatfield House, and for registration.

We look forward to seeing you in September.

Ben Burningham (University of Hertfordshire) on behalf of the Mind the Gap LOC & SOC

Download/Website: `http://star.herts.ac.uk/mindthegap`

Contact: `mindthegap@herts.ac.uk`

4 Announcements

Exploring Habitable Worlds beyond our Solar System

A. Quirrenbach et al.

White paper in response to ESA's call for science themes for the L2/L3 missions of its Cosmic Vision program, Submitted

Triggered by the discoveries of the first planets outside the Solar System twenty years ago, the study of planetary systems associated with other stars and of the properties of exoplanets has grown into one of the most vibrant fields of astrophysics. Surveys covering thousands of stars have yielded nearly 1000 confirmed planet discoveries, and steady progress is being made from Jupiter-size objects towards Neptune- and now Earth-size planets, driven by refinements in instrumentation and observing techniques. Thanks to the ubiquity of planetary systems and the broad diversity of exoplanets, in terms of size, composition, temperature, and orbits, we have already begun the exploration of some distant worlds by remote sensing. The population of gaseous exoplanets at short orbital periods (the so called hot Jupiters or hot Neptunes depending on their size/mass) that includes a significant fraction of transiting objects has provided us with the data to expand comparative planetary science beyond our own Solar System. Transmission and emission spectroscopy achieved during primary transits and secondary eclipse, respectively, as well as orbital spectrophotometry for transiting and non-transiting planets have made possible the detection of atmospheric species and clouds, and the measurement of atmospheric temperatures, vertical/longitudinal thermal structures and wind speeds. First applied to the most favorable hot Jupiters, these techniques are now providing results on smaller and cooler planets. The trend towards the observation of terrestrial exoplanets will continue, but characterizing them, assessing their habitability and searching for signs of biological activity implies an ambitious space program that will aim, beyond the next decade, at the direct imaging of exoplanets that do not necessarily transit, which represent the vast majority of exoplanets and include our nearest neighbors. The stunning progress in exoplanet science during the past years has broadened our view, and changed the perspective we had on these questions when they were framed within the Cosmic Vision program. Whereas previous proposals for large space missions, informed solely by our own Solar System, focused strongly on the possibility of detecting "Earth twins", we are now in a position to formulate questions about habitability and ultimately extraterrestrial life in the more general context of comparative planetology, with a large number of systems available for study. Among the remarkable feats of the exoplanet community has been the ingenuity with which new observing techniques have been invented and put into successful use over the past twenty years. We now have a diverse set of tools at our disposal, with which we can explore different aspects of exoplanetary systems. A number of complementary approaches have been identified that can address habitability from different angles. Coronographs and infrared interferometers have been studied at some level of detail, and other more recent concepts (external occulters and integrated-light telescopes) also show considerable promise. While none of these is ready yet for flight, the rapid progress over the past few years in the development of the key enabling technologies gives confidence that an exoplanet exploration mission will become viable technically and financially in time for implementation in the middle of the next decade. Ever since the first discovery of a planet around a Sun-like star, Europe has been playing a leading role in exoplanet science, with arguably the best ground-based instruments and the first dedicated exoplanet space mission (CoRoT). Future plans include the small mission CHEOPS, as well as two strong contenders for M3 (PLATO and EChO). The adoption of "Exploring Habitable Worlds beyond the Solar System" as the theme for a large mission will enable ESA to secure its leading role in this endeavor into and beyond the next decade.

An updated supporter list is maintained online and it is still possible to register as a supporter at : http://www.blue-dots.net/Support-the-Exoplanet-white-paper.html

