ExoPlanet News
An Electronic Newsletter

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Contents

1 Editorial

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

April has been an interesting month in Exoplanet science with the first identification of methane in the atmosphere of an exoplanet, and the report of a host of new transiting exoplanets by the superWASP project. In Europe and the US, the drive towards the next generation of exoplanet focussed space missions continues to advance. Following the success of COROT, AKARI and SPITZER, NASA's KEPLER and ESA's HERSCHEL missions will take a substantial step forward towards the characterisation of rocky Earth-like exoplanets when they are launched toward the end of this year. These advances have now been joined with improved technical solutions that should improve the efficacy of the radial velocity technique from the ground, using a new class of photonic device that should facilitate RV observations to previously unattainable levels that are determined by the microphysics of the photospheres of the host stars.

Remember that past editions of the 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.

Please send anything relevant to exoplanet@open.ac.uk, and it will appear in the next edition which we plan to send out close to the beginning of each calendar month.

Best wishes
Andrew Norton & Glenn White

2 Abstracts of refereed papers

Dust in brown dwarfs and extra-solar planets: I. Chemical composition and spectral appearance of quasi-static cloud layers

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Astronomy & Astrophysics, in press

Brown dwarfs are covered by dust cloud layers which cause inhomogeneous surface features and move below the observable $\tau = 1$ level during the object's evolution. The cloud layers have a strong influence on the structure and spectral appearance of brown dwarfs and extra-solar planets, e.g. by providing high local opacities and by removing condensable elements from the atmosphere causing a sub-solar metalicity in the atmosphere. We aim at understanding the formation of cloud layers in quasi-static substellar atmospheres that consist of dirty grains composed of numerous small islands of different solid condensates.
The time-dependent description is a kinetic model describing nucleation, growth and evaporation. It is extended to treat gravitational settling and is applied to the static-stationary case of substellar model atmospheres. From the solution of the dust moments, we determine the grain size distribution function approximately which, together with the calculated material volume fractions, provides the basis for applying effective medium theory and Mie theory to calculate the opacities of the composite dust grains.
The cloud particles in brown dwarfs and hot giant-gas planets are found to be small in the high atmospheric layers ($a \approx 0.01\,\mu$m), and are composed of a rich mixture of all considered condensates, in particular the abundant

$MgSiO_3$[s], Mg_2SiO_4[s] and SiO_2[s]. As the particles settle downward, they increase in size and reach several $100\,\mu$m in the deepest layers. The more volatile parts of the grains evaporate and the particles stepwise purify to form composite particles of high-temperature condensates in the deeper layers, mainly Fe[s] and Al_2O_3[s]. The gas phase abundances of the elements involved in the dust formation process vary by orders of magnitudes throughout the atmosphere. The grain size distribution is found to be relatively broad in the upper atmospheric layers but strongly peaked in the deeper layers. This reflects the cessation of the nucleation process at intermediate heights. The spectral appearance of the cloud layers in the mid IR ($7-20\,\mu$m) is close to a grey body with only weak broad features of a few percent, mainly caused by $MgSiO_3$[s], and Mg_2SiO_4[s]. These features are, nevertheless, a fingerprint of the dust in the higher atmospheric layers that can be probed by observations.
Our models predict that the gas phase depletion is much weaker than phase-equilibrium calculations in the high atmospheric layers. Because of the low densities, the dust formation process is incomplete there, which results in considerable amounts of left-over elements that might produce stronger and broader neutral metallic lines.

Download/Website: `http://adsabs.harvard.edu/abs/2008arXiv0803.4315H`

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Rayleigh scattering by H_2 in the extrasolar planet HD 209458b

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Institut d'astrophysique de Paris (CNRS/UPMC)

Astronomy & Astrophysics, in press (arxiv/0805.0595)

Transiting planets, such as HD 209458b, offer a unique opportunity to scrutinize the planetary atmospheric content. Although molecular hydrogen is expected to be the main atmospheric constituent, H_2 remains uncovered because of the lack of strong transition from near-ultraviolet to near-infrared. Here we analyse the absorption spectrum of HD 209458b obtained by Sing et al. (2008a) which provides a measurement of the absorption depth in the 3000-6200 Å wavelength range. We show that the rise in absorption depth at short wavelengths can be interpreted as Rayleigh scattering within the atmosphere of HD 209458b. Since Rayleigh scattering traces the entire atmosphere, this detection enables a direct determination of the pressure-altitude relationship, which is required to determine the absolute fraction of other elements such as sodium. At the zero altitude defined by the absorption depth of 1.453%, which corresponds to a planetary radius of 0.1205 times the stellar radius, we find a pressure of 33 ± 5 mbar. Using the variation of the Rayleigh scattering cross-section as a function of wavelength, we determine the temperature to be 2200 ± 260 K at 33 mbar pressure.

