ExoPlanet News
An Electronic Newsletter

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Contents

1 Editorial

Welcome to edition number 68 of ExoPlanet News. This month's edition is notable for it's jobs section – Eighteen posts are available in Switzerland.
The next edition of the newsletter will be sent out at the end of April 2014. Please send anything relevant before then to exoplanet@open.ac.uk, and it will appear in the next edition. Remember that past editions of this newsletter, submission templates and other information can be found at the ExoPlanet News website: http://exoplanet.open.ac.uk.

Best wishes
Andrew Norton
The Open University

2 Abstracts of refereed papers

Clouds on the hot Jupiter HD189733b: constraints from the reflection spectrum

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The Astrophysical Journal, in press (arXiv:1403.6664)

The hot Jupiter HD 189733b is probably the best studied of the known extrasolar planets, with published transit and eclipse spectra covering the near UV to mid-IR range. Recent work on the transmission spectrum has shown clear evidence for the presence of clouds in its atmosphere, which significantly increases the model atmosphere parameter space that must be explored in order to fully characterise this planet. In this work, we apply the NEMESIS atmospheric retrieval code to the recently published *HST*/STIS reflection spectrum, and also to the dayside thermal emission spectrum in the light of new *Spitzer*/IRAC measurements, as well as our own re-analysis of the *HST*/NICMOS data. We first use the STIS data to place some constraints on the nature of the cloud on HD 189733b, and explore solution degeneracy between different cloud properties and the abundance of Na in the atmosphere; as already noted in previous work, absorption due to Na plays a significant role in determining the shape of the reflection spectrum. We then perform a new retrieval of the temperature profile and abundances of H_2O, CO_2, CO and CH_4 from the dayside thermal emission spectrum. Finally, we investigate the effect of including cloud in the model on this retrieval process. We find that the current quality of data does not warrant the extra complexity introduced by including cloud in the model; however, future data are likely to be of sufficient resolution and signal-to-noise that a more complete model, including scattering particles, will be required.

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Pseudo 2D chemical model of hot-Jupiter atmospheres: application to HD 209458b and HD 189733b

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Astronomy & Astrophysics, in press, arXiv:1403.0121

The high temperature contrast between the day and night sides of hot-Jupiter atmospheres may result in strong variations of the chemical composition with longitude if the atmosphere were at chemical equilibrium. On the other hand, the vigorous dynamics predicted in these atmospheres, with a strong equatorial jet, would tend to supress such longitudinal variations. To address this subject we have developed a pseudo two-dimensional model of a planetary atmosphere, which takes into account thermochemical kinetics, photochemistry, vertical mixing, and horizontal transport, the latter being modeled as a uniform zonal wind. We have applied the model to the atmospheres of the hot Jupiters HD 209458b and HD 189733b. The adopted eddy diffusion coefficients were calculated by following the behavior of passive tracers in three-dimensional general circulation models, which results in much lower eddy values than in previous estimates. We find that the distribution of molecules with altitude and longitude in the atmospheres of these two hot Jupiters is complex because of the interplay of the various physical and chemical processes at work. Much of the distribution of molecules is driven by the strong zonal wind and the limited extent of vertical transport, resulting in an important homogenization of the chemical composition with longitude. The homogenization is more marked in planets lacking a thermal inversion such as HD 189733b than in planets with a strong stratosphere such as HD 209458b. In general, molecular abundances are quenched horizontally to values typical of the hottest dayside regions, and thus the composition in the cooler nightside regions is highly contaminated by that of warmer dayside regions. As a consequence, the abundance of methane remains low, even below the predictions of previous one-dimensional models, which probably is in conflict with the high CH_4 content inferred from observations of the dayside of HD 209458b. Another consequence of the important longitudinal homogenization of the abundances is that the variability of the chemical composition has little effect on the way the emission spectrum is modified with phase and on the changes in the transmission spectrum from the transit ingress to the egress. These variations in the spectra are mainly due to changes in the temperature, rather than in the composition, between the different sides of the planet.

Download/Website: `http://dx.doi.org/10.1051/0004-6361/201322895`

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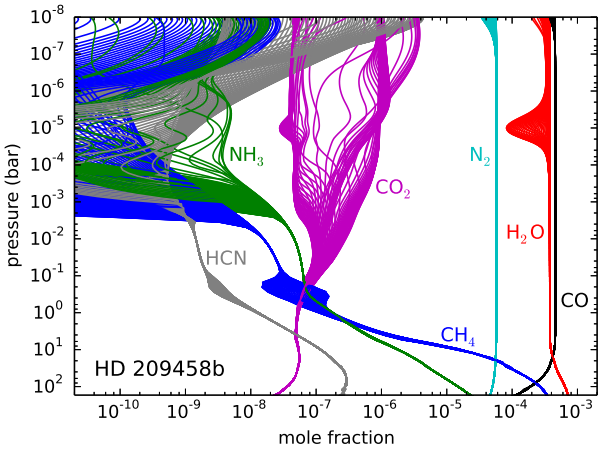

Figure 1: (Agúndez et al.) (Vertical cuts of the abundance distributions of some of the most abundant molecules at longitudes spanning the 0-360° range, as calculated with the pseudo two-dimensional chemical model for HD 209458b's atmosphere.)

A Window on Exoplanet Dynamical Histories: Rossiter-McLaughlin Observations of WASP-13b and WASP32b

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Monthly Notices of the Royal Astronomical Society, in press (arXiv:1403.4095)

We present Rossiter-McLaughlin observations of WASP-13b and WASP-32b and determine the sky-projected angle between the normal of the planetary orbit and the stellar rotation axis (λ). WASP-13b and WASP-32b both have prograde orbits and are consistent with alignment with measured sky-projected angles of $\lambda = 8^{\circ}{}^{+13}_{-12}$ and $\lambda = -2^{\circ}{}^{+17}_{-19}$, respectively. Both WASP-13 and WASP-32 have $T_{\rm eff} < 6250$K and therefore these systems support the general trend that aligned planetary systems are preferentially found orbiting cool host stars. A Lomb-Scargle periodogram analysis was carried out on archival SuperWASP data for both systems. A statistically significant stellar rotation period detection (above 99.9% confidence) was identified for the WASP-32 system with $P_{\rm rot} = 11.6 \pm 1.0$ days. This rotation period is in agreement with the predicted stellar rotation period calculated from the stellar radius, $R_{\star}$, and $v \sin i$ if a stellar inclination of $i_{\star} = 90^{\circ}$ is assumed. With the determined rotation period, the true 3D angle between the stellar rotation axis and the planetary orbit, ψ, was found to be $\psi = 11^{\circ} \pm 14$. We conclude with a discussion on the alignment of systems around cool host stars with $T_{\rm eff} < 6150$K by calculating the tidal dissipation timescale. We find that systems with short tidal dissipation timescales are preferentially aligned and systems with long tidal dissipation timescales have a broad range of obliquities.