Download/Website: `http://www.blue-dots.net/Download-the-Exoplanet-White-Paper`

Contact: `exoplanet.whitepaper@obspm.fr`

5 As seen on astro-ph

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

astro-ph/1306.0390: **Enhanced Halpha activity at periastron in the young and massive spectroscopic binary HD200775** by *M. Benisty, et al.*

astro-ph/1306.0464: **Habitability in Different Milky Way Stellar Environments: a Stellar Interaction Dynamical Approach** by *Juan J. Jiménez-Torres, et al.*

astro-ph/1306.0489: **TraMoS project III: Improved physical parameters, timing analysis, and star-spot modelling of the WASP-4b exoplanet system from 38 transit observations** by *S. Hoyer, et al.*

astro-ph/1306.0566: **The Formation of Systems with Tightly-packed Inner Planets (STIPs) via Aerodynamic Drift** by *Aaron C. Boley, Eric B. Ford*

astro-ph/1306.0567: **Evidence for the Tidal Destruction of Hot Jupiters by Subgiant Stars** by *Kevin C. Schlaufman, Joshua N. Winn*

astro-ph/1306.0576: **Inside-Out Planet Formation** by *Sourav Chatterjee, Jonathan C. Tan*

astro-ph/1306.0578: **CoRoT: harvest of the exoplanet program** by *Claire Moutou, et al.*

astro-ph/1306.0581: **The SEEDS Direct Imaging Survey for Planets and Scattered Dust Emission in Debris Disk Systems** by *Markus Janson, et al.*

astro-ph/1306.0592: **The short-lived production of exozodiacal dust in the aftermath of a dynamical instability in planetary systems** by *Amy Bonsor, Sean Raymond, Jean-Charles Augereau*

astro-ph/1306.0610: **A Combined VLT and Gemini Study of the Atmosphere of the Directly-Imaged Planet, beta Pictoris b** by *Thayne Currie, et al.*

astro-ph/1306.0624: **HATS-3b: An inflated hot Jupiter transiting an F-type star** by *D. Bayliss, et al.*

astro-ph/1306.0687: **Characterizing the Orbital and Dynamical State of the HD 82943 Planetary System With Keck Radial Velocity Data** by *Xianyu Tan et al.*

astro-ph/1306.0689: **Resonant planetary dynamics: Periodic orbits and long-term stability** by *George Voyatzis, Kyriaki I. Antoniadou, John D. Hadjidemetriou*

astro-ph/1306.0739: **The effect of stellar spots on the high precision transit light curve** by *M. Oshagh, et al.*

astro-ph/1306.0878: **A Nearly Polar Orbit for the Extrasolar Hot Jupiter WASP-79b** by *B. C. Addison, et al.*

astro-ph/1306.0904: **The HARPS search for southern extra-solar planets. XXXIV. A planetary system around the nearby M dwarf GJ163, with a super-Earth possibly in the habitable zone** by *X. Bonfils, et al.*

astro-ph/1306.0935: **Quick-MESS: A fast statistical tool for Exoplanet Imaging Surveys** by *Mariangela Bonavita, Ernst J.W. de Mooij, Ray Jayawardhana*

astro-ph/1306.0956: **An interferometric study of the Fomalhaut inner debris disk. III. Detailed models of the exozodiacal disk and its origin** by *J. Lebreton, et al.*

astro-ph/1306.0973: **Atmospheric mass loss and evolution of short-period exoplanets: the examples of CoRoT-7b and Kepler-10b** by *Hiroyuki Kurokawa, Lisa Kaltenegger*

astro-ph/1306.1005: **Microlensing by a wide-separation planet: detectability and boundness** by *Yoon-Hyun Ryu, et al.*

astro-ph/1306.1006: **Prospects of detecting the polarimetric signature of the Earth-mass planet alpha Centauri B b with SPHERE / ZIMPOL** by *Julien Milli, et al.*

astro-ph/1306.1233: **The Gemini NICI Planet-Finding Campaign: The Frequency of Giant Planets around Young B and A Stars** by *Eric L. Nielsen, et al.*

astro-ph/1306.1446: **PlanetPack: a radial-velocity time-series analysis tool facilitating exoplanets detection, characterization, and dynamical simulations** by *Roman V. Baluev*

astro-ph/1306.1530: **The Hunt for Exomoons with Kepler (HEK): III. The First Search for an Exomoon around a Habitable-Zone Planet** by *David M. Kipping, et al.*

astro-ph/1306.1672: **On the Possibility of Detecting Class A Stellar Engines Using Exoplanet Transit**

