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1 Editorial

Welcome to the nineteenth edition of ExoPlanet News, an electronic newsletter reporting the latest developments and research outputs in the field of exoplanets.

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. As ever, we rely on you, the subscribers of the newsletter, to send us your abstracts of recent papers, conference announcements, thesis abstracts, job adverts etc for each edition.

Apologies that, in the call for submissions to this edition, we forgot to remind you that we intended to experiment with the inclusion of ONE figure per abstract. We’ll try this again next time! So, if you wish to do so, please include a figure caption at the end of your abstract and append a single Encapsulated Postscript file (.eps) of your figure. Please send anything relevant to exoplanet@open.ac.uk, and it will appear in the next edition which we plan to send out at the beginning of July 2009.

Best wishes
Andrew Norton & Glenn White
The Open University

2 Abstracts of refereed papers

Is Beta Pic b the transiting planet of November 1981?

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In 1981, $\beta$ Pictoris showed strong and rapid photometric variations that were attributed to the transit of a giant comet or a planet orbiting at several AUs. Recently, a candidate planet has been identified by imagery in the circumstellar disk of $\beta$ Pictoris (Lagrange et al. 2009). This planet, named $\beta$ Pic b, is observed at a projected distance of 8 AU from the central star. It is therefore a plausible candidate for the photometric event observed in 1981. The coincidence of the observed position of the planet in November 2003 and the calculated position assuming that the 1981 transit is due to a planet orbiting at 8 AU is intriguing. Assuming that the planet that is detected on the image is the same as the object transiting in November 1981, we estimate ranges of possible orbital distances and periods. In the favored scenario, the planet orbits at $\sim$8 AU and was seen close to its quadrature position in the 2003 images. In this case, most of the uncertainties are related to error bars on the position in 2003. Uncertainties related to the stellar mass and orbital eccentricity are also discussed. We find a semi-major axis in the range [7.6 - 8.7] AU and an orbital period in the range [15.9 - 19.5] years. We give predictions for imaging observations at quadrature in the southwest branch of the disk in future years (2011-2015). We also estimate possible dates for the next transits and anti-transits.

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Dynamics of the TrES-2 system

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Astronomische Nachrichten, published (arXiv:0905.1806)

The TrES-2 system harbors one planet which was discovered with the transit technique. In this work we investigate the dynamical behavior of possible additional, lower-mass planets. We identify the regions where such planets can move on stable orbits and show how they depend on the initial eccentricity and inclination. We find, that there are stable regions inside and outside the orbit of TrES-2b where additional, smaller planets can move. We also show that those planets can have a large orbital inclination which makes a detection with the transit technique very difficult.

Download/Website: http://www.astro.uni-jena.de/Observations/gsh/gsh.papers.htm
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A possible architecture of the planetary system HR 8799

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Astronomy & Astrophysics, accepted (arXiv:0905.4688)

HR8799 is a nearby A-type star with a debris disk and three planetary candidates recently imaged directly. We undertake a coherent analysis of various portions of observational data on all known components of the system, including the central star, imaged companions, and dust. The goal is to elucidate the architecture and evolutionary status of the system. We try to further constrain the age and orientation of the system, orbits and masses of the companions, as well as the location of dust. From the high luminosity of debris dust and dynamical constraints, we argue for a rather young system’s age of < 50 Myr. The system must be seen nearly, but not exactly, pole-on. Our analysis of the stellar rotational velocity yields an inclination of 13 – 30°, whereas i > 20° is needed for the system to be dynamically stable, which suggests a probable inclination range of 20 – 30°. The spectral energy distribution, including the Spitzer/IRS spectrum in the mid-infrared as well as IRAS, ISO, JCMT and IRAM observations, is naturally reproduced with two dust rings associated with two planetesimal belts. The inner “asteroid belt” is located at ∼ 10 AU inside the orbit of the innermost companion and a “Kuiper belt” at > 100 AU is just exterior to the orbit of the outermost companion. The dust masses in the inner and outer ring are estimated to be ≈ 1 x 10⁻⁵ and 4 x 10⁻² Earth masses, respectively. We show that all three planetary candidates may be stable in the mass range suggested in the discovery paper by Marois et al. 2008 (between 5 and 13 Jupiter masses), but only for some of all possible orientations. For (Mₗₜ, M₃ₗₜ, M₄ₗₜ) = (5, 7, 7) Jupiter masses, an inclination i > 20° is required and the line of nodes of the system’s symmetry plane on the sky must lie within 0° to 50° from north eastward. For higher masses (Mₗₜ, M₃ₗₜ, M₄ₗₜ) from (7, 10, 10) to (11, 13, 13), the constraints on both angles are even more stringent. Stable orbits imply a double (4:2:1) mean-motion resonance between all three companions. We finally show that in the cases where the companions themselves are orbitally stable, the dust-producing planetesimal belts are also stable against planetary perturbations.

