ExoPlanet News
An Electronic Newsletter

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1 Editorial

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

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

Turbulence in extrasolar planetary systems implies that mean motion resonances are rare

Fred C. Adams[1,2], *Gregory Laughlin*[3], *Anthony M. Bloch*[1,4]

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[2] Astronomy Department, University of Michigan, Ann Arbor, MI 48109
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[3] Department of Mathematics, University of Michigan, Ann Arbor, MI 48109

Astrophysical Journal, in press (arXiv:0805.1681v1)

This paper considers the effects of turbulence on mean motion resonances in extrasolar planetary systems and predicts that systems rarely survive in a resonant configuration. A growing number of systems are reported to be in resonance, which is thought to arise from the planet migration process. If planets are brought together and moved inward through torques produced by circumstellar disks, then disk turbulence can act to prevent planets from staying in a resonant configuration. This paper studies this process through numerical simulations and via analytic model equations, where both approaches include stochastic forcing terms due to turbulence. We explore how the amplitude and forcing time intervals of the turbulence affect the maintenance of mean motion resonances. If turbulence is common in circumstellar disks during the epoch of planet migration, with the amplitudes indicated by current MHD simulations, then planetary systems that remain deep in mean motion resonance are predicted to be rare. More specifically, the fraction of resonant systems that survive over a typical disk lifetime of $\sim$1 Myr is of order 0.01. If mean motion resonances are found to be common, their existence would place tight constraints on the amplitude and duty cycle of turbulent fluctuations in circumstellar disks. These results can be combined by expressing the expected fraction of surviving resonant systems in the approximate form $P_{\rm b} \approx C/N_{\rm orb}^{1/2}$, where the dimensionless parameter $C \sim 10 - 50$ and $N_{\rm orb}$ is the number of orbits for which turbulence is active.

Download/Website: `http://arxiv.org/abs/0805.1681v1`

Contact: `fca@umich.edu`

Metallicities & activities of southern stars

J.S. Jenkins[1,2], *H.R.A. Jones*[2], *Y. Pavlenko*[2], *D.J. Pinfield*[2], *J.R. Barnes*[2], *Y. Lyubchik*[2]

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Astronomy & Astrophysics, in press (arXiv:0804.1128)

We present the results from high-resolution spectroscopic measurements to determine metallicities and activities of bright stars in the southern hemisphere. We measured the iron abundances ([Fe/H]'s) and chromospheric emission indices ($\log R'_{\rm HK}$) of 353 solar-type stars with V=7.5−9.5. [Fe/H] abundances are determined using a custom χ^2 fitting procedure within a large grid of Kurucz model atmospheres. The chromospheric activities were determined by measuring the amount of emission in the cores of the strong CaII HK lines. Our comparison of the metallicity sample to other [Fe/H] determinations was found to agree at the $\pm$0.05 dex level for spectroscopic values and at the $\pm$0.1 dex level for photometric values. The distribution of chromospheric activities is described by a bimodal distribution, agreeing with the conclusions from other works. Also an analysis of Maunder minimum status was attempted, and it was found that 6$\pm$4 stars in the sample could be in a Maunder minimum phase of their evolution and hence the Sun should only spend a few per cent of its main sequence lifetime in Maunder minimum.

Download/Website: `http://adsabs.harvard.edu/abs/2008arXiv0804.1128J`

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Hot Jupiters and stellar magnetic activity

A. F. Lanza

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Astronomy & Astrophysics, in press (arXiv:0805.3010)

