ExoPlanet News
An Electronic Newsletter

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Contents

1 Editorial

Welcome to the thirty-ninth edition of ExoPlanet News.

This month's edition seems to have something of a bonanza of papers on Super Earths, along with a large range of conferences and graduate schools. We hope readers will excuse one of the editors for including, under 'Other Abstracts', information about a publication that may appeal to a somewhat younger readership than our usual distribution lists.

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.

The next edition is planned for the beginning of June 2011. Please send anything relevant to exoplanet@open.ac.uk, and it will appear then.

Best wishes
Andrew Norton & Glenn White
The Open University

2 Abstracts of refereed papers

Model Spectra of the First Potentially Habitable Super-Earth - Gl581d

L. Kaltenegger [1,2]*, A. Segura* [3]*, S. Mohanty*[4]
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Astrophysical Journal, published ApJ, 733, 35

Gl581d has a minimum mass of 7 $M_{\rm Earth}$ and is the first detected potentially habitable rocky Super-Earth. Our models confirm that a habitable atmosphere can exist on Gl581d. We derive spectroscopic features for atmospheres, assuming an Earth-like composition for this planet, from high oxygen atmosphere analogous to Earth's to high CO2 atmospheres with and without biotic oxygen concentrations. We find that a minimum CO2 partial pressure of about 7 bar, in an atmosphere with a total surface pressure of 7.6 bar, are needed to maintain a mean surface temperature above freezing on Gl581d. We model transmission and emergent synthetic spectra from 0.4μm to 40μm and show where indicators of biological activities in such a planet's atmosphere could be observed by future ground- and space-based telescopes. The model we present here only represents one possible nature - an Earth-like composition - of a planet like Gl581d in a wide parameter space. Future observations of atmospheric features can be used to examine if our concept of habitability and its dependence on the carbonate-silicate cycle is correct, and assess whether Gl581d is indeed a habitable super-Earth.

Download/Website: `http://stacks.iop.org/0004-637X/733/35`

Contact: `lkaltene@cfa.harvard.edu, kaltenegger@mpia.de`

Atmospheric studies of habitability in the Gliese 581 system

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Astronomy & Astrophysics, in press (arXiv:1104.3756)

The M-type star Gliese 581 is orbited by at least one terrestrial planet candidate in the habitable zone, i.e. GL 581 d. Orbital simulations have shown that additional planets inside the habitable zone of GL 581 would be dynamically stable. Recently, two further planet candidates have been claimed, one of them in the habitable zone. In view of the ongoing search for planets around M stars which is expected to result in numerous detections of potentially habitable Super-Earths, we take the GL 581 system as an example to investigate such planets. In contrast to previous studies of habitability in the GL 581 system, we use a consistent atmospheric model to assess surface conditions and habitability. Furthermore, we perform detailed atmospheric simulations for a much larger subset of potential planetary and atmospheric scenarios than previously considered. A 1D radiative-convective atmosphere model is used to calculate temperature and pressure profiles of model atmospheres, which we assumed to be composed of molecular nitrogen, water, and carbon dioxide. In these calculations, key parameters such as surface pressure and CO_2 concentration as well as orbital distance and planetary mass are varied. Results imply that surface temperatures above freezing could be obtained, independent of the here considered atmospheric scenarios, at an orbital distance of 0.117 AU. For an orbital distance of 0.146 AU, CO_2 concentrations as low as 10 times the present Earth's value are sufficient to warm the surface above the freezing point of water. At 0.175 AU, only scenarios with CO_2 concentrations of 5% and 95% were found to be habitable. Hence, an additional Super-Earth planet in the GL 581 system in the previously determined dynamical stability range would be considered a potentially habitable planet.

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Gliese 581d is the first discovered terrestrial-mass exoplanet in the habitable zone

Robin D. Wordsworth[1], François Forget[1], Franck Selsis[2,3], Ehouarn Millour[1], Benjamin Charnay[1], Jean-Baptiste Madeleine[1]

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[3] Université de Bordeaux, Observatoire Aquitain des Sciences de l'Univers, 2 rue de l'Observatoire, BP 89, F-33271 Floirac Cedex, France

Astrophysical Journal Letters, in press

It has been suggested that the recently discovered exoplanet GJ581d might be able to support liquid water due to its relatively low mass and orbital distance. However, GJ581d receives 35% less stellar energy than Mars and is probably locked in tidal resonance, with extremely low insolation at the poles and possibly a permanent night side. Under such conditions, it is unknown whether any habitable climate on the planet would be able to withstand global glaciation and / or atmospheric collapse. Here we present three-dimensional climate simulations that demonstrate GJ581d will have a stable atmosphere and surface liquid water for a wide range of plausible cases, making it the first confirmed super-Earth (exoplanet of 2-10 Earth masses) in the habitable zone. We find that atmospheres with over 10 bar CO_2 and varying amounts of background gas (e.g., N_2) yield global mean temperatures above 0 °C for both land and ocean-covered surfaces. Based on the emitted IR radiation calculated by the model, we propose observational tests that will allow these cases to be distinguished from other possible scenarios in the future.

