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 74th edition of ExoPlanet News which is larger than any newsletter of recent months. If you find the contents useful, please continue to encourage your colleagues to send abstracts, conference & meeting announcements, and jobs & studentships for future editions

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, as previously notified, following a change to the way our webservers operate my updates to the website only become live over-night. As a result it may be up to 24 hours from the time the newsletter is e-mailed out before it is available on the website. That means that if you subscribe to the newsletter, you will receive it by e-mail 1 day sooner than those who only access it online.

Best wishes
Andrew Norton
The Open University

2 Abstracts of refereed papers

Surface Flux Patterns on Planets in Circumbinary Systems, and Potential for Photosynthesis

D.H. Forgan[1,2]*, A. Mead*[1]*, C.S. Cockell*[2]*, J.A. Raven*[3]

[1] Scottish Universities Physics Alliance (SUPA), Institute for Astronomy, University of Edinburgh, Blackford Hill, Edinburgh, EH9 3HJ, UK
[2] UK Centre for Astrobiology, School of Physics and Astronomy, University of Edinburg
[3] Division of Plant Sciences, University of Dundee at TJHI, The James Hutton Institute, Invergowrie, Dundee, UK

International Journal of Astrobiology, in press (arXiv:1408.5207)

Recently, the Kepler Space Telescope has detected several planets in orbit around a close binary star system. These so-called circumbinary planets will experience non-trivial spatial and temporal distributions of radiative flux on their surfaces, with features not seen in their single-star orbiting counterparts. Earthlike circumbinary planets inhabited by photosynthetic organisms will be forced to adapt to these unusual flux patterns.

We map the flux received by putative Earthlike planets (as a function of surface latitude/longitude and time) orbiting the binary star systems Kepler-16 and Kepler-47, two star systems which already boast circumbinary exoplanet detections. The longitudinal and latitudinal distribution of flux is sensitive to the centre of mass motion of the binary, and the relative orbital phases of the binary and planet. Total eclipses of the secondary by the primary, as well as partial eclipses of the primary by the secondary add an extra forcing term to the system. We also find that the patterns of darkness on the surface are equally unique. Beyond the planet's polar circles, the surface spends a significantly longer time in darkness than latitudes around the equator, due to the stars' motions delaying the first sunrise of spring (or hastening the last sunset of autumn). In the case of Kepler-47, we also find a weak longitudinal dependence for darkness, but this effect tends to average out if considered over many orbits.

In the light of these flux and darkness patterns, we consider and discuss the prospects and challenges for photosynthetic organisms, using terrestrial analogues as a guide.

Download/Website: `http://arxiv.org/abs/1408.5277`

Contact: `dhf3@st-andrews.ac.uk`

Defocussed Transmission Spectroscopy: A potential detection of sodium in the atmosphere of WASP-12b

J. R. Burton[1,2]*, C. A. Watson*[1]*, P. Rodríguez-Gil*[3,4,5]*, I. Skillen*[5]*, S. P. Littlefair*[6]*. S. Dhillon*[6] *and D. Pollacco*[7]

[1] Astrophysics Research Centre, Queen's University Belfast, Belfast BT7 1NN, UK
[2] Department of Earth & Space Science & Engineering, York University, 4700 Keele St., Toronto, ON, M3J1P3, Canada
[3] Instituto de Astrofísica de Canarias, Vía Láctea, s/n, La Laguna, E-38205, Santa Cruz de Tenerife, Spain
[4] Departamento de Astrofísica, Universidad de La Laguna, La Laguna, E-38204, Santa Cruz de Tenerife, Spain
[5] Isaac Newton Group of Telescopes, Apartado de correos 321, Santa Cruz de La Palma, E-38700, Spain
[6] Department of Physics and Astronomy, University of Sheffield, Sheffield S3 7RH, UK
[7] Department of Physics, University of Warwick, Coventry CV4 7AL, UK

Monthly Notices of the Royal Astronomical Society, Accepted (arXiv:1410.3702)

We report on a pilot study of a novel observing technique, defocussed transmission spectroscopy, and its application to the study of exoplanet atmospheres using ground-based platforms. Similar to defocussed photometry, defocussed transmission spectroscopy has an added advantage over normal spectroscopy in that it reduces systematic errors due to flat-fielding, PSF variations, slit-jaw imperfections and other effects associated with ground-based observations. For one of the planetary systems studied, WASP-12b, we report a tentative detection of additional Na absorption of 0.12±0.03[+0.03]% during transit using a 2Å wavelength mask. After consideration of a systematic that occurs mid-transit, it is likely that the true depth is actually closer to 0.15%. This is a similar level of absorption reported in the atmosphere of HD209458b (0.135±0.017%, Snellen et al. 2008). Finally, we outline methods that will improve the technique during future observations, based on our findings from this pilot study.

Download/Website: `http://arxiv.org/abs/1410.3702`

Contact: `jburton04@qub.ac.uk`

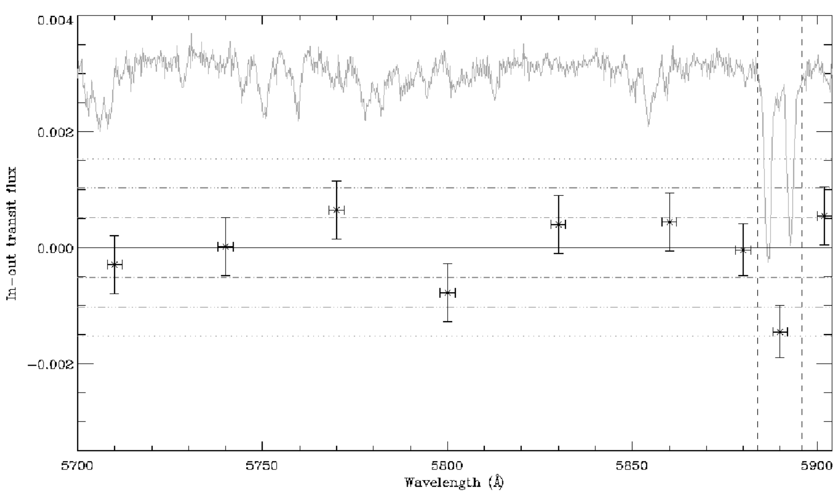

Figure 1: (Burton et al.) (The difference in flux ratio (in-out of transit flux) for a series of windows in the comparison region for the Na feature (highlighted by the vertical dashed lines). The horizontal error bars represent the wavelength coverage of the mask in the spectrum analysis. The dot-dash, dot-dot-dash and dotted horizontal lines are the 1σ, 2-σ and 3-σ levels, respectively. The points have been overlaid on an example WASP-12 spectra for an indication of where the windows were placed. Note how the Na region is the only one which shows a significant difference between the in- and out-of-transit depths, lying in the 3σ region. The comparison windows have been taken at 30Å intervals along the continuum.).

Can dust coagulation trigger streaming instability?

J. Drążkowska & C. P. Dullemond
Heidelberg University, Center for Astronomy, Institute of Theoretical Astrophysics, Albert-Ueberle-Str. 2, 69120 Heidelberg, Germany

Astronomy & Astrophysics, in press (arXiv:1410.3832)

Streaming instability can be a very efficient way of overcoming growth and drift barriers to planetesimal formation. However, it was shown that strong clumping, which leads to planetesimal formation, requires a considerable number of large grains. State-of-the-art streaming instability models do not take into account realistic size distributions resulting from the collisional evolution of dust. We investigate whether a sufficient quantity of large aggregates can be produced by sticking and what the interplay of dust coagulation and planetesimal formation is. We develop a semi-analytical prescription of planetesimal formation by streaming instability and implement it in our dust coagulation code based on the Monte Carlo algorithm with the representative particles approach. We find that planetesimal formation by streaming instability may preferentially work outside the snow line, where sticky icy aggregates are present. The efficiency of the process depends strongly on local dust abundance and radial pressure gradient, and requires a super-solar metallicity. If planetesimal formation is possible, the dust coagulation and settling typically need ~100 orbits to produce sufficiently large and settled grains and planetesimal formation lasts another ~1000 orbits. We present a simple analytical model that computes the amount of dust that can be turned into planetesimals given the parameters of the disk model.

Download/Website: `http://arxiv.org/abs/1410.3832`

Contact: `drazkowska@uni-heidelberg.de`

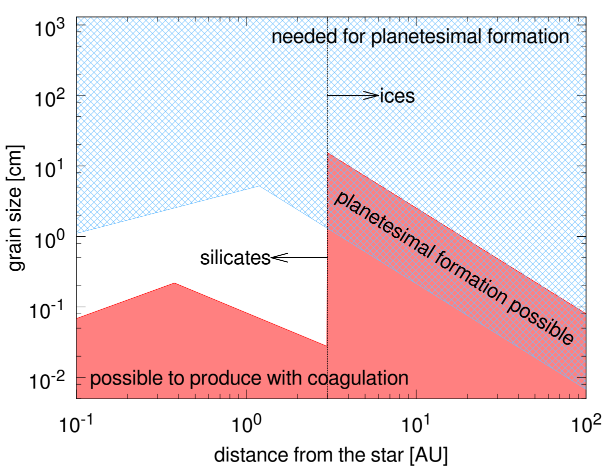

Figure 2: (Drążkowska & Dullemond) Comparison of maximum dust particle size produced by coagulation (red shaded region) and minimum size needed for planetesimal formation in a dead zone (blue crosshatched region). We assume that particle growth is limited by the relative drift velocities, ignoring turbulence, which corresponds to the dead zone. We find that the maximum particle size exceeds the size corresponding to the critical Stokes number value of $\mathrm{St} = 10^{-2}$ only for the ices that can exist beyond the snow line, where the presence of ice makes the dust particles more sticky.

The NASA-UC-UH ETA-Earth Program. IV. A Low-mass Planet Orbiting an M Dwarf 3.6pc from Earth

Andrew W. Howard[1], *Geoffrey W. Marcy*[2], *Debra A. Fischer*[3], *Howard Isaacson*[2], *Philip S. Muirhead*[4,5], *Gregory W. Henry*[6], *Tabetha S. Boyajian*[3], *Kaspar von Braun*[7,8], *Juliette C. Becker*[4], *Jason T. Wright*[9,10], *John Asher Johnson*[11,12]

[1] Institute for Astronomy, University of Hawaii, 2680 Woodlawn Drive, Honolulu, HI 96822, USA
[2] Department of Astronomy, University of California, Berkeley, CA 94720-3411, USA
[3] Department of Astronomy, Yale University, New Haven, CT 06511, USA
[4] Department of Astrophysics, California Institute of Technology, MC 249-17, Pasadena, CA 91125, USA
[5] Current address: Department of Astronomy, Boston University, 725 Commonwealth Ave, Boston, MA 02215, USA
[6] Center of Excellence in Information Systems, Tennessee State University, 3500 John A. Merritt Blvd., Box 9501, Nashville, TN 37209, USA
[7] NASA Exoplanet Science Institute, California Institute of Technology, Pasadena, CA 91125, USA
[8] Max-Planck-Institute for Astronomy, Königstuhl 17, 69117 Heidelberg, Germany
[9] Department of Astronomy and Astrophysics, The Pennsylvania State University, University Park, PA 16802, USA
[10] Center for Exoplanets and Habitable Worlds, The Pennsylvania State University, University Park, PA 16802, USA
[11] Center for Planetary Astronomy, California Institute of Technology, 1200 E. California Blvd, Pasadena, CA 91125, USA
[12] Current address: Harvard-Smithsonian Center for Astrophysics, 60 Garden St., Cambridge, MA 02138, USA

The Astrophysical Journal, published (2014ApJ...794...51H)

We report the discovery of a low-mass planet orbiting Gl 15 A based on radial velocities from the Eta-Earth Survey using HIRES at Keck Observatory. Gl 15 Ab is a planet with minimum mass $M \sin i = 5.35 \pm 0.75 M_{\oplus}$, orbital period $P = 11.4433 \pm 0.0016$ d, and an orbit that is consistent with circular. We characterize the host star using a variety of techniques. Photometric observations at Fairborn Observatory show no evidence for rotational modulation of spots at the orbital period to a limit of $\sim$0.1 mmag, thus supporting the existence of the planet. We detect a second RV signal with a period of 44 days that we attribute to rotational modulation of stellar surface features, as confirmed by optical photometry and the Ca II H & K activity indicator. Using infrared spectroscopy from Palomar-TripleSpec, we measure an M2 V spectral type and a sub-solar metallicity ([M/H] $= -0.22$, [Fe/H] $= -0.32$). We measure a stellar radius of $0.3863 \pm 0.0021 R_{\odot}$ based on interferometry from CHARA.

