ExoPlanet News
An Electronic Newsletter

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Editor: Andrew J. Norton
Department of Physical Sciences, The Open University, Milton Keynes MK7 6AA, UK
exoplanet@open.ac.uk, http://exoplanet.open.ac.uk/

Contents

1 Editorial

Here is the 79th edition of ExoPlanet News. First of all, apologies to Aline Vidotto for omitting her abstract from last month's bumper edition – I include it this month as the first article.
Remember that past editions of this newsletter, submission templates and other information can be found at the ExoPlanet News website: http://exoplanet.open.ac.uk. Although note that my updates to the website only become live over-night. So if you want to get the newsletter as soon as it is ready, please subscribe and get it by email on the day it's released.

Best wishes
Andrew Norton
The Open University

2 Abstracts of refereed papers

On the environment surrounding close-in exoplanets

A. A. Vidotto[1], *R. Fares*[2], *M. Jardine*[2], *C. Moutou*[3,4], *J.-F. Donati*[5]

[1] Observatoire de Genève, Université de Genève, Chemin des Maillettes 51, Versoix, CH-1290, Switzerland
[2] SUPA, School of Physics and Astronomy, University of St Andrews, North Haugh, St Andrews, KY16 9SS, UK
[3] Canada-France-Hawaii Telescope Corporation, CNRS, 65-1238 Mamalahoa Hwy, Kamuela HI 96743, USA
[4] Aix Marseille Université, CNRS, LAM (Laboratoire d'Astrophysique de Marseille) UMR 7326, 13388, Marseille, France
[5] LATT - CNRS/Université de Toulouse, 14 Av. E. Belin, Toulouse, F-31400, France

Monthly Notices of the Royal Astronomical Society, 2015MNRAS.449.4117V

Exoplanets in extremely close-in orbits are immersed in a local interplanetary medium (i.e., the stellar wind) much denser than the local conditions encountered around the solar system planets. The environment surrounding these exoplanets also differs in terms of dynamics (slower stellar winds, but higher Keplerian velocities) and ambient magnetic fields (likely higher for host stars more active than the Sun). Here, we quantitatively investigate the nature of the interplanetary media surrounding the hot Jupiters HD46375b, HD73256b, HD102195b, HD130322b, HD179949b. We simulate the three-dimensional winds of their host stars, in which we directly incorporate their observed surface magnetic fields. With that, we derive mass-loss rates (1.9 to 8.0×10^{-13} $\mathrm{M}_\odot$ yr^{-1}) and the wind properties at the position of the hot-Jupiters' orbits (temperature, velocity, magnetic field intensity and pressure). We show that these exoplanets' orbits are super-magnetosonic, indicating that bow shocks are formed surrounding these planets. Assuming planetary magnetic fields similar to Jupiter's, we estimate planetary magnetospheric sizes of 4.1 to 5.6 planetary radii. We also derive the exoplanetary radio emission released in the dissipation of the stellar wind energy. We find radio fluxes ranging from 0.02 to 0.13 mJy, which are challenging to be observed with present-day technology, but could be detectable with future higher sensitivity arrays (e.g., SKA). Radio emission from systems having closer hot-Jupiters, such as from τ Boo b or HD 189733b, or from nearby planetary systems orbiting young stars, are likely to have higher radio fluxes, presenting better prospects for detecting exoplanetary radio emission.

Download/Website: `http://arxiv.org/pdf/1503.05711.pdf`

Contact: `Aline.Vidotto@unige.ch`

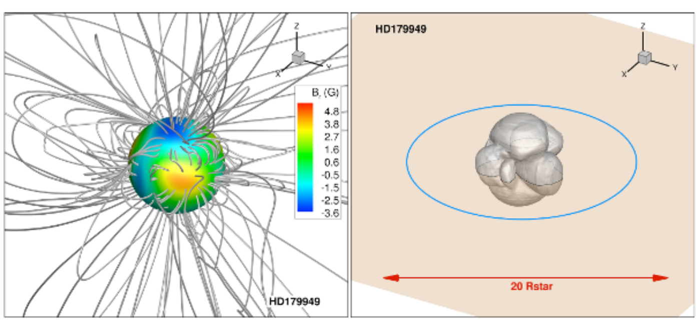

Figure 1: (Vidotto et al.) Left: the configuration of the stellar magnetic field lines for one of the planet-hosting stars in our sample (HD 179949). Overplotted at the surface of the star is the observationally reconstructed stellar magnetic field (Fares et al. 2013), used as boundary condition for the radial magnetic field in our 3D stellar wind simulations. Right: the Alfven surfaces are shown in grey. Note their irregular, asymmetric shapes due to the irregular distribution of the observed field. The equatorial (xy) planes of the star, assumed to contain the orbits of the planet, are also shown, as are the intersections between the xy plane and the Alfven surface (thin black contour) and the orbital radius of the planet (thick blue contour).

Orbital Survival of m-size and Larger Bodies During Gravitationally Unstable Phases of Protoplanetary Disk Evolution

Alan P. Boss
DTM, Carnegie Institution, Washington, DC, USA

Astrophysical Journal, in press

A long-standing problem in the collisional accretion of terrestrial planets is the possible loss of m-size bodies through their inward migration onto the protostar as a result of gas drag forces. Such inward migration can be halted, and indeed even reversed, in a protoplanetary disk with local pressure maxima, such as marginally gravitationally unstable (MGU) phases of evolution, e.g., FU Orionis events. Results are presented for a suite of three-dimensional models of MGU disks extending from 1 AU to 10 AU and containing solid particles with sizes of 1 cm, 10 cm, 1 m, or 10 m, subject to disk gas drag and gravitational forces. These hydrodynamical models show that over disk evolution time scales of $\sim 6 \times 10^3$ yr or longer, during which over half the gaseous disk mass is accreted by the protostar, very few 1 m and 10 m bodies are lost through inward migration: most bodies survive and orbit stably in the outer disk. A greater fraction of 1 cm and 10 cm particles are lost to the central protostar during these time periods, as such particles are more closely tied to the disk gas accreting onto the protostar, but even in these cases, a significant fraction survive and undergo transport from the hot inner disk to the cold outer disk, perhaps explaining the presence of small refractory particles in Comet Wild 2. Evidently MGU disk phases offer a means to overcome the m-sized migration barrier to collisional accumulation.

Download/Website: `https://home.dtm.ciw.edu/users/boss/ftp/orbital.pdf`

Contact: `boss@dtm.ciw.edu`

Modelling the local and global cloud formation on HD 189733b

G. Lee[1]*, Ch. Helling*[1]*, I. Dobbs-Dixon*[2] *and D. Juncher*[3]
[1] SUPA, School of Physics and Astronomy, University of St Andrews, North Haugh, St Andrews, Fife KY16 9SS, UK
[2] NYU Abu Dhabi, PO Box 129188, Abu Dhabi, UAE
[3] Niels Bohr Institute & Centre for Star and Planet Formation, University of Copenhagen, DK-2100 Copenhagen, Denmark

Astronomy & Astrophysics, in press (arXiv: 1505.06576)

Context. Observations suggest that exoplanets such as HD 189733b form clouds in their atmospheres which have a strong feedback onto their thermodynamical and chemical structure, and overall appearance.
Aims. Inspired by mineral cloud modelling efforts for Brown Dwarf atmospheres, we present the first spatially varying kinetic cloud model structures for HD 189733b.
Methods. We apply a 2-model approach using results from a 3D global radiation-hydrodynamic simulation of the atmosphere as input for a detailed, kinetic cloud formation model. Sampling the 3D global atmosphere structure with 1D trajectories allows us to model the spatially varying cloud structure on HD 189733b. The resulting cloud properties enable the calculation of the scattering and absorption properties of the clouds.
Results. We present local and global cloud structure and property maps for HD 189733b. The calculated cloud properties show variations in composition, size and number density of cloud particles which are strongest between the dayside and nightside. Cloud particles are mainly composed of a mix of materials with silicates being the main component. Cloud properties, and hence the local gas composition, change dramatically where temperature inversions occur locally. The cloud opacity is dominated by absorption in the upper atmosphere and scattering at higher pressures in the model. The calculated 8μm single scattering Albedo of the cloud particles are consistent with Spitzer bright regions. The cloud particles scattering properties suggest that they would sparkle/reflect a midnight blue colour at optical wavelengths.

