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Editors: S. P. Quanz,Y. Alibert, A. Leleu, C. Mordasini
NCCR PlanetS, Gesellschaftsstrasse 6, CH-3012 Bern, Switzerland

exoplanetnews@nccr-planets.ch http://nccr-planets.ch/exoplanetnews

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1 Editorial

Welcome to edition 107 of the ExoPlanet News!

Thanks a lot to all of you who contributed to this issue of the newsletter! We have, for the first time, a short summary of recent updates at the NASA exoplanet archive, which we think is a great addition to the general announcements of newly accepted papers, conferences and job ads. Also, as announced last time, we are still in the process of updating the information available on the ExoPlanet News webpage (http://nccr-planets.ch/exoplanetnews/). If you have suggestions for additional links to be added, please get in touch with us. This could be links to other newsletters, exoplanet related missions or projects, or databases for instance.

The current Latex template for submitting contributions of any kind, as well as all previous editions of ExoPlanet News, can also be found on the webpage mentioned above. As usual, we would be happy to receive feedback concerning the newsletter.

The next issue of will appear June 18, 2018.

Thanks for all your support and best regards from Switzerland

Sascha P. Quanz
Yann Alibert
Adrien Leleu
Christoph Mordasini

2 Abstracts of refereed papers

Origin and continuation of 3/2, 5/2, 3/1, 4/1 and 5/1 resonant periodic orbits in the circular and elliptic restricted three-body problem

Kyriaki I. Antoniadou & Anne-Sophie Libert
NaXys, Department of Mathematics, University of Namur, 8 Rempart de la Vierge, 5000 Namur, Belgium

Celestial Mechanics and Dynamical Astronomy, in press

We consider a planetary system consisting of two primaries, namely a star and a giant planet, and a massless secondary, say a terrestrial planet or an asteroid, which moves under their gravitational attraction. We study the dynamics of this system in the framework of the circular and elliptic restricted three-body problem, when the motion of the giant planet describes circular and elliptic orbits, respectively. Originating from the circular family, families of symmetric periodic orbits in the 3/2, 5/2, 3/2, 4/1 and 5/1 mean-motion resonances are continued in the circular and the elliptic problems. New bifurcation points from the circular to elliptic problem are found for each of the above resonances and thus, new families, continued from these points are herein presented. Stable segments of periodic orbits were found at high eccentricity values of the already known families considered as whole unstable previously. Moreover, new isolated (not continued from bifurcation points) families are computed in the elliptic restricted problem. The majority of the new families mainly consist of stable periodic orbits at high eccentricities. The families of the 5/1 resonance are investigated for the first time in the restricted three-body problems. We highlight the effect of stable periodic orbits on the formation of stable regions in their vicinity and unveil the boundaries of such domains in phase space by computing maps of dynamical stability. The long-term stable evolution of the terrestrial planets or asteroids is dependent on the existence of regular domains in their dynamical neighbourhood in phase space, which could host them for long time spans. This study, apart from other celestial architectures that can be efficiently modelled by the circular and elliptic restricted problems, is particularly appropriate for the discovery of terrestrial companions among the single-giant planet systems discovered so far.

Download/Website: `https://doi.org/10.1007/s10569-018-9834-8`

Contact: `kyriaki.antoniadou@unamur.be`

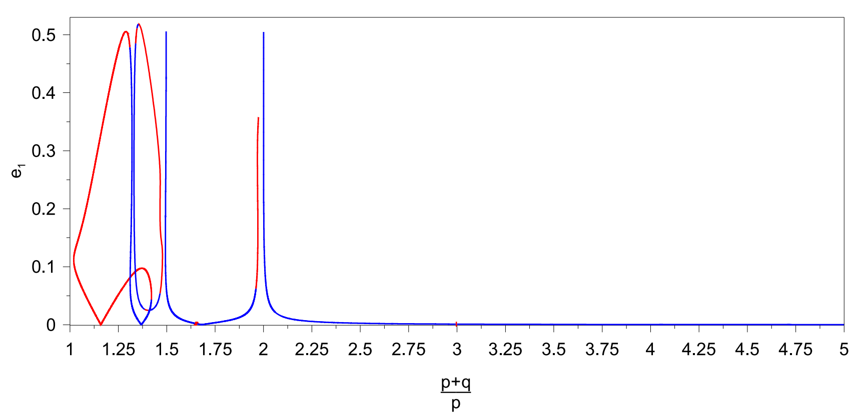

Figure 1: Antoniadou: The circular family (of circular stable (blue) periodic orbits with $e_{1,2} \approx 0$) for $\mu = 0.001$ as the mean-motion ratio ($\frac{p+q}{p}$) varies. As the eccentricity, e_1, of the small body increases, the continuation of the circular family to the elliptic families of the CRTBP is showcased. At first-order MMRs, the gaps at the circular family are evident. At second-order MMRs, the circular periodic orbits become unstable (red).

New inner boundaries of the habitable zones around M dwarfs

J. Bin[1,2], *F. Tian*[1,2], *L. Liu*[1,2]
[1] Ministry of Education Key Laboratory for Earth System Modeling, Department of Earth System Science, Tsinghua University, Beijing 100084, China
[2] Joint Center for Global Change Studies, Beijing 100875, China

Earth and Planetary Science Letters, published (10.1016/j.epsl.2018.04.003)

Two general circulation models CAM4 and CAM5 are used to study the climate of ocean planets around M dwarfs with different effective temperatures. The atmospheres in CAM5 simulations are warmer and contain more water vapor than those in CAM4 under identical model settings, a result likely caused by improved treatments of radiation and possibly clouds in CAM5. The inner boundary of the habitable zones of M dwarfs based on CAM5 simulations, expressed as a second order polynomial function, are farther away from the stars than what are suggested by previous works and the corresponding atmospheres are in the moist greenhouse state.

Download/Website: `https://doi.org/10.1016/j.epsl.2018.04.003/`

Contact: `tianfengco@126.com`

KPS-1b: the first transiting exoplanet discovered using an amateur astronomer's wide-field CCD data