Curves by *Duncan H. Forgan*

astro-ph/1306.1717: **Up to four planets around the M dwarf GJ 163. Sensitivity of Bayesian planet detection criteria to prior choice** by *Mikko Tuomi, Guillem Anglada-Escude*

astro-ph/1306.1768: **A Major Asymmetric Dust Trap in a Transition Disk** by *Nienke van der Marel (et al.*

astro-ph/1306.2276: **Magnetic Coupling in the Disks Around Young Gas Giant Planets** by *N. J. Turner, M. H. Lee, T. Sano*

astro-ph/1306.2308: **Kepler Microlens Planets and Parallaxes** by *Andrew Gould, Keith Horne*

astro-ph/1306.2311: **Transit observations of the Hot Jupiter HD 189733b at X-ray wavelengths** by *K. Poppenhaeger, J.H.M.M. Schmitt, S.J. Wolk*

astro-ph/1306.2332: **The Hot and Energetic Universe: Solar system and exoplanets** by *G. Branduardi-Raymont, et al.*

astro-ph/1306.2418: **Atmospheric Circulation of Terrestrial Exoplanets** by *Adam P. Showman, et al.*

astro-ph/1306.2514: **Orbital migration of giant planets induced by gravitationally unstable gaps: the effect of planet mass** by *Ryan Cloutier, Min-Kai Lin*

astro-ph/1306.2855: **Herschel's "Cold Debris Disks": Background Galaxies or Quiescent Rims of Planetary Systems?** by *A. V. Krivov, et al.*

astro-ph/1306.2889: **Calculating the Habitable Zone of Binary Star Systems I: S-Type Binaries** by *L. Kaltenegger, N. Haghighipour*

astro-ph/1306.2890: **Calculating the Habitable Zone of Binary Star Systems II: P-Type Binaries** by *N. Haghighipour, L. Kaltenegger*

astro-ph/1306.2969: **The 0.5-2.22-micron Scattered Light Spectrum of the Disk Around TW Hya: Detection of a Partially Filled Disk Gap at 80 AU** by *J. H. Debes, et al.*

astro-ph/1306.3100: **Direct Imaging Search for Extrasolar Planets in the Pleiades** by *Kodai Yamamoto, et al.*

astro-ph/1306.3157: **A Cautionary Tale: MARVELS Brown Dwarf Candidate Reveals Itself To Be A Very Long Period, Highly Eccentric Spectroscopic Stellar Binary** by *Claude E. Mack III, et al.*

astro-ph/1306.3221: **A simple, quantitative method to infer the minimum atmospheric height of small exoplanets** by *David M. Kipping, David S. Spiegel, Dimitar D. Sasselov*

astro-ph/1306.3225: **Astrometric orbit of a low-mass companion to an ultracool dwarf** by *J. Sahlmann, et al.*

astro-ph/1306.3266: **Water loss from terrestrial planets with CO2-rich atmospheres** by *Robin Wordsworth, Raymond Pierrehumbert*

astro-ph/1306.3509: **High-precision photometry by telescope defocussing. V. WASP-15 and WASP-16** by *J. Southworth, et al.*

astro-ph/1306.3523: **A linear distribution of orbits in compact planetary systems?** by *Cezary Migaszewski, Krzysztof Gozdziewski, Mariusz Slonina*

astro-ph/1306.3526: **A lack of short-period multiplanet systems with close-proximity pairs and the curious case of Kepler 42** by *Jason H. Steffen, Will Farr*

astro-ph/1306.3672: **Can planetesimals form by collisional fusion?** by *Dhrubaditya Mitra, J.S. Wettlaufer, Axel Brandenburg*

astro-ph/1306.3709: **A library of near-infrared integral field spectra of young M-L dwarfs** by *M. Bonnefoy, et al.*

astro-ph/1306.3937: **Streaming instability in the quasi-global protoplanetary disks** by *Kacper Kowalik, et al.*

astro-ph/1306.3939: **Study of the impact of the post-MS evolution of the host star on the orbits of close-in planets. II. A giant planet in a close-in orbit around the RGB star HIP63242** by *M.I. Jones, et al.*

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