Download/Website: `http://arxiv.org/pdf/1505.06576v1.pdf`

Contact: `gl239@st-andrews.ac.uk`

Water ice lines and the formation of giant moons around super-Jovian planets

R. Heller[1,2], *R. Pudritz*[1]

[1] Origins Institute, Department of Physics & Astronomy, McMaster Univ., 1280 Main St W, Hamilton, ON L8S 4M1, CAN
[2] Postdoctoral Fellow of the Canadian Astrobiology Training Program

The Astrophysical Journal, in press (arXiv:1410.5802)

Most of the exoplanets with known masses at Earth-like distances to Sun-like stars are heavier than Jupiter, which raises the question of whether such planets are accompanied by detectable, possibly habitable moons. Here we simulate the accretion disks around super-Jovian planets and find that giant moons with masses similar to Mars can form. Our results suggest that the Galilean moons formed during the final stages of accretion onto Jupiter, when the circumjovian disk was sufficiently cool. In contrast to other studies, with our assumptions, we show that Jupiter was still feeding from the circumsolar disk and that its principal moons cannot have formed after the complete photoevaporation of the circumsolar nebula. To counteract the steady loss of moons into the planet due to type I migration, we propose that the water ice line around Jupiter and super-Jovian exoplanets acted as a migration trap for moons. Heat transitions, however, cross the disk during the gap opening within $\approx 10^4$ yr, which makes them inefficient as moon traps and indicates a fundamental difference between planet and moon formation. We find that icy moons larger than the smallest known exoplanet can form at about 15 - 30 Jupiter radii around super-Jovian planets. Their size implies detectability by the *Kepler* and *PLATO* space telescopes as well as by the *European Extremely Large Telescope*. Observations of such giant exomoons would be a novel gateway to understanding planet formation, as moons carry information about the accretion history of their planets.

Download/Website: `http://adsabs.harvard.edu/abs/2014arXiv1410.5802H`

Contact: `rheller@physics.mcmaster.ca`

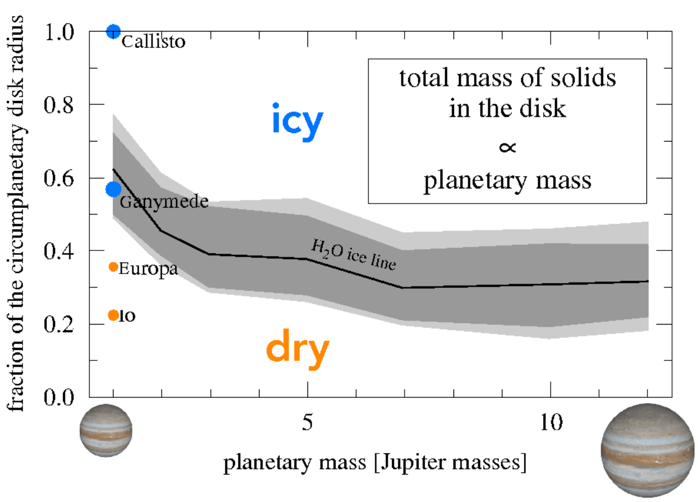

Figure 2: (Heller & Pudritz) Distance of the H_2O ice lines at the shutdown of moon formation around super-Jovian planets. The solid line indicates the mean, while shaded areas denote the statistical scatter (dark gray $1\,\sigma$, light gray $2\,\sigma$) in our calculations, based on the posterior distribution of the disk Planck mean opacity ($\kappa_{\rm P}$) and the shut-down accretion rate for moon formation ($\dot{M}_{\rm shut}$). All planets are assumed to orbit a Sun-like star at a distance of 5.2 AU. Labeled circles at $1\,M_{\rm Jup}$ denote the orbits of the Galilean satellite Io, Europa, Ganymede, and Callisto. Orange indicates rocky composition, blue represents H_2O-rich composition. Circle sizes scale with moon radii. Note that Ganymede sits almost exactly on the circumjovian ice line at moon formation shutdown.

Transiting Planets with LSST. II. Period Detection of Planets Orbiting 1 $M_\odot$ Hosts

Savannah Jacklin[1,2], Michael B. Lund[2], Joshua Pepper[3], Keivan G. Stassun[3,4]

[1] Department of Astrophysics and Planetary Science, Villanova University, Villanova, PA 19085, USA
[2] Department of Physics and Astronomy, Vanderbilt University, Nashville, TN 37235, USA
[3] Department of Physics, Lehigh University, Bethlehem, PA 18015, USA
[4] Department of Physics, Fisk University, Nashville, TN 37208, USA

The Astronomical Journal, in press (arXiv:1503.00059)

The Large Synoptic Survey Telescope (LSST) will photometrically monitor $\sim 10^9$ stars for ten years. The resulting light curves can be used to detect transiting exoplanets. In particular, as demonstrated by Lund et al. (2015), LSST will probe stellar populations currently undersampled in most exoplanet transit surveys, including out to extragalactic distances. In this paper we test the efficiency of the box-fitting least-squares (BLS) algorithm for accurately recovering the periods of transiting exoplanets using simulated LSST data. We model planets with a range of radii orbiting a solar-mass star at a distance of 7 kpc, with orbital periods ranging from 0.5 to 20 d. We find that standard-cadence LSST observations will be able to reliably recover the periods of Hot Jupiters with periods shorter than $\sim$3 d, however it will remain a challenge to confidently distinguish these transiting planets from false positives. At the same time, we find that the LSST deep drilling cadence is extremely powerful: the BLS algorithm successfully recovers at least 30% of sub-Saturn-size exoplanets with orbital periods as long as 20 d, and a simple BLS power criterion robustly distinguishes $\sim$98% of these from photometric (i.e. statistical) false positives.

Download/Website: `http://http://arxiv.org/abs/1503.00059`

Contact: `savannah.jacklin@gmail.com`

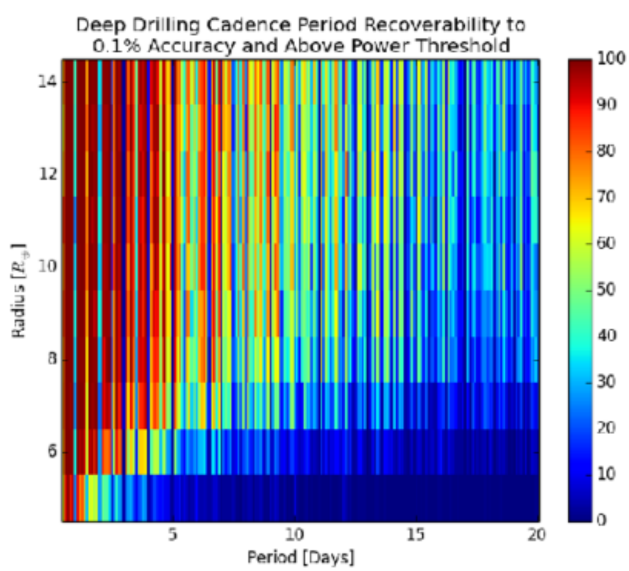

Figure 3: (Jacklin et al.) Period recovery for a planet around a 1-solar mass star 7kpc away from the Earth. For Hot Jupiters in periods less than 5 days, recovery approaches 100%. Correct periods are recovered at a rate greater than $\sim$30% out to at least periods of 30 days.