Download/Website: `http://arxiv.org/abs/0805.0595`

Contact: `lecaveli@iap.fr`

Ices in Low-Mass Extrasolar Planets

. *Marboeuf*[1,7], *O. Mousis*[1,7], *D. Ehrenreich*[2], *Y. Alibert*[1,3], *A. Cassan*[4,7], *V. Wakelam*[5], *J.-P. Beaulieu*[6,7]
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[7] The HOLMES collaboration

Astrophysical Journal, in press

We study the formation conditions of icy planetesimals in protoplanetary disks in order to determine the composition of ices in small and cold extrasolar planets. Assuming that ices are formed from hydrates, clathrates, and pure condensates, we calculate their mass fractions with respect to the total quantity of ices included in planetesimals, for a grid of disk models. We find that the composition of ices weakly depends on the adopted disk thermodynamic conditions, and is rather influenced by the initial composition of the gas phase. The use of a plausible range of molecular abundance ratios and the variation of the relative elemental carbon over oxygen ratio in the gas phase of protoplanetary disks, allow us to apply our model to a wide range of planetary systems. Our results can thus be used to constrain the icy/volatile phase composition of cold planets evidenced by microlensing surveys, hypothetical ocean-planets and carbon planets, which could be detected by Corot or Kepler.

The Solar-System-Scale Disk Around AB Aurigae

Ben R. Oppenheimer[1,7], *Douglas Brenner*[1], *Sasha Hinkley*[2], *Neil Zimmerman*[2], *Anand Sivaramakrishnan*[1], *Remi Soummer*[1], *Jeffrey Kuhn*[3], *James R. Graham*[4], *Marshall Perrin*[4], *James P. Lloyd*[5], *Lewis C. Roberts, Jr.*[6], *David M. Harrington*[3]

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Astrophysical Journal, in press (http://arxiv.org/abs/0803.3629)

The young star AB Aurigae is surrounded by a complex combination of gas-rich and dust dominated structures. The inner disk which has not been studied previously at sufficient resolution and imaging dynamic range seems to contain very little gas inside a radius of least 130 astronomical units (AU) from the star. Using adaptive-optics coronagraphy and polarimetry we have imaged the dust in an annulus between 43 and 302 AU from the star, a region never seen before. An azimuthal gap in an annulus of dust at a radius of 102 AU, along with a clearing at closer radii inside this annulus, suggests the formation of at least one small body at an orbital distance of about 100 AU. This structure seems consistent with crude models of mean motion resonances, or accumulation of material at two of the Lagrange points relative to the putative object and the star. We also report a low significance detection of a point source in this outer annulus of dust. This source may be an overdensity in the disk due to dust accreting onto an unseen companion. An alternate interpretation suggests that the object's mass is between 5 and 37 times the mass of Jupiter. The results have implications for circumstellar disk dynamics and planet formation.

Download/Website: `http://arxiv.org/abs/0803.3629`

Contact: `bro@amnh.org`

The nature of mid-infrared excesses from hot dust around Sun-like stars

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Astronomy & Astrophysics, in press (arXiv:0804.4580)

Studies of the debris disk phenomenon have shown that most systems are analogous to the Edgeworth-Kuiper Belt (EKB). However a rare subset of sun-like stars possess dust which lies, in contrast, in the terrestrial planet region. In this study we aim to determine how many sources with apparent mid-infrared excess are truly hosts of warm dust,

and investigate where the dust in these systems must lie. We observed using ground-based mid-infrared imaging with TIMMI2, VISIR and MICHELLE a sample of FGK main sequence stars previously reported to have hot dust. A new modelling approach was developed to determine the constraints that can be set on the radial extent of excess emission in such observations by demonstrating how the detectability of a disk of a given flux as a fraction of the total flux from the system ($F_{\rm disk}/F_{\rm total}$) depends primarily on the ratio of disk radius to PSF width and on the uncertainty on that PSF width. We confirm the presence of warm dust around three of the candidates; η Corvi, HD145263 and HD202406. For η Corvi modelling constrains the dust to lie in regions smaller than $\sim$3.5 AU. The modelling constrains the dust to regions smaller than 80-100AU for HD145263 and HD202406, with SED fitting suggesting the dust lies at a few tens of AU. Of two alternative models for the η Corvi excess emission, we find that a model with one hot dust component at less than 0.″164 ($<$3 AU) (combined with the known submm dust population at $\sim$ 150 AU) fits all the data better at the 2.6 σ level than an alternative model with two populations of dust emitting in the mid-infrared: hot dust at less than 0.″19 ($<$ 3.5 AU) and a mid-temperature component at $\sim$ 0.″66 (12 AU). We identify several systems which have a companion (HD65277 and HD79873) or background object (HD53246, HD123356 and HD128400) responsible for their mid-infrared excess, and for three other systems we were able to rule out a point-like mid-infrared source near the star at the level of excess observed in lower resolution observations (HD12039, HD69830 and HD191089). Hot dust sources are either young and possibly primordial or transitional in their emission, or have relatively small radius steady-state planetesimal belts, or they are old and luminous with transient emission. High resolution imaging can be used to constrain the location of the disk and help to discriminate between different models of disk emission. For some small disks, interferometry is needed to resolve the disk location.