Download/Website: `http://arxiv.org/abs/1403.4095`

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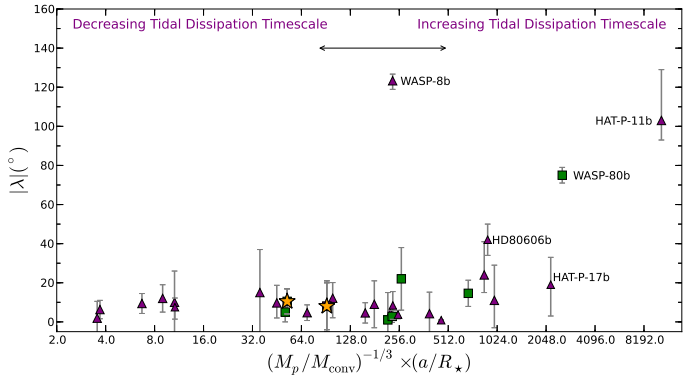

Figure 2: (Brothwell et al.) Plot of $|\lambda|$ against $\tau_{\rm CE}^{1/6} \propto (M_p/M_{\rm conv})^{-1/3} \times (a/R_{\star})$, where $\tau_{\rm CE}$ is the tidal dissipation timescale. $a/R_{\star}$ is obtained directly from the planetary transit. The convective mass, $M_{\rm conv}$, was derived from the EZ-Web stellar evolution code. Systems with age determinations are shown as triangle symbols and those with an assumed age of 4 Gyrs are shown as square symbols. WASP-13b and WASP-32b are shown as starred symbols on the plot. The plot includes all systems orbiting 'cool' host stars ($T_{\rm eff} < 6150$K) where tidal interactions are thought to play a role in damping the obliquities of hot-Jupiters. Systems with short tidal dissipation timescales are preferentially aligned. At longer timescales, there is a broad range of measured misalignment angles.

Comets formed in solar-nebula instabilities! – An experimental and modeling attempt to relate the activity of comets to their formation process

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Icarus, accepted

When comet nuclei approach the Sun, the increasing energy flux through the surface layers leads to sublimation of the underlying ices and subsequent outgassing that promotes the observed emission of gas and dust. While the release of gas can be straightforwardly understood by solving the heat-transport equation and taking into account the finite permeability of the ice-free dust layer close to the surface of the comet nucleus, the ejection of dust additionally requires that the forces binding the dust particles to the comet nucleus must be overcome by the forces caused by the sublimation process. This relates to the question of how large the tensile strength of the overlying dust layer is. Homogeneous layers of micrometer-sized dust particles reach tensile strengths of typically 10^3 to 10^4 Pa. This exceeds by far the maximum sublimation pressure of water ice in comets. It is therefore unclear how cometary dust activity is driven.

To solve this paradox, we used the model by Skorov and Blum (Icarus 221, 1-11, 2012), who assumed that cometesimals formed by gravitational instability of a cloud of dust and ice aggregates and calculated for the corresponding structure of comet nuclei tensile strength of the dust-aggregate layers on the order of 1 Pa. Here we present evidence that the emitted cometary dust particles are indeed aggregates with the right properties to fit the model by Skorov and Blum. Then we experimentally measure the tensile strengths of layers of laboratory dust aggregates and confirm the values derived by the model. To explain the comet activity driven by the evaporation of water ice, we derive a minimum size for the dust aggregates of ~ 1 mm, in agreement with meteoroid observations and dust-agglomeration models in the solar nebula. Finally we conclude that cometesimals must have formed by gravitational instability, because all alternative formation models lead to higher tensile strengths of the surface layers.

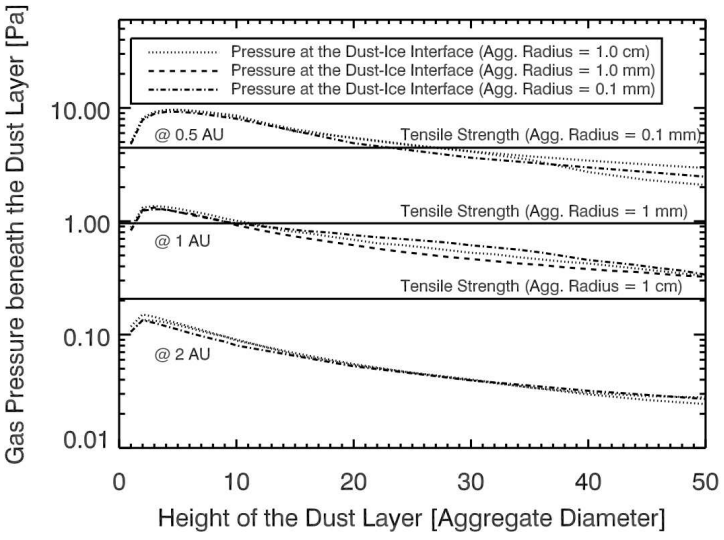

Figure 3: (Blum et al.) Comparison between gas pressures at the dust-ice interface (curves) and the tensile strengths of the dust-aggregate layers (lines), the latter computed by using the model of Skorov 2012 as a function of the height of the covering dust-aggregate layers, in units of the diameter of the aggregates. The three curves and lines denote dust-aggregate radii of $10\,\mathrm{mm}$ (dotted), $1\,\mathrm{mm}$ (dashed) and $0.1\,\mathrm{mm}$ (dash-dotted). The pressure at the dust-ice interface was determined by computing the temperature of the dust-covered ice surface by numerically solving the heat transfer equation and by taking the permeability of the dust-aggregate layer into account. The calculations were performed for heliocentric distances of $0.5\,\mathrm{AU}$ (upper curves), $1\,\mathrm{AU}$ (middle curves), and $2\,\mathrm{AU}$ (lower curves).

The GAPS Programme with HARPS-N at TNG. III: The retrograde orbit of HAT-P-18b.

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Astronomy & Astrophysics Letters, in press (arXiv:1403.6728)

The measurement of the Rossiter-McLaughlin effect for transiting exoplanets places constraints on the orientation of the orbital axis with respect to the stellar spin axis, which can shed light on the mechanisms shaping the orbital configuration of planetary systems. Here we present the interesting case of the Saturn-mass planet HAT-P-18b, which orbits one of the coolest stars for which the Rossiter-McLaughlin effect has been measured so far. We acquired a spectroscopic time-series, spanning a full transit, with the HARPS-N spectrograph mounted at the TNG telescope. The very precise radial velocity measurements delivered by the HARPS-N pipeline were used to measure the Rossiter-McLaughlin effect. Complementary new photometric observations of another full transit were also analysed to obtain an independent determination of the star and planet parameters. We find that HAT-P-18b lies on a counter-rotating orbit, the sky-projected angle between the stellar spin axis and the planet orbital axis being $\lambda = 132 \pm 15$ deg. By joint modelling of the radial velocity and photometric data we obtain new determinations of the star ($M_\star = 0.770 \pm 0.027$ M$_\odot$; $R_\star = 0.717 \pm 0.026$ R$_\odot$; $V \sin I_\star = 1.58 \pm 0.18$ km s^{-1}) and planet ($M_{\rm p} = 0.196 \pm 0.008$ M$_{\rm J}$; $R_{\rm p} = 0.947 \pm 0.044$ R$_{\rm J}$) parameters. Our spectra provide for the host star an effective temperature $T_{\rm eff} = 4870 \pm 50$ K, a surface gravity of $\log g_\star = 4.57 \pm 0.07$ cm s^{-2} and an iron abundance of [Fe/H] = 0.10 ± 0.06. HAT-P-18b is one of the few planets known to transit a star with $T_{\rm eff} < 6250$ K on a retrograde orbit. Objects such as HAT-P-18b (low planet mass and/or relatively long orbital period) most likely have a weak tidal coupling with their parent stars, therefore their orbits preserve any original misalignment. As such, they are ideal targets to study the causes of orbital evolution in cool main-sequence stars.