Detailed structure of the outer disk around HD 169142 with polarized light in H-band

M. Momose[1], *A. Morita*[1], *M. Fukagawa*[2], *T. Muto*[3], *T. Takeuchi*[4], *J. Hashimoto*[5], *M. Honda*[6], *T. Kudo*[7], *Y. K. Okamoto*[1], *K. D. Kanagawa*[8], *H. Tanaka*[8], *C. A. Grady*[9,10,11], *M. L. Sitko*[12,13], *E. Akiyama*[14], *T. Currie*[7], *K. B. Follette*[15], *S. Mayama*[16,17], *N. Kusakabe*[14], *L. Abe*[18], *W. Brandner*[19], *T. D. Brandt*[20], *J. C. Carson*[21], *S. Egner*[7], *M. Feldt*[19], *M. Goto*[22], *O. Guyon*[7], *Y. Hayano*[7], *M. Hayashi*[14], *S. S. Hayashi*[7], *T. Henning*[19], *K. W. Hodapp*[23], *M. Ishii*[14], *M. Iye*[14], *M. Janson*[24], *R. Kandori*[14], *G. R. Knapp*[25], *M. Kuzuhara*[4], *J. Kwon*[26], *T. Matsuo*[27], *M. W. McElwain*[9], *S. Miyama*[28], *J.-I. Morino*[14], *A. Moro-Martin*[25,29], *T. Nishimura*[7], *T.-S. Pyo*[7], *E. Serabyn*[30], *T. Suenaga*[14,17], *H. Suto*[14], *R. Suzuki*[14], *Y. H. Takahashi*[14,26], *M. Takami*[31], *N. Takato*[7], *H. Terada*[7], *C. Thalmann*[32], *D. Tomono*[7], *E. L. Turner*[25,33], *M. Watanabe*[34], *J. Wisniewski*[5], *T. Yamada*[35], *H. Takami*[14], *T. Usuda*[14], and *M. Tamura*[14,26]

[1] College of Science, Ibaraki University, 2-1-1 Bunkyo, Mito, Ibaraki 310-8512
[2] Graduate School of Science, Osaka University, 1-1 Machikaneyama, Toyonaka, Osaka 560-0043
[3] Division of Liberal Arts, Kogakuin University, 1-24-2 Nishi-Shinjuku, Shinjuku-ku, Tokyo 163-8677
[4] Department of Earth and Planetary Sciences, Tokyo Institute of Technology, Meguro-ku, Tokyo 152-8551
[5] H. L. Dodge Department of Physics and Astronomy, University of Oklahoma, 440 W Brooks St Norman, OK 73019, USA
[6] Department of Mathematics and Physics, Kanagawa University, 2946 Tsuchiya, Hiratsuka, Kanagawa 259-1293
[7] Subaru Telescope, 650 North A'ohoku Place, Hilo, HI 96720, USA
[8] Institute of Low Temperature Science, Hokkaido University, Sapporo, Hokkaido 060-0819
[9] Exoplanets and Stellar Astrophysics Laboratory, Code 667, Goddard Space Flight Center, Greenbelt, MD 20771, USA
[10] Eureka Scientific, 2452 Delmer, Suite 100, Oakland, CA 96002, USA
[11] Goddard Center for Astrobiology
[12] Space Science Institute, 4750 Walnut St., Suite 205, Boulder, CO 80301, USA
[13] Department of Physics, University of Cincinnati, Cincinnati, OH 45221-0011, USA
[14] National Astronomical Observatory of Japan, 2-21-1 Osawa, Mitaka, Tokyo 181-8588
[15] Steward Observatory, University of Arizona, 933 N Cherry Ave, Tucson, AZ 85721, USA
[16] The Center for the Promotion of Integrated Sciences, The Graduate University for Advanced Studies (SOKENDAI), Shonan International Village, Hayama-cho, Miura-gun, Kanagawa 240-0193
[17] Department of Astronomical Science, The Graduate University for Advanced Studies (SOKENDAI), 2-21-1 Osawa, Mitaka, Tokyo 181-8588
[18] Laboratoire Lagrange (UMR 7293), Universitè de Nice-Sophia Antipolis, CNRS, Observatoire de la Côte d'Azur, 28 avenue Valrose, 06108 Nice Cedex 2, France
[19] Max Planck Institute for Astronomy, Königstuhl 17, 69117 Heidelberg, Germany
[20] Astrophysics Department, Institute for Advanced Study, Princeton, NJ 08540, USA
[21] Department of Physics and Astronomy, College of Charleston, 66 George St., Charleston, SC 29424, USA
[22] Universitäts-Sternwarte München, Ludwig-Maximilians-Universität, Scheinerstr. 1, 81679 München, Germany
[23] Institute for Astronomy, University of Hawaii, 640 N. A'ohoku Place, Hilo, HI 96720, USA
[24] Department of Astronomy, Stockholm University, AlbaNova University Center, 106 91 Stockholm, Sweden
[25] Department of Astrophysical Science, Princeton University, Peyton Hall, Ivy Lane, Princeton, NJ 08544, USA
[26] Department of Astronomy, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033
[27] Department of Astronomy, Kyoto University, Kitashirakawa-Oiwake-cho, Sakyo-ku, Kyoto, Kyoto 606-8502
[28] Hiroshima University, 1-3-2, Kagamiyama, Higashihiroshima, Hiroshima 739-8511
[29] Department of Astrophysics, CAB-CSIC/INTA, 28850 Torrejón de Ardoz, Madrid, Spain
[30] Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109, USA
[31] Institute of Astronomy and Astrophysics, Academia Sinica, P.O. Box 23-141, Taipei 10617, Taiwan
[32] Astronomical Institute "Anton Pannekoek", University of Amsterdam, Postbus 94249, 1090 GE, Amsterdam, The Netherlands
[33] Kavli Institute for Physics and Mathematics of the Universe, The University of Tokyo, 5-1-5, Kashiwanoha, Kashiwa, Chiba 277-8568
[34] Department of Cosmosciences, Hokkaido University, Kita-ku, Sapporo, Hokkaido 060-0810
[35] Astronomical Institute, Tohoku University, Aoba-ku, Sendai, Miyagi 980-8578

Publications of the Astronomical Society of Japan, in press (arXiv:1505.04937)

Coronagraphic imagery of the circumstellar disk around HD 169142 in H-band polarized intensity (PI) with Subaru/HiCIAO is presented. The emission scattered by dust particles at the disk surface in $0.2'' \leq r \leq 1.2''$, or $29 \leq r \leq 174$ AU, is successfully detected. The azimuthally-averaged radial profile of the PI shows a double power-law distribution, in which the PIs in $r = 29 - 52$ AU and $r = 81.2 - 145$ AU respectively show r^{-3}-dependence. These two power-law regions are connected smoothly with a transition zone (TZ), exhibiting an apparent gap in $r = 40 - 70$ AU. The PI in the inner power-law region shows a deep minimum whose location seems to coincide

with the point source at $\lambda = 7$ mm. This can be regarded as another sign of a protoplanet in TZ. The observed radial profile of the PI is reproduced by a minimally flaring disk with an irregular surface density distribution or with an irregular temperature distribution or with the combination of both. The depletion factor of surface density in the inner power-law region ($r < 50$ AU) is derived to be ≥ 0.16 from a simple model calculation. The obtained PI image also shows small scale asymmetries in the outer power-law region. Possible origins for these asymmetries include corrugation of the scattering surface in the outer region, and shadowing effect by a puffed up structure in the inner power-law region.