Download/Website: `http://adsabs.harvard.edu/abs/2014ApJ...794...51H`

Contact: `howard@ifa.hawaii.edu`

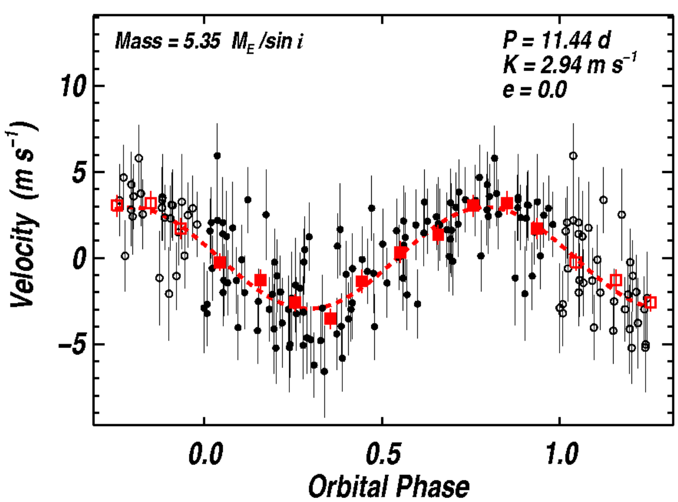

Figure 3: (Howard et al.) Single-planet model for the Keck-HIRES RVs of Gl 15 Ab. Filled black circles represent phased measurements while the open black circles represent the same velocities wrapped one orbital phase. The error bars show the quadrature sum of measurement uncertainties and jitter. Red squares show RVs binned in 0.1 phase increments and have an RMS to the model of 0.62 m s^{-1}. The best-fit circular orbital solution is shown as a dashed red line.

Mass and period limits on the ringed companion transiting the young star J1407

M. A. Kenworthy[1], *S. Lacour*[2], *A. Kraus*[3], *A. H. M. J. Triaud*[4,5], *E. E. Mamajek*[6], *E. L. Scott*[6], *D. Ségransan*[5], *M. Ireland*[7], *F.-J. Hambsch*[8], *D. E. Reichart*[9], *J. B. Haislip*[9], *A. P. LaCluyze*[9], *J. P. Moore*[9], *N. R. Frank*[9]

[1] Leiden Observatory, Leiden University, P.O. Box 9513, 2300 RA Leiden, the Netherlands
[2] LESIA, CNRS/UMR-8109, Observatoire de Paris, UPMC, Université Paris Diderot, 5 place Jules Janssen, 92195 Meudon, France
[3] Institute for Astronomy, University of Hawaii, 2680 Woodlawn Drive, Honolulu, HI 96822, USA
[4] Kavli Institute for Astrophysics & Space Research, Massachusetts Institute of Technology, Cambridge, MA, USA
[5] Observatoire Astronomique de l'Université de Genève, Chemin des Maillettes, 51, CH-1290 Sauverny, Switzerland
[6] Department of Physics and Astronomy, University of Rochester, Rochester, NY 14627-0171, USA
[7] Research School of Astronomy and Astrophysics, Mt Stromlo Observatory, Cotter Rd, Weston ACT 2611, Australia
[8] Center for Backyard Astrophysics (Antwerp), American Association of Variable Star Observers (AAVSO),Vereniging Voor Sterrenkunde (VVS), Andromeda Observatory, Oude Bleken 12, 2400 Mol, Belgium
[9] Department of Physics and Astronomy, University of North Carolina at Chapel Hill, Campus Box 3255, Chapel Hill, NC 27599, USA

Monthly Notices of the Royal Astronomical Society, in press arXiv:1410.6577

The young (~ 16 Myr) pre-main-sequence star in Sco–Cen 1SWASP J140747.93-394542.6, hereafter referred to as J1407, underwent a deep eclipse in 2007 April, bracketed by several shallower eclipses in the surrounding 54 d. This has been interpreted as the first detection of an eclipsing ring system circling a substellar object (dubbed J1407b). We report on a search for this companion with Sparse Aperture Mask imaging and direct imaging with both the UT4 VLT and Keck telescopes. Radial velocity measurements of J1407 provide additional constraints on J1407b and on short period companions to the central star. Follow-up photometric monitoring using the PROMPT-4 and ROAD observatories during 2012-2014 has not yielded any additional eclipses. Large regions of mass-period space are ruled out for the companion. For circular orbits the companion period is constrained to the range 3.5-13.8 yr ($a \simeq$ 2.2-5.6 au), and stellar masses ($> 80\,M_{Jup}$) are ruled out at 3σ significance over these periods. The complex ring system appears to occupy more than 0.15 of its Hill radius, much larger than its Roche radius and suggesting a ring structure in transition. Further, we demonstrate that the radial velocity of J1407 is consistent with membership in the Upper Cen–Lup subgroup of the Sco–Cen association, and constraints on the rotation period and projected rotational velocity of J1407 are consistent with a stellar inclination of $i_\star \simeq 68^\circ \pm 10^\circ$.

Download/Website: `http://arxiv.org/abs/1410.6577`

Contact: `kenworthy@strw.leidenuniv.nl`

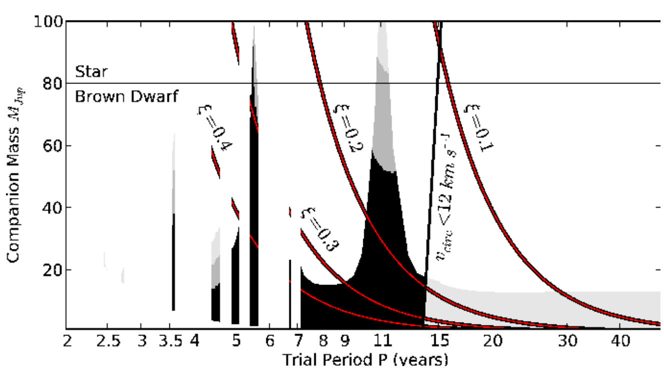

Figure 4: (Kenworthy et al.) Combined mass/period limits for circular orbits of J1407b. The plot is constructed from upper limits by direct imaging, radial velocity measurements, photometric monitoring, and dynamical stability limits. The most likely masses and periods are shown by black regions. See the paper for details.

Signatures of massive collisions in debris discs

Q. Kral[1], *P. Thébault*[1], *J.-C. Augereau*[2,3], *A. Boccaletti*[1], *S. Charnoz*[4]
[1] LESIA-Observatoire de Paris, UPMC Univ. Paris 06, Univ. Paris-Diderot, France
[2] Univ. Grenoble Alpes, IPAG, F-38000 Grenoble, France
[3] CNRS, IPAG, F-38000 Grenoble, France
[4] Laboratoire AIM, Université Paris Diderot / CEA / CNRS, Institut Universitaire de France

A&A, in press (arXiv:1409.7609)

Violent stochastic collisional events have been invoked as a possible explanation for some debris discs displaying pronounced azimuthal asymmetries or having a luminosity excess exceeding that expected for systems at collisional steady-state. So far, no thorough modelling of the consequences of such stochastic events has been carried out, mainly because of the extreme numerical challenge of coupling the dynamical and collisional evolution of the released dust.

We perform the first fully self-consistent modelling of the aftermath of massive breakups in debris discs. We follow the collisional and dynamical evolution of dust released after the breakup of a Ceres-sized body at 6 AU from its central star. We investigate the duration, magnitude and spatial structure of the signature left by such a violent event, as well as its observational detectability.

We use the recently developed LIDT-DD code (Kral et al., 2013), which handles the coupled collisional and dynamical evolution of debris discs. The main focus is placed on the complex interplay between destructive collisions, Keplerian dynamics and radiation pressure forces. We use the GRaTer package to estimate the system's luminosity at different wavelengths.

The breakup of a Ceres-sized body at 6 AU creates an asymmetric dust disc that is homogenized, by the coupled action of collisions and dynamics, on a timescale of a few 10^5 years. The particle size distribution in the system, after a transient period where it is very steep, relaxes to a collisional steady-state law after $\sim 10^4$ years. The luminosity excess in the breakup's aftermath should be detectable by mid-IR photometry, from a 30 pc distance, over a period of $\sim 10^6$ years that exceeds the duration of the asymmetric phase of the disc (a few 10^5 years). As for the asymmetric structures, we derive synthetic images for the SPHERE/VLT and MIRI/JWST instruments, showing that they should be clearly visible and resolved from a 10 pc distance. Images at 1.6μm (marginally), 11.4 and 15.5μm would show the inner disc structures while 23μm images would display the outer disc asymmetries.

Download/Website: `http://arxiv.org/abs/1409.7609`

Contact: `quentin.kral@obspm.fr`

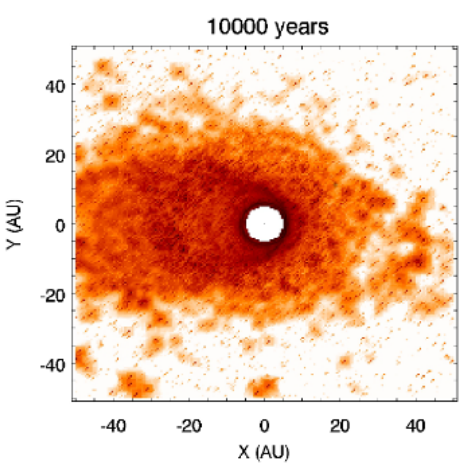

Figure 5: (Kral et al.) Total smoothed vertical geometrical optical depth in the case of a massive planetesimal breakup within a debris disc.