Recent observations suggest that stellar magnetic activity may be influenced by the presence of a close-by giant planet. Specifically, chromospheric hot spots rotating in phase with the planet orbital motion have been observed during some seasons in a few stars harbouring hot Jupiters. The spot leads the subplanetary point by a typical amount of $\sim 60^\circ - 70^\circ$, with the extreme case of υ And where the angle is $\sim 170^\circ$. The interaction between the star and the planet is described considering the reconnection between the stellar coronal field and the magnetic field of the planet. Reconnection events produce energetic particles that moving along magnetic field lines impact onto the stellar chromosphere giving rise to a localized hot spot. A simple magnetohydrostatic model is introduced to describe the coronal magnetic field of the star connecting its surface to the orbiting planet. The field is assumed to be axisymmetric around the rotation axis of the star and its configuration is more general than a linear force-free field. With a suitable choice of the free parameters, the model can explain the phase differences between the hot spots and the planets observed in HD 179949, υ And, HD 189733, and τ Boo, as well as their visibility modulation on the orbital period and seasonal time scales. The possible presence of cool spots associated with the planets in τ Boo and HD 192263 cannot be explained by the present model. However, we speculate about the possibility that reconnection events in the corona may influence subphotospheric dynamo action in those stars producing localized photospheric (and chromospheric) activity migrating in phase with their planets.

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Ground-based detection of sodium in the transmission spectrum of exoplanet HD209458b

I Snellen, S. Albrecht, E. de Mooij, R. Le Poole
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Astronomy & Astrophysics, in press (arXiv:0805.0789)

Context: The first detection of an atmosphere around an extrasolar planet was presented by Charbonneau and collaborators in 2002. In the optical transmission spectrum of the transiting exoplanet HD209458b, an absorption signal from sodium was measured at a level of 0.023 ± 0.006%, using the STIS spectrograph on the Hubble Space Telescope. Despite several attempts, so far only upper limits to the Na D absorption have been obtained using telescopes from the ground, and the HST result has yet to be confirmed.
Aims: The aims of this paper are to re-analyse data taken with the High Dispersion Spectrograph on the Subaru telescope, to correct for systematic effects dominating the data quality, and to improve on previous results presented in the literature.
Methods: The data reduction process was altered in several places, most importantly allowing for small shifts in the wavelength solution. The relative depth of all lines in the spectra, including the two sodium D lines, are found to correlate strongly with the continuum count level in the spectra. These variations are attributed to non-linearity effects in the CCDs. After removal of this empirical relation the uncertainties in the line depths are only a fraction above that expected from photon statistics.
Results: The sodium absorption due to the planet's atmosphere is detected at $>5\sigma$, at a level of 0.056 ± 0.007% (2×3.0Å band), 0.070 ± 0.011% (2×1.5 Å band), and 0.135 ± 0.017% (2×0.75Å band). There is no evidence that the planetary absorption signal is shifted with respect to the stellar absorption, as recently claimed for HD189733b.
Conclusions: The STIS/HST measurements are confirmed. The measurements of the Na D absorption in the two most narrow bands indicate that some signal is being resolved. Due to variations in the instrumental resolution and intrinsic variations in the stellar lines due to the Rossiter-McLauglin effect, it will be challenging to probe the planetary absorption on spectral scales smal ler than the stellar absorption using conventional transmission spectroscopy.

Download/Website: `http://arxiv.org/abs/0805.0789`

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3 Abstracts of theses

Resonances and Collisions in Circumstellar Debris Discs with an Embedded Planet

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PhD Thesis, submitted

This work considers theoretical models of circumstellar debris discs. The main focus is the combination of mean motion resonances between a planet and circumstellar small bodies, which create structures, and collisions among the small bodies, which smear the structures out. It is examined to what degree resonances do influence the collisional behaviour. Instead of the often applied, computer-intensive N-body-simulations we make use of statistical methods, especially the kinetic theory. This requires more effort on the mathematical-analytical side, but involves comparably low computational expense.