Download/Website: http://arxiv.org/abs/1505.04937

Contact: momose@mx.ibaraki.ac.jp

The stratification of regolith on celestial objects

R. Schräpler [1], *J. Blum* [1], *I. von Borstel* [1], *C. Güttler* [2,1]

[1] Insitut für Geophysik und extraterrestrische Physik, Technische Universität Braunschweig, Mendelssohngstr. 3, D-38100 Braunschweig, Germany
[2] Max Planck Institut for Solar System Research, Justuts von Liebig Weg 3, D-37077 Göttingen , Germany

ICARUS, accepted (arXiv:1505.02923)

All atmosphere-less planetary bodies are covered with a dust layer, the so-called regolith, which determines the optical, mechanical and thermal properties of their surface. These properties depend on the regolith material, the size distribution of the particles it consists of, and the porosity to which these particles are packed. We performed experiments in parabolic flights to determine the gravity dependency of the packing density of regolith for solid-particle sizes of 60 μm and 1 mm as well as for 100-250 μm-sized agglomerates of 1.5 μm-sized solid grains. We utilized g-levels between 0.7 m s^{-2} and 18 m s^{-2} and completed our measurements with experiments under normal gravity conditions. Based on previous experimental and theoretical literature and supported by our new experiments, we developed an analytical model to calculate the regolith stratification of celestial rocky and icy bodies and estimated the mechanical yields of the regolith under the weight of an astronaut and a spacecraft resting on these objects.

Download/Website: http://arxiv.org/abs/1505.02923

Contact: r.schraepler@tu-bs.de

The snow line in viscous disks around low-mass stars: implications for water delivery to terrestrial planets in the habitable zone

Gijs D. Mulders[1], *Fred J. Ciesla*[2], *Michiel Min*[3], *Ilaria Pascucci*[1]

[1] Lunar and Planetary Laboratory, The University of Arizona, Tucson, AZ, USA
[2] Department of the Geophysical Sciences, The University of Chicago, Chicago, IL, USA
[3] Astronomical Institute Anton Pannekoek, University of Amsterdam, The Netherlands

The Astrophysical Journal, in press (arXiv:1505.03516)

The water ice or snow line is one of the key properties of protoplanetary disks that determines the water content of terrestrial planets in the habitable zone. Its location is determined by the properties of the star, the mass accretion rate through the disk, and the size distribution of dust suspended in the disk. We calculate the snow line location from recent observations of mass accretion rates and as a function of stellar mass. By taking the observed dispersion in mass accretion rates as a measure of the dispersion in initial disk mass, we find that stars of a given mass will exhibit a range of snow line locations. At a given age and stellar mass, the observed dispersion in mass accretion rates of 0.4 dex naturally leads to a dispersion in snow line locations of ~0.2 dex. For ISM-like dust sizes, the one-sigma snow line location among solar mass stars of the same age ranges from ~2 to ~5 au. For more realistic dust opacities that include larger grains, the snow line is located up to two times closer to the star.
We use these locations and the outcome of N-body simulations to predict the amount of water delivered to terrestrial planets that formed in situ in the habitable zone. We find that the dispersion in snow line locations leads to a large range in water content (See Figure). For ISM-like dust sizes, a significant fraction of habitable-zone terrestrial planets around sun-like stars remain dry, and no water is delivered to the habitable zones of low-mass M stars ($< 0.5M_\odot$) as in previous works. The closer-in snow line in disks with larger grains enables water delivery to the habitable zone for a significant fraction of M stars and all FGK stars. Considering their larger numbers and higher planet occurrence, M stars may host most of the water-rich terrestrial planets in the galaxy if these planets are able to hold on to their water in their subsequent evolution.

Download/Website: `http://arxiv.org/abs/1505.03516`

Contact: `mulders@lpl.arizona.edu`

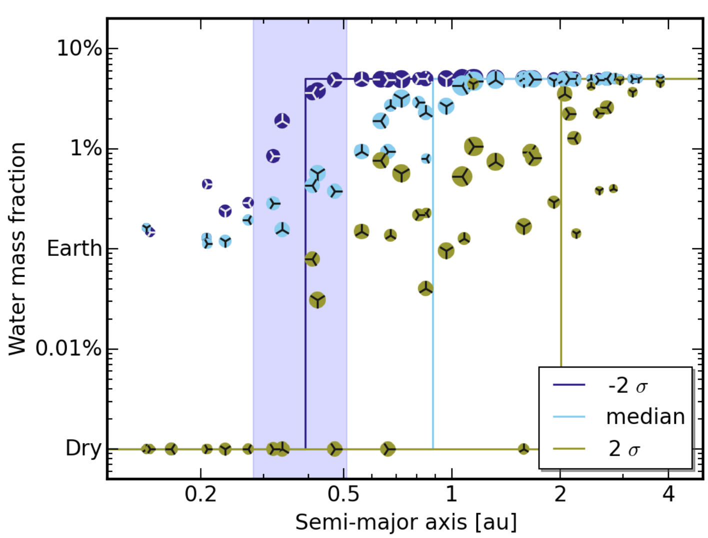

Figure 4: (Mulders et al.) Planetary water abundances for planets (colored symbols) around a $0.6M_\odot$ star. Different colors correspond to different locations of the snow line. The initial water abundance of planetesimals and planetary embryos is indicated by the solid lines. The blue shaded region indicates the location of the habitable zone.

The orbital evolution of asteroids, pebbles and planets from giant branch stellar radiation and winds

D. Veras[1], *S. Eggl*[2], *B.T. Gänsicke*[1]
[1] Department of Physics, University of Warwick, Coventry CV4 7AL, UK
[2] IMCCE Observatroire de Paris, Univ. Lille 1, UPMC, 77 Av. Denfert-Rochereau, 75014 Paris, France

Monthly Notices of the Royal Astronomical Society, in press (arXiv:1505.01851)

The discovery of over 50 planets around evolved stars and more than 35 debris discs orbiting white dwarfs highlight the increasing need to understand small body evolution around both early and asymptotic giant branch (GB) stars. Pebbles and asteroids are susceptible to strong accelerations from the intense luminosity and winds of GB stars. Here, we establish equations that can model time-varying GB stellar radiation, wind drag and mass loss. We derive the complete three-dimensional equations of motion in orbital elements due to (1) the Epstein and Stokes regimes of stellar wind drag, (2) Poynting-Robertson drag, and (3) the Yarkovsky drift with seasonal and diurnal components. We prove through averaging that the potential secular eccentricity and inclination excitation due to Yarkovsky drift can exceed that from Poynting-Robertson drag and radiation pressure by at least three orders of magnitude, possibly flinging asteroids which survive YORP spin-up into a widely dispersed cloud around the resulting white dwarf. The GB Yarkovsky effect alone may change an asteroids orbital eccentricity by ten per cent in just one Myr. Damping perturbations from stellar wind drag can be just as extreme, but are strongly dependent on the highly uncertain local gas density and mean free path length. We conclude that GB radiative and wind effects must be considered when modelling the post-main-sequence evolution of bodies smaller than about 1000 km.