Dusty tails of evaporating exoplanets. I. Constraints on the dust composition

R. van Lieshout[1], *M. Min*[1], *C. Dominik*[1,2]

[1] Anton Pannekoek Institute for Astronomy, University of Amsterdam, Science Park 904, 1098 XH Amsterdam, The Netherlands
[2] Department of Astrophysics/IMAPP, Radboud University Nijmegen, P.O. Box 9010, 6500 GL Nijmegen, The Netherlands

Astronomy & Astrophysics, in press (arXiv:1410.3494)

Recently, two exoplanet candidates have been discovered, KIC 12557548b and KOI-2700b, whose transit profiles show evidence of a comet-like tail of dust trailing the planet, thought to be fed by the evaporation of the planet's surface. We aim to put constraints on the composition of the dust ejected by these objects from the shape of their transit light curves. We derive a semi-analytical expression for the attenuation of the dust cross-section in the tail, incorporating the sublimation of dust grains as well as their drift away from the planet. This expression shows that the length of the tail is highly sensitive to the sublimation properties of the dust material. We compute tail lengths for several possible dust compositions, and compare these to observational estimates of the tail lengths of KIC 12557548b and KOI-2700b, inferred from their light curves. The observed tail lengths are consistent with dust grains composed of corundum (Al_2O_3) or iron-rich silicate minerals (e.g., fayalite, Fe_2SiO_4). Pure iron and carbonaceous compositions are not favoured. In addition, we estimate dust mass loss rates of 1.7 ± 0.5 $M_\oplus$ Gyr^{-1} for KIC 12557548b, and > 0.007 $M_\oplus$ Gyr^{-1} (1σ lower limit) for KOI-2700b.

Download/Website: `http://arxiv.org/abs/1410.3494`

Contact: `r.vanlieshout@uva.nl`

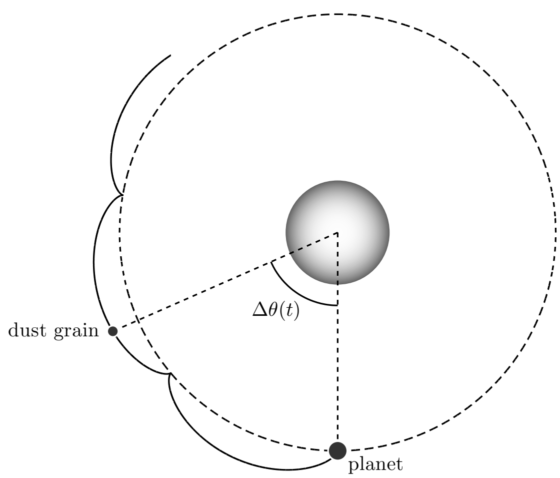

Figure 6: (Van Lieshout et al.) Diagram of the path followed by a dust grain released from an evaporating planet (ignoring sublimation of the dust grain) for 3 orbital periods of the planet, in the frame corotating with the planet. The position of the dust particle is indicated at a time 1.6 orbital periods of the planet after release.

Transiting exoplanets and magnetic spots characterized with optical interferometry

R. Ligi[1], *D. Mourard*[1], *A.-M. Lagrange*[2], *K. Perraut*[2], *A. Chiavassa*[1]
[1] Laboratoire Lagrange, UMR 7293 UNS-CNRS-OCA, Boulevard de l'Observatoire, CS 34229, 06304 NICE Cedex 4, France.
[2] UJF-Grenoble1/CNRS-INSU, Institut de Planétologie et d'Astrophysique de Grenoble, UMR 5274, Grenoble, F-38041, France.

Astronomy & Astrophysics, in press (arXiv:1410.5333)

Stellar activity causes difficulties in the characterization of transiting exoplanets. In particular, the magnetic spots present on most exoplanet host stars can lead to false detections with radial velocity, photometry, or astrometry technics. Studies have been performed to quantify their impact on infrared interferometry, but no such studies have been performed in the visible domain. This wavelength domain, however, allows reaching better angular resolution than in the infrared and is also the wavelength most often used for spectroscopic and photometric measurements.
We use a standard case to completely analyse the impact of an exoplanet and a spot on interferometric observables and relate it to current instrument capabilities, taking into account realistic achievable precisions.
We built a numerical code called `COMETS` using analytical formulae to perform a simple comparison of exoplanet and spot signals. We explored instrumental specificities needed to detect them, such as the required baseline length, the accuracy, and signal-to-noise ratio. We also discuss the impact of exoplanet and spot parameters on squared visibility and phase: exoplanet diameter and size, exoplanet position, spot temperature, star diameter.
According to our study, the main improvement to achieve is the instrument sensitivity. The accuracy on squared visibilities has to be improved by a factor 10 to detect an exoplanet of 0.10 mas, leading to $< 0.5\%$ precision, along with phase measurements of $\sim 5°$ accuracy beyond the first null of visibility. For an exoplanet of 0.05 mas, accuracies of $\sim 0.1\%$ and $\sim 1°$ from the first null are required on squared visibilities and phases. Magnetic spots can mimic these signals, leading to false exoplanet characterization. Phase measurements from the third lobe are needed to distinguish between the spot and the exoplanet if they have the same radius.
By increasing interferometer sensitivity, more objects will become common between interferometric and photometric targets. Furthermore, new missions such as PLATO, CHEOPS, or TESS will provide bright exoplanet host stars. Measurements will thus overlap and provide a better characterization of stellar activity and exoplanet.

Download/Website: `http://fr.arxiv.org/abs/1410.5333`

Contact: `roxanne.ligi@oca.eu`

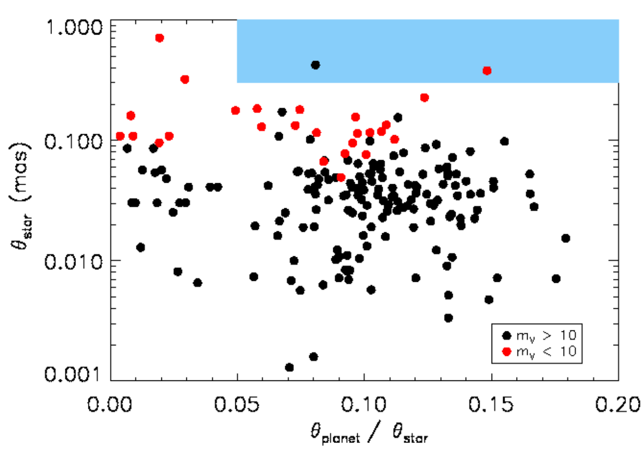

Figure 7: (Ligi et al.) Transiting exoplanets host stars with available distance and radius that allow deriving their angular diameter. They are plotted according to the ratio $\theta_{\rm p}/\theta_\star$. Stars with $m_{\rm V} < 10$ are plotted in red and those with $m_{\rm V} > 10$ in black. The blue box represents the detecting ability of VEGA/CHARA (Mourard et al. 2009; Ligi et al. 2013). Future missions such as PLATO (Rauer & Catala 2012), CHEOPS (Broeg et al. 2013), or TESS (Ricker et al. 2010) will target bright stars and allow filling the upper part of the diagram.

On the Cool Side: Modeling the Atmospheres of Brown Dwarfs and Giant Planets

M. S. Marley & T. D. Robinson
NASA Ames Research Center, MS 245-3, Moffett Field, CA 94035, USA

Annual Review of Astronomy and Astrophysics, in press (arXiv:1410.6512)

The atmosphere of a brown dwarf or extrasolar giant planet controls the spectrum of radiation emitted by the object and regulates its cooling over time. While the study of these atmospheres has been informed by decades of experience modeling stellar and planetary atmospheres, the distinctive characteristics of these objects present unique challenges to forward modeling. In particular, complex chemistry arising from molecule-rich atmospheres, molecular opacity line lists (sometimes running to 10 billion absorption lines or more) multiple cloud-forming condensates, and disequilibrium chemical processes all combine to create a challenging task for any modeling effort. This review describes the process of incorporating these complexities into one-dimensional radiative-convective equilibrium models of sub-stellar objects. We discuss the underlying mathematics as well as the techniques used to model the physics, chemistry, radiative transfer, and other processes relevant to understanding these atmospheres. The review focuses on the process of the creation of atmosphere models and briefly presents some comparisons of model predictions to data. Current challenges in the field and some comments on the future conclude the review.

Download/Website: `http://arxiv.org/abs/1410.6512`

Contact: `tyler.d.robinson@nasa.gov`

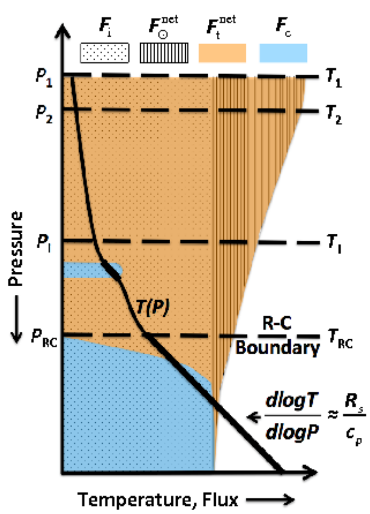

Figure 8: (Marley & Robinson) Schematic depiction of a thermal structure model. The vertical axis is pressure, increasing downwards, which is the independent variable, and the horizontal axis shows, relatively, temperature and energy flux. Model levels are shown (horizontal dashed lines), and the solid line is the thermal structure (i.e., temperature) profile, where bolded lengths indicate a convective region. Level pressures and temperatures are indicated with associated sub-scripted symbols, and 'RC' indicates the radiative-convective boundary. In equilibrium, net thermal flux ($F_{\rm t}^{\rm net}$, orange) and the convective flux ($F_{\rm c}$, blue) must sum to the internal heat flux ($F_{\rm i}$, dotted) and, for an irradiated object, the net absorbed stellar flux ($F_{\odot}^{\rm net}$, striped). Note that the internal heat flux is constant throughout the atmosphere, whereas the schematic profile of net absorbed stellar flux decreases with increasing pressure, and eventually reaches zero in the deep atmosphere. At depth, convection carries the vast majority of the summed internal and stellar fluxes, but is a smaller component in detached convective regions (upper blue region).

Dust in brown dwarfs and extra-solar planets IV. Assessing TiO_2 and SiO nucleation for cloud formation modelling

G. Lee[1], *Ch. Helling*[1], *H. Giles*[1], *S.T. Bromley*[2,3]

[1] SUPA, School of Physics and Astronomy, University of St. Andrews, North Haugh, St. Andrews, KY16 9SS, United Kingdom
[2] Departament de Quimica Fisica and IQTCUB, Universitat de Barcelona, Marti i Franques 1, E-08028 Barcelona, Spain
[3] Institucio Catalana de Recerca i Estudis Avancats (ICREA), E-08010 Barcelona, Spain

Astronomy & Astrophysics, in press (arXiv:1410.6610)

Clouds form in atmospheres of brown dwarfs and planets. The cloud particle formation processes are similar to the dust formation process studied in circumstellar shells of AGB stars and in Supernovae. Cloud formation modelling in substellar objects requires gravitational settling and element replenishment in addition to element depletion. All processes depend on the local conditions, and a simultaneous treatment is required. We apply new material data in order to assess our cloud formation model results regarding the treatment of the formation of condensation seeds. We re-address the question of the primary nucleation species in view of new $(TiO2)_N$-cluster data and new SiO vapour pressure data. We apply the density functional theory using the computational chemistry package GAUSSIAN 09 to derive updated thermodynamical data for $(TiO2)_N$-clusters as input for our TiO2 seed formation model. We test different nucleation treatments and their effect on the overall cloud structure by solving a system of dust moment equations and element conservation for a pre-scribed DRIFT-PHOENIX atmosphere structure. Updated Gibbs free energies for the $(TiO2)_N$-clusters are presented, and a slightly temperature dependent surface tension for T=500...2000K with an average value of σ_∞ = 480.6 erg 1/cm^2. The TiO2-seed formation rate changes only slightly with the updated cluster data. A considerably larger effect on the rate of seed formation, and hence on grain size and dust number density, results from a switch to SiO-nucleation. Despite the higher abundance of SiO over TiO2 in the gas phase, TiO2 remains considerably more efficient in forming condensation seeds by homogeneous nucleation followed by heterogeneous grain growth. The paper discussed the effect on the cloud structure in more detail.