Download/Website: http://arxiv.org/abs/0905.4688
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X-Ray and Infrared Observations of Two Externally Polluted white Dwarfs
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3 Leicester


With XMM-Newton and the Spitzer Space Telescope, we obtain upper bounds to the X-ray fluxes from G29-38 and GD 362, and the 70 µm flux from G29-38. These data provide indirect evidence that G29-38 is accreting from a tidally disrupted asteroid: it is neither accreting large amounts of hydrogen and helium nor is its surrounding dusty disk being replenished from a reservoir of cold grains experiencing Poynting-Robertson drag. The upper bound to the X-ray flux from GD 362 is consistent with the estimated rate of mass accretion required to explain its pollution by elements heavier than helium. GD 362 also possesses 0.01 M⊙ of hydrogen, an anomalously large amount for a white dwarf with a helium-dominated atmosphere. One possibility is that before the current disk was formed, this hydrogen was accreted from either ∼100 Ceres-like asteroids or one large object. An alternative scenario which simultaneously explains all of GD 362’s distinctive properties is that we are witnessing the consequences of the tidal-destruction of a single parent body that had internal water and was at least as massive as Callisto and probably as massive as Mars.

Download/Website: http://lanl.arxiv.org/pdf/0905.0117
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Planetary transit observations at the University Observatory Jena: XO-1b and TrES-1
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AN, accepted (arXiv:0905.1833)

We report on observations of transit events of the transiting planets XO-1b and TrES-1 with a 25 cm telescope of the University Observatory Jena. With the transit timings for XO-1b from all 50 available XO, SuperWASP, Transit Light Curve (TLC)-Project- and Exoplanet Transit Database (ETD)-data, including our own I-band photometry obtained in March 2007, we find that the orbital period is \( P = (3.941501 \pm 0.000001) \) d, a slight change by ∼3 s compared to the previously published period. We present new ephemeris for this transiting planet. Furthermore, we present new R-band photometry of two transits of TrES-1. With the help of all available transit times from literature this allows us to refine the estimate of the orbital period: \( P = (3.0300722 \pm 0.0000002) \) d. Our observations will be useful for future investigations of timing variations caused by additional perturbing planets and/or stellar spots and/or moons.

Download/Website: http://arxiv.org/abs/0905.1833
Contact: straetz@astro.uni-jena.de
Planetary transit observations at the University Observatory Jena: TrES-2

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AN, accepted (arXiv:0905.1842)

We report on observations of several transit events of the transiting planet TrES-2 obtained with the Cassegrain-Teleskop-Kamera at the University Observatory Jena. Between March 2007 and November 2008 ten different transits and almost a complete orbital period were observed. Overall, in 40 nights of observation 4291 exposures (in total 71.52 h of observation) of the TrES-2 parent star were taken. With the transit timings for TrES-2 from the 34 events published by the TrES-network, the Transit Light Curve project and the Exoplanet Transit Database plus our own ten transits, we find that the orbital period is \( P = (2.470614 \pm 0.000001) \) d, a slight change by \( \sim 0.6 \) s compared to the previously published period. We present new ephemeris for this transiting planet. Furthermore, we found a second dip after the transit which could either be due to a blended variable star or occultation of a second star or even an additional object in the system.

Our observations will be useful for future investigations of timing variations caused by additional perturbing planets and/or stellar spots and/or moons.