Download/Website: `http://arxiv.org/abs/1505.01851`

Contact: `d.veras@warwick.ac.uk`

Formation of planetary debris discs around white dwarfs II: Shrinking extremely eccentric collisionless rings

D. Veras[1], *Z.M. Leinhardt*[2], *S. Eggl*[3], *B.T. Gänsicke*[1]
[1] Department of Physics, University of Warwick, Coventry CV4 7AL, UK
[2] The School of Physics, University of Bristol, Bristol BS8 1TL, UK
[3] IMCCE Observatroire de Paris, Univ. Lille 1, UPMC, 77 Av. Denfert-Rochereau, 75014 Paris, France

Monthly Notices of the Royal Astronomical Society, in press (arXiv:1505.06204)

The formation channel of the tens of compact debris discs which orbit white dwarfs (WDs) at a distance of one Solar radius remains unknown. Asteroids that survive the giant branch stellar phases beyond a few au are assumed to be dynamically thrust towards the WD and tidally disrupted within its Roche radius, generating extremely eccentric (e¿0.98) rings. Here, we establish that WD radiation compresses and circularizes the orbits of super-micron to cm-sized ring constituents to entirely within the WD's Roche radius. We derive a closed algebraic formula which well-approximates the shrinking time as a function of WD cooling age, the physical properties of the star and the physical and orbital properties of the ring particles. The shrinking timescale increases with both particle size and cooling age, yielding age-dependent WD debris disc size distributions.

Download/Website: `http://arxiv.org/abs/1505.06204`

Contact: `d.veras@warwick.ac.uk`

GTC OSIRIS transiting exoplanet atmospheric survey: detection of potassium in HAT-P-1b from narrow-band spectrophotometry

P. A. Wilson[1,2], D. K. Sing[2], N. Nikolov[2], A. Lecavelier des Etangs[1], F. Pont[2], J. J. Fortney,[3] G. E. Ballester[4], M. López-Morales[5], J.-M. Désert[6], A. Vidal-Madjar[1]

[1] Institut d'Astrophysique de Paris, UMR7095 CNRS, Université Pierre & Marie Curie, 98bis boulevard Arago, 75014 Paris, France
[2] Astrophysics Group, School of Physics, University of Exeter, Stocker Road, Exeter EX4 4QL, UK
[3] Department of Astronomy and Astrophysics, University of California, Santa Cruz, CA 95064, USA
[4] Lunar and Planetary Laboratory, University of Arizona, Sonett Space Sciences Building, Tucson, Arizona 85721-0063, USA
[5] Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, Massachusetts 02138, USA
[6] Department of Astrophysical and Planetary Sciences, University of Colorado, Boulder CO 80309

Monthly Notices of the Royal Astronomical Society, published (2015MNRAS.450..192W)

We present the detection of potassium in the atmosphere of HAT-P-1b using optical transit narrowband photometry. The results are obtained using the 10.4-m Gran Telescopio Canarias (*GTC*) together with the OSIRIS instrument in tunable filter imaging mode. We observed four transits, two at continuum wavelengths outside the potassium feature, at 6792 Å and 8844 Å, and two probing the potassium feature in the line wing at 7582.0 Å and the line core at 7664.9 Å using a 12 Å filter width (R $\sim$ 650). The planet-to-star radius ratios in the continuum are found to be $R_{\rm pl}/R_{\star}=$ 0.1176 ± 0.0013 at 6792 Å and $R_{\rm pl}/R_{\star}=$ 0.1168 ± 0.0022 at 8844 Å, significantly lower than the two observations in the potassium line: $R_{\rm pl}/R_{\star}=$ 0.1248 ± 0.0014 in the line wing at 7582.0 Å and $R_{\rm pl}/R_{\star}=$ 0.1268 ± 0.0012 in the line core at 7664.9 Å. With a weighted mean of the observations outside the potassium feature $R_{\rm pl}/R_{\star}=$ 0.1174 ± 0.0010, the potassium is detected as an increase in the radius ratio of $\Delta R_{\rm pl}/R_{\star}=$ 0.0073 ± 0.0017 at 7582.0 Å and $\Delta R_{\rm pl}/R_{\star}=$ 0.0094 ± 0.0016 at 7664.9 Å (a significance of 4.3 and 6.1 σ respectively). We hypothesize that the strong detection of potassium is caused by a large scale height, which can be explained by a high-temperature at the base of the upper atmosphere. A lower mean molecular mass caused by the dissociation of molecular hydrogen into atomic hydrogen by the EUV flux from the host star may also partly explain the amplitude of our detection.

Download/Website: `http://adsabs.harvard.edu/abs/2015MNRAS.450..192W`

Contact: `pwilson@iap.fr`

The Composition Of A Disrupted Extrasolar Planetesimal At SDSS J0845+2257 (Ton 345)

D. J. Wilson[1], B. T. Gänsicke[1], D. Koester[2], O. Toloza[1], A. F. Pala[1], E. Breedt[1], S. G. Parsons[3]

[1] Department of Physics, University of Warwick, Coventry CV4 7AL, UK
[2] Institut für Theoretische Physik und Astrophysik, University of Kiel, 24098 Kiel, Germany
[3] Departamento de Física y Astronomía, Universidad de Valparaíso, Avenida Gran Bretaña 1111, Valparaíso 2360102, Chile

Monthly Notices of the Royal Astronomical Society, in press (arXiv: 1505.07466)

We present a detailed study of the metal-polluted DB white dwarf SDSS J0845+2257 (Ton 345). Using high-resolution *HST*/COS and VLT spectroscopy, we have detected hydrogen and eleven metals in the atmosphere of the white dwarf. The origin of these metals is almost certainly the circumstellar disc of dusty and gaseous debris from a tidally-disrupted planetesimal, accreting at a rate of $1.6 \times 10^{10}\,{\rm g\,s^{-1}}$. Studying the chemical abundances of the accreted material demonstrates that the planetesimal had a composition similar to the Earth, dominated by rocky silicates and metallic iron, with a low water content. The mass of metals within the convection zone of the white dwarf corresponds to an asteroid of at least $\sim$130–170 km in diameter, although the presence of ongoing accretion from the debris disc implies that the planetesimal was probably larger than this. While a previous abundance study of the accreted material has shown an anomalously high mass fraction of carbon (15 percent) compared to the bulk Earth, our independent analysis results in a carbon abundance of just 2.5 percent. Enhanced abundances of core material (Fe, Ni) suggest that the accreted object may have lost a portion of its mantle, possibly due to stellar

wind stripping in the asymptotic giant branch. Time-series spectroscopy reveals variable emission from the orbiting gaseous disc, demonstrating that the evolved planetary system at SDSS J0845+2257 is dynamically active.

Download/Website: `http://arxiv.org/abs/1505.07466`

Contact: `d.j.wilson.1@warwick.ac.uk`

3 Jobs and Positions

Lecturer in Astrophysics

Isabelle Baraffe
Physics and Astronomy, University of Exeter

University of Exeter, October 1st 2015

The University of Exeter invites applications for a Lecturer position in Astrophysics. This post is available from October 1st 2015 for a period of 5 years in the first instance.

The post will contribute to extending the research profile in theoretical or observational Astrophysics at Exeter in the field of exoplanets or related areas. Preference will be given to candidates that will strengthen existing links with the Exeter-based Met Office, particularly in the area of radiative transfer and atmosphere modelling, and to candidates that will contribute to the development and scientific exploitation of the Terra Hunting Experiment. The University of Exeter is investing £1M in the Terra Hunting Experiment, which is a Doppler velocity search for Earth-twins, based on the development of the HARPS-III spectrograph.