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Observational evidence for a metal rich atmosphere on the super-Earth GJ1214b

Jean-Michel Désert[1], *J. Bean*[1,2], *E. Miller-Ricci Kempton*[3], *Z. K. Berta*[1], *D. Charbonneau*[1], *J. Irwin*[1], *J. J. Fortney*[3], *C. J. Burke*[1], *P. Nutzman*[3]

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Astrophysical Journal Letters, published (2011ApJ...731L..40D)

We report observations of two consecutive transits of the warm super-Earth exoplanet GJ 1214b at 3.6 and 4.5 μm with the Infrared Array Camera instrument on-board the *Spitzer* Space Telescope. The two transit light curves allow for the determination of the transit parameters for this system. We find these paremeters to be consistent with the previously determined values and no evidence for transit timing variations. The main investigation consists of measuring the transit depths in each bandpass to constrain the planet's transmission spectrum. Fixing the system scale and impact parameters, we measure $R_p/R_\star = 0.1176^{+0.0008}_{-0.0009}$ and $0.1163^{+0.0010}_{-0.0008}$ at 3.6 and 4.5 μm, respectively. Combining these data with the previously reported *MEarth* Observatory measurements in the red optical allows us to rule-out a cloud-free, solar composition (i.e., hydrogen-dominated) atmosphere at $4.5\ \sigma$ confidence. This independently confirms a recent finding that was based on a measurement of the planet's transmission spectrum using the *VLT*. The *Spitzer*, *MEarth*, and *VLT* observations together yield a remarkably flat transmission spectrum over the large wavelength domain spanned by the data. Consequently, cloud-free atmospheric models require more than 30% metals (assumed to be in the form of H_2O) by volume to be consistent with all the observations.

Download/Website: `http://adsabs.harvard.edu/abs/2011ApJ...731L..40D`

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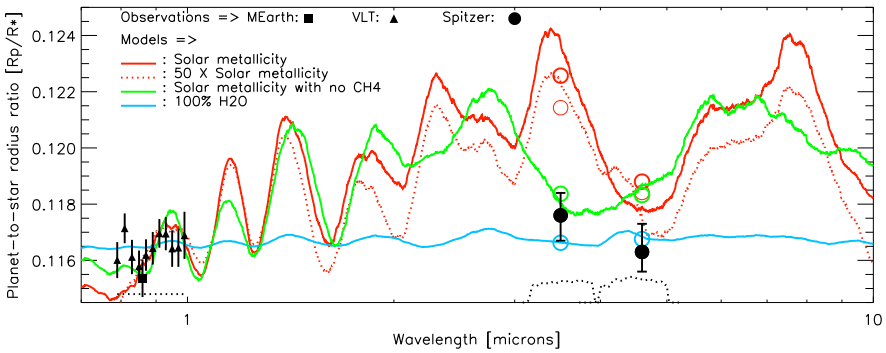

Figure 1: (Désert et al.) Comparison of the measured wavelength dependent planet-to-star radius ratios to transmission spectroscopic models from Kempton et al. 2010. The two radius ratios obtained from the *Spitzer* observations are the black filled circles with their $1\ \sigma$ error bars. The results from *MEarth* and *VLT* observations are shown as black square and triangles, respectively. The continuous lines correspond to the best-scaled and smoothed transmission spectra expected from model of GJ 1214b atmosphere's Kempton et al. 2010. The red continuous line corresponds to a transmission spectra with solar composition (H/He rich), the red dotted lines is the same spectra but with metallicity enhanced by a factor of 50. The green line is a model with solar composition but with no methane and the blue line is a model with 100% water vapor in the atmosphere. The open circles are the flux weighted integrated models in the *Spitzer* bandpasses. The dotted black lines at the bottom of the plot correspond to the instrumental bandpasses. The hydrogen rich model (red continous line) is ruled out a $7\ \sigma$ level by the combined set of observations.

Secular dynamics of planetesimals in tight binary systems: Application to γ-Cephei

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Astronomy & Astrophysics, DOI: 10.1051/0004-6361/201016375 (arXiv:1105.0243)

The secular dynamics of small planetesimals in tight binary systems play a fundamental role in establishing the possibility of accretional collisions in such extreme cases. The most important secular parameters are the forced eccentricity and secular frequency, which depend on the initial conditions of the particles, as well as on the mass and orbital parameters of the secondary star.
We construct a second-order theory (with respect to the masses) for the planar secular motion of small planetasimals and deduce new expressions for the forced eccentricity and secular frequency. We also reanalyze the radial velocity data available for γ-Cephei and present a series of orbital solutions leading to residuals compatible with the best fits. Finally, we discuss how different orbital configurations for γ-Cephei may affect the dynamics of small bodies in circunmstellar motion. The secular theory is constructed using a Lie series perturbation scheme restricted to second order in the small parameter. The orbital fits were analyzed is done with a minimization code that employs a genetic algorithm for a preliminary solution plus a simulated annealing for the fine tuning.
For γ-Cephei, we find that the classical first-order expressions for the secular frequency and forced eccentricity lead to large inaccuracies $\sim 50\%$ for semimajor axes larger than one tenth the orbital separation between the stellar components. Low eccentricities and/or masses reduce the importance of the second-order terms. The dynamics of small planetesimals only show a weak dependence with the orbital fits of the stellar components, and the same result is found including the effects of a nonlinear gas drag. Thus, the possibility of planetary formation in this binary system largely appears insensitive to the orbital fits adopted for the stellar components, and any future alterations in the system parameters (due to new observations) should not change this picture. Finally, we show that planetesimals migrating because of gas drag may be trapped in mean-motion resonances with the binary, even though the migration is divergent.

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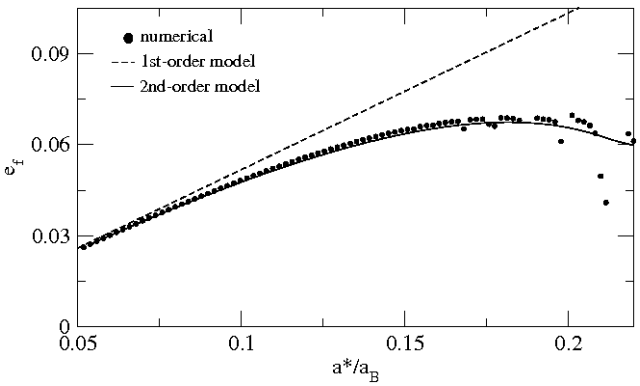

Figure 2: (Giuppone et al.) Forced eccentricity as function of the proper semimajor axis, calculated by three different methods: filtered exact numerical simulations (filled black circles), first-order analytical model (dashed lines), and the new second-order secular model (continuous lines).