A. Burdanov[1], *P. Benni*[2], *E. Sokov*[3,4], *V. Krushinsky*[5], *A. Popov*[5], *L. Delrez*[6], *M. Gillon*[1], *G. Hébrard*[7,8], *M. Deleuil*[9], *P. A. Wilson*[7,10], *O. Demangeon*[11], *Ö. Baştürk* [12], *E. Pakštiene*[13], *I. Sokova*[3], *S. A. Rusov*[3], *V. V. Dyachenko*[4], *D. A. Rastegaev*[4], *A. Beskakotov*[4], *A. Marchini*[14], *M. Bretton*[15], *S. Shadick*[16], *K. Ivanov*[17]
[1] Space sciences, Technologies and Astrophysics Research (STAR) Institute, Université de Liège, Allée du 6 Août 17, B-4000 Liège, Belgium
[2] Acton Sky Portal (Private Observatory), Acton, MA, USA
[3] Central Astronomical Observatory at Pulkovo of Russian Academy of Sciences, Pulkovskoje shosse d. 65, St. Petersburg, 196140, Russia
[4] Special Astrophysical Observatory, Russian Academy of Sciences, Nizhnij Arkhyz, 369167, Russia
[5] Ural Federal University, ul. Mira d. 19, Yekaterinburg, 620002, Russia
[6] Astrophysics Group, Cavendish Laboratory, J.J. Thomson Avenue, Cambridge CB3 0HE, UK
[7] Institut d'Astrophysique de Paris, UMR 7095 CNRS, Université Pierre & Marie Curie, 98bis boulevard Arago, F-75014 Paris, France
[8] Observatoire de Haute-Provence, Université d'Aix-Marseille & CNRS, F-04870 Saint Michel l' Observatoire, France
[9] Aix Marseille Université, CNRS, LAM (Laboratoire d'Astrophysique de Marseille) UMR 7326, F-13388 Marseille, France
[10] Leiden Observatory, Leiden University, Postbus 9513, 2300 RA Leiden, The Netherlands
[11] Instituto de Astrofísica e Ciências do Espaço, Universidade do Porto, CAUP, Rua das Estrelas, PT4150-762 Porto, Portugal
[12] Ankara University, Faculty of Science, Department of Astronomy and Space Science, TR-06100 Tandogan, Ankara, Turkey
[13] Institute of Theoretical Physics and Astronomy, Vilnius University, Saulėtekio al. 3, Vilnius LT-10257, Lithuania
[14] Astronomical Observatory - DSFTA, University of Siena, Via Roma 56, I-53100 Siena, Italy
[15] Baronnies Provençales Observatory, Hautes Alpes - Parc Naturel Régional des Baronnies Provençales, F-05150 Moydans, France
[16] Physics and Engineering Physics Department, University of Saskatchewan, Saskatoon, SK, S7N 5E2, Canada
[17] Irkutsk State University, ul. Karla Marxa d. 1, Irkutsk, 664003, Russia

Publications of the Astronomical Society of the Pacific, in press (arXiv:1804.05551)

We report the discovery of the transiting hot Jupiter KPS-1b. This exoplanet orbits a V=13.0 K1-type main-sequence star every 1.7 days, has a mass of $1.090^{+0.086}_{-0.087}\ M_{\rm Jup}$ and a radius of $1.03^{+0.13}_{-0.12}\ R_{\rm Jup}$. The discovery was made by the prototype Kourovka Planet Search (KPS) project, which used wide-field CCD data gathered by an amateur astronomer using readily available and relatively affordable equipment. Here we describe the equipment and observing technique used for the discovery of KPS-1b, its characterization with spectroscopic observations by the SOPHIE spectrograph and with high-precision photometry obtained with 1-m class telescopes. We also outline the KPS project evolution into the Galactic Plane eXoplanet (GPX) survey. The discovery of KPS-1b represents a new major step of the contribution of amateur astronomers to the burgeoning field of exoplanetology.

Download/Website: `http://arxiv.org/abs/1804.05551`

Contact: `artem.burdanov@uliege.be`

Transit time derivation for hot planet bow-shocks

P. Wilson Cauley[1], *Evgenya L. Shkolnik*[1], *& Joe Llama*[2]
[1] Arizona State University, School of Earth and Space Exploration, Tempe, AZ 85287
[2] Lowell Observatory, Flagstaff, AZ 86001

RNAAS, published (arXiv:1805.01496)

In this research note we present a derivation of the estimated transit time of the bow shock for short-period exoplanets. While such an estimate has been given previously, our derivation is explicit and is in terms of the physically relevant orbital and bow shock parameters. The analytical estimate for the beginning of the bow shock transit may be useful in order to approximate how much observing time is needed to capture a pre-transit signal caused by material compressed in the shock front.

Download/Website: `http://iopscience.iop.org/article/10.3847/2515-5172/aac219`

Contact: `pwcauley@gmail.com`

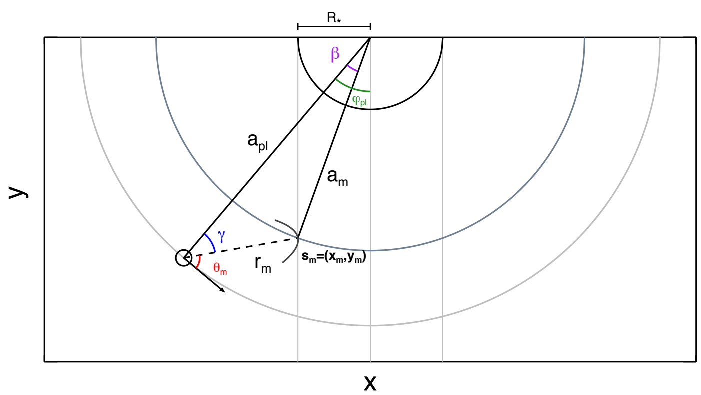

Figure 2: Cauley: Bow shock geometry assuming an impact parameter of $b = 0$.

Mass, radius, and composition of the transiting planet 55 Cnc e : using interferometry and correlations

A. Crida[1,2], *R. Ligi*[3], *C. Dorn*[4], *Y. Lebreton* [5,6]
[1] Université Côte d'Azur / Observatoire de la Côte d'Azur, Lagrange (UMR 7293), Boulevard de l'Observatoire, CS 34229, 06300 Nice, France
[2] Institut Universitaire de France, 103 Boulevard Saint-Michel, 75005 Paris, France
[3] INAF-Osservatorio Astronomico di Brera, Via E. Bianchi 46, I-23807 Merate, Italy
[4] University of Zurich, Institut of Computational Sciences, University of Zurich, Winterthurerstrasse 190, CH-8057, Zurich, Switzerland
[5] LESIA, Observatoire de Paris, PSL Research University, CNRS, Univ. Pierre et Marie Curie, Univ. Paris Diderot, 92195 Meudon, France
[6] Institut de Physique de Rennes, Université de Rennes 1, CNRS UMR 6251, 35042 Rennes, France

The Astrophysical Journal, in press (arXiv:1804.07537)

The characterisation of exoplanets relies on that of their host star. However, stellar evolution models cannot always be used to derive the mass and radius of individual stars, because many stellar internal parameters are poorly constrained. Here, we use the probability density functions (PDF) of directly measured parameters to derive the joint PDF of the stellar and planetary mass and radius. Because combining the density and radius of the star is our most reliable way of determining its mass, we find that the stellar (resp. planetary) mass and radius are strongly (resp. moderately) correlated. We then use a generalized Bayesian inference analysis to characterize the possible interiors of 55 Cnc e. We quantify how our ability to constrain the interior improves by accounting for correlation. The information content of the mass-radius correlation is also compared with refractory element abundance constraints. We provide posterior distributions for all interior parameters of interest. Given all available data, we find that the radius

of the gaseous envelope is $0.08 \pm 0.05 R_p$. A stronger correlation between the planetary mass and radius (potentially provided by a better estimate of the transit depth) would significantly improve interior characterization and reduce drastically the uncertainty on the gas envelope properties.