Download/Website: `http://arxiv.org/abs/1403.6728`

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Transit Search from Antarctica and Chile – Comparison and Combination

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Publications of the Astronomical Society of the Pacific, in press (arXiv:1403.1780)

Observing sites at the East-Antarctic plateau are considered to provide exceptional conditions for astronomy. The aim of this work is to assess its potential for detecting transiting extrasolar planets through a comparison and combination of photometric data from Antarctica with time series from a midlatitude site.
During 2010, the two small aperture telescopes ASTEP 400 (Dome C) and BEST II (Chile) together performed an observing campaign of two target fields and the transiting planet WASP-18b. For the latter, a bright star, Dome C appears to yield an advantageous signal-to-noise ratio. For field surveys, both Dome C and Chile appear to be of comparable photometric quality. However, within two weeks, observations at Dome C yield a transit detection efficiency that typically requires a whole observing season in Chile. For the first time, data from Antarctica and Chile have been combined to extent the observational duty cycle. This approach is both feasible in practice and favorable for transit search, as it increases the detection yield by 12–18%.

Download/Website: `http://arxiv.org/abs/1403.1780`

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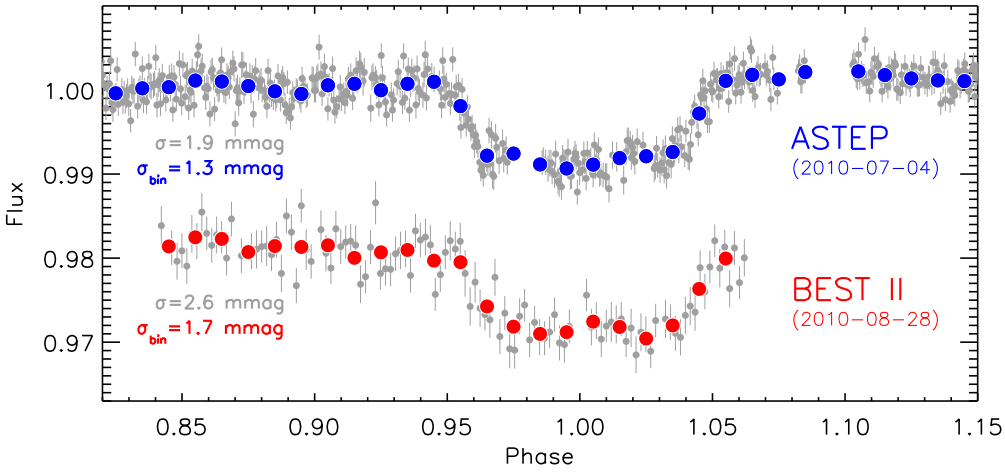

Figure 4: (Fruth et al.) Phase-folded light curves of WASP-18b around transit. Shown are two individual events, one observed with ASTEP (upper line) and one observed with BEST II (lower line).

Detecting extrasolar moons akin to Solar System satellites with an orbital sampling effect

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The Astrophysical Journal, in press (arXiv:1403.5839)

Despite years of high accuracy observations, none of the available theoretical techniques has yet allowed the confirmation of a moon beyond the Solar System. Methods are currently limited to masses about an order of magnitude higher than the mass of any moon in the Solar System. I here present a new method sensitive to exomoons similar to the known moons. Due to the projection of transiting exomoon orbits onto the celestial plane, satellites appear more often at larger separations from their planet. After about a dozen randomly sampled observations, a photometric orbital sampling effect (OSE) starts to appear in the phase-folded transit light curve, indicative of the moons' radii and planetary distances. Two additional outcomes of the OSE emerge in the planet's transit timing variations (TTV-OSE) and transit duration variations (TDV-OSE), both of which permit measurements of a moon's mass. The OSE is the first effect that permits characterization of multi-satellite systems. I derive and apply analytical OSE descriptions to simulated transit observations of the *Kepler* space telescope assuming white noise only. Moons as small as Ganymede may be detectable in the available data, with M stars being their most promising hosts. Exomoons with the 10-fold mass of Ganymede and a similar composition (about 0.86 Earth radii in radius) can most likely be found in the available *Kepler* data of K stars, including moons in the stellar habitable zone. A future survey with *Kepler*-class photometry, such as *Plato 2.0*, and a permanent monitoring of a single field of view over 5 years or more will very likely discover extrasolar moons via their OSEs.

Download/Website: `http://arxiv.org/abs/1403.5839`

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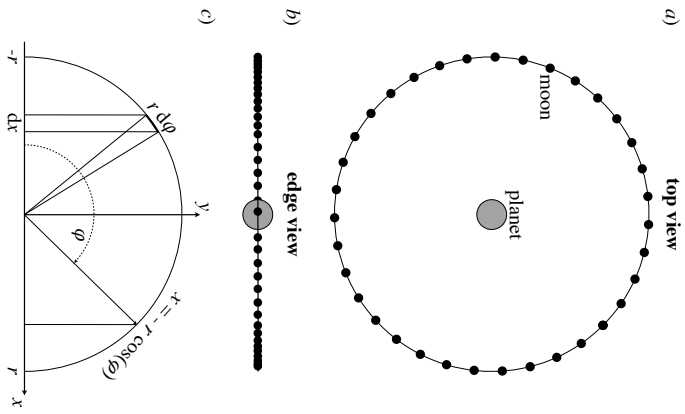

Figure 5: (Heller) Geometry of a moon's orbital sampling effect. Assuming a constant sampling frequency over one moon orbit (panel *a*), an observer in the moon's orbital plane would recognize a non-uniform projected density distribution (panel *b*). All snapshots combined in one sequence frame, the moon is more likely to occur at larger separations x from the planet. After about a dozen transits, this statistical effect starts to appear in the transit light curve of the planet-moon system. The probability distribution $P_{\rm s}(x)$ along the projected orbit can be constructed as $P_{\rm s}(x) = r\ {\rm d}\varphi/{\rm d}x$ (panel *c*).