Detection of a transit of the super-Earth 55 Cnc e with *Warm Spitzer*

B.-O. Demory[1], M. Gillon[2], D. Deming[3], D. Valencia[1], S. Seager[1], B. Benneke[1], C. Lovis[4], P. Cubillos[5], J. Harrington[5], K. B. Stevenson[5], M. Mayor[4], F. Pepe[4], D. Queloz[4], D. Segransan[4], S. Udry[4]

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Astronomy & Astrophysics, in press (arXiv:1105.0415)

We report on the detection of a transit of the super-Earth 55 Cnc e with *Warm Spitzer* in IRAC's 4.5μm band. Our MCMC analysis includes an extensive modeling of the systematic effects affecting *Warm Spitzer* photometry, and yields a transit depth of 450 ± 50 ppm, which translates to a planetary radius of $2.13^{+0.14}_{-0.13}\,R_{\oplus}$ as measured in IRAC 4.5μm channel. A planetary mass of $7.98 \pm 0.69\,M_{\oplus}$ is derived from an extensive set of radial-velocity data, yielding a planetary density of $0.83 \pm 0.18 \rho_{\oplus}$. Interestingly, the derived radius is $1.3\times$ larger than the one recently reported in the visible by Winn et al. Thanks to the brightness of its host star ($V = 6$, $K = 4$), 55 Cnc e is a unique target for the thorough characterization of a super-Earth orbiting around a solar-type star.

Download/Website: `http://arxiv.org/abs/1105.0415`

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Chemical Evolution of Protoplanetary Disks - The Effects of Viscous Accretion, Turbulent Mixing, and Disk Winds

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Astrophysical Journal, published (2011ApJ...731..115H)

We calculate the chemical evolution of protoplanetary disks considering radial viscous accretion, vertical turbulent mixing, and vertical disk winds. We study the effects on the disk chemical structure when different models for the formation of molecular hydrogen on dust grains are adopted. Our gas-phase chemistry is extracted from the UMIST Database for Astrochemistry (Rate06) to which we have added detailed gas-grain interactions. We use our chemical model results to generate synthetic near- and mid-infrared local thermodynamic equilibrium line emission spectra and compare these with recent Spitzer observations. Our results show that if H_2 formation on warm grains is taken into consideration, the H2O and OH abundances in the disk surface increase significantly. We find that the radial accretion flow strongly influences the molecular abundances, with those in the cold midplane layers particularly affected. On the other hand, we show that diffusive turbulent mixing affects the disk chemistry in the warm molecular layers, influencing the line emission from the disk and subsequently improving agreement with observations. We find that NH_3, CH_3OH, C_2H_2, and sulfur-containing species are greatly enhanced by the inclusion of turbulent mixing. We demonstrate that disk winds potentially affect the disk chemistry and the resulting molecular line emission in a manner similar to that found when mixing is included.

Download/Website: `http://iopscience.iop.org/0004-637X/731/2/115`
`http://arxiv.org/abs/1102.3972`

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The Photoevaporative Wind from the Disk of TW Hya

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The Astrophysical Journal, in press (arXiv:1105.0045))

Photoevaporation driven by the central star is expected to be a ubiquitous and important mechanism to disperse the circumstellar dust and gas from which planets form. Here, we present a detailed study of the circumstellar disk surrounding the nearby star TW Hya and provide observational constraints to its photoevaporative wind. Our new high-resolution ($R \sim 30,000$) mid-infrared spectroscopy in the [NeII] 12.81 micron line confirms that this gas diagnostic traces the unbound wind component within 10 AU from the star. From the blueshift and asymmetry in the line profile, we estimate that most ($>$80%) of the [NeII] emission arises from disk radii where the midplane is optically thick to the redshifted outflowing gas, meaning beyond the 1 or 4 AU dust rim inferred from other observations. We re-analyze high-resolution ($R \sim 48,000$) archival optical spectra searching for additional transitions that may trace the photoevaporative flow. Unlike the [NeII] line, optical forbidden lines from OI, SII, and MgI are centered at the stellar velocity and have symmetric profiles. The only way these lines could trace the photoevaporative flow is if they arise from a disk region physically distinct from that traced by the [NeII] line, specifically from within the optically thin dust gap. However, the small ($\sim$10 km/s) FWHM of these lines suggest that most of the emitting gas traced at optical wavelengths is bound to the system rather than unbound. We discuss the implications of our results for a planet-induced versus a photoevaporation-induced gap.

Download/Website: `http://arxiv.org/pdf/1105.0045v1`

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Symplectic integrators in the shearing sheet

Hanno Rein & Scott Tremaine
Institute for Advanced Study, Princeton

Monthly Notices of the Royal Astronomical Society, in press (arXiv:1103.1376)

The shearing sheet is a model dynamical system that is widely used to study the small-scale dynamics of astrophysical disks. Numerical simulations of particle trajectories in the shearing sheet usually employ the leapfrog integrator, but this integrator performs poorly because of velocity-dependent (Coriolis) forces. We describe two new integrators for this purpose; both are symplectic, time-reversible and second-order accurate, and can easily be generalized to higher orders. Moreover, both integrators are exact when there are no small-scale forces such as mutual gravitational forces between disk particles. In numerical experiments these integrators have errors that are often several orders of magnitude smaller than competing methods. The first of our new integrators (SEI) is well-suited for disks in which the typical inter-particle separation is large compared to the particles' Hill radii (e.g., planetary rings), and the second (SEKI) is designed for disks in which the particles are on bound orbits or the separation is smaller than the Hill radius (e.g., irregular satellites of the giant planets).