Download/Website: `http://cdsads.u-strasbg.fr/abs/2018arXiv180407537C`

Contact: `crida@oca.eu`

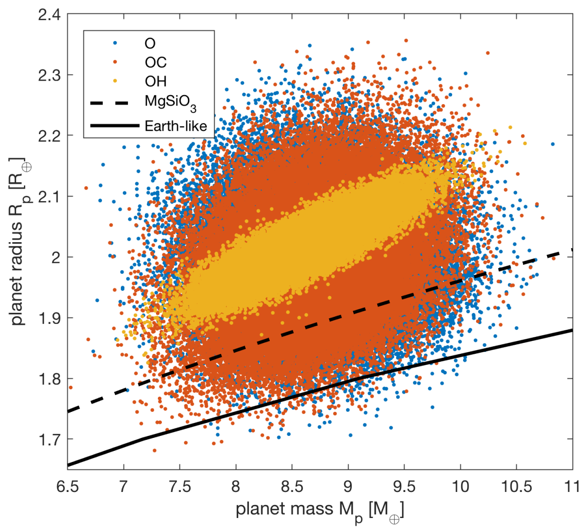

Figure 3: Crida: Mass and radius data samples for the different scenarios considered : `O` (no mass-radius correlation), `OC` (real mass-radius correlation), and `OH` (hypothetical mass-radius correlation). In comparison, two idealized mass-radius relationships for pure $MgSiO_3$ and Earth-like interiors are plotted. $MgSiO_3$ represents the least dense end-member of purely rocky interiors. Therefore, purely rocky interiors cannot be exluded in cases of `O` and `OC`, in contrast to the `OH` case.

Exoplanet detection in angular differential imaging by statistical learning of the nonstationary patch covariances: The PACO algorithm

O. Flasseur[1], *L. Denis*[1], *É. Thiébaut*[2], *M. Langlois*[2]

[1] Univ. de Lyon, UJM-Saint-Etienne, CNRS, Inst. d'Optique Graduate School, Lab. Hubert Curien UMR 5516, F-42023, Saint-Etienne, France
[2] Univ. de Lyon, Univ. Lyon1, ENS de Lyon, CNRS, Centre de Recherche Astrophys. de Lyon UMR 5574, F-69230, Saint-Genis-Laval, France

Astronomy & Astrophysics, in press

We introduce a new method dedicated to source detection from angular differential imaging data: PACO (for PAtch COvariances). Data reduction in angular differential imaging is challenging because the faint point sources are hidden in a stronger nonstationary background (speckles) displaying strong spatial correlations. PACO learns locally a statistical model of the background directly from the data. This model captures short-scale spatial correlations up to a separation of ten pixels (i.e., within an image patch). The decision in favor of the presence or the absence of an exoplanet is then performed by a binary hypothesis test.

PACO offers appealing characteristics compared to existing detection approaches. Since no image subtraction is performed, photometry is preserved. PACO is completely parameter-free, from the computation of a detection map to its thresholding to extract meaningful detections and the estimation of fluxes of the detected sources. Finally, the resulting detection maps are stationary and statistically grounded so that the false alarm rate, the probability of detection and the contrast can be directly assessed without post-processing and/or Monte Carlo simulations. We have shown using datasets from the VLT/SPHERE-IRDIS instrument that the proposed method achieves significantly better detection performance than current cutting-edge algorithms such as TLOCI, KLIP-PCA and LLSG. We believe that these significant pratical advantages should make PACO a method of choice for the analysis of ADI observations, in particular for large exoplanet surveys.

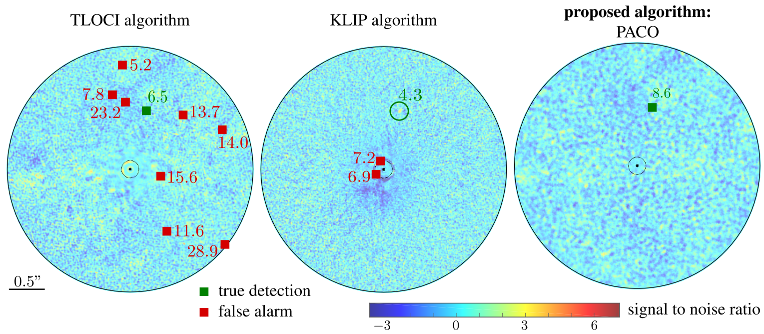

Figure 4: Flasseur: Signal-to-noise maps produced by 3 algorithms on HD131399 observed in 2015 by VLT/SPHERE-IRDIS at wavelength 2.110μm. Maps with TLOCI and KLIP are nonstationary, with several false alarms. PACO produces a much more stationary map with only one peak above the 5σ threshold, corresponding to a known source.

In the forthcoming *SPIE Astronomical Telescopes+Instrumentation* conference, we will describe a natural extension of PACO to ADI+SDI datasets.

Download/Website: `https://doi.org/10.1051/0004-6361/201832745`

Contact: `olivier.flasseur@univ-st-etienne.fr ; loic.denis@univ-st-etienne.fr`

Unmasking the hidden NGTS-3Ab: a hot Jupiter in an unresolved binary system

Maximilian N. Günther[c], Didier Queloz[c,g], Edward Gillen[c], Laetitia Delrez[c], François Bouchy[g], James McCormac[w,ce], Barry Smalley[k], Yaseen Almleaky[ks,ka], David J. Armstrong[w,ce], Daniel Bayliss[w], Artem Burdanov[li], Matthew Burleigh[l], Juan Cabrera[d], Sarah L. Casewell[l], Benjamin F. Cooke[w,ce], Szilárd Csizmadia[d], Elsa Ducrot[li], Philipp Eigmüller[d,tu], Anders Erikson[d], Boris T. Gänsicke[w,ce], Neale P. Gibson[q], Michaël Gillon[li], Michael R. Goad[l], Emmanuël Jehin[li], James S. Jenkins[uc,ci], Tom Louden[w,ce], Maximiliano Moyano[a], Catriona Murray[c], Don Pollacco[w,ce], Katja Poppenhaeger[q], Heike Rauer[d,tu,fu], Liam Raynard[l], Alexis M. S. Smith[d], Sandrine Sohy[li], Samantha J. Thompson[c], Stéphane Udry[g], Christopher A. Watson[q], Richard G. West[w], Peter J. Wheatley[w,ce]

[c] Astrophysics Group, Cavendish Laboratory, J.J. Thomson Avenue, Cambridge CB3 0HE, UK
[g] Observatoire de Genève, Université de Genève, 51 Ch. des Maillettes, 1290 Sauverny, Switzerland
[w] Dept. of Physics, University of Warwick, Gibbet Hill Road, Coventry CV4 7AL, UK
[ce] Centre for Exoplanets and Habitability, University of Warwick, Gibbet Hill Road, Coventry CV4 7AL, UK
[k] Astrophysics Group, Lennard-Jones Laboratories, Keele University, Staffordshire ST5 5BG, UK
[ks] Space and Astronomy Department, Faculty of Science, King Abdulaziz University, 21589 Jeddah, Saudi Arabia
[ka] King Abdullah Centre for Crescent Observations and Astronomy, Makkah Clock, Mecca 24231, Saudi Arabia
[li] Space sciences, Technologies and Astrophysics Research Institute, Univ. de Liège, Allée du 6 Août 17, Bat. B5C, 4000 Liège, Belgium
[l] Department of Physics and Astronomy, Leicester Institute of Space and Earth Observation, University of Leicester, LE1 7RH, UK
[d] Institute of Planetary Research, German Aerospace Center, Rutherfordstrasse 2, 12489 Berlin, Germany
[tu] Center for Astronomy and Astrophysics, TU Berlin, Hardenbergstr. 36, D-10623 Berlin, Germany
[fu] Institute of Geological Sciences, FU Berlin, Malteserstr. 74-100, D-12249 Berlin, Germany
[q] Astrophysics Research Centre, School of Mathematics and Physics, Queen's University Belfast, BT7 1NN Belfast, UK
[uc] Departamento de Astronomía, Universidad de Chile, Casilla 36-D, Santiago, Chile
[ci] Centro de Astrofísica y Tecnologías Afines (CATA), Casilla 36-D, Santiago, Chile
[a] Instituto de Astronomía, Angamos 0610, D-1272709,Antofagasta, Chile