Trapping of giant-planet cores - I. Vortex aided trapping at the outer dead zone edge

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Monthly Notices of the Royal Astronomical Society, published (2013 arXiv 1305.5676)

In this paper the migration of a $10\mathrm{M}_\oplus$ planetary core is investigated at the outer boundary of the 'dead zone' of a protoplanetary disc by means of 2D hydrodynamic simulations done with the graphics processor unit version of the FARGO code. In the dead zone, the effective viscosity is greatly reduced due to the disc self-shielding against stellar UV radiation, X-rays from the stellar magnetosphere and interstellar cosmic rays. As a consequence, mass accumulation occurs near the outer dead zone edge, which is assumed to trap planetary cores enhancing the efficiency of the core-accretion scenario to form giant planets. Contrary to the perfect trapping of planetary cores in 1D models, our 2D numerical simulations show that the trapping effect is greatly dependent on the width of the region where viscosity reduction is taking place. Planet trapping happens exclusively if the viscosity reduction is sharp enough to allow the development of large-scale vortices due to the Rossby wave instability. The trapping is only temporarily, and its duration is inversely proportional to the width of the viscosity transition. However, if the Rossby wave instability is not excited, a ring-like axisymmetric density jump forms, which cannot trap the $10\mathrm{M}_\oplus$ planetary cores. We revealed that the stellar torque exerted on the planet plays an important role in the migration history as the barycentre of the system significantly shifts away from the star due to highly non-axisymmetric density distribution of the disc. Our results still support the idea of planet formation at density/pressure maximum, since the migration of cores is considerably slowed down enabling them further growth and runaway gas accretion in the vicinity of an overdense region.

Download/Website: `http://adsabs.harvard.edu/abs/2013MNRAS.433.2626R`

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Astrometric planet search around southern ultracool dwarfs I. First results, including parallaxes of 20 M8–L2 dwarfs

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Astronomy & Astrophysics, in press (arXiv:1403.1275)

We present first results of an astrometric search for planets around 20 nearby dwarf stars with spectral types M8–L2. Over a time-span of two years, we obtained I-band images of the target fields with the FORS2 camera at the Very Large Telescope. Using background stars as references, we monitored the targets' astrometric trajectories, which allowed us to measure parallax and proper motions, set limits on the presence of planets, and to discover the orbital motions of two binary systems. We determined trigonometric parallaxes with an average accuracy of 0.09 mas ($\simeq 0.2\,\%$), which resulted in a reference sample for the study of ultracool dwarfs at the M/L transition, whose members are located at distances of 9.5–40 pc. This sample contains two newly discovered tight binaries (DE0630−18 and DE0823−49) and one previously known wide binary (DE1520−44). Only one target shows I-band variability >5 mmag r.m.s. We derived planet exclusion limits that set an upper limit of 9 % on the occurrence of giant planets with masses $> 5\,M_J$ in intermediate-separation (0.01–0.8 AU) orbits around M8–L2 dwarfs. We demonstrate that astrometric observations with an accuracy of 120 μas over two years are feasible from the ground and can be used for a planet-search survey.

Download/Website: `http://arxiv.org/abs/1403.1275`

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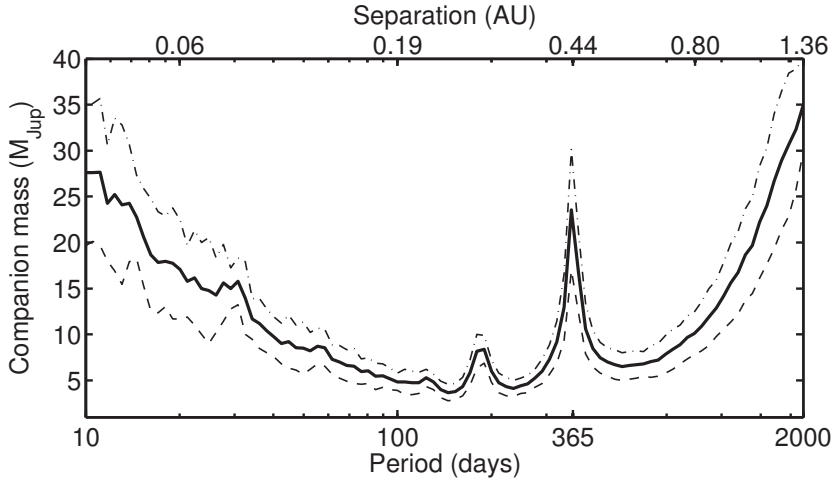

Figure 6: (Sahlmann et al.) Sample-averaged companion exclusion limits (solid line) as a function of orbital period (bottom label) and relative primary-secondary separation (top label). The minimum companion mass incompatible with the measurements is shown, i.e. companions on and above the curve are excluded by the data. This shows that super-Jupiters in intermediate-period orbits are rare around ultracool dwarfs.

Astrometric planet search around southern ultracool dwarfs II. Astrometric reduction methods and a deep astrometric catalogue

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[3] Observatoire de Genève, Université de Genève, 51 Chemin Des Maillettes, 1290 Versoix, Switzerland
[4] INTA-CSIC Centro de Astrobiología, 28850 Torrejón de Ardoz, Madrid, Spain
[5] University of Cambridge, Cavendish Laboratory, J J Thomson Avenue, Cambridge, CB3 0HE, UK

Astronomy & Astrophysics, in press (arXiv:1403.4619)

We describe the astrometric reduction of images obtained with the FORS2/VLT camera in the framework of an astrometric planet search around 20 M/L-transition dwarfs. We present the correction of systematic errors, the achieved astrometric performance, and a new astrometric catalogue containing the faint reference stars in 20 fields located close to the Galactic plane. Remote reference stars were used both to determine the astrometric trajectories of the nearby planet search targets and to identify and correct systematic errors. We detected three types of systematic errors in the FORS2 astrometry: the relative motion of the camera's two CCD chips, errors that are correlated in space, and an error contribution of as yet unexplained origin. We find that a consecutive sequence of 32 images of a well-exposed star over 40 min at 0.6" seeing results in a median r.m.s. of the epoch residuals of 0.126 mas. Overall, the epoch residuals are distributed according to a normal law with a χ^2 value near unity. We compiled a catalogue of 12 000 stars with I-band magnitudes of 16–22 located in 20 fields, each covering $\sim 2' \times 2'$. It contains I-band magnitudes, ICRF positions with 40–70 mas precision, and relative proper motions and absolute trigonometric parallaxes with a precision of 0.1 mas/yr and 0.1 mas at the bright end, respectively.

Download/Website: `http://arxiv.org/abs/1403.4619`

Contact: `laz@mao.kiev.ua`

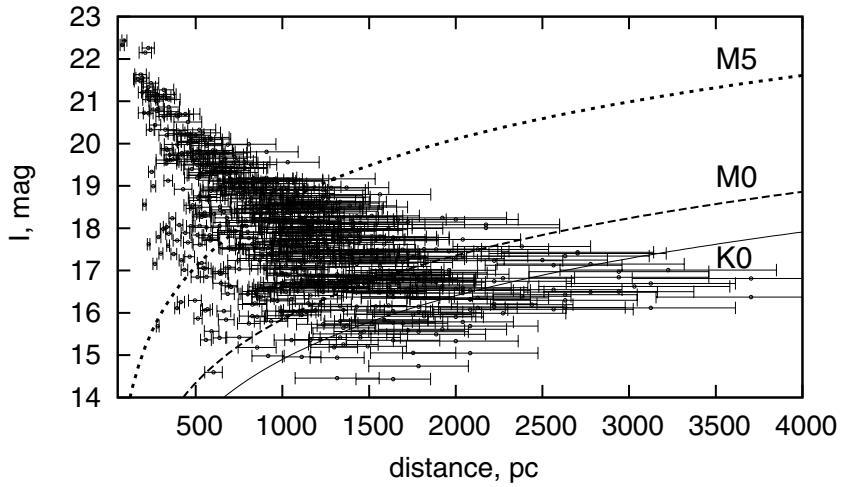

Figure 7: (Lazorenko et al.) Distances and I-band magnitudes of 720 reference stars included in the catalogue that have acceptable astrometric solutions ($\chi^2 < 6$) and well-determined parallaxes ($\varpi/\sigma_\varpi > 5$). Theoretical curves correspond to M5, M0, and K0 main-sequence stars. We are able to determine reliable distances to $I = 15 - 18$ stars out to a distance of $\sim$1–3.5 kpc.