Download/Website: `http://arxiv.org/abs/1410.6610`

Contact: `ch80@st-and.ac.uk`

Correcting the spectroscopic surface gravity using transits and asteroseismology. No significant effect on temperatures or metallicities with ARES+MOOG in LTE

A. Mortier[1,2], *S.G. Sousa*[1,3,4], *V.Zh. Adibekyan*[1], *I.M. Brandão*[1], *N.C. Santos*[1,3]

[1] Instituto de Astrofísica e Ciências do Espaço, Universidade do Porto, CAUP, Rua das Estrelas, 4150-762 Porto, Portugal
[2] SUPA, School of Physics and Astronomy, University of St Andrews, St Andrews KY16 9SS, UK
[3] Departamento de Física e Astronomia, Faculdade de Ciências, Universidade do Porto, Portugal
[4] Instituto de Astrofísica de Canarias, 38200 La Laguna, Tenerife, Spain

Astronomy & Astrophysics, in press (arXiv:1410.1310)

Context. Precise stellar parameters (effective temperature, surface gravity, metallicity, stellar mass, and radius) are crucial for several reasons, amongst which are the precise characterization of orbiting exoplanets and the correct determination of galactic chemical evolution. The atmospheric parameters are extremely important because all the other stellar parameters depend on them. Using our standard equivalent-width method on high-resolution spectroscopy, good precision can be obtained for the derived effective temperature and metallicity. The surface gravity, however, is usually not well constrained with spectroscopy.
Aims. We use two different samples of FGK dwarfs to study the effect of the stellar surface gravity on the precise spectroscopic determination of the other atmospheric parameters. Furthermore, we present a straightforward formula for correcting the spectroscopic surface gravities derived by our method and with our linelists.

Methods. Our spectroscopic analysis is based on Kurucz models in LTE, performed with the MOOG code to derive the atmospheric parameters. The surface gravity was either left free or fixed to a predetermined value. The latter is either obtained through a photometric transit light curve or derived using asteroseismology.
Results. We find first that, despite some minor trends, the effective temperatures and metallicities for FGK dwarfs derived with the described method and linelists are, in most cases, only affected within the errorbars by using different values for the surface gravity, even for very large differences in surface gravity, so they can be trusted. The temperatures derived with a fixed surface gravity continue to be compatible within 1 sigma with the accurate results of the InfraRed Flux Method (IRFM), as is the case for the unconstrained temperatures. Secondly, we find that the spectroscopic surface gravity can easily be corrected to a more accurate value using a linear function with the effective temperature.

Download/Website: `http://arxiv.org/abs/1410.1310`

Contact: `am352@st-andrews.ac.uk`

A stellar-mass-dependent drop in planet occurrence rate

Gijs D. Mulders[1], *Ilaria Pascucci*[1], *and Dániel Apai*[1,2]

[1] Lunar and Planetary Laboratory, The University of Arizona, Tucson, AZ, USA
[2] Department of Astronomy, The University of Arizona, Tucson, AZ, USA

The Astrophysical Journal, in press (arXiv:1406.7356)

The *Kepler Spacecraft* has discovered a large number of planets up to one-year periods and down to terrestrial sizes. While the majority of the target stars are main-sequence dwarfs of spectral type F, G, and K, *Kepler* covers stars with effective temperature as low as 2500 K, which corresponds to M stars. These cooler stars allow characterization of small planets near the habitable zone, yet it is not clear if this population is representative of that around FGK stars. In this paper, we calculate the occurrence of planets around stars of different spectral types as a function of planet radius and distance from the star, and show that they are significantly different from each other. We further identify two trends: First, the occurrence of Earth to Neptune-sized planets ($1 - 4R_{\oplus}$) is successively higher toward later spectral types at all orbital periods probed by *Kepler*; Planets around M stars occur twice as frequently as around G stars, and thrice as frequently as around F stars. Second, a drop in planet occurrence is evident at all spectral types inward of a ~ 10 day orbital period, with a plateau further out. By assigning to each spectral type a median stellar mass, we show that the distance from the star where this drop occurs is stellar mass dependent, and scales with semi-major axis as the cube root of stellar mass. By comparing different mechanisms of planet formation, trapping and destruction, we find that this scaling best matches the location of the pre-main-sequence co-rotation radius, indicating efficient trapping of migrating planets or planetary building blocks close to the star. These results demonstrate the stellar-mass dependence of the planet population, both in terms of occurrence rate and of orbital distribution. The prominent stellar-mass dependence of the inner boundary of the planet population shows that the formation or migration of planets is sensitive to the stellar parameters.

Download/Website: `http://arxiv.org/abs/1406.7356`

Contact: `mulders@lpl.arizona.edu`

Towards a comprehensive model of Earth's disk-integrated Stokes vector

A. García Muñoz
ESA Fellow, ESA/RSSD, ESTEC, 2201 AZ Noordwijk, the Netherlands

International Journal of Astrobiology, In press (arXiv:1409.8573)

A significant body of work on simulating the remote appearance of Earth-like exoplanets has been done over the last decade. The research is driven by the prospect of characterizing habitable planets beyond the Solar System in the near future. In this work, I present a method to produce the disk-integrated signature of planets that are described in their three-dimensional complexity, *i.e.* with both horizontal and vertical variations in the optical properties of their envelopes. The approach is based on Pre-conditioned Backward Monte Carlo integration of the vector Radiative Transport Equation and yields the full Stokes vector for outgoing reflected radiation. The method is demonstrated through selected examples inspired by published work at wavelengths from the visible to the near infrared and terrestrial prescriptions of both cloud and surface albedo maps. I explore the performance of the method in terms of computational time and accuracy. A clear advantage of this approach is that its computational cost does not appear to be significantly affected by non-uniformities in the planet optical properties. Earth's simulated appearance is strongly dependent on wavelength; both brightness and polarisation undergo diurnal variations arising from changes in the planet cover, but polarisation yields a better insight into variations with phase angle. There is partial cancellation of the polarised signal from the northern and southern hemispheres so that the outgoing polarisation vector lies preferentially either in the plane parallel or perpendicular to the planet scattering plane, also for non-uniform cloud and albedo properties and various levels of absorption within the atmosphere. The evaluation of circular polarisation is challenging; a number of one-photon experiments of 10^9 or more is needed to resolve hemispherically-integrated degrees of circular polarisation of a few times 10^{-5}. Last, I introduce brightness curves of Earth obtained with one of the Messenger cameras at three wavelengths (0.48, 0.56 and 0.63 μm) during a flyby in 2005. The light curves show distinct structure associated with the varying aspect of the Earth's visible disk (phases of 98–107°) as the planet undergoes a full 24h rotation; the structure is reasonably well reproduced with model simulations.

Download/Website: `http://arxiv.org/abs/1409.8573`

Contact: `agarcia@cosmos.esa.int; tonhingm@gmail.com`

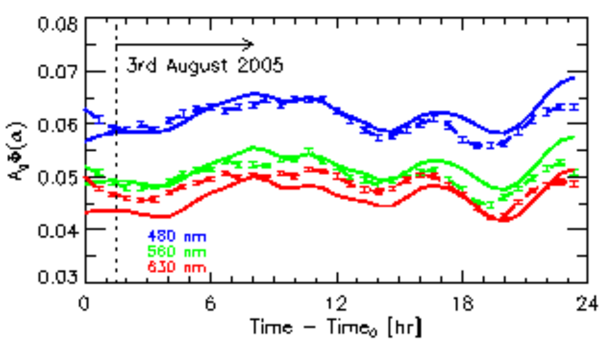

Figure 9: (Muñoz) Messenger diurnal light curves. Solid curves are Messenger data; dashed curves are model predictions with clouds at 2–3 km altitude and cloud optical thickness τ_c=3. For the model predictions, the error bars are standard deviations σ_{F_I}/F_I~1%.

Tracking Advanced Planetary Systems (TAPAS) with HARPS-N .I. A multiple planetary system around the red giant star TYC 1422-614-1.

A. Niedzielski,[1] *E. Villaver,*[2] *A. Wolszczan,*[3,4] *M. Adamów,*[1] *K. Kowalik,* [1] *G. Maciejewski,*[1] *G. Nowak,*[5,6,1] *D. A. García-Hernández,*[5,6] *B. Deka,*[1] *M. Adamczyk*[1]

[1] Toruń Centre for Astronomy, Faculty of Physics, Astronomy and Applied Informatics, Nicolaus Copernicus University in Toruń, Grudziadzka 5, 87-100 Toruń, Poland.
[2] Departamento de Física Teórica, Universidad Autónoma de Madrid, Cantoblanco 28049 Madrid, Spain.
[3] Department of Astronomy and Astrophysics, Pennsylvania State University, 525 Davey Laboratory, University Park, PA 16802, USA.
[4] Center for Exoplanets and Habitable Worlds, Pennsylvania State University, 525 Davey Laboratory, University Park, PA 16802, USA.
[5] Instituto de Astrofísica de Canarias, E-38205 La Laguna, Tenerife, Spain.
[6] Departamento de Astrofísica, Universidad de La Laguna, E-38206 La Laguna, Tenerife, Spain.

Astronomy & Astrophysics, accepted (arXiv:1410.5971)

Context: Stars that have evolved-off the Main Sequence are crucial in expanding the frontiers of knowledge on exoplanets towards higher stellar masses, and to constrain star-planet interaction mechanisms. These stars, however suffer from intrinsic activity that complicates the interpretation of precise radial velocity measurement and are often avoided in planet searches. We have, over the last 10 years, monitored about 1000 evolved stars for radial velocity variations in search for low-mass companions under the Penn State - Toruń Centre for Astronomy Planet Search with the Hobby-Eberly Telescope. Selected prospective candidates that required higher RV precision meassurements have been followed with HARPS-N at the 3.6 m Telescopio Nazionale Galileo.
Aim: To detect planetary systems around evolved stars, to be able to build sound statistics on the frequency and intrinsic nature of these systems, and to deliver in-depth studies of selected planetary systems with evidences of star-planet interaction processes.
Methods: We have obtained for TYC 1422-614-1 69 epochs of precise radial velocity measurements collected over 3651 days with the Hobby-Eberly Telescope, and 17 epochs of ultra precise HARPS-N data collected over 408 days. We have complemented these RV data with photometric time-series from the All Sky Automatic Survey archive.
Results: We report the discovery of a multiple planetary system around the evolved K2 giant star TYC 1422-614-1. The system orbiting the 1.15 $M_\odot$ star is composed of a planet with mass m$sini$=2.5 M_J in a 0.69 AU orbit, and a planet/brown dwarf with m$sini$=10 M_J in a 1.37 AU orbit. The multiple planetary system orbiting TYC 1422-614-1 is the first finding of the *TAPAS* project, a HARPS-N monitoring of evolved planetary systems identified with the Hobby-Eberly Telescope.