Monthly Notices of the Royal Astronomical Society, in press (arXiv:1805.01378)

We present the discovery of NGTS-3Ab, a hot Jupiter found transiting the primary star of an unresolved binary system. We develop a joint analysis of multi-colour photometry, centroids, radial velocity (RV) cross-correlation function (CCF) profiles and their bisector inverse slopes (BIS) to disentangle this three-body system. Data from the Next Generation Transit Survey (NGTS), SPECULOOS and HARPS are analysed and modelled with our new BLENDFITTER software. We find that the binary consists of NGTS-3A (G6V-dwarf) and NGTS-3B (K1V-dwarf) at < 1" separation. NGTS-3Ab orbits every 1.675 days. The planet radius and mass are $R_{\rm planet} = 1.48 \pm 0.37$ R$_J$ and $M_{\rm planet} = 2.38 \pm 0.26$ M$_J$, suggesting it is potentially inflated. We emphasise that only combining all the information from multi-colour photometry, centroids and RV CCF profiles can resolve systems like NGTS-3. Such systems

cannot be disentangled from single-colour photometry and RV measurements alone. Importantly, the presence of a BIS correlation indicates a blend scenario, but is not sufficient to determine which star is orbited by the third body. Moreover, even if no BIS correlation is detected, a blend scenario cannot be ruled out without further information. The choice of methodology for calculating the BIS can influence the measured significance of its correlation. The presented findings are crucial to consider for wide-field transit surveys, which require wide CCD pixels (> 5”) and are prone to contamination by blended objects. With TESS on the horizon, it is pivotal for the candidate vetting to incorporate all available follow-up information from multi-colour photometry and RV CCF profiles.

Download/Website: `https://arxiv.org/abs/1805.01378`

Contact: `mg719@cam.ac.uk`

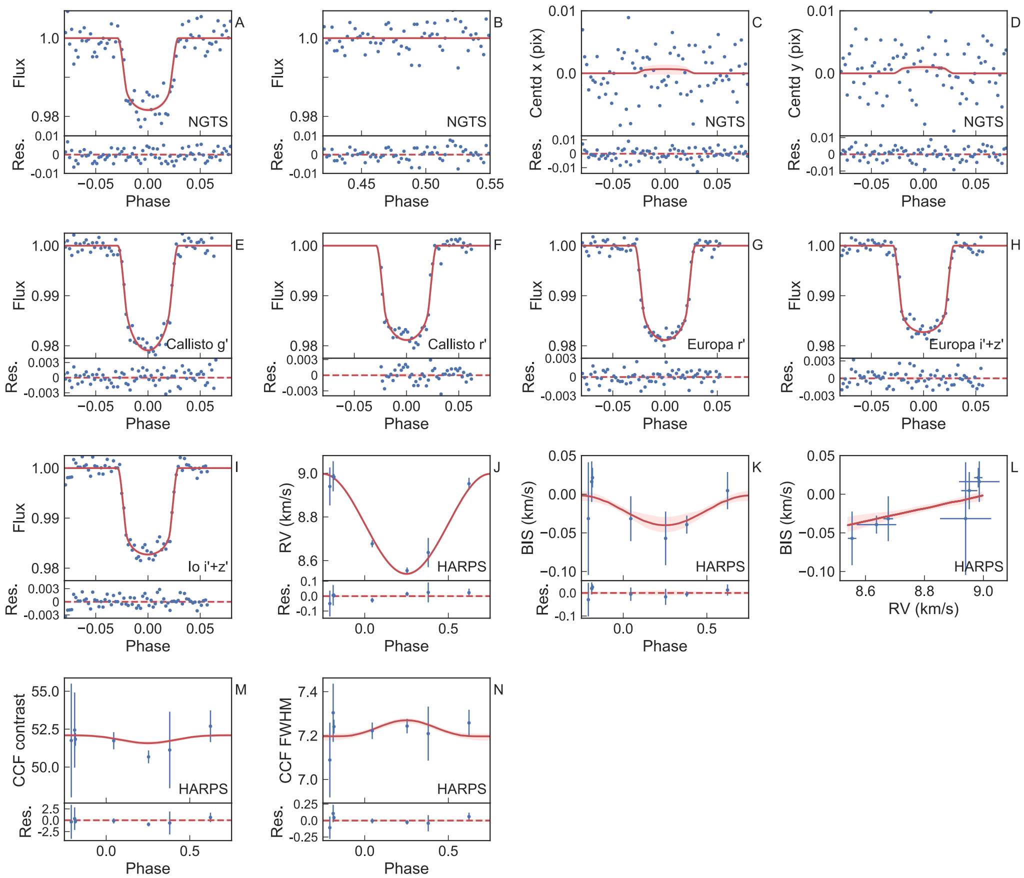

Figure 5: Guenther: Data for NGTS-3, phase-folded at the best-fitting period of 1.675 d. A) NGTS light curve, B) NGTS light curve around phase 0.5, C) NGTS centroid in x, D) NGTS centroid in y, E) SPECULOOS Callisto g’-band, F) SPECULOOS Callisto r’-band, G) SPECULOOS Europa r’-band, H) SPECULOOS Europa i’+z’-band, I) SPECULOOS Io i’+z’-band, J) HARPS radial velocity (RV) measurements, K) HARPS bisector inverse slope (BIS), L) HARPS BIS versus RV, M) HARPS Contrast measurements, and N) HARPS FWHM measurements. Photometric measurements are binned equally in phase with a spacing of 0.002 (total of 500 phase-folded points). We randomly draw 100 samples from the MCMC chain and calculate the models. Red curves in A)-N) display the median and 16th / 84th percentile of all drawn models. The global, joint modelling is described in the paper.

Exploring Kepler Giant Planets in the Habitable Zone

Michelle L. Hill[1,2,3], *Stephen R. Kane*[1,4], *Eduardo Seperuelo Duarte*[5], *Ravi K. Kopparapu*[6,7,8], *Dawn M. Gelino*[9], *Robert A. Wittenmyer*[1]

[1] University of Southern Queensland, Computational Engineering and Science Research Centre, Toowoomba, Queensland 4350, Australia
[2] University of New England, Department of Physics, Armidale, NSW 2351, Australia
[3] San Francisco State University, Department of Physics & Astronomy, 1600 Holloway Avenue, San Francisco, CA 94132, USA
[4] University of California, Riverside, Department of Earth Sciences, CA 92521, USA
[5] Instituto Federal do Rio de Janeiro, Grupo de Física e Astronomia, R. Cel. Delio Menezes Porto, 1045, CEP 26530-060, Nilópolis - RJ, Brazil
[6] NASA Goddard Space Flight Center, 8800 Greenbelt Road, Mail Stop 699.0 Building 34, Greenbelt, MD 20771
[7] NASA Astrobiology Institute's Virtual Planetary Laboratory, P.O. Box 351580, Seattle, WA 98195, USA
[8] Sellers Exoplanet Environments Collaboration, NASA Goddard Space Flight Center.
[9] NASA Exoplanet Science Institute, Caltech, MS 100-22, 770 South Wilson Avenue, Pasadena, CA 91125, USA