3 Announcements

Habitable Zone Gallery upgrade

Stephen R. Kane[1] *& Dawn M. Gelino*[2]

[1] Department of Physics & Astronomy, San Francisco State University, 1600 Holloway Avenue, San Francisco, CA 94132, USA
[2] NASA Exoplanet Science Institute, Caltech, MS 100-22, 770 South Wilson Avenue, Pasadena, CA 91125, USA

Announcement of upgrade, Website

The Habitable Zone Gallery (hzgallery.org) is a service to the exoplanet community which provides Habitable Zone information for each of the exoplanetary systems with known planetary orbital parameters. We are pleased to announce the release of significant upgrades to the service to improve both functionality and the scientific content. These include:

- A dedicated "Plots" page with various figures that summarize the current state of Habitable Zone exoplanet discoveries.
- A filter box on the "Gallery" and "Movie" pages so that you can easily locate your favorite planetary system.
- Gallery figures now have planet letter designation labels for individual planetary orbits.
- Movies now include AVI format as well as MPEG-2 and MPEG-4.
- The addition of more than 700 new planets discovered by the Kepler mission.

We welcome feedback and suggestions.

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

Contact: `skane@sfsu.edu,dawn@ipac.caltech.edu`

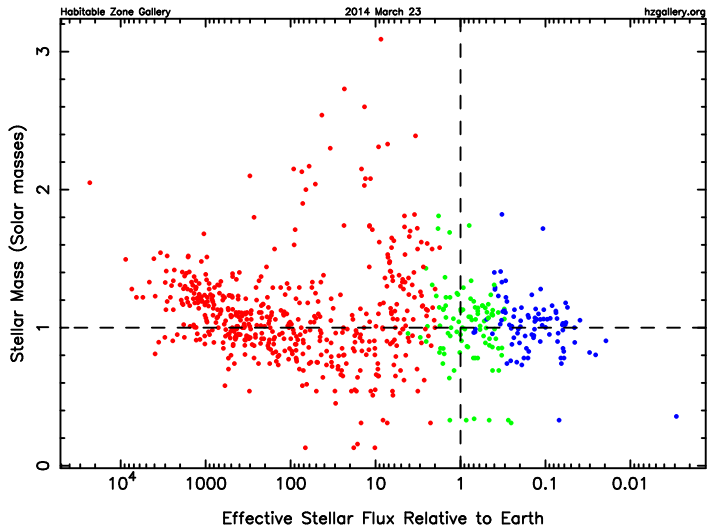

Figure 8: (Kane & Gelino) An example plot from the new plots page which shows the dependence of the effective stellar flux received by the planet on stellar mass. The green points are those planets which spend more than 50% of their orbital phase within the optimistic Habitable Zone. Red and blue points are planets interior and exterior to the Habitable Zone respectively. The dashed crosshairs show the location of Earth.

Exoplanet-Science.com web site

H.M.Relles
Citizen Science, USA

Announcement of resource, Website

Transit Timing Variation (TTV) of Exoplanets & Other Exoplanet Science; KAFO (Kepler Amateur Follow-up Observations) project-related TTVs.

Download/Website: `http://exoplanet-science.com`

Contact: `rellesh@yahoo.com`

4 Jobs and Positions

9 Postdoctoral positions in Swiss-wide exoplanet framework

Universities of Bern, Geneva, Zürich, ETH-Zürich, June 2014 or later

As part of its long-term strategic interest in exoplanet science, the government of Switzerland has awarded funding to a network of universities and research groups to create a Swiss-wide research framework known as "PlanetS". The scope of the framework is broad (see http://adonis.unibe.ch/planets/) and includes planet origin, evolution and characterization, considering both the Solar System and exoplanets, in theory, observation and instrumentation. The program, led by Prof. Willy Benz (University of Bern) and Prof. Stéphane Udry (University of Geneva), is divided in seven research areas:

1. Circumstellar discs and planetary systems, Prof. Michael Meyer, ETHZ, `MMeyer@phys.ethz.ch`
2. Origins and Evolution of volatiles in planets, Prof. Maria Schönbächler, ETHZ, `MariaSc@ethz.ch`
3. Atmospheres of Exoplanets, Prof. Francesco Pepe, University of Geneva, `Francesco.Pepe@unige.ch`
4. Solar system data analysis, laboratory investigations, and modelling, Prof. Nicolas Thomas, University of Bern, `Nicolas.Thomas@space.unibe.ch`
5. Planet formation and evolution, Prof. Willy Benz, University of Bern, `Willy.Benz@space.unibe.ch`
6. Numerical laboratory for planet formation, Prof. Ben Moore, University of Zürich, `Moore@physik.uzh.ch`, `LMayer@physik.uzh.ch`
7. Multi-faceted determination of planet properties and system architecture, Prof. Stéphane Udry, University of Geneva, `Stephane.Udry@unige.ch`

In order to support these research projects, the following postdoc positions are offered in the following topics:

- Exoplanetary atmosphere modelling and interpretation (project 3, University of Geneva)
- Formation and evolution of planetary system architecture (project 7, University of Geneva)
- Ground-based search for transiting Neptunes with NGTS (Next Generation Transit Search, project 7, University of Geneva)
- Exoplanet imaging using extreme adaptive optics (project 7, University of Geneva)

- Coupling planet formation models and hydrodynamical disk models (project 5, University of Bern)
- Study of the dynamics of terrestrial planetary interior - chemical coupling with the atmosphere (project 5, ETHZ and University of Bern)
- Study of planetary and/or cometary surfaces through analysis of imaging data (project 4, University of Bern)
- Hydrodynamic simulations of proto-planetary disks and the formation of gas giant planets (project 6, University of Zürich)
- N-body simulations and theoretical models of the formation of Earth-like planets (project 6, University of Zürich)

More details on these positions can be found on http://www.exoplanets.ch/vacancies/

Interested applicants should contact the respective project leaders and send (in a single pdf) a curriculum vitae and a list of publications, a one page motivation letter, a 2-page research statement describing past achievements and future projects. Also please arrange for letters of references (pdf) to be e-mailed to the project leaders and indicate contact details of up to 3 reference persons.

The length of a postdoc contract is of 2 years, with possible extension to a third year depending on funding. Applicants should be less than 4 years after their PhD at the beginning of the position. Swiss postdoc salaries are extremely competitive (starting at 69,000 CHF a year, commensurable with experience) even considering local costs of living and are set by standard of local regulations. Complete applications received by May 1st, 2014, will receive full considerations. Past this date, applications will be considered depending on availability.