Download/Website: http://arxiv.org/abs/0905.1842

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Planet-planet scattering in planetesimal disks

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We study the final architecture of planetary systems that evolve under the combined effects of planet-planet and planetesimal scattering. Using N-body simulations we investigate the dynamics of marginally unstable systems of gas and ice giants both in isolation and when the planets form interior to a planetesimal belt. The unstable isolated systems evolve under planet-planet scattering to yield an eccentricity distribution that matches that observed for extrasolar planets. When planetesimals are included the outcome depends upon the total mass of the planets. For \( M_{\text{tot}} > 1 M_J \), the final eccentricity distribution remains broad, whereas for \( M_{\text{tot}} < 1 M_J \) a combination of divergent orbital evolution and recircularization of scattered planets results in a preponderance of nearly circular final orbits. We also study the fate of marginally stable multiple planet systems in the presence of planetesimal disks, and find that for high planet masses the majority of such systems evolve into resonance. A significant fraction lead to resonant chains that are planetary analogs of Jupiter’s Galilean satellites. We predict that a transition from eccentric to near-circular orbits will be observed once extrasolar planet surveys detect sub-Jovian mass planets at orbital radii of \( a \approx 5 – 10 \) AU.

Download/Website: http://arxiv.org/abs/0905.3741

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The role of cluster evolution in disrupting planetary systems and disks: the Kozai mechanism

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We examine the effects of dynamical evolution in clusters on planetary systems or protoplanetary disks orbiting the components of binary stars. In particular, we look for evidence that the companions of host stars of planetary systems or disks could have their inclination angles raised from zero to between the threshold angles (39.23° and 140.77°) that can induce the Kozai mechanism. We find that up to 20 per cent of binary systems have their inclination angles increased to within the threshold range. Given that half of all extrasolar planets could be in binary systems, we suggest that up to 10 per cent of extrasolar planets could be affected by this mechanism.

Download/Website: http://arxiv.org/abs/0905.0815
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The sub-Jupiter mass transiting exoplanet WASP-11b


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We report the discovery of a sub-Jupiter mass exoplanet transiting a magnitude V = 11.6 host star 1SWASP J030928.54+304024.7. A simultaneous fit to the transit photometry and radial-velocity measurements yield a planet mass $M_p = 0.53 \pm 0.07 M_J$, radius $R_p = 0.91^{+0.06}_{-0.03} R_J$ and an orbital period of $3.722465^{+0.000006}_{-0.000009}$ days. The host star is an early to mid-K dwarf, with a spectral analysis yielding an effective temperature of $4800 \pm 100$ K and $\log g = 4.45 \pm 0.2$. It is amongst the smallest, least massive and lowest luminosity stars known to harbour a transiting exoplanet. WASP-11b is the third least strongly irradiated transiting exoplanet discovered to date, experiencing an incident flux $F_p = 1.9 \times 10^8$ erg s$^{-1}$ cm$^{-2}$ and having an equilibrium temperature $T_{eq} = 960 \pm 70$ K.

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Precessing planetary magnetospheres in SiO stars? First detection of quasi-periodic polarization fluctuations in R Leonis and V Camelopardalis

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Context: The origin of magnetism around asymptotic giant branch (AGB) stars remains an uncertainty. These stars may drive an important dynamo, but if the magnetic energy dissipates entirely into X-rays, the observed X-ray luminosities are too low to maintain a strong, dynamically important global field. Other explanations of the circular polarization in SiO masers in AGB atmospheres may thus be required. Aims: The interaction of the AGB wind with both previously ejected matter and planets is expected to produce complex magnetohydrodynamic phenomena on a short timescale, such that strong magnetic fields can be maintained locally. Here, we provide observational evidence of the corresponding magnetic fluctuations. Methods: We use the circular polarization of the $v = 1, J = 2 - 1$ SiO masers as a tracer of magnetic activity. A correlation polarimeter allows us to record simultaneously all Stokes parameters. An SiO maser survey of 80 AGB stars was performed from which eight sources of the strongest circular polarization were selected for further monitoring. Results: In two AGB stars, V Cam and R Leo, we find evidence of pseudo-periodic fluctuations in the fractional circular polarization on a timescale of a few hours, from which we infer magnetic fluctuations of $\sim 1$ G. The phenomenon is rare and, if detected in an SiO star, restricted to a narrow range of velocities. It seems to be associated with planetary wake flows suggested by VLBI maps. Conclusions: While scenarios involving magnetic activity in the extended stellar atmosphere have problems explaining all observed features, precessing Jovian magnetospheres predict all of them without difficulty. For the case of R Leo, we constrain the orbit of the planet (estimated period 5.2 years), derive a stellar mass estimate of $0.7 M_\odot$ from it, and discuss the impact of planetary magnetism on the survival of planets. Smooth velocity variations in the fluctuating circular polarization feature are predicted as the planet moves along its orbit.