The successful applicant will hold a PhD in Physics, Astrophysics or a related area and have an independent, internationally-recognised research programme in an active field related or complementary to existing Exeter activities in the field of exoplanets. He/she will be able to demonstrate the following qualities and characteristics: a good record in attracting research funding, or demonstrable potential to attract such funding, teamwork skills to work in collaboration with existing group members, an active and supportive approach to inter-disciplinary and multi-disciplinary research that will help to foster interactions and links both within the University and externally, the attitude and ability to engage in continuous professional development, the aptitude to develop familiarity with a variety of strategies to promote and assess learning and enthusiasm for delivering undergraduate programmes.

Appointments will be made within the Education and Research job family, salary range £33,242 - £37,394 per annum.

Informal enquiries can be made to Prof Isabelle Baraffe (tel +44 (0)1392 725123 or I.Baraffe@exeter.ac.uk).

Please apply using the University's online application system (https://jobs.exeter.ac.uk/) with the job reference P49203.

The closing date for completed applications is 31st July 2015. Interviews are expected to take place in September 2015.

Download/Website: `https://jobs.exeter.ac.uk/`

Contact: `I.Baraffe@exeter.ac.uk`

Research fellowships (PhD-level) positions in the field of planetary systems

Nuno C. Santos
Institute of Astrophysics and Space Science, Portugal

Institute of Astrophysics and Space Sciences (Portugal), October 1st 2015

A call for up-to 2 research fellowships (Bolsa de Investigação Mestre) in the field of planetary systems is open at the Instituto de Astrofsica e Ciências do Espaço (IA). The position is offered in the context of the project UID/FIS/04434/2013 with financial support provided by the FCT/MEC through national funds and co-funded by FEDER under the PT2020 agreement, when applicable.

The successful candidates are expected to pursue research on topics relevant to the participation of the team in several strategic projects such as ESPRESSO@VLT, CHEOPS-ESA, PLATO2.0-ESA, and Spirou@CFHT, including:

- Study of stellar sources of noise for precise radial velocity and photometric planet search and characterization projects;
- Derivation of precise stellar parameters and abundances for stars with planetary companions;
- Solar system and extra-solar planet atmosphere studies using high-resolution spectroscopy.

The Instituto de Astrofsica e Ciências do Espaço (IA) assembles more than two-thirds of all active researchers working in Space Sciences in Portugal, and is responsible for an even greater fraction of the national productivity in international ISI journals in this area. The research and development effort at the IA includes most of the topics at the forefront of research in Astrophysics and Space Sciences, complemented by work on instrumentation and systems with potential use in Astronomy and Astrophysics.

The students will be required to enroll on a PhD program at the IA host Universities, University of Porto or University of Lisboa. The yearly renewal of the fellowship take into account the successful completion of the PhD program milestones as well as on the overall performance.

The submission of application is open from the **4th of June to the 5th of July, 2015**.

More details about this opportunity and the application procedure can be found at http://www.iastro.pt/ia/jobs.html

Download/Website: `http://www.iastro.pt/ia/jobDetails.html?ID=5`
Contact: `nuno.santos@astro.up.pt`

Postdoctoral and PhD position in protoplanetary/debris discs or evolved stars with planets

Gwendolyn Meeus and Eva Villaver

Madrid, Spain, Fall 2015

Applications are invited for a 2-year postdoctoral position (1+1yr after positive evaluation) and a 4-year PhD position at the Department of Theoretical Physics from the Universidad Autónoma de Madrid (UAM). The successful candidates will be hired under the project ”From stones to planets and back to rocks: understanding planet formation and destruction” (AYA2014-55840-P), lead by Eva Villaver and Gwendolyn Meeus and funded by the Spanish National Plan of R&D. The research will depend on the experience of the candidate, but should focus on either:

- How the structure of protoplanetary and debris discs depends on the presence of planets.
- How stellar evolution affects the architecture of planetary systems.

The methods can either be observational or theoretical. We are seeking a highly motivated researcher with experience in some of the following areas: protoplanetary or debris disc modelling, stellar evolution, detection of planets, or high spatial/spectral resolution disc observations (e.g. with ALMA, SPHERE or NACO).

Postdoctoral applicants must have obtained their PhD in Astrophysics or Physics and have a doctoral certificate at the moment of appointment, while the doctoral candidate must have a Master in Astrophysics or Physics at that time. Ideally the position will start in fall of 2015, but a later start is also possible. Applicants should send their CV with publication list, along with a cover letter briefly describing research interests and achievements, and arrange for two recommendation letters to be sent to eva.villaver@uam.es and gwendolyn.meeus@uam.es by July 20th, 2015.

The contracts include medical insurance under the Spanish National Health Service which also cover your accompanying partner and children, if relevant.

Our group is also a host for Marie S. Curie fellowships, and can provide administrative support for those wishing to apply.

Located in Madrid, Spain, the Department of Theoretical Physics at UAM offers a rich atmosphere in front-line physics research, ranging from Particle Physics (both theoretical and experimental), Nuclear Physics, Neuroscience, Experimental High-Energy Physics, to Astrophysics. The Astrophysics group at the department carries out research on Cosmology, Galactic and Extra-galactic Astrophysics, and runs a Master PhD program in Astrophysics. Further information about UAM’s Department of Theoretical Physics is available via the Internet on the UAM Web page (www.ft.uam.es). Close collaboration with the Centre for Astrobiology (CAB) and the ESA European Space Astronomy Centre (ESAC), also located in Madrid, is ongoing.

Download/Website: `http://astro.ft.uam.es/`

Contact: `gwendolyn.meeus@uam.es`

4 Conference announcements

Exoplanetary Atmospheres and Habitability – Thermodynamics, Disequilibrium and Evolution focus group

Eugenion Simoncini[1], *Andrea Chiavassa*[2]
[1] Arcetri Observatory
[2] Lagrange Laboratory, OCA

Observatoire de la Côte d'Azur, Nice, France, 12 to 16 October 2015

SCIENTIFIC RATIONALE

Dear colleagues,

We are glad to annonce the "Exoplanetary Atmospheres and Habitability -Thermodynamics, Disequilibrium and Evolution focus group workshop that will be held in Nice at the Observatoire de la Cote dAzur from 12 to 16 October 2015. http://exoatmo.sciencesconf.org

The first indicative program is available here: http://exoatmo.sciencesconf.org/program
The registration is free and includes lunches during the week as well as the social event
http://exoatmo.sciencesconf.org/registration/index
We encourage PhDs and Postdocs to apply and to submit an abstract:
http://exoatmo.sciencesconf.org/submission/submit

IMPORTANT DATES
June 30th, 2015: Deadline for registration and abstract submission
October 12th, 2015: The workshop starts
Only few places are still available

Looking forward to seeing you in Nice,
Eugenio Simoncini and Andrea Chiavassa on behalf of the SOC

SCIENTIFIC RATIONALE
The aim of the workshop is to discuss chemical disequilibrium and its link to planetary habitability. In particular, the Thermodynamics, Disequilibrium and Evolution focus group seeks to understand how disequilibria are generated in geological / chemical / biological systems, and how these disequilibria can lead to emergent phenomena, such as self-organization and eventually, metabolism. The prospects for planetary atmosphere characterization are excellent with access to a large amount of data for different kinds of stars either with ground- or space-based telescopes, and supported by accurate modeling of atmospheric compositions and their corresponding spectra. In particular, for many discovered exoplanets (hot and gaseous), a large chemical disequilibrium in the atmosphere has been observed, due to the high vertical temperature gradient. Several new studies are now comparing this vertical-mixing driven disequilibrium with the chemical disequilibrium characterizing the atmosphere of planet Earth, which is mainly due to the presence of life. However, present research on exoplanet's atmospheric disequilibrium is focused on a very small number of compounds (CH4, CO, CO2, H2O), and lacks a generalized and wider methodology. In this workshop we plan to enlarge these studies to a joint effort between the thermodynamics of habitable conditions and exoplanetary atmospheres.
Three principal topics will be tackled during the workshop, together with the invited speakers:

1. Icy moons, icy planets and the conditions for the emergence of life:
   (a) Laurie Barge - JPL, CalTech, Pasadena (USA)

   (b) Athena Coustenis - Observatoire de Meudon, Meudon (France)
   (c) Robert Pascal - CNRS and Universit de Montpellier (France)

2. The modeling and observations of exoplanetary atmospheres: chemistry and physics:
   (a) Daniel Angerhausen - Goddard Space Flight Center, NASA, Greenbelt (USA)
   (b) Renyu Hu - Jet Propulsion Laboratory (USA)
   (c) Franck Selsis - Observatoire de Bordeaux, Bordeaux (France)
   (d) Giovanna Tinetti - University College London (UK)
3. The chemical disequilibrium in planetary atmospheres: from hot Jupiters to habitable planets
   (a) Sebastian Danielache - Sophia University, Tokyo (Japan)
   (b) Tommaso Grassi - Starplan, University of Copenhagen, (Denemark)
   (c) Eugenio Simoncini - Astrophysical Observatory of Arcetri, INAF, Firenze (Italy)

Download/Website: `http://exoatmo.sciencesconf.org`
Contact: `exoatmo@sciencesconf.org`

K2 Sci Con: Featuring Exoplanets and Astrophysics from K2, Kepler, and Tess

R. Street
Las Cumbres Observatory Global Telescope Network (LCOGT), Santa Barbara, CA, USA

Santa Barbara, CA, November 2-5, 2015

Please save the first week of November 2015 for the K2 Science Conference (K2 Sci Con)!

The LCOGT invites the whole astronomical community to celebrate the science from the first year of the K2 mission in sunny Santa Barbara! All K2 users are welcome to present early scientific results from all areas of research, from our own Solar System and exoplanets, to young stars and distant galaxies. We will hear updates on the mission and discuss the latest in data processing techniques. We also encourage contributions on results from the Kepler prime mission and the future TESS mission.

More information, including registration and abstract submission, will be posted on the website in the coming weeks.

Download/Website: `http://lcogt.net/k2scicon/`
Contact: `k2scicon-loc@lcogt.net`

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

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

Pasadena, CA, July 27-31, 2015

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

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

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

Important Dates

- April 6, 2015: POP/Poster/Talk submission period open
- July 10, 2015: On-line Registration closed; final agenda posted
- July 27-31, 2015: Sagan Exoplanet Summer Workshop

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

5 Announcements

ExoFOP website to support follow-up observations for K2

R. Akeson, D. Ciardi, M. Crane

Pasadena, CA, USA, May 4, 2015

The NASA Exoplanet Science Institute is pleased to announce the release of ExoFOP-K2, a web site designed to optimize resources and facilitate collaboration in follow-up studies of K2 targets. Based on the Kepler follow-up observation site, CFOP, this site serves as a repository for community-gathered follow-up data.

ExoFOP-K2 is open to the entire community and currently contains magnitudes, finding charts, and nearby source lists for the targets from Campaigns 0-4 and the engineering campaign. A new feature allows users to designate possible planetary candidates, false positives and eclipsing binaries. ExoFOP-K2 allows detailed searches of K2 targets similar to the CFOP search pages and, coming soon, you can specify lists of targets or programs to receive updates when new information is entered.

All K2 content can be viewed and downloaded without logging in. A username and password are only required if you wish to upload data, notes, or files. Your existing CFOP username and password will work on ExoFOP-K2.

Download/Website: `https://cfop.ipac.caltech.edu/k2/`

Contact: `cfop@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 May 2015. If you see any that we missed, please let us know and we'll include them in the next issue.

astro-ph/1505.00014: **Criteria for Sample Selection to Maximize Planet Sensitivity and Yield from Space-Based Microlens Parallax Surveys** by *Jennifer C. Yee, et al.*

astro-ph/1505.00139: **Methane Planets and their Mass-Radius Relation** by *Ravit Helled, Morris Podolak, Eran Vos*

astro-ph/1505.00262: **A SCUBA-2 850-m survey of circumstellar disks in the ? Orionis cluster** by *Megan Ansdell, Jonathan P. Williams, Lucas A. Cieza*

astro-ph/1505.00269: **Variability in the super-Earth 55 Cnc e** by *Brice-Olivier Demory, et al.*

astro-ph/1505.00280: **Thorium Abundances in Solar Twins and Analogues: Implications for the Habitability of Extrasolar Planetary Systems** by *Cayman T. Unterborn, Jennifer A. Johnson, Wendy R. Panero*

astro-ph/1505.00806: **Discovery of a young planetary mass companion to the nearby M dwarf VHS J125601.92-125723.9** by *Bartosz Gauza, et al.*

astro-ph/1505.00882: **Evidence of fast pebble growth near condensation fronts in the HL Tau protoplanetary disk** by *Ke Zhang, Geoffrey A. Blake, Edwin A. Bergin*

astro-ph/1505.01063: **XO-2b: a hot Jupiter with a variable host star that potentially affects its measured transit depth** by *Robert T. Zellem, et al.*

astro-ph/1505.01086: **Formation of terrestrial planets in disks evolving via disk winds and implications for the origin of the solar system's terrestrial planets** by *Masahiro Ogihara, et al.*

astro-ph/1505.01154: **Modeling gravitational instabilities in self-gravitating protoplanetary disks with adaptive mesh refinement techniques** by *Tim Lichtenberg, Dominik R. G. Schleicher* astro-ph/1505.01483: **An ALMA Constraint on the GSC 6214-210 B Circum-Substellar Accretion Disk Mass** by *Brendan P. Bowler, et al.*

astro-ph/1505.01488: **An LBT view of the atmosphere of GJ1214b** by *V. Nascimbeni, et al.*

astro-ph/1505.01490: **Spectroscopic Evidence for a Temperature Inversion in the Dayside Atmosphere of the Hot Jupiter WASP-33b** by *Korey Haynes, et al.*

astro-ph/1505.01494: **Planets Around Low-Mass Stars (PALMS). V. Age-Dating Low-Mass Companions to Members and Interlopers of Young Moving Groups** by *Brendan P. Bowler, et al.*

astro-ph/1505.01568: **Orbital evolution of planetesimals in gaseous disks** by *Hiroshi Kobayashi*

astro-ph/1505.01778: **Capture of Planets Into Mean Motion Resonances and the Origins of Extrasolar Orbital Architectures** by *Konstantin Batygin*

astro-ph/1505.01816: **On the migration of two planets in a disc and the formation of mean motion resonances** by *Cezary Migaszewski*

astro-ph/1505.01840 : **Characterizing the Habitable Zones of Exoplanetary Systems with a Large Ultraviolet/Visible/Near-IR Space Observatory** by *Kevin France, et al.*

astro-ph/1505.01845: **The Five Planets in the Kepler-296 Binary System All Orbit the Primary: A Statistical and Analytical Analysis** by *Thomas Barclay, et al.*

astro-ph/1505.01851: **The orbital evolution of asteroids, pebbles and planets from giant branch stellar radiation and winds** by *Dimitri Veras, Siegfried Eggl, Boris T. Gaensicke*