In the first part collisional velocities and rates for hypothetical circumstellar debris discs are investigated. Hypothetical especially in the sense that several orbital elements are assumed to be distributed uniformly for simplicity, although observations suggest otherwise. The main focus here is not the analysis of certain, observed discs, but instead the investigation and representation of the influence of a mean motion resonance on the collisional behaviour. The results show, that this influence is much smaller than exspected. The changes of the collisional velocity due to resonance, even a very strong one, are negligibly small. The collisional rate is influenced more strongly. It shows a highly nonlinear dependence and especially develops a maximum. But even for a very strong resonance it increases by less than a factor of 4.
In the second part of this work two models aiming to explain the structures observed in debris discs are developed and compared. One which is based upon the transport of small dust grains by Poynting-Robertson and stellar wind drag forces, and one which is based upon cascade-like collisions of planetesimals residing in a resonance. Both models are analytical ones, they take into consideration the most important effects while being kept as simple as possible at the same time. It turns out that the efficiency of the first scenario depends heavily on the stellar wind, which is most difficult to quantify. Scenario II is determined by the details of the collisional process and the whole collisional cascade.
With the experimental and observational data available today it is not possible to determine if the structures in circumstellar discs originate from the first scenario or second one.

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4 Conference announcements

Measuring atmospheric spectra of extrasolar planets

S. Aigrain, F. Pont
School of Physics, University of Exeter, Stocker Road, Exeter EX4 4QL, UK

Workshop announcement, Exeter, September 15 – 17, 2008

Measuring the spectrum of Earth-like planets in search for atmospheric bio-markers is one of the great objectives of astrophysics in the next generation. We have now come to the point of measuring spectral featuring in nearby transiting hot Jupiters. The objective of this meeting is to share experience and viewpoints on the current status and prospect of this topic, from the observational viewpoint. In particular:
– instrumental systematics in space transmission and emission spectroscopic data (HST, Spitzer) and how to deal with them,
– which observations provide the most useful constraints
– atmospheric features and evolution of rock/ice planets
– re-assessment of prospects for habitable exoplanet spectroscopy in light of new results (JWST, dedicated missions)
– synergy with (Solar-System) Planetology
– the Earth's climate in the context of extra-solar planets
To enable a truly interactive atmosphere, the meeting is limited to 30 participants. For more information and to pre-register, visit www.astro.ex.ac.uk/esp08/.

Download/Website: http://www.astro.ex.ac.uk/esp08

Contact: suz@astro.ex.ac.uk

Cosmic cataclysms and life

N. André, C. Bingham, M. Fridlund, O. Witasse
RSSD, ESA

ESLAB Symposium announcement, ESRIN (Frascati, Italy), 10-14 November 2008

A number of cataclysms have occurred in the history of the Universe and the Solar System. The Symposium will review those that had a critical influence on the evolution of habitable worlds and on the emergence and survival of life on Earth, and possibly elsewhere. The sessions will discuss the following topics:

- Big Bang and the formation of light elements, element nucleosynthesis in stars and Supernovae
- Violent processes in star formation, interstellar/circumstellar shocks and the synthesis of molecules
- Collisions and planetary formation
- Formation of the Moon and its influence on Earth
- Late heavy bombardment and the emergence of life
- The role of impacts in inhibiting, transporting or threatening life
- Hazards from stellar flares and space weather
- Hazards from black holes and gamma ray bursts
- Cosmic habitability, prevalence of Earth-like planets, the fate of the Earth
- Historical, outreach and education aspects of cataclysms (e.g. Tunguska 1908)

This symposium is an invitation to the wider scientific community to present and discuss in depth the science topics which constitute the broad themes mentioned above. The program will include a number of invited talks, which will give an overview of the science themes, plus a number of contributed talks.

Updated information about the Workshop will be made on the web site.
Abstract Deadline:17 June 2008

Scientific Organizing Committee: J.-C. Augereau, W. Benz, A. Chicarro, C. Cockell, B. Foing, L. Kaltenegger, H. Lammer, R. Liseau, H. Opgenoorth, G. Wuchterl, F. Westall

Local Organizing Committee: N. André, C. Bingham, M. Fridlund, O. Witasse

Download/Website: `http://www.congrex.nl/08C16`
Contact: `nandre@rssd.esa.int`

5 Jobs and positions

Postdoc position in planetary dynamics at the Observatoire de la Cote d'Azur in Nice (France)

A. Morbidelli
Observatoire de la Cote d'Azur. Currently on sabbatical at: SWRI, 1050 Walnut str., Suite 300, Boulder, CO. 80302, USA