Download/Website: `http://adsabs.harvard.edu/abs/2014arXiv1410.5971N`

Contact: `Andrzej.Niedzielski@umk.pl`

Hot Jupiters from coplanar high-eccentricity migration

C. Petrovich

Department of Astrophysical Sciences, Princeton University, Ivy Lane, Princeton, NJ 08544, USA

The Astrophysical Journal, submitted, arXiv:1409.8296

We study the possibility that hot Jupiters (HJs) are formed through secular gravitational interactions between two planets in eccentric orbits with relatively low mutual inclinations ($\lesssim 20°$) and friction due to tides raised on the planet by the host star. We term this migration mechanism Coplanar High-eccentricity Migration because, like disk migration, it allows for migration to occur on the same plane in which the planets formed. Coplanar High-eccentricity Migration can operate from the following typical initial configurations: (i) inner planet in a circular orbit and the outer planet with an eccentricity $\gtrsim 0.67$ for $m_{\rm in}/m_{\rm out}(a_{\rm in}/a_{\rm out})^{1/2} \lesssim 0.3$; (ii) two eccentric ($\gtrsim 0.5$) orbits for $m_{\rm in}/m_{\rm out}(a_{\rm in}/a_{\rm out})^{1/2} \lesssim 0.16$. A population synthesis study of hierarchical systems of two giant planets using the observed eccentricity distribution of giant planets shows that Coplanar High-eccentricity Migration can produce HJs: (i) in $\sim 3-5\%$ of our simulated systems; (ii) with a semi-major axis distribution that matches the

observations; (iii) with low stellar obliquities ($\lesssim 30°$). A different mechanism is needed to create large obliquity HJs, either a different migration channel or a mechanism that tilts the star or the proto-planetary disk. Coplanar High-eccentricity Migration predicts that hot Jupiters should have distant ($a \gtrsim 8$ AU) and massive (most likely $\sim 1-3$ more massive than the HJ) companions in nearly coplanar (mutual inclinations $\lesssim 20°$) and moderately eccentric ($e \sim 0.2-0.5$) orbits.

Download/Website: `http://arxiv.org/abs/1409.8296`

Contact: `cpetrovi@princeton.edu`

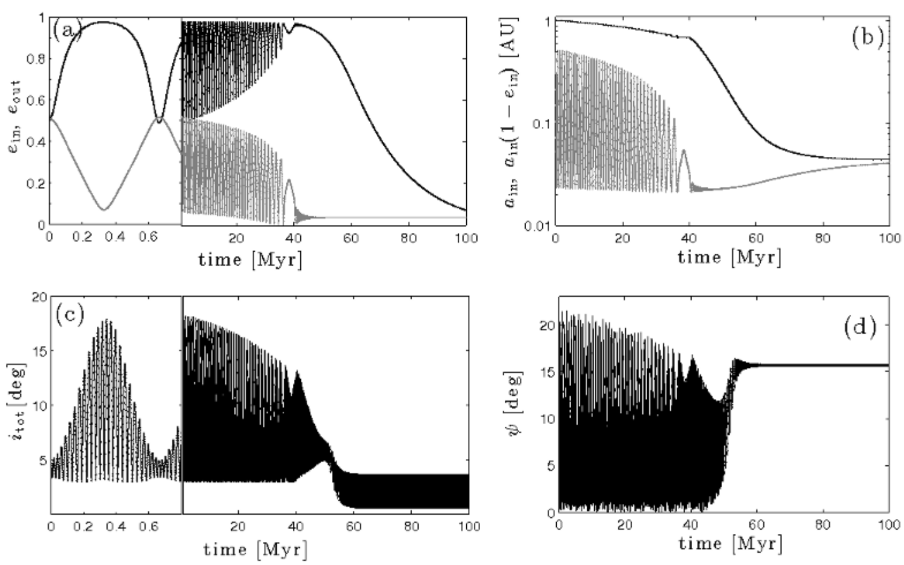

Figure 10: (Petrovich et al.) Evolution of two planets initially in orbits (inner and outer) with $a_{\rm in} = 1$ AU, $e_{\rm in} = 0.51$, $a_{\rm out} = 8$ AU, $e_{\rm out} = 0.51$, and mutual inclination $i_{\rm tot} = 5°$. Initially the arguments of pericenter are $\omega_{\rm in} = \omega_{\rm out} = 0$, the ascending nodes are $\Omega_{\rm in} = 0$ and $\Omega_{\rm out} = 180°$, and the stellar obliquity is $\psi = 0$ (angle between the stellar spin and angular momentum vector of the inner planet). The planets have masses of $m_{\rm in} = 2M_J$ and $m_{\rm out} = 3.3M_J$. We chose planetary and stellar viscous times of $t_{V,p} = 0.03$ yr and $t_{V,s} = 50$ yr, respectively (Petrovich 2014). Panel (a): eccentricities of the inner ($e_{\rm in}$, black line) and outer ($e_{\rm out}$, gray line) planets. Panel (b): semi-major axis (black line) and pericenter distance $a_{\rm in}(1-e_{\rm in})$ (gray line) of the inner planet. Panel (c): mutual inclination between the two planetary orbits. Panel (d): stellar obliquity (angle between the host star's spin axis and the orbital angular momentum vector of the inner orbit).

ALMA observations of a misaligned binary protoplanetary disk system in Orion

J. P. Williams[1], *R. K. Mann*[2], *J. Di Francesco*[2,3], *S. M. Andrews*[4], *A. M. Hughes*[5], *L. Ricci*[4], *J. Bally*[6], *D. Johnstone*[2,3,7], *and B. Matthews*[2,3]

[1] Institute for Astronomy, University of Hawaii, Honolulu, HI 96816, USA
[2] NRC Herzberg Astronomy and Astrophysics, 5071 West Saanich Road, Victoria, BC, V9E 2E7, Canada
[3] Department of Physics and Astronomy, University of Victoria, Victoria, BC, V8P 1A1, Canada
[4] Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138, USA
[5] Van Vleck Observatory, Astronomy Department, Wesleyan University, 96 Foss Hill Drive, Middletown, CT 06459, USA
[6] CASA, University of Colorado, CB 389, Boulder, CO 80309, USA
[7] Joint Astronomy Centre, 660 North Aohoku Place, University Park, Hilo, HI 96720, USA

The Astrophysical Journal, in press

We present *ALMA* observations of a wide binary system in Orion, with projected separation 440 AU, in which we detect submillimeter emission from the protoplanetary disks around each star. Both disks appear moderately massive and have strong line emission in CO 3–2, HCO^+ 4–3, and HCN 3–2. In addition, CS 7–6 is detected in one disk. The line-to-continuum ratios are similar for the two disks in each of the lines. From the resolved velocity gradients across each disk, we constrain the masses of the central stars, and show consistency with optical-infrared spectroscopy, both indicative of a high mass ratio ~ 9. The small difference between the systemic velocities indicates that the binary orbital plane is close to face-on. The angle between the projected disk rotation axes is very high, $\sim 72°$, showing that the system did not form from a single massive disk or a rigidly rotating cloud core. This finding, which adds to related evidence from disk geometries in other systems, protostellar outflows, stellar rotation, and similar recent *ALMA* results, demonstrates that turbulence or dynamical interactions act on small scales well below that of molecular cores during the early stages of star formation.

Download/Website: `http://arxiv.org/abs/1410.3570`

Contact: `jpw@ifa.hawaii.edu`

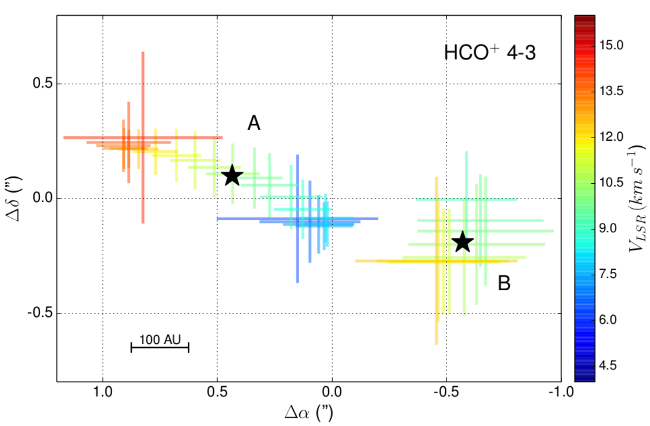

Figure 11: (Williams et al.) The centroids of each velocity channel in the HCO^+ 4–3 datacube. The cross displays the center and uncertainty associated with an elliptical gaussian fit to each channel, and the color indicates the velocity as shown by the scale on the right hand side. There are clear gradients in the disks around both sources, and the projected rotational angles are almost perpendicular to each other. The highest velocity channels for component A are closer to the star than slightly lower velocities indicative of gravitational motion..

Updated Emission Spectroscopy of Exoplanet HD 189733b

K. O. Todorov[1,2,5], *D. Deming*[2], *A. Burrows*[3], *C. J. Grillmair*[4]

[1] Department of Astronomy and Astrophysics, The Pennsylvania State University, University Park, PA 16802, USA
[2] Department of Astronomy, University of Maryland at College park, College Park, MD 20742, USA
[3] Department of Astrophysical Sciences, Princeton University, Princeton, NJ 08544, USA
[4] Spitzer Science Center, California Institute of Technology, Mail Stop 220-6, Pasadena,CA 91125, USA
[5] Current address: Institute for Astronomy, ETH Zürich, Wolfgang-Pauli-Strasse 27, 8093 Zürich, Switzerland

The Astrophysical Journal, in press (arXiv:1410.1400)

We analyze all existing secondary eclipse time series spectroscopy of hot Jupiter HD 189733b acquired with the now defunct *Spitzer*/IRS instrument. We describe the novel approaches we develop to remove the systematic effects and extract accurate secondary eclipse depths as a function of wavelength in order to construct the emission spectrum of the exoplanet. We compare our results to a previous study by Grillmair et al. that did not examine all data sets available to us. We are able to confirm the detection of a water feature near 6 μm claimed by Grillmair et al. We compare the planetary emission spectrum to three model families – based on isothermal atmosphere, gray atmosphere, and two realizations of the complex radiative transfer model by Burrows et al., adopted in Grillmair et al.'s study. While we are able to reject the simple isothermal and gray models based on the data at the 97% level just from the IRS data, these rejections hinge on eclipses measured within relatively narrow wavelength range, between 5.5 and 7 μm. This underscores the need for observational studies with broad wavelength coverage and high spectral resolution, in order to obtain robust information on exoplanet atmospheres.