The Astrophysical Journal, in press (arXiv:1805.03370)

The *Kepler* mission found hundreds of planet candidates within the habitable zones (HZ) of their host star, including over 70 candidates with radii larger than 3 Earth radii ($R_\oplus$) within the optimistic HZ (OHZ) (Kane et al. 2016). These giant planets are potential hosts to large terrestrial satellites (or exomoons) which would also exist in the HZ. We calculate the occurrence rates of giant planets (R_p = 3.0–25 $R_\oplus$) in the OHZ and find a frequency of $(6.5 \pm 1.9)\%$ for G stars, $(11.5 \pm 3.1)\%$ for K stars, and $(6 \pm 6)\%$ for M stars. We compare this with previously estimated occurrence rates of terrestrial planets in the HZ of G, K and M stars and find that if each giant planet has one large terrestrial moon then these moons are less likely to exist in the HZ than terrestrial planets. However, if each giant planet holds more than one moon, then the occurrence rates of moons in the HZ would be comparable to that of terrestrial planets, and could potentially exceed them. We estimate the mass of each planet candidate using the mass-radius relationship developed by Chen & Kipping (2016). We calculate the Hill radius of each planet to determine the area of influence of the planet in which any attached moon may reside, then calculate the estimated angular separation of the moon and planet for future imaging missions. Finally, we estimate the radial velocity semi-amplitudes of each planet for use in follow up observations.

Download/Website: `https://arxiv.org/abs/1805.03370`

Contact: `Michelle.Hill@usq.edu.au`

M-dwarf exoplanet surface density distribution: a log-normal fit from 0.07-400 AU

Michael R. Meyer[1,2], *Adam Amara*[1], *Maddalena Reggiani*[1,3], *Sascha P. Quanz*[1]

[1] Institute for Astronomy, ETH Zurich Wolfgang-Pauli-Strasse 27, Zurich, Switzerland, CH-8093
[2] Department of Astronomy, University of Michigan, Ann Arbor, MI USA 48109
[3] Space sciences, Technologies and Astrophysics Research (STAR) Institute, Université de Liège, 19 Allée du Six Août, B-4000 Liège, Belgium

Astronomy & Astrophysics, published 2018, V612, L3

We fit a log-normal function to the M-dwarf orbital surface density distribution of gas giant planets, over the mass range 1-10 times that of Jupiter, from 0.07-400 AU. We used a Markov chain Monte Carlo approach to explore the likelihoods of various parameter values consistent with point estimates of the data given our assumed functional form. This fit is consistent with radial velocity, microlensing, and direct-imaging observations, is well-motivated from theoretical and phenomenological points of view, and predicts results of future surveys. We present probability distributions for each parameter and a maximum likelihood estimate solution. We suggest that this function makes more physical sense than other widely used functions, and we explore the implications of our results on the design of future exoplanet surveys.

Download/Website: `https://arxiv.org/abs/1707.05256`

Contact: `mrmeyer@umich.edu`

Planetary population synthesis

C. Mordasini
Physikalisches Institut, University of Bern, Gesellschaftsstrasse 6 CH 3012 Bern, Switzerland

Handbook of Exoplanets, in press (arXiv:1804.01532)

In stellar astrophysics, the technique of population synthesis has been successfully used for several decades. For planets, it is in contrast still a young method which only became important in recent years because of the rapid increase of the number of known extrasolar planets, and the associated growth of statistical observational constraints. With planetary population synthesis, the theory of planet formation and evolution can be put to the test against these constraints. In this review of planetary population synthesis, we first briefly list key observational constraints. Then, the work flow in the method and its two main components are presented, namely global end-to-end models that predict planetary system properties directly from protoplanetary disk properties and probability distributions for these initial conditions. An overview of various population synthesis models in the literature is given. The sub-models for the physical processes considered in global models are described: the evolution of the protoplanetary disk, the planets' accretion of solids and gas, orbital migration, and N-body interactions among concurrently growing protoplanets. Next, typical population synthesis results are illustrated in the form of new syntheses obtained with the latest generation of the Bern model. Planetary formation tracks, the distribution of planets in the mass-distance and radius-distance plane, the planetary mass function, and the distributions of planetary radii, semimajor axes, and luminosities are shown, linked to underlying physical processes, and compared with their observational counterparts. We finish by highlighting the most important predictions made by population synthesis models and discuss the lessons learned from these predictions - both those later observationally confirmed and those rejected.

Download/Website: https://arxiv.org/abs/1804.01532

Contact: christoph.mordasini@space.unibe.ch

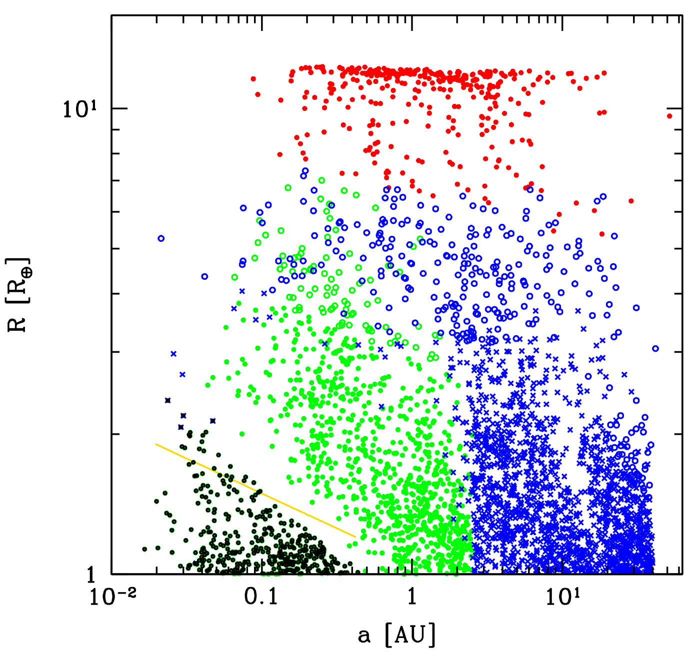

Figure 6: Mordasini: Radius-semimajor axis diagram at 5 Gyr for 504 synthetic planetary systems around solar-like stars. Each system contains initially 20 embryos of 0.01 $M_\oplus$. The colors and symbols show the bulk composition. Red points: giant planets with a H/He envelope mass bigger then the core mass ($M_{\rm env}/M_{\rm core}$>1). Blue symbols: planets that have accreted volatile material (ices) outside of the iceline(s) while green symbols have only accreted refractory solids. Open green and blue circles have $0.1 \leq M_{\rm env}/M_{\rm core} \leq 1$. Filled green points and blue crosses have $M_{\rm env}/M_{\rm core} \leq 0.1$. Small black open circles additionally show planets that have lost the entire primordial H/He envelope by atmospheric escape. The yellow line shows the location of the evaporation valley determined observationally by van Eylen et al. (2017).