The starting date of the position is negotiable, and could be as early as June 2014.

Download/Website: `http://adonis.unibe.ch/planets`
Download/Website: `http://www.exoplanets.ch/vacancies/`
Download/Website: `http://space.unibe.ch/open-positions.html`
Download/Website: `http://space.unibe.ch/pig/open-positions.html`
Contact: `see the different positions and relevant project leaders`

Adaptive optics specialist or optical engineer

NCCR PlanetS project 3: Atmospheres of Exoplanets

University of Geneva, June 2014 or later

We search for an adaptive optics specialist or optical engineer for the development of a modular IR-AO system for the high-efficiency coupling of stellar light into a fiber-fed spectrograph. The person shall also participate in the definition, organization and implementation of a technology platform for the exchange of information and know-how in the domain of astronomical instrumentation and components between astronomical institutes, industry and technical universities.

The length of the contract is initially of 4 years, with possible extension depending on funding and performances. Swiss salaries are extremely competitive (between 90,000 and 110,000 CHF a year) even considering local costs of living and are set by standard of local regulations.

Interested applicants should contact the project leaders and send their CV (including professional experiences), a one page motivation letter, the contact details of three reference persons, as well as the notes obtained at the Master level. Complete applications received by May 1st, 2014, will receive full consideration. Past this date, applications will be considered depending on availability.

Download/Website: `http://adonis.unibe.ch/planets`
Download/Website: `http://www.exoplanets.ch/vacancies/`
Contact: `Francesco.Pepe@unige.ch, Francois.Wildi@unige.ch`

Programmer analyst for DACE

NCCR PlanetS DACE platform

University of Geneva, June 2014 or later

DACE (Data and Analysis Center for Exoplanets) is a platform to store, exchange and visualise astronomical data collected from different instruments in the exoplanet research domain. This platform provides visualisation tools through web access to help astronomers in their research. It is funded by the National Center of Competence in Research (NCCR) and is a swiss-level project with european collaborations. The website is available at: https://dace.unige.ch.

The successful applicant will be working at the the department of astronomy of the University of Geneva (Geneva observatory) in a team of computer scientists and astronomers.

Your responsibilities include:

- Participate in the development of the DACE web site front-end.
- Implement analysis algorithms on the client side by using and/or modifying Javascript and jQuery libraries.
- Optionally you will participate in the design and discussions related to the database design and maintenance.

Your minimum profile:

- HES Master degree or equivalent in Computer Science.
- Previous experience with dynamic web site development.
- Strong knowledge and experience with HTML, CSS, PHP, Javascript and jQuery
- Good knowledge in object-oriented programming.
- Professional working proficiency level (ILR Level 3).
- Experience with Relational DBMS and Java Programming Language is a plus.
- A good team spirit.

The length of the contract is initially of 2 years, with possible extension depending on funding and performances. Swiss salaries are extremely competitive (starting at 85,000 CHF a year, commensurable with experience) even considering local costs of living and are set by standard of local regulations. The starting date of the position is negotiable, and could be as early as June 2014.

Interested applicants should contact the project leader and send their CV (including professional experiences), a one page motivation letter and some examples of web sites in the development of which they have participated. Complete applications received by May 1st, 2014, will receive full consideration. Past this date, applications will be considered depending on availability.

Download/Website: `http://adonis.unibe.ch/planets`
Download/Website: `http://www.exoplanets.ch/vacancies/`
Download/Website: `https://dace.unige.ch`
Contact: `Damien.Segransan@unige.ch`

7 PhD positions in Swiss-wide exoplanet framework

Universities of Bern, Geneva, Zürich, ETH-Zürich, June 2014 or later

As part of its long-term strategic interest in exoplanet science, the government of Switzerland has awarded funding to a network of universities and research groups to create a Swiss-wide research framework known as "PlanetS". The scope of the framework is broad (see http://adonis.unibe.ch/planets/) and includes planet origin, evolution and characterization, considering both the Solar System and exoplanets, in theory, observation and instrumentation. The program, led by Prof. Willy Benz (University of Bern) and Prof. Stéphane Udry (University of Geneva), is divided in seven research areas:

1. Circumstellar discs and planetary systems, Prof. Michael Meyer, ETHZ, `MMeyer@phys.ethz.ch`
2. Origins and Evolution of volatiles in planets, Prof. Maria Schönbächler, ETHZ, `MariaSc@ethz.ch`
3. Atmospheres of Exoplanets, Prof. Francesco Pepe, University of Geneva, `Francesco.Pepe@unige.ch`
4. Solar system data analysis, laboratory investigations, and modelling, Prof. Nicolas Thomas, University of Bern, `Nicolas.Thomas@space.unibe.ch`
5. Planet formation and evolution, Prof. Willy Benz, University of Bern, `Willy.Benz@space.unibe.ch`
6. Numerical laboratory for planet formation, Prof. Ben Moore, University of Zürich, `Moore@physik.uzh.ch`, `LMayer@physik.uzh.ch`
7. Multi-faceted determination of planet properties and system architecture, Prof. Stéphane Udry, University of Geneva, `Stephane.Udry@unige.ch`

In order to support these research projects, the following PhD positions are offered in the following topics:

- Adaptive optics for high-resolution spectroscopy (project 3, University of Geneva)
- Exoplanetary atmosphere: observations and theory (projects 3 and 5, Universities of Geneva and Bern).
- Planetary system statistical properties: model versus observations (project 5 and 7, Universities of Bern and Geneva)
- Exoplanet detection using space and ground-based astrometry (project 7, University of Geneva)
- GPU based computation of Nbody effects in planet formation models (projects 5 and 6, Universities of Bern and Zürich)
- Reduction, analysis and modeling of remote-sensing data from interplanetary missions (Project 4, University of Bern)

- Theoretical and numerical models of the formation of planetary systems (project 6, University of Zürich)

More details on these positions can be found on http://www.exoplanets.ch/vacancies/

Interested applicants should contact the respective project leaders and send within a single pdf file their curriculum (including professional experience), a one page motivation letter, the contact details of up to three reference persons, and the notes obtained at the Master level. Complete applications received by May 1st, 2014, will receive full considerations. Past this date, applications will be considered depending on availability.

A PhD position is funded for 4 years. A Swiss salary for a PhD candidate is about 50,000 CHF a year. The starting date of the position is negotiable, and could be as early as June 2014.

Download/Website: `http://adonis.unibe.ch/planets`
Download/Website: `http://www.exoplanets.ch/vacancies/`
Download/Website: `http://space.unibe.ch/open-positions.html`
Download/Website: `http://space.unibe.ch/pig/open-positions.html`
Contact: `see the different positions and relevant project leaders`

Postdoctoral position: Impact of stellar granulation and magnetic activity on the detectability of Earth-like exoplanets

SNF grant: Exploring exoplanets with cutting-edge spectroscopy

University of Geneva, August 2014 or later

Applications are invited for a postdoctoral research position on stellar granulation and magnetic activity in the context of exoplanet detection at the University of Geneva (Geneva Observatory). The successful applicant is expected to carry out a research program on the characterization of stellar granulation and magnetic activity phenomena in high-resolution spectra of cool stars. The goal is to improve our knowledge and understanding of the spectral signatures caused by the variable nature of stellar photospheres, and derive strategies to disentangle stellar and planetary signals in precise radial velocity observations. The successful applicant will have access to high-precision spectroscopic time series from the HARPS and HARPS-N instruments, and will contribute to the preparation of the ESPRESSO scientific program aiming at detecting Earth-like exoplanets.