Job announcement, Observatoire de la Cote d'Azur

A new post-doc position will be open from October 2008 in the Planetary Science Team at the Observatoire de la Cote d'Azur in Nice. The position is for one year, but renewable up to three years. The net salary will be 2.200 Euros/month and will include medical coverage.
The object of this post-doctoral research will be to investigate in details the dynamical evolution of the asteroid belt during the period of Late Heavy Bombard ment of the terrestrial planets, with emphasis on the history of the cratering r ate on Earth and the origin of projectiles. Other aspects of small bodies' evolu tions during the same phase of Solar System history will also be investigated.
Applicants should have some knowledge of dynamics in the Solar System and some e xperience in the use of numerical integrators. Applications should include a CV, a list of publications and three letters of recommendation. The applications sh ould be sent before June 30, 2008 by email to Alessandro Morbidelli (morby@obs-nice.fr), whom applicants may contact for further information.
The position will be funded by the Helmholtz-Society through the Research Allian ce 'Planetary Evolution and Life'. The Alliance is led and managed by Institut fur Planetenforschung, Deutsches Zentrum fur Luft- und Raumfahrt, Berlin.

Download/Website: `http://www.obs-nice.fr/morby/`

Contact: `morby@oca.eu`

6 Announcements

NASA Star and Exoplanet Database (NStED)

D. Gelino
Michelson Science Center, Caltech, 770 South Wilson Avenue, MS 100-22 Pasadena, CA 91125

Database, Release of new version

The Michelson Science Center (MSC) and the Infrared Processing & Analysis Center (IPAC) announce the release of the new version of the NASA Star and Exoplanet D atabase (NStED). NStED is a general purpose stellar and exoplanet archive to sup port NASA's planet finding and characterization activities. NStED offers a power ful query and download engine to search for data on individual stars or to searc h for groups of stars by stellar and exoplanet parameters.
This version significantly augments the previous stellar and exoplanet content, allowing detailed searches on 70+ parameters for over 140,000 bright, nearby sta rs, including all known exoplanet hosting stars. NStED also features a dedicated interface for transit survey data sets, including TrES observations of the Kepl er field.
The NStED Service is available at http://nsted.ipac.caltech.edu/ and contains:
* Data related to 140,000 bright nearby stars
* All known planet-hosting stars
* Query for individual stars or by stellar/planetary parameters
* Images and spectra

* Data related to known exoplanets
* Time series photometric data on known transiting exoplanets
* Radial velocity data of exoplanet hosting stars
* Dedicated interface related to exo-planet transit surveys

Download/Website: `http://nsted.ipac.caltech.edu/`

Contact: `dawn@ipac.caltech.edu`

7 As seen on astro-ph

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

Exoplanets

astro-ph/0805.0595: **Rayleigh scattering by H2 in the extrasolar planet HD209458b** by *A. Lecavelier des Etangs, A. Vidal-Madjar, J.-M. Desert et al*

astro-ph/0805.0654: **Nonuniform viscosity in the solar nebula and large masses of Jupiter and Saturn** by *Liping Jin*

astro-ph/0805.0777: **A Precise Estimate of the Radius of the Exoplanet HD 149026b from Spitzer Photometry** by *Philip Nutzman, David Charbonneau, Joshua N. Winn et al*

astro-ph/0805.0789: **Ground-based detection of sodium in the transmission spectrum of exoplanet HD209458b** by *I.A.G. Snellen, S. Albrecht, E.J.W. de Mooij et al*

astro-ph/0805.1019: **ELODIE metallicity-biased search for transiting Hot Jupiters V. An intermediate-period Jovian planet orbiting HD45652** by *N. C. Santos, S. Udry, F. Bouchy et al*

astro-ph/0805.1066: **Synthetic Spectra and Colors of Young Giant Planet Atmospheres: Effects of Initial Conditions and Atmospheric Metallicity** by *Jonathan J. Fortney, Mark S. Marley, Didier Saumon et al*