Download/Website: `http://arxiv.org/abs/1410.1400`

Contact: `todorovk@phys.ethz.ch`

Characterization of the atmosphere of the hot Jupiter HAT-P-32Ab and the M-dwarf companion HAT-P-32B

Ming Zhao[1,2], *Joseph G. O'Rourke*[3] *Jason T. Wright*[1,2], *Heather A. Knutson*[3], *Adam Burrows*[4], *Johnathan Fortney*[5], *Henry Ngo*[3], *Benjamin J. Fulton*[6], *Christoph Baranec*[6], *Reed Riddle*[7], *Nicholas M. Law*[8], *Philip S. Muirhead*[9], *Sasha Hinkley*[7], *Adam P. Showman*[10], *Jason Curtis* [1,2], *Rick Burruss*[11]

[1] Department of Astronomy & Astrophysics, Pennsylvania State University, PA 16802, USA
[2] Center for Exoplanets and Habitable Worlds
[3] Division of Geological & Planetary Sciences, California Institute of Technology, Pasadena, CA 91125, USA
[4] Department of Astrophysical Sciences, Princeton University
[5] Department of Astronomy and Astrophysics, University of California, Santa Cruz
[6] Institute for Astronomy, University of Hawai'i at Mānoa, Hilo, HI 96720-2700, USA
[7] Division of Physics, Mathematics, and Astronomy, California Institute of Technology, Pasadena, CA 91125, USA
[8] Department of Physics and Astronomy, University of North Carolina at Chapel Hill, Chapel Hill, NC 27599-3255, USA
[9] Department of Astronomy, Boston University, 725 Commonwealth Ave., Boston, MA 02215, USA
[10] Department of Planetary Sciences and Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ 85721, USA
[11] Jet Propulsion Laboratory, California Institute of Technology, CA 91109, USA

The Astrophysical Journal, in press (arXiv:1410.0968)

We report secondary eclipse photometry of the hot Jupiter HAT-P-32Ab, taken with Hale/WIRC in H and K_S bands and with *Spitzer*/IRAC at 3.6 and 4.5 μm. We carried out adaptive optics imaging of the planet host star HAT-P-32A and its companion HAT-P-32B in the near-IR and the visible. We clearly resolve the two stars from each other and find a separation of 2.923" $\pm$ 0.004" and a position angle $110.64° \pm 0.12°$. We measure the flux ratios of the binary in $g'r'i'z'$ and H & K_S bands, and determine $T_{\rm eff}$ = 3565 $\pm$ 82 K for the companion star, corresponding to an M1.5 dwarf. We use PHOENIX stellar atmosphere models to correct the dilution of the secondary eclipse depths of the hot Jupiter due to the presence of the M1.5 companion. We also improve the secondary eclipse photometry by accounting for the non-classical, flux-dependent nonlinearity of the WIRC IR detector in the H band. We measure planet-to-star flux ratios of 0.090 $\pm$ 0.033%, 0.178 $\pm$ 0.057%, 0.364 $\pm$ 0.016%, and 0.438 $\pm$ 0.020% in the H, K_S,

3.6 and 4.5 μm bands, respectively. We compare these with planetary atmospheric models, and find they prefer an atmosphere with a temperature inversion and inefficient heat redistribution. However, we also find that the data are equally well-described by a blackbody model for the planet with $T_{\rm p} = 2042 \pm 50$ K. Finally, we measure a secondary eclipse timing offset of 0.3 ± 1.3 min from the predicted mid-eclipse time, which constrains $e = 0.0072^{+0.0700}_{-0.0064}$ when combined with RV data and is more consistent with a circular orbit.

Download/Website: http://arxiv.org/abs/1410.0968

Contact: mingzhao@psu.edu

3 Jobs and Positions

Assistant Professor of Computational Astrophysics and/or Cosmology

Frédéric Masset & Juan Carlos Hidalgo

Instituto de Ciencias Físicas, UNAM, PO-Box 62251, Cuernavaca, Mor., Mexico

Instituto de Ciencias Físicas, UNAM, position available immediately

The Instituto de Ciencias Físicas of the Universidad Nacional Autónoma de México (ICF-UNAM), at the Morelos campus in the city of Cuernavaca, invites applications for an Associate Professorship (Tenure Track) in the area of cosmology and/or computational astrophysics. We seek a candidate with a strong, internationally recognized record in one of the above subjects, including co-authorship of a simulation code of astrophysical or cosmological interest, and/or proficiency in public simulation codes, as well as the ability to get supercomputing resources at national and international levels. Strong candidates in other areas of cosmology are also encouraged to apply.
The candidate is expected to keep a high publication rate and to contribute to the formation of students by teaching both at graduate and undergraduate level as well as by supervising students.
The successful candidate will be collaborating with local researchers, in particular Luis Benet, Gabriel German, Juan Carlos Hidalgo, Gloria Koenigsberger or Frdric Masset. Current research areas of this group at the ICF include: planetary formation and migration, studies of protoplanetary disks, early universe cosmology and relativistic corrections to Large Scale Structure formation.
Local computational facilities include a 5320 core cluster (at UNAM) and a 24 K20 GPUs cluster (totalizing nearly 60,000 CUDA cores) in the Institute premises. Starting salary, including supplements ranks between 31,500 and 32,500 USD, per annum after taxes, with a significant increment in supplements after the second January of the contract (SNI-CONACYT). The National University of Mexico has its own research funding program and there are good opportunities for external funding from national research agencies (CONACYT).
Interested researchers should submit an application consisting of Curriculum Vitae, a list of publications and a statement of research interests as well as three letters of recommendation. Female researchers are particularly encouraged to apply for this position. Applications will be accepted in electronic form until the 30th of November of 2014. For further information please write to masset@fis.unam.mx or hidalgo@fis.unam.mx.

Contact: masset@fis.unam.mx

Postdoctoral Position in Exoplanet Imaging

Dr. Olivier Absil
University of Liège, Belgium

University of Liège, Applications due Dec. 1, 2014

The Department of Astrophysics, Geophysics and Oceanography (AGO) of the University of Liège (ULg) is inviting applications for a postdoctoral research position in the field of exoplanet imaging. This position is open within the framework of the ERC/ARC VORTEX project, which aims to develop, manufacture, test and exploit vector vortex phase masks made up of sub-wavelength gratings for exoplanet direct imaging. The postdoc will work with Dr Olivier Absil and Prof Jean Surdej at the University of Liège, in close collaboration with Dr Dimitri Mawet (Caltech) and the rest of the VORTEX team, which currently comprises 12 researchers (5 senior staff, 3 postdocs, 4 PhD students).

The successful applicant will work on the scientific exploitation of the L- and N-band vortex phase masks currently installed on the VLT/NACO, VLT/VISIR and LBT/LMIRCam infrared cameras. He/she will also be strongly involved in the early scientific exploitation of the L-band vortex phase mask that will be installed on Keck/NIRC2 in Spring 2015. The postdoc is expected to take the lead on some already planned observing programs as well as on the submission of new, original observing proposals. He/she will also be strongly encouraged to contribute to the development of a PCA-based image processing pipeline that we are currently developing at ULg. The postdoc is expected to spend about 70% of his/her time on this project, while the rest of the time can be spent on a personal research subject, which should preferably be related to image processing, high-contrast imaging and/or exoplanets.

A successful candidate must hold a PhD in astronomy or a related field by the starting date of the position. A good experience in image processing and/or high-contrast imaging is required. Applications should include:
- a cover letter
- a curriculum vitae and a list of publications
- a statement of current and future research interests (up to 3 pages)

The application, merged into one single pdf file, should be sent by email to Olivier Absil (see email address below). The applicants should also provide the names and contact details of three referees who could be contacted for reference letters.

Complete applications received by 1 December 2014 will receive full consideration. The starting date of the appointment is flexible. It could be as early as January 2015, although we would accept starting dates up to September 2015. The appointment is for two years, with renewal for a third year contingent upon satisfactory progress.

The position comes with full benefits and a competitive salary.

Informal enquiries are welcome and should be sent to the email address provided below.

Download/Website: `http://denebola.astro.ulg.ac.be/~absil/vortex/`

Contact: `absil@astro.ulg.ac.be`

Postdoctoral Position in Exoplanet Research ETH Zurich

Dr. Sascha P. Quanz & Prof. Michael R. Meyer
Institute for Astronomy, ETH Zurich, Wolfgang-Pauli-Strasse 27, 8093 Zurich, Switzerland

ETH Zurich, start of position in summer 2015

The Institute for Astronomy, ETH Zurich, Star and Planet Formation Research Group invites applications for a new post-doctoral fellowship focussed on exoplanet research with Dr. Sascha P. Quanz, Prof. Hans. Martin Schmid, and Prof. Michael R. Meyer. Research in our group covers several areas including the direct detection and characterization of extra-solar planets, the structure and evolution of circumstellar disks, and the formation and evolution of young star clusters. More information can be found at http://www.astro.ethz.ch/meyer/index
Successful applicants will have the opportunity to work with students at all levels and become involved in large programs in which our research group participates (for example the Guaranteed Time Program for the high-contrast imager SPHERE recently installed at ESO's Very Large Telescope in Chile). Our group is also involved in the Swiss National Centre for Competence in Research (NCCR) PlanetS Project, an interdisciplinary and inter-institutional research program focussed on the origin, evolution, and characterization of planets inside and outside the Solar System. More information can be found here http://www.exoplanets.ch/nccr-planets/.
Switzerland is a member of ESO and ESA, and successful applicants will have full access to their facilities. The Institute for Astronomy maintains access to a range of high performance computing options, including stand-alone machines, large clusters, and the resources of the Swiss National Supercomputing Center (CSCS). Interested applicants will also be welcome to explore research opportunities in the Astronomical Instrumentation Laboratory.
Salaries and duration of appointments will be commensurate with experience. Starting salaries begin at CHF 85,750, with initial appointments of 2+1 years, up to a maximum of six. Applications are invited from all nationalities and should consist of a CV and brief descriptions of past/proposed research (combined length not to exceed 6 pages). A separate publication list should be attached. Materials should be sent electronically in a single pdf file. This file, as well as three letters of reference (sent directly by the referees) should be sent to eth-astro-star-planet@phys.ethz.ch. Review of applications will begin December 1, 2014 and will continue until position is filled.
The ETH Zurich will provide benefits for maternity leave, retirement, accident insurance, and relocation costs. Weblink: https://www.ethz.ch/en/the-eth-zurich/working-teaching-and-research.html

Download/Website: `http://www.exoplanets.ch/nccr-planets/`

Contact: `Marianne Chiesi: marianne.chiesi@phys.ethz.ch`

Phd Program in Astronomy at Leiden University – PhD project on exoplanet instrumentation

Ignas Snellen & Christoph Keller
Leiden Observatory, Leiden University, The Netherlands

Leiden Observatory, Leiden University, Deadline: December 1, 2014; start date: Autumn 2015

Leiden Observatory invites applications for more than ten PhD positions. There will be one opening in the field of exoplanet instrumentation, in the groups of Ignas Snellen and Christoph Keller. The PhD project is focused on the design and construction of the Leiden Exoplanet Instrument (LEXI), a pathfinder towards E-ELT instruments that will characterize the atmospheres of Earth-like exoplanets and search for biological activity by combining high-dispersion spectroscopy (HDS) with high-contrast imaging (HCI) techniques. We are searching for a candidate highly interested in astronomical engineering.
Leiden Observatory, founded in 1633, is the oldest university astronomy department in the world. With about 25 faculty, over 40 postdoctoral associates and about 75 PhD students it is the largest astronomy department in the Netherlands. Leiden is a charming university town with international flair. Most Leiden researchers have an international background. English is the common language.
During their thesis, Leiden PhD students are paid as civil servants, which means that they earn competitive salaries (the current annual gross salary, including allowances, increases from about EUR 28,000 in year 1 to about EUR 36,000 in year 4) and are eligible for both social security and retirement benefits. PhD positions are funded for four years.
Application forms and instructions are available at http://www.strw.leidenuniv.nl/phd/apply. Applicants are requested to upload a curriculum vitae, a list of all university courses taken and transcripts of grades obtained, brief statements of research interests and experience, and the contact information for at least two referees. The successful candidates must have a MSc degree (or equivalent) by the starting date. The positions are open to candidates from all countries. The research will be carried out in the framework of the Netherlands Research School for Astronomy (NOVA). Please do not hesitate to contact Ignas Snellen for further information.