Download/Website: `http://arxiv.org/abs/1103.1376`

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The physics of protoplanetesimal dust agglomerates. VI. Erosion of large aggregates as a source of micrometer-sized particles

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Astrophysical Journal, accepted (2011arXiv1103.0427S)

Observed protoplanetary disks consist of a large amount of micrometer-sized particles. Dullemond & Dominik (2005) pointed out for the first time the difficulty in explaining the strong mid-IR excess of classical T-Tauri stars without any dust-retention mechanisms. Because high relative velocities in between micrometer-sized and macroscopic particles exist in protoplanetary disks, we present experimental results on the erosion of macroscopic agglomerates consisting of micrometer-sized spherical particles via the impact of micrometer-sized particles. We find that after an initial phase, in which an impacting particle erodes up to 10 particles of an agglomerate, the impacting particles compress the agglomerate's surface, which partly passivates the agglomerates against erosion. Due to this effect the erosion halts within our error bars for impact velocities up to $\sim$30 m s^{-1}. For larger velocities, the erosion is reduced by an order of magnitude. This outcome is explained and confirmed by a numerical model. In a next step we build an analytical disk model and implement the experimentally found erosive effect. The model shows that erosion is a strong source of micrometer-sized particles in a protoplanetary disk. Finally we use the stationary solution of this model to explain the amount of micrometer-sized particles in observational infrared data of Furlan et al. (2006).

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The four-populations model: a new classification scheme for pre-planetesimal collisions

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Astronomy & Astrophysics, accepted (arXiv:1105.0915)

Within the collision growth scenario for planetesimal formation, the growth step from centimetre sized pre-planetesimals to kilometre sized planetesimals is still unclear. The formation of larger objects from the highly porous pre-planetesimals may be halted by a combination of fragmentation in disruptive collisions and mutual rebound with compaction. However, the right amount of fragmentation is necessary to explain the observed dust features in late T Tauri discs. Therefore, detailed data on the outcome of pre-planetesimal collisions is required and has to be presented in a suitable and precise format. We wish to develop a new classification scheme broad enough to encompass all events with sticking, bouncing, and fragmentation contributions, accurate enough to capture the important collision outcome nuances, and at the same time simple enough to be implementable in global dust coagulation simulations. We furthermore wish to demonstrate the reliability of our numerical smoothed particle hydrodynamics (SPH) model and the applicability of our new collision outcome classification to previous results as well as our simulation results. We propose and apply a scheme based on the quantitative aspects of four fragment populations: the largest and second largest fragment, a power-law population, and a sub-resolution population. For the simulations of pre-planetesimal collisions, we adopt the SPH numerical scheme with extensions for the simulation of porous solid bodies. By means of laboratory benchmark experiments, this model was previously calibrated and tested for the correct simulation of the compaction, bouncing, and fragmentation behaviour of macroscopic highly porous SiO_2 dust aggregates.It is shown that previous attempts to map collision data were much too oriented on qualitatively categorising into sticking, bouncing, and fragmentation events. Intermediate categories are found in our simulations which are hard to map to existing qualitative categorisations. We show that the four-populations

model encompasses all previous categorisations and in addition allows for transitions. This is because it is based on quantitative characteristic attributes of each population such as the mass, kinetic energy, and filling factor. In addition, the numerical porosity model successfully passes another benchmark test: the correct simulation of the entire list of collision outcome types yielded by laboratory experiments. As a demonstration of the applicability and the power of the four-populations model, we utilise it to present the results of a study on the influence of collision velocity in head-on collisions of intermediate porosity aggregates.

Download/Website: `http://arxiv.org/abs/1105.0915`

Contact: `ralf.j.geretshauser@uni-tuebingen.de`

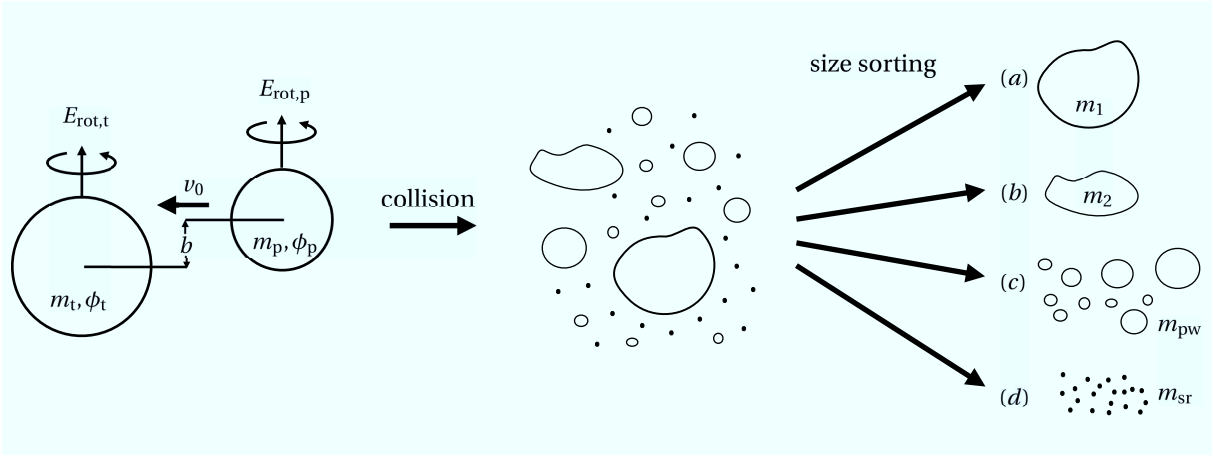

Figure 3: (Geretshauser et al.) Illustration of the four-populations model. The left side displays the situation before the collision: Two pre-planetesimals collide with impact velocity v_0 and impact parameter b. The target and projectile are characterised by their defining quantities, e.g. mass m, filling factor ϕ, and rotational energy E_{rot}. Depending on these parameters an outcome population is generated in the collision (middle). The four-populations model distinguishes the fragments according to their mass. The population classes are: (a) the largest fragment, (b) the second largest fragment, (c) the power-law population, and (d) the sub-resolution population.