astro-ph/0805.1681: **Turbulence in extrasolar planetary systems implies that mean motion resonances are rare** by *Fred C. Adams, Gregory Laughlin & Anthony M. Bloch*

astro-ph/0805.2399: **XO-5b: A Transiting Jupiter-sized Planet With A Four Day Period** by *Christopher J. Burke, P. R. McCullough, Jeff A. Valenti et al*

astro-ph/0805.2418: **Thermal Emission of Exoplanet XO-1b** by *Pavel Machalek, Peter R. McCullough, Christopher J. Burke et al*

astro-ph/0805.2600: **WASP-7: The brightest transiting-exoplanet system in the Southern hemisphere** by *Coel Hellier, D.R. Anderson, M. Gillon et al*

astro-ph/0805.2921: **XO-4b: An Extrasolar Planet Transiting an F5V Star** by *P. R. McCullough, Christopher J. Burke, Jeff A. Valenti et al*

astro-ph/0805.2962: **A comprehensive comparison of the Sun to other stars: searching for self-selection effects** by *Jose A. Robles, Charles H. Lineweaver, Daniel Grether et al*

astro-ph/0805.3010: **Hot Jupiters and stellar magnetic activity** by *A.F. Lanza*

astro-ph/0805.3532: **ExoFit: Orbital Parameters of Extra-solar Planets from Radial Velocities** by *Balan, Sreekumar T. Lahav, Ofer*

astro-ph/0805.3915: **Photometric Follow-up Observations of the Transiting Neptune-Mass Planet GJ 436b** by *Shporer, Avi, Mazeh, Tsevi, Winn, Joshua N. et al*

astro-ph/0805.4263: **Possibility of Detecting Moons of Pulsar Planets Through Time-of-Arrival Analysis** by *Lewis, Karen M., Sackett, Penny D., & Mardling, Rosemary A.*

astro-ph/0805.4826: **Spectroscopic parameters for 451 stars in the HARPS GTO planet search program. Stellar [Fe/H] and the frequency of exo-Neptunes** by *S. G. Sousa, N. C. Santos, M. Mayor et al*

Debris and Transition Disks

astro-ph/0805.0199: **Basic Mechanics of Planet-Satellite Interaction with special reference to Earth-Moon System** by *Bijay Kumar Sharma*
astro-ph/0805.0386: **Disk Dispersal and Planet Formation Time Scales** by *Lynne A. Hillenbrand*
astro-ph/0805.1354: **Planet Formation in Binary Stars: The case of Gamma Cephei** by *Wilhelm Kley & Richard Nelson*
astro-ph/0805.2293: **Molecules in the Circumstellar Disk Orbiting BP Piscium** by *Joel H. Kastner, B. Zuckerman, Thierry Forveille*
astro-ph/0805.3009: **Baroclinic Generation of Potential Vorticity in an Embedded Planet-Disk System** by *Ji Jianghui, Ou Shangli, Liu Lin*
astro-ph/0805.3314: **Spectro-astrometric imaging of molecular gas within protoplanetary disk gaps** by *Klaus M. Pontoppidan, Geoffrey A. Blake, Ewine F. van Dishoeck et al*
astro-ph/0805.3936: **Spectroscopic metallicities of Vega-like stars** by *Saffe, C., Gomez, M., Pintado, O. et al*
astro-ph/0805.4376: **Size-sorting dust grains in the surface layers of protoplanetary disks** by *Dullemond, C. P. & Dominik, C.*
astro-ph/0805.4625: **X-ray irradiated protoplanetary disk atmospheres I: Predicted emission line spectrum and photoevaporation** by *Barbara Ercolano, Jeremy J. Drake, John C. Raymond et al*

Instrumentation and Techniques

astro-ph/0805.0238: **Properties of analytic transit light curve models** by *Andras Pal*
astro-ph/0805.2157: **Analytic Approximations for Transit Light Curve Observables, Uncertainties, and Covariances** by *Joshua A. Carter, Jennifer C. Yee, Jason Eastman et al*