The length of a postdoc contract is of 2 years, with possible extension depending on funding. Applicants should have a PhD in astrophysics and have previous experience with stellar atmosphere modeling and spectral synthesis. Swiss postdoc salaries are extremely competitive (starting at 69,000 CHF a year, commensurable with experience) even considering local costs of living and are set by standard of local regulations. Complete applications received by May 1st, 2014, will receive full considerations. Past this date, applications will be considered depending on availability. The starting date of the position is negotiable, and could be as early as August 2014.

Interested applicants should contact the respective project leaders and send (in a single pdf) a curriculum vitae and a list of publications, a one page motivation letter, a short research statement describing past achievements and future projects. Also please arrange for letters of references (pdf) to be e-mailed to the project leaders and indicate contact details of up to 3 reference persons.

Download/Website: `http://www.exoplanets.ch/`
Contact: `Christophe.Lovis@unige.ch, Francesco.Pepe@unige.ch`

5 Conference announcements

2014 Sagan Summer Workshop: Imaging Planets and Disks

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

Pasadena, CA, July 20-25, 2014

Registration for the 2014 Sagan Exoplanet Summer Workshop on "Imaging Planets and Disks" hosted by the NASA Exoplanet Science Institute (NExScI) is now available. The workshop will take place on the Caltech campus July 20 - 25, 2014. The workshop is intended for graduate students and postdocs, however all interested parties are welcome to attend.

The 2014 workshop will explore current techniques and technology used to image exoplanets and debris disks, as well as the underlying science driving the modeling of exoplanetary atmospheres and disk structure. Leaders in the field will summarize the current state of the art in science, hardware, and software for both ground and space-based missions and data. Prospects for future space instruments will also be discussed. Attendees will participate in hands-on exercises to gain experience working with imaging data, astrophysical models, and instrument design. Attendees will also have the opportunity to present their own work through short presentations (research POPs) and posters. The online submission site for POPs and posters will be available on April 2; plesae check the workshop website for more information.

Important Dates

- April 2: POP/Poster submission page on-line
- June 20: Early on-line registration ends
- July 4: POP/Poster Submission deadline and hotel registration deadline to be eligible for group rate
- July 11: On-line registration closed and final agenda posted
- July 20: Sagan Exoplanet Summer Workshop Opening Reception
- July 21-25: 2014 Sagan Exoplanet Summer Workshop

Download/Website: `http://nexsci.caltech.edu/workshop/2014`
Contact: `sagan_workshop@ipac.caltech.edu`

The Second Workshop on Precise Radial Velocities

Debra Fischer
Yale University

Yale University, New Haven, CT, July 6 – 8, 2015

This meeting follows up the successful 2010 Penn State workshop: "Astronomy of Exoplanets with Precise Radial Velocities." The community has worked hard to reach 1 m/s precision. However, we need new solutions to measure masses of rocky planets around nearby stars. The detection of near Earth analogs will require an increase in Doppler measurement precision to at least 0.1 m/s. The challenges that will be addressed at this meeting include: engineering design of the instrument, wavelength calibration, coupling of light into the spectrometer, understanding and extracting signals from the stellar photosphere, robust data mining techniques to extract weak signals.

Download/Website: `http://exoplanets.astro.yale.edu/workshop/EPRV.php`

Contact: `debra.fischer@yale.edu`

The outer regions of extrasolar planetary systems: Symposium 2 at EWASS 2014

T. Henning, A-M. Lagrange, M. Meyer, C. Moutou, J. Sahlmann (co-chair), D. Ségransan (co-chair), A. Sozzetti
SOC of S2 Symposium at EWASS2014

Geneva, Switzerland, July 3rd – 4th, 2014

Abstract submission to this Symposium that is part of the European Week of Astronomy and Space Science 2014 is open. The symposium sessions will blend invited overview presentations with contributed talks, of which we expect to schedule approximately 10, and there will be time reserved for discussion. There is also the possibility of contributing with a poster.
The aim of this 2-day symposium is to discuss our current knowledge of the outer regions of exoplanetary systems and to foresee the advances of this field in the near future. It will address the following topics and questions: What are the planet formation scenarios in the outer regions? How do outer-zone planets influence close-in planets and what are the observable signatures of these (dynamical) interactions? What do we know about planets in the intermediate and outer zones from observations? What results can we expect from the upcoming large surveys that are specially sensitive to outer-zone planets, e.g. Gaia astrometry of nearby stars, the new generation of exoplanet imagers on very large telescopes, and other future projects and missions? How can we synthesize observational and theoretical/simulation results to obtain a global picture of the outer exoplanet population in the solar neighbourhood? The deadline for abstract submission is Tuesday, April 8, 2014 (late submissions may be considered).

Download/Website: `http://eas.unige.ch/EWASS2014/program.jsp`

Contact: `exoplanetsewass2014@unige.ch`

Abstract submission reminder: UK NAM 2014 Exoplanet Sessions on Atmospheres and Instrumentation

Joanna Barstow[1], *Enzo Pascale*[2]

[1] Department of Physics, University of Oxford, Keble Road, Oxford, OX1 3RH, UK
[2] School of Physics and Astronomy, Cardiff University, Queens' Buildings, The Parade, Cardiff, CF24 3AA

Portsmouth, 23rd—26th June 2014

This is a reminder that the abstract submission deadline for NAM is tomorrow (April 1st 2014), and we would like to remind you of two sessions related to exoplanet science. You can submit abstracts online and view the preliminary programme at http://www.nam2014.org/

There will be a session on Atmospheres and Aurorae of Planets and Brown Dwarfs. The session will bring together astronomers from the brown dwarf, exoplanet and solar system fields to discuss scientific comparisons of both brown dwarfs and planets, and to promote synergy of spectral modelling techniques from the data-led Bayesian and Optimal Estimation approaches developed for solar system planetary science to the physically detailed *ab initio* models that have evolved from stellar physics. These methods are highly complementary, and so we hope that this session will enable the community to discuss ways of combining the approaches. In addition, we hope to discuss the implications of new exoplanet and brown dwarf science for the studies of solar system atmospheres and magnetospheres.

We would also like to draw your attention to the session on Future Instruments for Exoplanet Characterisation. The goal of this parallel session is to review the UK observational and instrumentation effort with facilities that will become available in the medium term from the ground and from space (eELT, JWST, Cheops and PLATO), and with PI instrumentation. The UK astronomical community has an international leading role in the field, with activities going from detection, to atmosphere characterization and planet formation studies. With more than 1,000 confirmed exoplanets to date and thousands more expected in the near future, the field will continue its exponential growth.