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The modulation of SiO maser polarization by Jovian planets

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Aims: Searching for planets in the atmosphere of AGB stars is difficult, due to confusion with the stellar wind and pulsations. The aim here is to provide a complementary strategy for planet searches in such a dense environment. Methods: The polarization properties of SiO masers, especially their circular polarization, are, under certain conditions, good tracers of rapid magnetospheric events. A Jovian planet with a magnetosphere whose dipole axis is misaligned with its rotation axis naturally provides such conditions. Here I present several models showing that the polarization will be periodically modulated. Results: The linear and circular polarization of an SiO maser in a planetary magnetosphere is modulated by the precessing dipole component of the latter. The effect is measurable in saturated masers, while unsaturated masers only exhibit weak changes, because of dilution effects, and because the circular polarization there stems from the Zeeman effect making it as weak as for thermal radiation. The situation would change if anisotropic pump- and loss-rates were included, which would increase the fractional linear and, via magnetorotation, the circular polarization of the modulation. Conclusions: Single-dish monitoring with a dense enough time sampling and a carefully calibrated polarimeter, in combination with VLBI observations, are suited to
detecting and locating a periodic modulation of the circular maser polarization due to a precessing Jovian magnetosphere. The phenomenon will be rare, because a favorable arrangement of maser and magnetosphere is needed. Otherwise the polarization may be below the detection threshold, especially if the maser is unsaturated. Though exhibiting a qualitatively similar modulation, linear polarization is likely to suffer more from confusion due to dilution of the magnetosphere within the maser cross section, even in VLBI observations.

*Download/Website: http://dx.doi.org/10.1051/0004-6361/200811537*

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### 3 Conference announcements

**Unsinkable planets: telluric planet detection and stellar activity**

*S. Aigrain, F. Pont*  
Astrophysics Group, University of Exeter, UK  

*University of Exeter, 16-18 September 2009*

Telluric planets are now detectable both by radial velocity (high-accuracy Doppler surveys like HARPS) and by photometric transits (wide-field space missions CoRoT and Kepler). In this regime, stellar activity is the major obstacle to planet detection. Star-spots induce semi-periodic fluctuations in radial velocity as well as in photometry, with amplitudes and timescales that overlap with the planet signals. Developing tools to tackle this problem robustly is an imperative if we are to find "unsinkable" telluric planets in the next few years.

The aim of this workshop is to take stock of what we know of stellar activity as an integrated time signal, to estimate its impact on detection limits for transit, radial velocity and astrometry planet searches, and to discuss future developments: how to assign confidence levels to transit candidates in the presence of stellar activity (especially in the context of the CoRoT and Kepler missions), how to separate stellar activity from planetary orbits in radial velocity and astrometry near the instrumental detection limit.

The program will be a mixture of invited and contributed talks with considerable time for discussion. The number of participants will be limited to approximately 30, so please register early (by emailing the address below) if you would like to come. If you would like to give a presentation, please provide a title and brief abstract in your email.