Download/Website: `http://arxiv.org/abs/0804.4580`

Contact: `rsed@ast.cam.ac.uk`

Dead Zone Accretion Flows in Protostellar Disks

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Astrophysical Journal Letters, in press (arXiv:0804.2916)

Planets form inside protostellar disks in a dead zone where the electrical resistivity of the gas is too high for magnetic forces to drive turbulence. We show that much of the dead zone nevertheless is active and flows toward the star while smooth, large-scale magnetic fields transfer the orbital angular momentum radially outward. Stellar X-ray and radionuclide ionization sustain a weak coupling of the dead zone gas to the magnetic fields, despite the rapid recombination of free charges on dust grains. Net radial magnetic fields are generated in the magneto-rotational turbulence in the electrically conducting top and bottom surface layers of the disk, and reach the midplane by Ohmic diffusion. A toroidal component to the fields is produced near the midplane by the orbital shear. The process is similar to the magnetization of the Solar tachocline. The result is a laminar, magnetically-driven accretion flow in the region where the planets form.

Download/Website: `http://arxiv.org/abs/0804.2916`

Contact: `neal.turner@jpl.nasa.gov`

3 Jobs and positions

Reader/Lecturer in Exoplanets

A. Fitzsimmons
School of Mathematics and Physics, Queen's University Belfast

Queen's University Belfast, Readership/Lecturership

The School of Mathematics and Physics at Queen's University Belfast seeks to make an appointment in Astrophysics by July 1st 2008 or as soon as possible thereafter. The position will be at either the Reader or Lecturer level. The successful candidate will be expected to contribute to the teaching, research and administrative activities of the School.
The research interest of the successful candidate will be in the area of Low Mass Stars and Extra-solar Planets (exoplanets), and should complement and extend existing research within the Astrophysics Research Centre. The interests of the current members of the Centre may be found at http://star.pst.qub.ac.uk. In particular, we have a vigorous and highly productive research programme which uses the SuperWASP extra-solar planet detection facility.
Applicants must have a PhD (or equivalent) in Astrophysics or a related discipline, a record of high quality research publications commensurate with experience and the position applied for. They must be able to teach Mathematics and/or Physics at all levels through the medium of English. Demonstrably successful teaching experience in the Higher Education sector is desirable, as is a track record of successful grant applications. For a Readership, teaching experience in the Higher Education sector, a track record of successful grant applications and a record of successful Ph.D. supervision are all essential.
Applicants should clearly state if they wish to be considered for the Reader post, the Lecturer post, or both.
Informal enquiries may be directed to: Professor A.Fitzsimmons, e-mail a.fitzsimmons@qub.ac.uk, telephone +44 (0)28 9097 3124.
An application pack for the post, containing further details of the essential and desirable criteria, as well as instructions on how to submit an application, is available from our website.
A PhD studentship has been allocated to work with the successful candidate. In addition, a generous start-up package will be available.
Salary: 27,466-35,837 pounds (AC2), 33,779-44,074 pounds (AC3), 42,791-54,206 pounds (AC4) per annum (including contribution points).
Closing date: 4.00 pm, Friday 6 June 2008.

Download/Website: `http://www.qub.ac.uk/sites/QUBJobVacancies/AcademicJobs/`

Contact: `a.fitzsimmons@qub.ac.uk`

Research Fellow in Low Mass Stars and Exoplanets

A. Fitzsimmons
School of Mathematics and Physics, Queen's University Belfast

Queen's University Belfast, Research Fellowship

Applications are invited for a 3-year Post Doctoral Research Fellowship position in low mass stars and exoplanets, funded in part by the Science & Technology Facilities Council (STFC). The post is located within the Astrophysics Research Centre (ARC) of the School of Mathematics and Physics. ARC is one of the founders of the WASP Project and operates and maintains the Super WASP facility on La Palma. The Exoplanet Group within ARC is well supported by S TFC and is expanding. By mid-2008 the group is expected to consist of 3 academic staff, 3 research staff and a number of PhD students.