Many thanks,

Joanna Barstow, Sarah Casewell, Gabby Provan and Ben Burningham - Atmospheres session

Enzo Pascale, Neil Bowles, Paul Ecclestone, Bruce Swinyard, Giovanna Tinetti and Gillian Wright - Instrumentation session

Contact: jo.barstow@astro.ox.ac.uk, enzo.pascale@astro.cf.ac.uk

6 As seen on astro-ph

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

astro-ph/1403.0086 : **Planetary Transit Candidates in the CSTAR Field: Analysis of the 2008 Data** by *Songhu Wang, et al.*

astro-ph/1403.0121 : **Pseudo 2D chemical model of hot Jupiter atmospheres: application to HD 209458b and HD 189733b** by *Marcelino Agundez, et al.*

astro-ph/1403.0168 : **A New Hypothesis On The Origin and Formation of The Solar And Extrasolar Planetary Systems** by *Lihong Yao*

astro-ph/1403.0357 : **Generation of an optimal target list for the Exoplanet Characterisation Observatory (EChO)** by *Ryan Varley, et al.*

astro-ph/1403.0390 : **Complex organic molecules in protoplanetary disks** by *Catherine Walsh, et al.*

astro-ph/1403.0430 : **Bayesian search for low-mass planets around nearby M dwarfs. Estimates for occurrence rate based on global detectability statistics** by *Mikko Tuomi, et al.*

astro-ph/1403.0560 : **Magellan Adaptive Optics first-light observations of the exoplanet β Pic b. I. Direct imaging in the far-red optical with MagAO+VisAO and in the near-IR with NICI** by *Jared R. Males, et al.*

astro-ph/1403.0586 : **Ground-based detection of the near-infrared emission from the dayside of WASP-5b** by *Guo Chen et al.*

astro-ph/1403.0652 : **Planets in Spin-Orbit Misalignment and the Search for Stellar Companions** by *Brett C. Addison, et al.*

astro-ph/1403.0905 : **A Low-order Model of Water Vapor, Clouds, and Thermal Emission for Tidally Locked Terrestrial Planets** by *Jun Yang, Dorian S. Abbot*

astro-ph/1403.1032 : **Reevaluating of the feasibility of ground-based earth-mass microlensing planet detections** by *Youn Kil Jung, et al.*

astro-ph/1403.1266 : **Atmospheric Characterization of 5 Hot Jupiters with Wide Field Camera 3 on the Hubble Space Telescope** by *Sukrit Ranjan, et al.*

astro-ph/1403.1275 : **Astrometric planet search around southern ultracool dwarfs I: First results, including parallaxes of 20 M8-L2 dwarfs** by *J. Sahlmann, et al.*

astro-ph/1403.1330 : **Detection of planets in extremely weak central perturbation microlensing events via next-generation ground-based surveys** by *Sun-Ju Chung, Chung-Uk Lee, Jae-Rim Koo*

astro-ph/1403.1372 : **Kepler-9 revisited 60% the mass with six times more data** by *Stefan Dreizler, Aviv Ofir*

astro-ph/1403.1463 : **Spiral arms in the disk of HD 142527 from CO emission lines with ALMA** by *Valentin Christiaens et al.*

astro-ph/1403.1587 : **Diversity in the outcome of dust radial drift in protoplanetary discs** by *Christophe Pinte, Guillaume Laibe*

astro-ph/1403.1672 : **OGLE-2012-BLG-0455/MOA-2012-BLG-206: Microlensing event with ambiguity in planetary interpretations caused by incomplete coverage of planetary signal** by *H. Park, et al.*

astro-ph/1403.1780 : **Transit Search from Antarctica and Chile - Comparison and Combination** by *T. Fruth, et al.*

astro-ph/1403.1813 : **Core-assisted gas capture instability: a new mode of giant planet formation by gravitationally unstable discs** by *Sergei Nayakshin, Ravit Helled, Aaron C. Boley*

astro-ph/1403.1870 : **Planets on the Edge** by *Francesca Valsecchi, Frederic A. Rasio*

astro-ph/1403.1879 : **Multiwavelength Observations of the Candidate Disintegrating sub-Mercury KIC 12557548b** by *Bryce Croll, et al.*

astro-ph/1403.1895 : **TTVFast: An efficient and accurate code for transit timing inversion problems** by *Katherine M. Deck, et al.*

astro-ph/1403.2134 : **MOA-2013-BLG-220Lb: Planetary Companion to a Possible Brown Dwarf Host** by *J.C. Yee, et al.*

astro-ph/1403.2143 : **Atmospheric Circulation of Brown Dwarfs: Jets, Vortices, and Time Variability** by *Xi Zhang, Adam P. Showman*

astro-ph/1403.2379 : **A Study of the Shortest-Period Planets Found With Kepler** by *Roberto Sanchis-Ojeda, et al.*

astro-ph/1403.2539 : **Asymmetric fundamental band CO lines as a sign of an embedded giant planet** by *Zs. Regaly, S. Kiraly, L. L. Kiss*

astro-ph/1403.2713 : **Abiotic oxygen-dominated atmospheres on terrestrial habitable zone planets** by *Robin Wordsworth, Raymond Pierrehumbert*

astro-ph/1403.2723 : **Ground-based transit observations of the super-Earth GJ 1214b** by *Claudio Caceres, et al.*

astro-ph/1403.2874 : **A new look at Spitzer primary transit observations of the exoplanet HD189733b** by *Giuseppe Morello, et al.*

astro-ph/1403.3056 : **Stellar Scattering and the Formation of Hot-Jupiters in Binary Systems** by *J. G. Martí, C. Beaugé*

astro-ph/1403.3238 : **Kepler-210: An active star with at least two planets** by *P. Ioannidis, et al.*
astro-ph/1403.3487 : **The Stagger-grid: A grid of 3D stellar atmosphere models - IV. Limb darkening coefficients** by *Zazralt Magic, et al.*
astro-ph/1403.3732 : **Global evolution of the magnetic field in a thin disc and its consequences for protoplanetary systems** by *Jerome Guilet, Gordon I. Ogilvie*
astro-ph/1403.4095 : **A Window on Exoplanet Dynamical Histories: Rossiter-McLaughlin Observations of WASP-13b and WASP-32b** by *R. D. Brothwell, et al.*
astro-ph/1403.4420 : **Disk evolution, element abundances and cloud properties of young gas giant planets** by *Ch.Helling et al.*
astro-ph/1403.4436 : **Exploring the Diversity of Jupiter-Class Planets (Discussion Meeting Contribution)** by *Leigh N. Fletcher, et al.*
astro-ph/1403.4602 : **Hubble Space Telescope Near-IR Transmission Spectroscopy of the Super-Earth HD 97658b** by *Heather A. Knutson, et al.*
astro-ph/1403.4619 : **Astrometric planet search around southern ultracool dwarfs II: Astrometric reduction methods and a deep astrometric catalogue** by *P.F. Lazorenko, et al.*
astro-ph/1403.4809 : **The Mt John University Observatory Search For Earth-mass Planets In The Habitable Zone Of Alpha Centauri** by *M. Endl, et al.*
astro-ph/1403.4936 : **Predictions for Microlensing Planetary Events from Core Accretion Theory** by *Wei Zhu et al.*
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