3 Other abstracts

Oogle-Flip and the Planet Adventure

Text: Andrew Norton, Illustrations: Christy Croll
Magic World Media

Magic World Media, ISBN: 978-0982114162

This title is suitable for children aged 5 to 7 years. Oogle is a precocious alien from Flip-world on a quest to find another planet that is just right for life. Since no other habitable planets have ever been found, Oogle's friends don't think he'll succeed, but they wish him luck on his hunt. Along the way, he visits many different planets and learns lessons about the conditions needed for life. With colourful illustrations and cheerful rhymes, this adventure teaches children about scientific inquiry and the benefits of perseverance.

Hardcover, 38pp, 28.7 x 22.1 x 1 cm, published 1st April 2011. $16.95 / £14.50.

Download/Website: `http://www.magicworldmedia.com/`

Contact: `A.J.Norton@open.ac.uk`

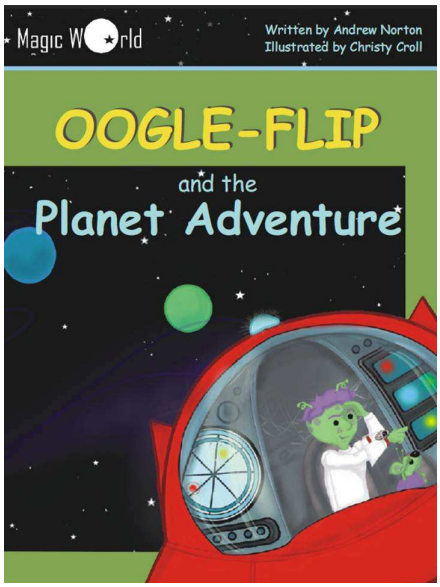

Figure 4: (Norton & Croll) Oogle-Flip and the Planet Adventure: Exoplanets for kids!

4 Conference announcements

EPSC-DPS Joint Meeting 2011 – Session: Exoplanetary magnetic fields and stellar-planetary magnetic interactions: Modelling, Detection, Characterization

M. Khodachenko[1], *J.-M. Grießmeier*[2]

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[2] Lab. de Physique et Chimie de l'Environnement et de l'Espace & Observatoire des Sciences de l'Univers en région Centre, Orléans, France

Nantes, France, 03-07 October 2011

Dear colleagues,
we would like to bring to your attention and invite you to participate in the interdisciplinary session **MG3: Exoplanetary magnetic fields and stellar-planetary magnetic interactions: Modelling, detection, characterization** of the oncoming EPSC-DPS Joint Meeting 2011 in Nantes, France (October 03-07, 2011).

The focus of this session is exoplanetary magnetism. Due to the generality and the far-reaching implications of the subject, we welcomes participants from the fields of stellar and exoplanetary physics, including the topics like stellar activity, observation and characterization of planetary systems, stellar-planetary relations, planetary evolution, dedicated computational modelling and data analysis. Special emphasis is put on the transfer of the experiences gained in the studies of magnetism and magnetospheres of the solar system planets to the new field of exoplanets, taking into account the specifics of orbital location of exoplanets, stellar activity etc. Implementation of the theoretical/computational predictions to the observational and detection techniques represent another key topic of the envisaged discussions during the session.

The deadline for submission of contributions is May 31, 2011. Please feel free to circulate this announcement among all colleagues who may be interested in this session.

With best regards,
Maxim Khodachenko and Jean-Mathias Grießmeier (Conveners)

Download/Website: `http://meetingorganizer.copernicus.org/EPSC-DPS2011/session/8884`

Contact: `maxim.khodachenko@oeaw.ac.at, jean-mathias.griessmeier@cnrs-orleans.fr`

EPSC-DPS Joint Meeting 2011 – Session: Super-Earth and Life

Session Chair(s): L. Kaltenegger[1,2], *A. Segura*[3]

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[3] UNAM, Mexico City, Mexico

Nantes, France, 3-7 October 2011

After a decade rich in giant exoplanet detections, observation techniques have reached the threshold to find and characterize planets of less than 10 Earth masses - so called Super-Earths - potentially rocky and habitable worlds.

The detection of the first Super-Earths in April 2007 led to fundamental questions: from the influence of plate tectonics and different geochemical cycles on habitable conditions to the detectability of different biota from a remote spectrum. This number will raise significantly when Kepler planetary candidates will be confirmed. What does it take for super-Earths to support life?

Ground as well as space based telescopes to characterization rocky exoplanets, are already in development phase (E-ELT, TNT, GMT, James Webb Space Telescope). With no similar planet in our solar system, we will discuss what it take to characterize these new worlds. This session will connect theory of rocky planets and observation strategy to search for the atmospheric signatures of small exoplanets in general and for biospheres in particular.