Planet Populations as a Function of Stellar Properties

Gijs D. Mulders[1,2]

[1] Lunar and Planetary Laboratory, The University of Arizona, 1629 E University Blvd, Tucson, AZ 85721, USA
[2] Earths in Other Solar Systems Team, NASA Nexus for Exoplanet System Science

Handbook of Exoplanets, in press (arXiv:1805.00023)

Exoplanets around different types of stars provide a window into the diverse environments in which planets form. This chapter describes the observed relations between exoplanet populations and stellar properties and how they connect to planet formation in protoplanetary disks. Giant planets occur more frequently around more metal-rich and more massive stars. These findings support the core accretion theory of planet formation, in which the cores of giant planets form more rapidly in more metal-rich and more massive protoplanetary disks. Smaller planets, those with sizes roughly between Earth and Neptune, exhibit different scaling relations with stellar properties. These planets are found around stars with a wide range of metallicities and occur more frequently around lower mass stars. This indicates that planet formation takes place in a wide range of environments, yet it is not clear why planets form more efficiently around low mass stars. Going forward, exoplanet surveys targeting M dwarfs will characterize the exoplanet population around the lowest mass stars. In combination with ongoing stellar characterization, this will help us understand the formation of planets in a large range of environments. Trends in the exoplanet population as function of stellar mass and metallicity, illustrating the different behavior of the giant planet population (large pink circles) and planets smaller than Neptune (small cyan circles). The location of the sun is indicated with a yellow star. The location of individual symbols is randomly generated, with the density of points corresponding to the exoplanet occurrence rate.

Download/Website: `https://arxiv.org/abs/1805.00023`

Contact: `mulders@lpl.arizona.edu`

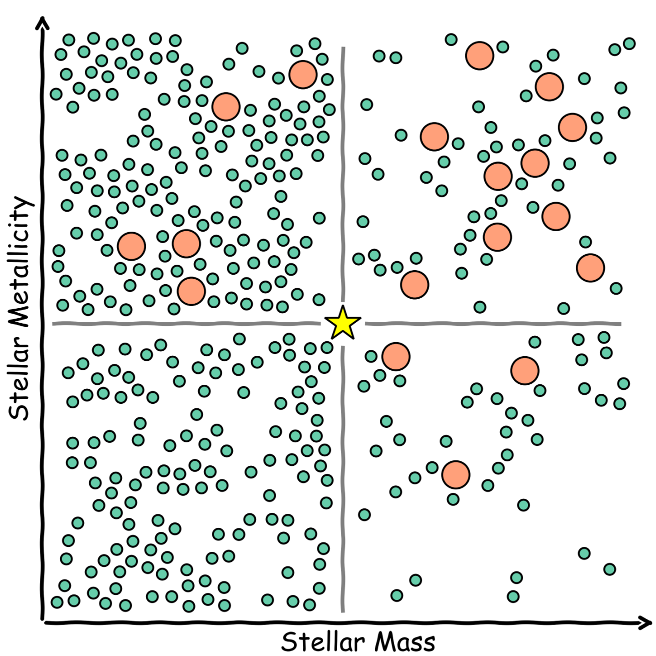

Figure 7: Mulders: Trends in the exoplanet population as function of stellar mass and metallicity, illustrating the different behavior of the giant planet population (large pink circles) and planets smaller than Neptune (small cyan circles). The location of the sun is indicated with a yellow star. The location of individual symbols is randomly generated, with the density of points corresponding to the exoplanet occurrence rate.

Microphysical Modeling of Mineral Clouds in GJ1214 b and GJ436 b: Predicting Upper Limits on the Cloud-Top Height

Kazumasa Ohno & Satoshi Okuzumi
Department of Earth and Planetary Sciences, Tokyo Institute of Technology

Astrophysical Journal, in press

The ubiquity of clouds in the atmospheres of exoplanets, especially of super-Earths, is one of the outstanding issues for transmission spectra survey. The understanding about the formation process of clouds in super-Earths is necessary to interpret the observed spectra correctly. In this study, we investigate the vertical distributions of particle size and mass density of mineral clouds in super-Earths using a microphysical model that takes into account the vertical transport and growth of cloud particles in a self-consistent manner. We demonstrate that the vertical profiles of mineral clouds significantly vary with the concentration of cloud condensation nuclei and atmospheric metallicity. We find that the height of the cloud top increases with increasing metallicity as long as the metallicity is lower than a threshold. If the metallicity is larger than the threshold, the cloud-top height no longer increases appreciably with metallicity because coalescence yields larger particles of higher settling velocities. We apply our cloud model to GJ1214 b and GJ436 b for which recent transmission observations suggest the presence of high-altitude opaque clouds. For GJ436 b, we show that KCl particles can ascend high enough to explain the observation. For GJ1214 b, by contrast, the height of KCl clouds predicted from our model is too low to explain its flat transmission spectrum. Clouds made of highly porous KCl particles could explain the observations if the atmosphere is highly metal-rich, and hence the particle microstructure might be a key to interpret the flat spectrum of GJ1214 b.

Download/Website: `https://arxiv.org/abs/1804.05708`

Contact: `ohno.k.ab@eps.sci.titech.ac.jp`

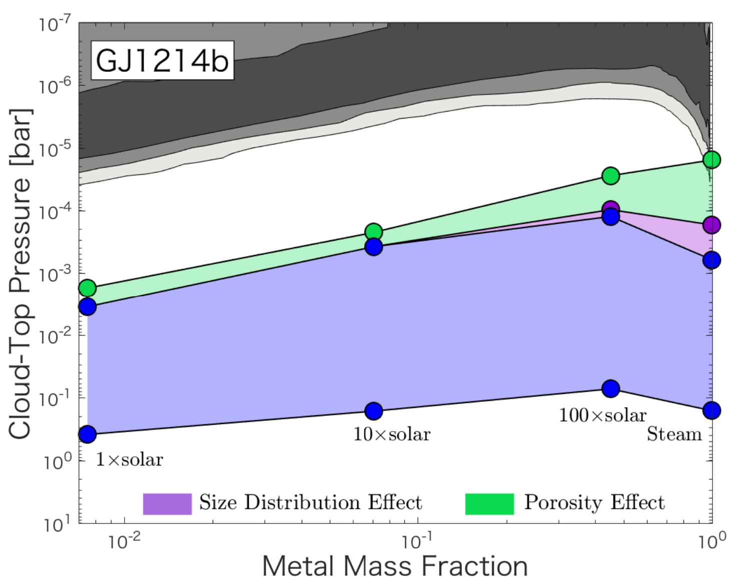

Figure 8: Ohno: Predicted maximum extent of the KCl cloud for GJ1214 b as a function of the metal mass fraction. The dots correspond to, from left to right, hydrogen-rich atmosphere at $1\times$, $10\times$, $100\times$ solar metallicity, and pure steam atmosphere, respectively. The lower line indicates the height (in pressure) of the cloud base, while the upper line indicates the maximum height of the cloud top for fixed metallicity. The gray shaded area indicates the location of the cloud top inferred from the Bayesian analysis of the transmission spectrum by Kreidberg et al. (2014) with the black contours marking the 1σ, 2σ, and 3σ Bayesian credible regions. The purple and green shaded area indicate how the size distribution and particle porosity affect the maximum height of the cloud top.