Download/Website: `http://www.strw.leidenuniv.nl/phd/apply.php`

Contact: `snellen@strw.leidenuniv.nl`

4 Conference announcements

PLATO 2.0 Science Conference

Isabella Pagano[1], Don Pollacco[2] & Heike Rauer[3] on behalf of the SOC
[1] INAF, Osservatorio Astrofisico di Catania, via Santa Sofia 78, I-95125 Catania, Italy
[2] Department of Physics, University of Warwick, Coventry CV4 7AL, UK
[3] Institut für Planetenforschung, Extrasolare Planeten und Atmosphären, Rutherfordstrasse 2, 12489 Berlin, Germany

ISecond Announcement: PLATO 2.0 Science Conference Taormina, Italy, 3–5 December 2014

Rational: PLATO 2.0, the third medium class mission in the ESA Cosmic Vision 2015-2025 program, is a survey project with the prime goals to detect planets down to Earth size and characterize the bulk planet parameters for a large sample of planets with orbital distances up to the habitable zone of solar-like stars.

With the launch scheduled in 2024, PLATO 2.0 will build on the foundations provided by CoRoT, Kepler and the forthcoming TESS and CHEOPS missions.

The goal of the conference is to bring together experts of the exoplanet and stellar physic communities already involved or willing to collaborate to the preparation of the mission to share ideas and expertise and to highlight the potential contribution of PLATO 2.0 to the (exo-)planetology in the next decades. The program envisages invited talks, oral contributions and posters. There will be time for discussions. Oral and poster contributions can be submitted through the registration form. The abstract submission deadline is 31 October for oral contributions, and 15 November for poster contributions.

Confirmed Invited Speakers: Y. Alibert, J. Cabrera, W.J. Chaplin, H. Deeg, M. Deleuil, D. Ehrenreich, L. Gizon, P. Gondoin, M.-J. Goupil, T. Guillot, A. Hatzes, A. Heras, K. Kislyakova, A.F. Lanza, J. Laskar, R. Mardling, A. Miglio, V. Nascimbeni, R. Nelson, I. Pagano, G. Piotto, H. Rauer, N. Santos, F. Sohl, A. Tkachenko, S. Udry, K. Zwintz

SOC: C. Aerts, T. Appourchaux, W. Benz, A. Brandeker, J. Christensen Dalsgaard, M. Deleuil, L. Gizon, P. Gondoin, M.-J. Goupil, M. Gdel, E. Janot-Pacheco, A. Heras, M. Mass-Hesse, I. Pagano, G. Piotto, D. Pollacco (Chair), R. Ragazzoni, H. Rauer, N. Santos, A. Smith, J.-C. Suarez, R. Szabo, S. Udry

Looking forward to meet you in Taormina, Isabella Pagano, Don Pollacco & Heike Rauer on behalf of the SOC.

Download/Website: `(http://www.oact.inaf.it/plato/PPLC/RegistrationTao.html)`

I Advanced School on Exoplanetary Science: Methods of Detecting Exoplanets

V. Bozza[1], *L. Mancini*[2], *A. Sozzetti*[3]

[1] University of Salerno
[2] Max Planck Institute for Astronomy
[3] INAF – Astrophysical Observatory of Turin

Vietri sul Mare (Salerno), Italy, from 25 to 29 May, 2015

The *Advanced School on Exoplanetary Science* - taking place in the enchanting Amalfi Coast - is aimed to provide a comprehensive, state-of-the-art picture of a variety of relevant aspects of the fast-developing, highly interdisciplinary field of extrasolar planets research.

The 1st-year school will be held at the International Institute for Advanced Scientific Studies (IIASS) in Vietri sul Mare (Salerno), Italy, from 25 to 29 May, 2015 and the topic will be:

METHODS OF DETECTING EXOPLANETS

Lecture topics will be presented by four senior researchers to an audience of graduate students and young post-docs, for a total of 28 lectures:

- **Direct Imaging**: Riccardo Claudi, INAF - Astronomical Observatory of Padova
- **Planetary Transit**: Andrew Collier Cameron, University of St Andrews
- **Gravitational Microlensing**: Andrew Gould, Ohio State University
- **Radial Velocity**: Artie P. Hatzes, Thuringian State Observatory

Registration is now open. Registration Deadline: **March 1, 2015**

Download/Website: `http://www.iiassvietri.it/ases2015.html`

Contact: `mancini@mpia.de`

Dynamical problems in extrasolar planets science

Alessandro Morbidelli
Observatoire de la Cote d'Azur, CS 34229, 06304 Nice Cedex 4, France

Honolulu, Hawaii, August 12 – 14, 2015

I would like to advertise the Focused Meeting on "Dynamical problems in extrasolar planets science" which will be held on Aug. 12-14, 2015 in the framework of the IAU general assembly in Honolulu.

Co-Chairs of SOC:

Alessandro Morbidelli (OCA- President C7)
Alain Levavalier des Etains (IAP-President C53)
Jacques Laskar (IMCCE-Vice Pres. Div.A)
Nader Haghighipour (IFA-Vice Pres. Div. F)

Topics:

Dynamical evolution of planetary systems,
Origin of "hot" planets, origin of large eccentricities and orbital obliquities,
tidal and resonant effects.

Download/Website: `http://astronomy2015.org/focus_meeting_1`

Contact: `morby@oca.eu`

5 Announcements

Exoplanets UK research review – request for community input

The Science and Technology Facility Council: Exoplanets review panel.
STFC, UK

https://www.surveymonkey.com/s/Exoplanets_UK_Community_Questionnaire, Deadline: 10th Nov 2014

The Science and Technology Facility Council periodically conducts reviews of its programme. The last Exoplanet review, chaired by Mark McCaughran, reported in 2008 and while the intervening years have been financially challenging, the UK Community, often in partnership with STFC, has seen many of its recommendations come to pass. The STFC Science Board has agreed that, given how dynamic this area of research is, the growth in the UK community and the UKs role in the international community, it is timely to once more review progress in this field and try to look forward. This review should be seen as an opportunity for the exoplanet community to provide a summary of the scientific challenges and progress in our understanding, current strengths of the field in the UK and identify future needs and opportunities. At the recent UK Community Meeting at Cambridge there were 102 registered participants. The presentations showed a breadth of internationally competitive research.

Science Board, with input from the Advisory Panels has produced a Science Roadmap. We expect that this review will help ensure that the Science Board has access to up-to-date priorities in order to inform strategic decisions.

The initial part of the review will be conducted by the Chair of the AAP with advice from members of the AAP and SSAP, along with ad hoc specialists working in this area. The full Panel membership is:

Dr Chris Arridge (Lancs)
Dr Stephen Lowry (Kent)
Prof Richard Nelson (QMUL)
Prof Paul O'Brien (Chair) (Leic)
Prof Don Pollacco (Warwick)
Dr David Sing (Exeter)
Prof Giovanna Tinetti (UCL)
Dr Chris Watson (QUB)

with STFC support from: Sharon Bonfield & Michelle Cooper.

It is expected that the review Panel will submit a written report to the STFC Science Board in April 2015 and will present its findings at the UK Exoplanet Meeting at Warwick University at about that time. As part of the review process, the Panel wish to consult the Community to identify the areas that are perceived as its strengths in exoplanets, as well as solicit opinions on how the subject will change in the future. We understand that after a few years the accuracy with which we can predict the future will be limited, but you can see this review against the backdrop of international facilities and the time-line on which they become available.

The Panel will use your input as a basis on which to produce its report. This consultation is for the UK community including UK personnel located overseas at, for example, island sites. While we expect primarily the UK Exoplanet Community to be engaged with this process, we also encourage UK-based researchers from other areas to make their views known on this subject.

Please submit your views via the questionnaire at the link below, the closing date for responses is 10th November 2014.

Download/Website: https://www.surveymonkey.com/s/Exoplanets_UK_Community_Questionnaire

6 As seen on astro-ph

The following list contains all the entries relating to exoplanets that we spotted on astro-ph during October 2014. If you see any that we missed, please let us know and we'll include them in the next issue.

astro-ph/1410.0002 : **A Hubble Space Telescope Search for a Sub-Earth-Sized Exoplanet in the GJ 436 System** by *Kevin B. Stevenson, et al.*

astro-ph/1410.0052 : **A search for planetary eclipses of white dwarfs in the Pan-STARRS1 medium-deep fields** by *B. J. Fulton, et al.*

astro-ph/1410.0132 : **Planet-vortex interaction:How a vortex can shepherd a planetary embryo** by *S. Ataiee et al.*

astro-ph/1410.0186 : **Geothermal heating enhances atmospheric asymmetries on synchronously rotating planets** by *Jacob Haqq-Misra, Ravi Kumar Kopparapu*

astro-ph/1410.0361 : **Constraining the Oblateness of Kepler Planets** by *Wei Zhu et al.*

astro-ph/1410.0363 : **ExELS: an exoplanet legacy science proposal for the ESA Euclid mission. II. Hot exoplanets and sub-stellar systems** by *I. McDonald, et al.*

astro-ph/1410.0672 : **Helium abundance in giant planets and the local interstellar medium** by *Lotfi Ben-Jaffel, Ilyes Abbes*

astro-ph/1410.0968 : **Characterization of the atmosphere of the hot Jupiter HAT-P-32Ab and the M-dwarf companion HAT-P-32B** by *Ming Zhao et al.*