Download/Website: `http://meetingorganizer.copernicus.org/EPSC-DPS2011/sessionprogramme/AB`

Contact: `kaltenegger@mpia.de`

First Kepler Science Conference

Matthew Holman, Chair, Science Organizing Committee

Moffett Field, CA, December 5-9, 2011

The First Kepler Science Conference will be held 5-9 December 2011; hosted by the NASA Ames Research Center, Moffett Field, California. The conference will highlight the full range of scientific results that have emerged from more than two years of Kepler observations, as well as what to expect from continued observations. The meeting will consist of 9-10 half-day sessions, each session dedicated to a different topic. Topics will include:

- The Kepler Mission and Exoplanet Statistics
- Earth-analog and sub-Neptune-size Planets
- Multiple Planet Systems
- Exoplanet Theory
- Giant Planets and Planet Atmospheres
- Eclipsing and Interacting Binaries
- Stellar Activity and Rotation
- Asteroseismology Across the HR Diagram
- Red Giant Oscillations
- Asteroseismology of Solar-type Stars

The conference website is: http://kepler.nasa.gov/Science/ForScientists/keplerconference/

If you are interested in attending, please complete a short survey at: https://www.surveymonkey.com/s/TKSPKMG

Download/Website: `http://kepler.nasa.gov/Science/ForScientists/keplerconference/`

Characterizing Exoplanets – from formation to characterization

L. Kaltenegger[1,2]
[1] Max Planck Institute for Astronomy, Heidelberg, Germany
[2] Harvard Smithsonian Center for Astrophysics, Cambridge, USA

Heidelberg, Germany, 1-5 August 2011

The focus of this IMPRS school is to link current observations and theory from formation and detection of planets to explore their atmosphere and characterizing habitable environments. It will highlight the newest results in extra solar planet search in a cross-disciplinary environment, discuss different formation scenarios and observables, recently discovered Super-Earths to potential habitability of rocky planets in a very interactve environment.

The goals of the IMPRS Summer Schools are to: 1) bring together research students of various fields for discussion and exchange of ideas 2) encourage young researchers and advanced students to continue research in these fields; and 3) strengthen future interdisciplinary research in these areas.

Lecturers: Willy Benz, University of Bern; Peter Hauschildt, University of Hamburg; Anders Johansen, Lund Observatory; Lisa Kaltenegger, MPI for Astronomy, Heidelberg; Stephane Udry, Observatory of Geneva.

June 1st: Registration/application deadline for participation, and travel support

Download/Website: `http://www.mpia.de/imprs-hd/SummerSchools/2011/summerschool2011info.html`

Contact: `imprs-hd@mpia.de`

STFC graduate course: Exoplanets and their host stars

S. Aigrain[1], *W. J. Chaplin*[2]
[1] Department of Physics, University of Oxford
[2] School of Physics and Astronomy, University of Birmingham

St Anne's College, Oxford, 12–16 March 2012

We are entering a golden era for exoplanet science and asteroseismology, driven by new satellite and telescope observations of unprecedented quality and scope. The discovery and characterisation of exoplanets is one of the most active areas in modern astronomy, and has seen tremendous growth in the UK in the past decade. Transiting planets in particular offer unique opportunities to study the interior structures, compositions and atmospheres of a vast range of exoplanets. Understanding stars is clearly of central importance to astrophysics as a whole, but the synergy is particularly potent for exoplanets: in many cases, it is our knowledge of the host star properties which currently limits the detectability and characterization of planets.

This 3.5 day residential course is aimed primarily at graduate students studying exoplanets, asteroseismology and/or stellar activity. The programme consists of lectures by leading UK experts, providing an overview of the key scientific questions addressed by these areas and their mutual synergies, and team projects providing a hands-on introduction to the most important data analysis and modelling techniques using data from state-of-the-art facilities. The course is limited to a maximum of 30 students, and all participants must apply before Friday 18/11/2011. STFC-funded students have priority but other graduate students and young postdocs interested in exoplanets and asteroseismology are welcome to apply. STFC will cover the full cost of the course (including travel and subsistence) for STFC-funded graduate students. See website for instructions on how to apply.

Download/Website: `http://physics.ox.ac.uk/EAHS12`

Contact: `vfw@astro.ox.ac.uk`

5 Jobs and Positions

Senior Lecturer in Star Formation and/or Exoplanets

Göran Östlin
Dept. of Astronomy, Stockholm University, Sweden

Stockholm, Application dead line: May 31, 2011

The Department of Astronomy at Stockholm University announces a tenured position as Senior Lecturer in Astronomy in the area of Star Formation and Exoplanets. Research at the department covers a broad range, from solar physics, exo-planets, the formation and death of stars, galaxies, to the distant and early Universe. The Swedish memberships in ESO and ESA allow access to first-class observing facilities.

We are looking for a person with a research background in star formation and/or exoplanets. We welcome applications from theoreticians, observers, as well as instrumentalists. The research at the department in this area forms part of the astrobiology activities at the Faculty of Sciences, Stockholm University.

The main tasks of the appointee will be research, teaching and supervision of students. To qualify the applicant should have a PhD or equivalent scientific qualifications, as well as demonstrated teaching proficiency. In the evaluation equal and special weight will be given to scientific and teaching qualities. Some weight will also be given to experience with public outreach. Fluency in Swedish is not a requirement. Stockholm University strives towards gender balance and applications from women are particularly welcome.

The formal announcement (reference number SU 612-0838-11) can be found at the department's website `http://www.astro.su.se/new_pos.en.html` and at Stockholm University's page for vacancies `http://www.su.se/english/about/vacancies/lecturers-researchers`. The deadline for applications is May 31st, 2011.

Please refer to the formal announcement for details of the electronic application procedure. Further information can be obtained from the head of department, Professor Göran Östlin, e-mail: `ostlin@astro.su.se`, tel. +46-8-5537 8513.