The CARMENES search for exoplanets around M dwarfs: A low-mass planet in the temperate zone of the nearby K2-18

P. Sarkis[1], *T. Henning*[1], *M. Kürster*[1], *T. Trifonov*[1], *M. Zechmeister*[2], *L. Tal-Or*[2], *G. Anglada-Escudé*[3,4], *A. P. Hatzes*[5], *M. Lafarga*[6], *S. Dreizler*[2], *I. Ribas*[6], *J. Caballero*[7,8], *A. Reiners*[2], *M. Mallonn*[9], *J. C. Morales*[6], *A. Kaminski*[8], *J. Aceituno*[10], *P. J. Amado*[4], *V. J. S. Béjar*[11], *H. Hagen*[12], *S. Jeffers*[2], *A. Quirrenbach*[8], *R. Launhardt*[1], *C. Marvin*[2], *D. Montes*[13]

[1] Max-Planck-Institut für Astronomie, Königstuhl 17, D-69117 Heidelberg, Germany
[2] Institut für Astrophysik, Georg-August-Universität, Friedrich-Hund-Platz 1, 37077 Göttingen, Germany
[3] School of Physics and Astronomy, Queen Mary University of London, E1 4NS London, United Kingdom
[4] Instituto de Astrofísica de Andalucía (CSIC), Glorieta de la Astronomía s/n, E-18008 Granada, Spain
[5] Thüringer Landessternwarte, Sternwarte 5, 07778 Tautenburg, Germany
[6] Institut de Ciències de l'Espai (CSIC-IEEC), Campus UAB, c/ de Can Magrans s/n, E-08193 Bellaterra, Barcelona, Spain
[7] Centro de Astrobiología (CSIC-INTA), Campus ESAC, Camino Bajo del Castillo s/n, E-28692 Villanueva de la Cañada, Madrid, Spain
[8] Landessternwarte, Zentrum für Astronomie der Universtät Heidelberg, Königstuhl 12, D-69117 Heidelberg, Germany
[9] Leibniz Institute for Astrophysics Potsdam (AIP), An der Sternwarte 16, 14482 Potsdam, Germany
[10] Centro Astronómico Hispano Alemán de Calar Alto (CSIC-MPG), C/ Jesús Durbán Remón, 2, 4004 Almería, Spain
[11] Instituto de Astrofísica de Canarias, Via Láctea s/n, 38205 La Laguna, Tenerife, Spain, and Departamento de Astrofísica, Universidad de La Laguna, 38206 La Laguna, Tenerife, Spain
[12] Hamburger Sternwarte, Gojenbergsweg 112, D-21029 Hamburg, Germany
[13] Departamento de Astrofísica y Ciencias de la Atmósfera, Facultad de Ciencias Físicas, Universidad Complutense de Madrid, E-28040 Madrid, Spain

The Astronomical Journal, in press (arXiv:1805.00830)

K2-18 is a nearby M2.5 dwarf, located at 34 pc and hosting a transiting planet that was first discovered by the *K2* mission and later confirmed with *Spitzer Space Telescope* observations. With a radius of $\sim 2\,R_\oplus$ and an orbital period of ~ 33 days, the planet lies in the temperate zone of its host star and receives stellar irradiation similar to that of Earth. Here we perform radial velocity follow-up observations with the visual channel of CARMENES with the goal of determining the mass and density of the planet. We measure a planetary semi-amplitude of $K_b \sim 3.5 m\,s^{-1}$ and a mass of $M_b \sim 9\,M_\oplus$, yielding a bulk density around $\rho_b \sim 4\,\mathrm{g\,cm^{-3}}$. This indicates a low-mass planet with a composition consistent with a solid core and a volatile-rich envelope. A signal at 9 days was recently reported using radial velocity measurements taken with the HARPS spectrograph. This was interpreted as being due to a second planet. We see a weaker, time- and wavelength-dependent signal in the CARMENES data set and thus favor stellar activity for its origin. K2-18 b joins the growing group of low-mass planets detected in the temperate zone of M dwarfs. The brightness of the host star in the near-infrared makes the system a good target for detailed atmospheric studies with the *James Webb Space Telescope*.

Download/Website: `https://arxiv.org/abs/1805.00830 -- For a short summary, see https://tinyurl.com/sarkis-k2-18`

Contact: `sarkis@mpia.de`

The diverse lives of massive protoplanets in self-gravitating discs

Dimitris Stamatellos[1] *& Shu-ichiro Inutsuka*[2]

[1] Jeremiah Horrocks Institute for Mathematics, Physics & Astronomy, University of Central Lancashire, Preston, PR1 2HE, UK
[2] Department of Physics, Nagoya University, Chikusa-ku, Nagoya 464-8602, Japan

MNRAS, in press, arXiv:1804.00583

Gas giant planets may form early-on during the evolution of protostellar discs, while these are relatively massive. We study how Jupiter-mass planet-seeds (termed *protoplanets*) evolve in massive, but gravitationally stable ($Q \gtrsim 1.5$), discs using radiative hydrodynamic simulations. We find that the protoplanet initially migrates inwards rapidly, until it opens up a gap in the disc. Thereafter, it either continues to migrate inwards on a much longer timescale or starts migrating outwards. Outward migration occurs when the protoplanet resides within a gap with gravitationally

unstable edges, as a high fraction of the accreted gas is high angular momentum gas from outside the protoplanet's orbit. The effect of radiative heating from the protoplanet is critical in determining the direction of the migration and the eccentricity of the protoplanet. Gap opening is facilitated by efficient cooling that may not be captured by the commonly used β-cooling approximation. The protoplanet initially accretes at a high rate ($\sim 10^{-3}\mathrm{M_J\ yr^{-1}}$), and its accretion luminosity could be a few tenths of the host star's luminosity, making the protoplanet easily observable (albeit only for a short time). Due to the high gas accretion rate, the protoplanet generally grows above the deuterium-burning mass-limit. Protoplanet radiative feedback reduces its mass growth so that its final mass is near the brown dwarf-planet boundary. The fate of a young planet-seed is diverse and could vary from a gas giant planet on a circular orbit at a few AU from the central star to a brown dwarf on an eccentric, wide orbit.

Download/Website: http://ukads.nottingham.ac.uk/doi/10.1093/mnras/sty827

Contact: distamio@gmail.com

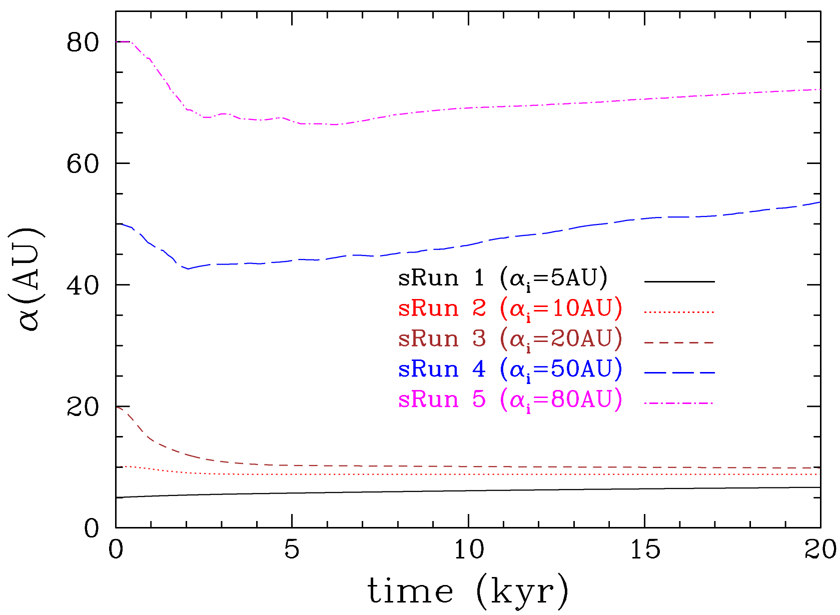

Figure 9: Stamatellos: The semi-major axis evolution of a 1-$\mathrm{M_J}$ protoplanet in a 0.1-$\mathrm{M_\odot}$ disc. When the protoplanet is placed in the outer disc region, it migrates inwards on a Type I migration timescale. However, when the gap opens up, inward migration stops and it reverses into an outward migration. On the other hand, when the protoplanet is placed in the inner disc region ($\lesssim$ 20 AU), it migrates inwards initially on a Type I migration timescale and once the gap is opened up the migration slows down and occurs on a Type II timescale.