astro-ph/1410.1060 : **Formation of close in Super-Earths & Mini-Neptunes: Required Disk Masses & Their Implications** by *Hilke E. Schlichting*
astro-ph/1410.1290 : **Search for a circum-planetary material and orbital period variations of short-period Kepler exoplanet candidates** by *Z. Garai, et al.*
astro-ph/1410.1310 : **Correcting the spectroscopic surface gravity using transits and asteroseismology. No significant effect on temperatures or metallicities with ARES+MOOG in LTE** by *A. Mortier, et al.*
astro-ph/1410.1325 : **On the orbital structure of the HD 82943 multi-planet system** by *Roman V. Baluev, Cristian Beaugé*
astro-ph/1410.1400 : **Updated Spitzer Emission Spectroscopy of Bright Transiting Hot Jupiter HD189733b** by *Kamen O. Todorov, et al.*
astro-ph/1410.1407 : **Trojan resonant dynamics, stability, and chaotic diffusion, for parameters relevant to exoplanetary systems** by *Rocio Isabel Páez, Christos Efthymiopoulos*
astro-ph/1410.1743 : **The effect of external environment on the evolution of protostellar disks** by *Eduard I. Vorobyov, D. N. C. Lin, Manuel Guedel*
astro-ph/1410.1754 : **Performance of the VLT Planet Finder SPHERE I. Photometry and astrometry precision with IRDIS and IFS in laboratory** by *A. Zurlo, et al.*
astro-ph/1410.2112 : **The effect of Lyman α radiation on mini-Neptune atmospheres around M stars: application to GJ 436b** by *Yamila Miguel, et al.*
astro-ph/1410.2241 : **Thermal structure of an exoplanet atmosphere from phase-resolved emission spectroscopy** by *Kevin B. Stevenson, et al.*
astro-ph/1410.2251 : **The Observational Effects and Signatures of Tidally Distorted Solid Exoplanets** by *Prabal Saxena, Peter Panka, Michael Summers*
astro-ph/1410.2255 : **A Precise Water Abundance Measurement for the Hot Jupiter WASP-43b** by *Laura Kreidberg, et al.*
astro-ph/1410.2382 : **The Atmospheric Circulation of the Hot Jupiter WASP-43b: Comparing Three-Dimensional Models to Spectrophotometric Data** by *Tiffany Kataria, et al.*
astro-ph/1410.2478 : **Statistical distributions of mean motion resonances and near-resonances in multiplanetary systems** by *Marian C. Ghilea*
astro-ph/1410.2604 : **A Class of Warm Jupiters with Mutually Inclined, Apsidally Misaligned, Close Friends** by *Rebekah Dawson, Eugene Chiang*
astro-ph/1410.2816 : **The Fate of Scattered Planets** by *Benjamin C. Bromley, Scott J. Kenyon*
astro-ph/1410.2999 : **KOI-1299 b: a massive planet in a highly eccentric orbit transiting a red giant** by *Simona Ciceri, et al.*
astro-ph/1410.3000 : **Spectroscopic confirmation of KOI-1299b: a massive warm Jupiter in a 52-day eccentric orbit transiting a giant star** by *Mauricio Ortiz, et al.*
astro-ph/1410.3134 : **Spin-orbit resonances and rotation of coorbital bodies in quasi-circular orbits** by *Philippe Robutel, A.C.M. Correia, Adrien Leleu*
astro-ph/1410.3235 : **The first planet detected in the WTS: an inflated hot-Jupiter in a 3.35 day orbit around a late F-star** by *M. Cappetta, et al.*
astro-ph/1410.3391 : **Migration and Growth of Protoplanetary Embryos I: Convergence of Embryos in Protoplanetary Disks** by *Xiaojia Zhang, et al.*
astro-ph/1410.3449 : **Six newly-discovered hot Jupiters transiting F/G stars: WASP-87b, WASP-108b, WASP-109b, WASP-110b, WASP-111b & WASP-112b** by *D. R. Anderson, et al.*
astro-ph/1410.3494 : **Dusty tails of evaporating exoplanets. I. Constraints on the dust composition** by *R. van Lieshout, M. Min, C. Dominik*
astro-ph/1410.3570 : **ALMA observations of a misaligned binary protoplanetary disk system in Orion** by *Jonathan P. Williams, et al.*
astro-ph/1410.3702 : **Defocussed Transmission Spectroscopy: A potential detection of sodium in the atmosphere of WASP-12b** by *J. R. Burton, et al.*

astro-ph/1410.3952 : **A theoretical calculation of microlensing signatures caused by free-floating planets towards the Galactic bulge** by *L. Hamolli, M. Hafizi, A.A. Nucita*

astro-ph/1410.4096 : **Gaia's potential for the discovery of circumbinary planets** by *Johannes Sahlmann, Amaury H. M. J. Triaud, David V. Martin*

astro-ph/1410.4192 : **The Kepler Dichotomy among the M Dwarfs: Half of Systems Contain Five or More Coplanar Planets** by *Sarah Ballard, John Asher Johnson*

astro-ph/1410.4196 : **Effects of dust feedback on vortices in protoplanetary disks** by *Wen Fu, et al.*

astro-ph/1410.4199 : **The Occurrence and Architecture of Exoplanetary Systems** by *Joshua N. Winn, Daniel C. Fabrycky*

astro-ph/1410.4219 : **Spitzer as Microlens Parallax Satellite: Mass Measurement for the OGLE-2014-BLG-0124L Planet and its Host Star** by *A. Udalski, et al.*

astro-ph/1410.4286 : **Near-infrared Thermal Emission Detections of a number of hot Jupiters and the Systematics of Ground-based Near-infrared Photometry** by *Bryce Croll, et al.*

astro-ph/1410.4289 : **The Relation between the Transit Depths of KIC 12557548b & the Stellar Rotation Period** by *Bryce Croll, Saul Rappaport, Alan M. Levine*

astro-ph/1410.4579 : **The theory of globulettes: candidate precursors of brown dwarfs and free floating planets in H II regions** by *Thomas J. Haworth, Stefano Facchini, Cathie J. Clarke*

astro-ph/1410.4658 : **Hydrodynamics of Embedded Planets' First Atmospheres. I. A Centrifugal Growth Barrier for 2D Flows** by *Chris W. Ormel, Rolf Kuiper, Ji-Ming Shi*

astro-ph/1410.4659 : **Hydrodynamics of Embedded Planets' First Atmospheres. II. A Rapid Recycling of Atmospheric Gas** by *Chris W. Ormel, Ji-Ming Shi, Rolf Kuiper*

astro-ph/1410.4843 : **Prospects for Characterizing Host Stars of the Planetary System Detections Predicted for the Korean Microlensing Telescope Network** by *Calen B. Henderson*

astro-ph/1410.4946 : **1/1 resonant periodic orbits in three dimensional planetary systems** by *Kyriaki I. Antoniadou, George Voyatzis, Harry Varvoglis*

astro-ph/1410.5203 : **Spin-orbit angle in compact planetary systems perturbed by an inclined companion. Application to the 55 Cancri system** by *Gwenaël Boué, Daniel C. Fabrycky*

astro-ph/1410.5248 : **SOPHIE velocimetry of Kepler transit candidates. XIII. KOI-189 B and KOI-686 B: two very low-mass stars in long-period orbits** by *R. F. Díaz et al.*

astro-ph/1410.5320 : **Understanding tidal dissipation in gaseous giant planets : the respective contributions of their core and envelope** by *M. Guenel, S. Mathis, F. Remus*

astro-ph/1410.5336 : **How accurate are stellar ages based on stellar models ? I. The impact of stellar models uncertainties** by *Yveline Lebreton, Marie-Jo Goupil, J. Montalban*

astro-ph/1410.5337 : **How accurate are stellar ages based on stellar models? II. The impact of asteroseismology** by *Yveline Lebreton, Marie-Jo Goupil, J. Montalban*

astro-ph/1410.5495 : **Transit light curve and inner structure of close-in planets** by *Alexandre C.M. Correia*

astro-ph/1410.5679 : **On the structure and evolution of planets and their host stars − effects of various heating mechanisms on the size of giant gas planets** by *M. Yildiz, et al.*

astro-ph/1410.5802 : **Water ice lines and the formation of giant moons around super-Jovian planets** by *René Heller, Ralph Pudritz*

astro-ph/1410.5819 : **Pebble Delivery for Inside-Out Planet Formation** by *Xiao Hu, Jonathan C. Tan, Sourav Chatterjee*

astro-ph/1410.5835 : **Probing the formation of planetesimals in the Galactic Centre using Sgr A* flares** by *Adrian S. Hamers, Simon F. Portegies Zwart*

astro-ph/1410.5844 : **Gravitational quantization of satellite orbits in the giant planets** by *Vassilis S. Geroyannis*

astro-ph/1410.5900 : **TTVs analysis in Southern Stars: the case of WASP-28** by *Romina Petrucci, et al.*

astro-ph/1410.5963 : **Gas and dust structures in protoplanetary disks hosting multiple planets** by *P. Pinilla, et al.*

astro-ph/1410.5971 : **Tracking Advanced Planetary Systems with HARPS-N (TAPAS). I. A multiple planetary**

system around the red giant star TYC 1422-614-1 by *A. Niedzielski, et al.*

astro-ph/1410.6029 : **Atmospheres of Brown Dwarfs** by *Christiane Helling, Sarah Casewell*

astro-ph/1410.6358 : **Three WASP-South transiting exoplanets: WASP-74b, WASP-83b & WASP-89b** by *Coel Hellier et al.*

astro-ph/1410.6379 : **The K2-TESS Stellar Properties Catalog** by *Keivan G. Stassun et al.*

astro-ph/1410.6422 : **Stellar parameters and chemical abundances of 223 evolved stars with and without planets** by *E. Jofré, et al.*

astro-ph/1410.6512 : **On the Cool Side: Modeling the Atmospheres of Brown Dwarfs and Giant Planets** by *Mark S. Marley, Tyler D. Robinson*

astro-ph/1410.6527 : **The frequency and infrared brightness of circumstellar discs at white dwarfs** by *M. Rocchetto, et al.*

astro-ph/1410.6542 : **Volatile-Rich Circumstellar Gas in the Unusual 49 Ceti Debris Disk** by *Aki Roberge, et al.*

astro-ph/1410.6610 : **Dust in brown dwarfs and extra-solar planets IV. Assessing TiO2 and SiO nucleation for cloud formation modeling** by *G. Lee, et al.*

astro-ph/1410.6815 : **Embryo impacts and gas giant mergers II: Diversity of Hot Jupiters' internal structure** by *Shang-Fei Liu, et al.*

astro-ph/1410.6819 : **Limits on low frequency radio emission from southern exoplanets with the Murchison Widefield Array** by *Tara Murphy et al.*

astro-ph/1410.7199 : **The stickiness of micrometer-sized water-ice particles** by *B. Gundlach, J. Blum*

astro-ph/1410.7379 : **Towards Understanding Stellar Radial Velocity Jitter as a Function of Wavelength: The Sun as a Proxy** by *Robert C. Marchwinski et al.*

astro-ph/1410.7428 : **Tidal evolution in multiple planet systems: application to Kepler-62 and Kepler-186** by *Emeline Bolmont, et al.*

astro-ph/1410.7594 : **Stars with and without planets: Where do they come from?** by *V. Zh. Adibekyan, et al.*

astro-ph/1410.7611 : **HST hot-Jupiter transmission spectral survey: detection of potassium in WASP-31b along with a cloud deck and Rayleigh scattering** by *D. K. Sing, et al.*

astro-ph/1410.7753 : **On the Morphology and Chemical Composition of the HR 4796A Debris Disk** by *Timothy J. Rodigas, et al.*

astro-ph/1410.7784 : **Gap Clearing by Planets in a Collisional Debris Disk** by *Erika R. Nesvold, Marc J. Kuchner*

astro-ph/1410.7952 : **Migration and Growth of Protoplanetary Embryos II: Emergence of Proto-Gas-Giants Cores versus Super Earths' Progenitor** by *Beibei Liu, et al.*

astro-ph/1410.8102 : **Electron densities and alkali atoms in exoplanet atmospheres** by *Panayotis Lavvas, Tommi Koskinen, Roger V. Yelle*

astro-ph/1410.8114 : **Planet Hunters VII. Discovery of a New Low-Mass, Low-Density Planet (PH3 c) Orbiting Kepler-289 with Mass Measurements of Two Additional Planets (PH3 b and d)** by *Joseph R. Schmitt, et al.*

astro-ph/1410.8168 : **CO gas inside the protoplanetary disk cavity in HD 142527: disk structure from ALMA** by *Sebastian Perez, et al.*

astro-ph/1410.8252 : **OGLE-2011-BLG-0265Lb: a Jovian Microlensing Planet Orbiting an M Dwarf** by *J. Skowron, et al.*

astro-ph/1410.8265 : **ALMA observations of the debris disk around the young Solar Analog HD 107146** by *L. Ricci, et al.*

astro-ph/1410.8363 : **On the correlation between stellar chromospheric flux and the surface gravity of close-in planets** by *A. F. Lanza*

astro-ph/1410.8658 : **Orbital Circularization of a Planet Accreting Disk Gas: Formation of Distant Jupiters in Circular Orbits based on Core Accretion Model** by *A. Kikuchi, A. Higuchi, S. Ida*