*Download/Website: http://www.astro.ex.ac.uk/esp09*  
*Contact: esp09@astro.ex.ac.uk*

**2009 Sagan Summer Workshop: Exoplanetary Atmospheres**

*Dr. Dawn Gelino on behalf of the SOC: Chas Beichman (NExScI), Dawn Gelino (NExScI), Glenn Orton (JPL), Sara Seager (MIT), Mark Swain (JPL), Wes Traub (JPL)*  
Caltech Campus, Pasadena, California, USA, July 19 - 24, 2009

The 2009 Sagan Summer Workshop, hosted by the NASA Exoplanet Science Institute, will consist of a series of tutorial discussions covering theory and observations of exoplanetary atmospheres. In addition, attendees will have the opportunity to present brief summaries of their research during short research Pops.

*Register by July 10 for the on-line rate!*

*Registration Fee includes: conference attendance and materials; transportation between Pasadena Hilton; and Workshop on Workshop Dates; lunches on Monday, Wednesday and Friday; light breakfast, snacks, and drinks during...*
morning and afternoon breaks each day of the workshop; opening reception; 1 ticket to attend workshop dinner on Thursday (extra tickets available for purchase); and 1 ticket to attend tour to the Griffith Observatory on Wednesday afternoon (extra tickets available for purchase)

Important Dates:
June 18: Hilton Hotel group rate registration deadline;
July 6: Deadline to submit research pops;
July 10: On-line registration deadline.

See the workshop website for more information, current participant list, and the workshop agenda complete with speaker names!

Download/Website: http://nexsci.caltech.edu/workshop/2009/
Contact: sagan_workshop@ipac.caltech.edu

4 As seen on astro-ph

The following list contains all the entries relating to exoplanets that we spotted on astro-ph during May 2009. If you spot any that we missed, please let us know and we’ll include them in the next issue. And of course, the best way to ensure we include your paper is to send us the abstract!

Exoplanets

astro-ph/0905.0565: Tracing the potential planet-forming regions around seven pre-main-sequence stars by A. A. Schegerer, S. Wolf, C. A. Hummel et al
astro-ph/0905.1806: Dynamics of the TrES-2 system by Florian Freistetter, Aron Suli & Barbara Funk
astro-ph/0905.1833: Planetary transit observations at the University Observatory Jena: XO-1b and TrES-1 by St. Raetz, M. Mugrauer, T. O. B. Schmidt et al
astro-ph/0905.2587: Gas accretion by planetary cores by Ben A. Ayliffe & Matthew R. Bate
astro-ph/0905.2597: The role of magnetic fields for planetary formation by Anders Johansen
astro-ph/0905.3115: The 0.5M, transiting exoplanet WASP-13b by I. Skillen, D. Pollacco, A. Collier Cameron et al
astro-ph/0905.3340: Looking for pulsations in HgMm stars through CoRoT lightcurves by A. Ofir, H. J. Deeg & C. H. S. Lucy
astro-ph/0905.3741: **Planet-planet scattering in planetesimal disks** by Sean N. Raymond, Philip J. Armitage & Noel Gorelick

astro-ph/0905.3829: **SPICA infrared coronagraph for the direct observation of exo-planets** by Keigo Enya, for the SPICA working group


astro-ph/0905.4688: **A possible architecture of the planetary system HR 8799** by Martin Reidemeister, Alexander V. Krivov, Tobias O. B. Schmidt et al


**Disks**


astro-ph/0905.2344: **Radiation pressure mixing of large dust grains in protoplanetary disks** by Dejan Vinkovic

astro-ph/0905.2649: **IRS Characterization of a Debris Disk around an M-type star in NGC2547** by Paula S. Teixeira, Charles J. Lada, Kenneth Wood et al


**Instrumentation and Techniques**

astro-ph/0905.0164: **The Subaru Coronagraphic Extreme AO project** by Frantz Martinache, Olivier Guyon, Julien Lozi et al

astro-ph/0905.0167: **Aperture Masking Interferometry for Subaru** by Frantz Martinache, Olivier Guyon & Vincent Garrel

astro-ph/0905.1676: **Shaped pupil design for the Gemini Planet Imager** by Eric Cady, Bruce Macintosh, N. Jeremy Kasdin et al


astro-ph/0905.3062: **An iterative filter to reconstruct planetary transit signals in the presence of stellar variability** by A. Alapini & S. Aigrain


astro-ph/0905.3426: **Characterization of Microlensing Planets with Moderately Wide Separations** by Cheongho Han