astro-ph/1505.01947 : **Quantifying the gas inside dust cavities in transitional disks: implications for young planets** by *E.F. van Dishoeck, et al.*

astro-ph/1505.02158: **Magnetic fields in gaps surrounding giant protoplanets** by *Sarah L. Keith, Mark Wardle*

astro-ph/1505.02163: **Cooling Requirements for the Vertical Shear Instability in Protoplanetary Disks** by *Min-Kai Lin, Andrew Youdin*

astro-ph/1505.02221: **Helium Atmospheres on Warm Neptune- and Sub-Neptune-Sized Exoplanets and Applications to GJ 436 b** by *Renyu Hu, Sara Seager, Yuk L. Yung*

astro-ph/1505.02663: **PASTIS: Bayesian extrasolar planet validation II. Constraining exoplanet blend scenarios using spectroscopic diagnoses** by *A. Santerne, et al.*

astro-ph/1505.02778: **Stellar activity mimics a habitable-zone planet around Kapteyn's star** by *Paul Robertson, Arpita Roy, Suvrath Mahadevan*

astro-ph/1505.02784: **Evolutionary Models of Super-Earths and Mini-Neptunes Incorporating Cooling and Mass Loss** by *Alex R. Howe, Adam S. Burrows*

astro-ph/1505.02814: **Eccentricity from transit photometry: small planets in Kepler multi-planet systems have low eccentricities** by *Vincent Van Eylen, Simon Albrecht*

astro-ph/1505.03036 : **Removing systematic errors for exoplanet search via latent causes** by *Bernhard Scholkopf, et al.*

astro-ph/1505.03082 : **Predicting exoplanet observability in time, contrast, separation and polarization, in scattered light** by *Guillaume Schworer, Peter G. Tuthill*

astro-ph/1505.03142: **The bulk composition of exo-planets** by *Boris Gaensicke, et al.*

astro-ph/1505.03152: **The 3D Flow Field Around an Embedded Planet** by *Jeffrey Fung, Pawel Artymowicz, Yanqin Wu*

astro-ph/1505.03158: **3.6 and 4.5 m Phase Curves of the Highly-Irradiated Eccentric Hot Jupiter WASP-14b** by *Ian Wong, et al.*

astro-ph/1505.03198 : **Towards a dynamics-based estimate of the extent of HR 8799's unresolved warm debris belt** by *B. Contro, et al.*

astro-ph/1505.03392: **Protoplanetary disks including radiative feedback from accreting planets** by *Matias Montesinos, et al.*

astro-ph/1505.03514: **A Simple Analytical Model for Gaps in Protoplanetary Disks** by *Paul C. Duffell*

astro-ph/1505.03516: **The snow line in viscous disks around low-mass stars: implications for water delivery to terrestrial planets in the habitable zone** by *Gijs D. Mulders, et al.*

astro-ph/1505.03552: **Lifetime and Spectral Evolution of a Magma Ocean with a Steam Atmosphere: Its Detectability by Future Direct Imaging** by *Keiko Hamano, et al.*
astro-ph/1505.03704: **Dust Dynamics in Protoplanetary Disk Winds Driven by Magneto-Rotational Turbulence: A Mechanism for Floating Dust Grains with Characteristic Size** by *Tomoya Miyake, Takeru K. Suzuki, Shu-ichiro Inutsuka*
astro-ph/1505.03858: **Discovery of Seven Companions to Intermediate Mass Stars with Extreme Mass Ratios in the Scorpius-Centaurus Association** by *Sasha Hinkley et al.*
astro-ph/1505.03987: **Synodic instabilities of dust orbits in mean motion resonances under action of stellar radiation** by *Pavol Pastor*
astro-ph/1505.04482: **Mass Estimates of a Giant Planet in a Protoplanetary Disk from the Gap Structures** by *Kazuhiro D. Kanagawa, et al.*
astro-ph/1505.04752: **Nonphotosynthetic Pigments as Potential Biosignatures** by *Edward W. Schwieterman, Charles S. Cockell, Victoria S. Meadows*
astro-ph/1505.04796: **RAFT I: Discovery of new planetary candidates and updated orbits from archival FEROS spectra** by *M. G. Soto, J. S. Jenkins, M. I. Jones*
astro-ph/1505.04896: **The Effect of Electron Heating on Magnetorotational Turbulence in Protoplanetary Disks: Self-regulation and Reduced Turbulence Strength** by *Shoji Mori, Satoshi Okuzumi*
astro-ph/1505.05363: **Influence of Stellar Multiplicity On Planet Formation. III. Adaptive Optics Imaging of Kepler Stars With Gas Giant Planets** by *Ji Wang, et al.*
astro-ph/1505.05384: **Tidal synchronization of close-in satellites and exoplanets. II. Spin dynamics and extension to Mercury and exoplanets host stars** by *Sylvio Ferraz-Mello*
astro-ph/1505.05514: **Survival of Planets Around Shrinking Stellar Binaries** by *Diego J. Munoz, Dong Lai*
astro-ph/1505.05539: **On the potentially dramatic history of the super-Earth rho 55 Cancri e** by *Brad Hansen, Jonathon Zink*
astro-ph/1505.05749: **No circumbinary planets transiting the tightest Kepler binaries - a fingerprint of a third star** by *David V. Martin, Tsevi Mazeh, Daniel C. Fabrycky*
astro-ph/1505.06037: **MOA-2007-BLG-197: Exploring the brown dwarf desert** by *C. Ranc et al.*
astro-ph/1505.06158 : **Planets in Other Universes: Habitability constraints on density fluctuations and galactic structure** by *Fred C. Adams, Katherine R. Coppess, Anthony M. Bloch*
astro-ph/1505.06204: **Formation of planetary debris discs around white dwarfs II: Shrinking extremely eccentric collisionless rings** by *Dimitri Veras, et al.*
astro-ph/1505.06576: **Modelling the local and global cloud formation on HD 189733b** by *G. Lee, et al.*
astro-ph/1505.06718: **Giant planets around two intermediate-mass evolved stars and confirmation of the planetary nature of HIP67851 c** by *M. I. Jones, et al.*
astro-ph/1505.06732: **Compact dust concentration in the MWC 758 protoplanetary disk** by *S. Marino, et al.*
astro-ph/1505.06734: **Direct Imaging and Spectroscopy of a Young Extrasolar Kuiper Belt in the Nearest OB Association** by *Thayne Currie, et al.*
astro-ph/1505.06738: **KELT-8b: A highly inflated transiting hot Jupiter and a new technique for extracting high-precision radial velocities from noisy spectra** by *Benjamin J. Fulton, et al.*
astro-ph/1505.06808: **Planet formation signposts: observability of circumplanetary disks via gas kinematics** by *Sebastian Perez, et al.*
astro-ph/1505.06859: **Hydrodynamic simulations of captured protoatmospheres around Earth-like planets** by *Alexander Stoekl, Ernst Dorfi, Helmut Lammer*
astro-ph/1505.06869: **Exoplanet Detection Techniques** by *Debra A. Fischer, et al.*
astro-ph/1505.07039: **The role of dynamics on the habitability of an Earth-like planet** by *E. Pilat-Lohinger*
astro-ph/1505.07069: **Can there be additional rocky planets in the Habitable Zone of tight binary stars with a known gas giant?** by *Barbara Funk, Elke Pilat-Lohinger, Siegfried Eggl*
astro-ph/1505.07265 : **Collisions of planetesimals and formation of planets** by *Rudolf Dvorak, et al.*
astro-ph/1505.07347 : **Impact flux of asteroids and water transport to the habitable zone in binary star sys-**