Download/Website: `http://www.su.se/english/about/vacancies/lecturers-researchers`

Contact: `ostlin@astro.su.se`

6 Announcements

NStED Access to Kepler Candidate Public Data

David R. Ciardi on behalf of the NStED team
NASA Exoplanet Science Institute/Caltech

The NASA Exoplanet Science Institute (NExScI) announces a major update to the NASA Star and Exoplanet Database (NStED: http://nsted.ipac.caltech.edu). The recently announced 1235 Kepler exoplanet candidates have been integrated into the Kepler light curve service at NStED. Users can search on properties of the host star, planet candidate, or confirmed planet. All public light curves that fulfill these criteria can be retrieved instantaneously. The planet candidate interface is integrated with the NStED periodogram service, allowing the user to find the correct period and phase data by it. The service is available at http://nsted.ipac.caltech.edu/applications/ETSS/Kepler_planetary_index.html

NStED also has added over 1,000 new validated photometric light curves and radial velocity curves for the known exoplanet hosting stars extracted from the literature and donated to NStED by authors. The release contains 395 light curves and 689 radial velocity curves of exoplanet host stars. These time-series data feature a uniform header format including basic statistics and data visualization options. The data are available through the search interface and or via a bulk download scripts (http://nsted.ipac.caltech.edu/bulk_data_download/).

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

Contact: `http://nsted.ipac.caltech.edu/applications/Helpdesk`

7 As seen on astro-ph

The following list contains all the entries relating to exoplanets that we spotted on astro-ph during April 2011. If you see any that we missed, please let us know and we'll include them in the next issue.

Exoplanets

astro-ph/1104.0011: **Broadband Transmission Spectroscopy of the super-Earth GJ 1214b suggests a Low Mean Molecular Weight Atmosphere** by *Bryce Croll, Loic Albert, Ray Jayawardhana et al*

astro-ph/1104.0041: **A ground-based Ks-band detection of the thermal emission from the transiting exoplanet WASP-4b** by *C.Caceres, V.D. Ivanov, D. Minniti et al*

astro-ph/1104.0512: **Beryllium abundances in stars with planets:Extending the sample** by *M.C. Galvez-Ortiz, E. Delgado-Mena, J.I. Gonzlez Hernandez et al*

astro-ph/1104.0535: **The Snow Border** by *M.G. Marseille, S. Cazaux*

astro-ph/1104.0570: **Ground-based NIR emission spectroscopy of HD189733b** by *I.P. Waldmann, P. Drossart, G. Tinetti et al*

astro-ph/1104.0925: **Evolutionary Constraints on the Planet-Hosting Subgiant Epsilon Reticulum from its WhiteDwarf Companion** by *J. Farihi, M. R. Burleigh, J. B. Holberg et al*

astro-ph/1104.0939: **The Heavy Element Composition of Disk Instability Planets Can Range From Sub- to Super-Nebular** by *Aaron C. Boley, Ravit Helled, Matthew J. Payne*

astro-ph/1104.1382: **Exo–Zodiacal Dust Levels for Nearby Main Sequence Stars** by *R. Millan-Gabet, E. Serabyn, B. Mennesson et al*

astro-ph/1104.1427: **Piercing the Glare: Direct Imaging Search for Planets in the Sirius System** by *Christian Thalmann,Tomonori Usuda, Matthew Kenworthy et al*

astro-ph/1104.1460: **On the dynamics and collisional growth of planetesimals in misaligned binary systems** by *M.M. Fragner, R.P. Nelson, W. Kley*

astro-ph/1104.2537: **FIRE Spectroscopy of Five Late-type T Dwarfs Discovered with the Wide-field Infrared Survey Explorer** by *Adam J. Burgasser, Michael C. Cushing, J. Davy Kirkpatrick et al*
astro-ph/1104.2823: **WASP-43b: The closest-orbiting hot Jupiter** by *Coel Hellier, D.R. Anderson, A. Collier Cameron et al*
astro-ph/1104.2827: **WASP-35b, WASP-48b and WASP-51b: Two new planets and an independent discovery of HAT-P-30b** by *B.Enoch, D.R.Anderson, S.C.C.Barros et al*
astro-ph/1104.2901: **A Spitzer Transmission Spectrum for the Exoplanet GJ 436b, Evidence for Stellar Variability, and Constraints on Dayside Flux Variations** by *Heather A. Knutson, Nikku Madhusudhan, Nicolas B. Cowan et al*
astro-ph/1104.3092: **Case Studies ofHabitable Trojan Planets in the System of HD 23079** by *J. Eberle, M. Cuntz, B.Quarles et al*
astro-ph/1104.3183: **Thermochemistry and Photochemistry in Cooler Hydrogen Dominated Extrasolar Planets: The Case ofGJ436b** by *Michael R Line, Gautam Vasisht, Pin Chen et al*
astro-ph/1104.3186: **Chromospheric activity of Southern Stars from the Magellan Planet Search Program** by *Pamela Arriagada*
astro-ph/1104.3268: **Auroral Radio Emission from Stars: the case of CU Virginis** by *Corrado Trigilio, Paolo Leto, Grazia Umana*
astro-ph/1104.3756: **Atmospheric studies of habitability in the Gliese 581 system** by *P. von Paris, S. Gebauer, M. Godolt et al*
astro-ph/1104.3863: **Warm Saturns: On the Nature of Rings around Extrasolar Planets that Reside Inside the Ice Line** by *Hilke E. Schlichting, Philip Chang*
astro-ph/1104.4106: **Mergerburst Transients of Brown Dwarfs with Exoplanets** by *Ealeal Bear, Amit Kashi, Noam Soker*
astro-ph/1104.4322: **On the Origin and Evolution of Life in the Galaxy** by *Michael McCabe, Holly Lucas*
astro-ph/1104.4431: **A likely exoplanet orbiting the oscillating K-giant ? Arietis** by *B.-C. Lee, D. E. Mkrtichian, I. Han et al*
astro-ph/1104.4763: **Thermal phase curves of non-transiting terrestrial exoplanets 1. Characterizing atmospheres** by *FranckSelsis, Robin Wordsworth, Francois Forget*
astro-ph/1104.4977: **On the formation location of Uranus and Neptune as constrained by dynamical and chemical models of comets** by *Jj Kavelaars, Olivier Mousis, Jean-Marc Petit et al*
astro-ph/1104.5014: **Detecting the Signatures of Uranus and Neptune** by *Stephen R. Kane*
astro-ph/1104.5230: **A Super-Earth Transiting a Naked-Eye Star** by *Joshua N. Winn, Jaymie M. Matthews, Rebekah I.Dawson*