Applicants must have a PhD in a relevant subject either awarded or submitted by the time of taking up the post. Experience of observational techniques used in a strophysics, including spectroscopy and photometry plus associated data reductio n techniques, are essential. However these do not have to be at optical waveleng ths. Also essential is a reasonable number of high quality publications commensu rate with stage of career.
Informal enquiries can be directed to Prof. Alan Fitzsimmons.
An application pack for the post, containing further details of the essential and desirable criteria, as well as instructions on how to submit an application, is available from our website.
Salary: 27,466-35,837 pounds per annum (including contribution points).
Closing date: 4.00 pm, Friday 6 June 2008

Download/Website: `http://www.qub.ac.uk/sites/QUBJobVacancies/ResearchJobs/`

Contact: `a.fitzsimmons@qub.ac.uk`

PhD position on organic chemistry in the protosolar nebula

I. Kamp
Kapteyn Astronomical Institute, Groningen, The Netherlands

Kapteyn Astronomical Institute, PhD position

The Kapteyn Astronomical Institute in Groningen, The Netherlands, is seeking an ambitious, highly motivated applicant for a 4-year PhD bursary position in Star and Planet Formation to work on organic chemistry in the protosolar nebula. The starting date can be anytime in 2008.
The PhD project will specifically study the processing and stability of organic material in the early Solar System and thereby studying the initial conditions for the formation of life. The goal is to assess the impact of stellar activity (UV and X-rays), winds and highly energetic particles on the formation and survival of abiotic organic species. The work will involve the extension of currently existing chemical reaction databases, the development of a multiphase gas-grain chemistry and the incorporation of laboratory results into local models of the protosolar nebula. The institute is part of the Netherlands Research School for Astronomy and belongs to the top research institutions in Astronomy worldwide. Research topics currently include cosmology, galaxy evolution, star and planet formation and interstellar matter.
Interested applicants should have a very good academic track record and hold the equivalent of a Masters degree, including a substantial thesis, in Astronomy or Physics when starting the position. Previous numerical experience and a strong chemistry background would be an asset.
Interested candidates should send application material, including curriculum vitae, education history with transcripts of study record, a brief statement of research experience and two letters of reference. Selection of candidates will start **May 30, 2008**, and will continue until the position is filled.
Please send applications to

Dr. Inga Kamp
Kapteyn Astronomical Institute
Postbus 800
9700 AV Groningen
The Netherlands

Tel: +31 (0)50 363 4070
email: kamp@astro.rug.nl

For inquiries about the position or project, please contact Dr. Kamp. For further information on the Kapteyn Astronomical Institute, please visit the webpages at http://www.rug.nl/sterrenkunde/

Download/Website: `http://www.rug.nl/sterrenkunde/vacatures/kapteyn`
Contact: `kamp@astro.rug.nl`

4 As seen on astro-ph

The following list contains all the entries relating to exoplanets that we spotted on astro-ph during April 2008. If you spot any that we missed, please let us know and we'll include them in the next issue.