Disks

astro-ph/1104.0007: **Debris disks assignposts of terrestrial planet formation** by *Sean N. Raymond, Philip J. Armitage, Amaya Moro-Martin et al*
astro-ph/1104.0284: **The Tucana/Horologium, Columba, AB Doradus, and Argus Associations: New Members and Dusty Debris Disks** by *B. Zuckerman, Joseph H. Rhee, Inseok Song et al*
astro-ph/1104.0462: **Formation of a Propeller Structure by a Moonlet in a Dense Planetary Ring** by *Shugo Michikoshi, Eiichiro Kokubo*
astro-ph/1104.0905: **Constraining the structure of the planet-forming region in the disk of the Herbig Be star HD100546** by *E. Tatulli, M. Benisty, F. Menard et al*
astro-ph/1104.0939: **The Heavy Element Composition of Disk Instability Planets Can Range From Sub- to Super-Nebular** by *Aaron C. Boley, Ravit Helled, Matthew J. Payne*
astro-ph/1104.0964: **Tidal decay and orbital circularization in close-in two-planet systems** by *Adrian Rodrguez, Sylvio Ferraz-Mello, Tatiana A. Michtchenko et al*
astro-ph/1104.1431: **Spitzer IRS Spectroscopy of the 10 Myr-old EF Cha Debris Disk: Evidence for Phyllosilicate-Rich Dust in the Terrestrial Zone** by *Thayne Currie, Carey M. Lisse, Aurora Sicilia-*

Aguilar et al

astro-ph/1104.1460: **On the dynamics and collisional growth of planetesimals in misaligned binary systems** by *M.M. Fragner, R.P. Nelson, W. Kley*

astro-ph/1104.1475: **Planet Formation In Highly Inclined Binary Systems I. Planetesimals Jump Inwards And Pile Up** by *Ji-Wei Xie, Matthew Payne, Philippe Thebault et al*

astro-ph/1104.2283: **Detection of CH+ emission from the disc around HD100546** by *W.-F. Thi, F. Menard, G. Meeus et al*

astro-ph/1104.2408: **Evolution of inclined planets in three-dimensional radiative discs** by *Bertram Bitsch, Willy Kley*

astro-ph/1104.2898: **The debris disk - terrestrial planet connection** by *Sean N. Raymond, Philip J. Armitage, Amaya Moro-Martn et al*

astro-ph/1104.3574: **On the Evolution of Dust Mineralogy, From Protoplanetary Disks to Planetary Systems** by *Isa Oliveira, Johan Olofsson, Klaus M. Pontoppidan et al*

astro-ph/1104.3560: **A Herschel resolved far-infrared dust ring around HD 207129** by *J.P. Marshall, T. Lohne, B. Montesinos et al*

astro-ph/1104.3987: **On the dynamics of planetesimals embedded in turbulent protoplanetary discs with dead zones** by *Oliver Gressel, Richard P. Nelson, Neal J. Turner*

astro-ph/1104.4358: **Chemical evolution of turbulent protoplanetary disks and the Solar nebula** by *D. Semenov, D. Wiebe*

astro-ph/1104.4499: **Estimating the mass of the debris disk in HD 69830** by *Kevin Heng*

astro-ph/1104.4806: **Emission Lines from the Gas Disk around TW Hydra and the Origin of the Inner Hole** by *Uma Gorti, DavidHollenbach, Joan Najita et al*

Instrumentation and Techniques

astro-ph/1104.2612: **An Affine-Invariant Sampler for Exoplanet Fitting and Discovery in Radial Velocity Data** by *FengjiHou, Jonathan Goodman, David W. Hogg et al*

astro-ph/1104.2903: **Multi-stage four-quadrant phase mask: achromatic coronagraph for space-based and ground-based telescopes** by *R. Galicher, P. Baudoz, J. Baudrand*

astro-ph/1104.3142: **Data Mining and Machine-Learning in Time-Domain Discovery & Classification** by *Joshua S. Bloom, Joseph W. Richards*

astro-ph/1104.3428: **Rotational Doppler beaming in eclipsing binaries** by *Paul J. Groot*

astro-ph/1104.3804: **Precision radial velocities with CSHELL** by *Christopher J. Crockett, Naved I. Mahmud, Lisa Prato*

astro-ph/1104.4112: **Habitable Planet Detection and Characterization with Far Infrared Coherent Interferometry** by *James P. Lloyd*

astro-ph/1104.5233: **A Data Cube Extraction Pipeline for a Coronagraphic Integral Field Spectrograph** by *Neil Zimmerman, Douglas Brenner, Ben R. Oppenheimer et al*