Exoplanets

arXiv:0804.0237: **Spitzer IRAC Observations of White Dwarfs. II. Massive Planetary and Cold Brown Dwarf Companions to Young and Old Degenerates** by *J. Farihi, E. E. Becklin & B. Zuckerman*
arXiv:0804.0406: **Composition of Ices in Low-Mass Extrasolar Planets** by *Ulysse Marboeuf, Olivier Mousis, David Ehrenreich et al*
arXiv:0804.0483: **'Tail-end' Bondi-Hoyle accretion in young star clusters: Implications for disks, planets, and stars** by *Henry B. Throop & John Bally*
arXiv:0804.0683: **Accretion discs, low-mass protostars and planets: probing the impact of magnetic fields on stellar formation** by *J. F. Donati, M. M. Jardine, S. G. Gregory et al*
arXiv:0804.0975: **Interaction of Close-in Planets with the Magnetosphere of their Host Stars I: Diffusion, Ohmic Dissipation of Time Dependent Field, Planetary Inflation, and Mass Loss** by *Randy O. Laine, Douglas N.C. Lin & Shawfeng Dong*
arXiv:0804.1150: **Predicting the Yields of Photometric Surveys for Transiting Extrasolar Planets** by *Thomas G. Beatty & B. Scott Gaudi*
arXiv:0804.1354: **OGLE-2005-BLG-071Lb, the Most Massive M-Dwarf Planetary Companion?** by *Subo Dong, Andrew Gould, Andrzej Udalski et al*
arXiv:0804.1946: **On the Dynamical Stability of the Solar System** by *Konstantin Batygin & Gregory Laughlin*
arXiv:0804.2117: **Retrograde resonances in compact multi-planetary systems: a feasible stabilizing mechanism** by *Julie Gayon & Eric Bois*
arXiv:0804.2259: **The Transit Light Curve Project. VIII. Six Occultations of the Exoplanet TrES-3** by *Joshua N. Winn, Matthew J. Holman & Avi Shporer*
arXiv:0804.2296: **Planet formation around stars of various masses: Hot super-Earths** by *Grant M. Kennedy & Scott J. Kenyon*
arXiv:0804.2479: **The Transit Light Curve Project. VIII. Six Occultations of the Exoplanet TrES-3** by *Joshua N. Winn, Matthew J. Holman, Avi Shporer et al*
arXiv:0804.2954: **A peculiarity of metal-poor stars with planets ?** by *Misha Haywood*
arXiv:0804.3030: **Limits to the planet candidate GJ 436c** by *R. Alonso, M. Barbieri &, M. Rabus*
arXiv:0804.3137: **Resonances of low orders in the planetary system around the star HD37124** by *Roman V. Baluev*
arXiv:0804.3354: **Beyond the Iron Peak: r- and s-process Elemental Abundances in Stars with Planets** by *J. C. Bond, D. S. Lauretta, C. G. Tinney et al*
arXiv:0804.3398: **Near-Infrared Constraints on the Presence of Warm Dust at Metal-Rich, Helium Atmosphere White Dwarfs** by *Mukremin Kilic, J. Farihi & Atsuko Nitta et al*
arXiv:0804.3526: **The potential impact of groove modes on Type II planetary migration** by *Stefano Meschiari & Gregory Laughlin*
arXiv:0804.3538: **Detecting transits from Earth-sized planets around Sun-like stars** by *S. Carpano & M. Fridlund*
arXiv:0804.3927: **Radio Emission from Exoplanets** by *Samuel J. George & Ian R. Stevens*

arXiv:0804.4475: **The Transit Light Curve Project. IX. Evidence for a Smaller Radius of the Exoplanet XO-3b** by *Joshua N. Winn, Matthew J. Holman, Guillermo Torres et al*
arXiv:0804.4609: **HD 75289Ab revisited - Searching for starlight reflected from a hot Jupiter** by *F. Rodler, M. Kuerster & T. Henning*
arXiv:0804.4547: **The Successful Prediction of the Extrasolar Planet HD 74156 d** by *Rory Barnes, Krzysztof Gozdziewski & Sean N. Raymond*

Debris and Transition Disks

arXiv:0804.0437: **The Structure of the DoAr 25 Circumstellar Disk** by *Sean M. Andrews, A. M. Hughes, D. J. Wilner et al*
arXiv:0804.0521: **The incidence of mid-infrared excesses in G and K giants** by *Mark H. Jones*
arXiv:0804.1192: **Large excess of heavy nitrogen in both hydrogen cyanide and cyanogen from comet 17P/Holmes** by *D. Bockelee-Morvan, N. Biver & E. Jehin*
arXiv:0804.2864: **The Youthful Appearance of the 2003 EL61 Collisional Family** by *David L. Rabinowitz, Bradley E. Schaefer & Martha W. Schaefer*
arXiv:0804.2916: **Dead Zone Accretion Flows in Protostellar Disks** by *N. J. Turner & T. Sano*
arXiv:0804.2924: **The Exceptionally Large Debris Disk around γ Ophiuchi** by *K. Y. L. Su, G. H. Rieke & K. R. Stapelfeldt*
arXiv:0804.4520: **On disc protoplanet interactions in a non-barotropic disc with thermal diffusion** by *S.-J. Paardekooper & J. C. B. Papaloizou*
arXiv:0804.4580: **The nature of mid-infrared excesses from hot dust around Sun-like stars** by *R. Smith, M. C. Wyatt & W. R. F. Dent*

Instrumentation and Techniques

arXiv:0804.0955: **A laser frequency comb that enables radial velocity measurements with a precision of 1 cm $\mathbf{s}^{-1}$** by *Chih-Hao Li, Andrew J. Benedick, Peter Fendel et al*
arXiv:0804.2674: **Closure Phase Signatures of Planet Transit Events** by *G.T.van Belle*