3 Jobs and Positions

Postdoctoral Research Assistant on PLATO Field Contaminants

U. Kolb
School of Physical Sciences, The Open University, Walton Hall, Milton Keynes MK7 6AA, UK

The Open University, 1 Aug 2018

Applications are invited for a 2 year postdoctoral research associate position at The Open University, to work on PLATO field contaminants, the Open University element of the PLATO Development Phase. Closing date for applications is 31 May 2018.
The project considers the problem of astrophysical false positives that will contaminate the sample of exoplanet candidates delivered by PLATO and will prepare tools to inform the PLATO field and target selection so as to minimize the number of contaminants, and maximize information available for contaminant analysis of individual sources. You will extend and enhance large-scale numerical simulations of a synthetic Galactic population of single stars, binary and multiple stellar systems, and their planetary systems, to match potential PLATO fields. You will engage with Gaia Data Release 2 to conduct a validation and calibration exercise, and to derive constraints on the statistics of stellar multiplicity and underlying physical mechanisms. You will have a PhD in Astronomy or a related discipline and an understanding of the physical concepts and mechanisms underpinning single and binary star formation. You will also have coding experience in a compiled language (e.g. Fortran) and in Python, and will have a developing track record of peer-reviewed publications in international scientific journals. The ability to work as part of a scientific team and to communicate scientific information effectively are also essential.
For full details about the post, and information on how to apply, follow the link below. http://www.open.ac.uk/about/employment/vacancies/post-doctoral-research-associate-14626

Download/Website:
`http://www.open.ac.uk/about/employment/vacancies/post-doctoral-research-associate-14626`

Contact: `Ulrich.Kolb@open.ac.uk`

4 Conference announcements

Call for Abstracts : SF2A 2018, Atelier S17
Star-planet characterisation : prospectives
Caractérisation étoiles-planètes : les promesses du futur

R. Ligi[1], *Y. Lebreton*[2,3], *T. Guillot*[4], *M. Deleuil*[5]

[1] INAF-Osservatorio Astronomico di Brera, Via E. Bianchi 46, I-23807 Merate, Italy
[2] LESIA, Observatoire de Paris, PSL Research University, CNRS, Univ. Pierre et Marie Curie, Univ. Paris Diderot, 92195 Meudon, France
[3] Institut de Physique de Rennes, Univ. de Rennes 1, CNRS UMR 6251, 35042 Rennes, France
[4] Univ. Côte d'Azur / Observatoire de la Côte d'Azur - Lagrange (UMR 7293), Boulevard de l'Observatoire, CS 34229, 06300 Nice, France
[5] Aix Marseille Univ, CNRS, LAM, Laboratoire d'Astrophysique de Marseille, Marseille, France

Bordeaux, France, 6 Juillet 2018

Rationale : The future in the exoplanets domain will be emphasised by the launch of the TESS (NASA), CHEOPS (ESA), and PLATO (ESA) missions. They promise an exceptional harvest of Earth- to Neptune-sized planets, and certainly the discovery of habitable ones. To characterise exoplanets, the knowledge of stellar parameters (radius, mass, effective temperature, age) is essential: *you know the planet if you know the star*.
The various techniques used to determine these parameters (spectroscopy, photometry, interferometry, asteroseismology) are not always precise enough, and above all, not always accessible for every planetary systems. Then, stellar models or scaling relations are used. These powerful but perfectible tools are inadequate regards to some spectral types, or not precise enough, with direct impact on the estimation of planetary parameters. With the new generation instruments at the VLT, the development of long baseline interferometry (CHARA, VLTI) and spectro-photometry (Gaia...), the characterisation of exoplanetary systems never appeared so close.
In this workshop, we will tackle the question of stellar characterisation, eandits impact on exoplanetary characterisation. What are the used and planed techniques to characterised TESS and CHEOPS targets? What are the expected accuracies and limitations? What is the impact on the estimation of exoplanets internal composition and habitability? This workshop aims at gathering both stellar physicists and planetary scientists to explore the recent and future progresses, the current limitations and expected solutions.

Inscription : The full description of the worhshop can be found in the section Programme → S17 on the SF2A website. We invite you to submit an abstract for an oral contribution or a poster before the 3rd of June 2018.

Note : you may do your presentation in English but most of them will probably be in French.

Download/Website: `http://2018.sf2a.eu/`

Contact: `roxanne.ligi@brera.inaf.it`

5 Exoplanet Archive Updates

April Updates at the NASA Exoplanet Archive

The NASA Exoplanet Archive team
Caltech/IPAC-NASA Exoplanet Science Institute, MC 100-22 Pasadena CA 91125

Pasadena CA USA, April 6th 2018

April 6, 2018

Four Planets Added: We've added K2-231 b, K2-232 b, Kepler-1655 b, and MOA-2010-BLG-117L b this week.

We've also removed HD 202206 b based on Benedict and Harrison (2018). See the Targets Excluded From the Archive page for the full list of removed targets: `http://exoplanetarchive.ipac.caltech.edu/docs/removed_targets.html`

April 12, 2018

Six More Planets! This week's newcomers are HATS-39 b, HATS-40 b, HATS-41 b, HATS-42 b, HD 158996 b, and OGLE-2017-BLG-1522L b.

2017 UKIRT Data Added: All data from the 2017 UKIRT Microlensing Survey of the Galactic bulge are now publicly available here on the NASA Exoplanet Archive. This release increases the archive's UKIRT holdings to more than 52 million light curves. The 2017 data are in two near-infrared filters (H and KS) and cover 10.5 square degrees. An initial analysis of these data led to the first microlensing planet discovered in the near-infrared: UKIRT-2017-BLG-001L b. At over 20,000 light years away from the Earth, this UKIRT-discovered microlensing planet is one of the most distant exoplanets known.

Browse the UKIRT documentation for details, search for specific time series, or download the data in bulk. See the UKIRT Figures page for coverage maps: `https://exoplanetarchive.ipac.caltech.edu/docs/UKIRT_figures.html`

April 26, 2018

Eight More Planets! This week the archive added KPS-1 b, the first transiting planet discovered by an amateur astronomer; K2-233 b, c, & d, three small planets orbiting a bright nearby K-star; 24 Boo b and gam Lib b & c, which are planets orbiting evolved giant stars; and OGLE-2017-BLG-0373L b, a Saturn-sized planet orbiting an M-star.

We've also made a series of data updates, including new parameters for the K2-155 system, model parameters for OGLE-2017-BLG-0373 b in the Microlensing Planets Table, and a series of stellar and planet parameter updates based on Gaia DR1 (Stassun, Collins & Gaudi 2017).

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

Contact: `jessie.christiansen@caltech.edu`

6 As seen on astro-ph

The following list contains all the entries relating to exoplanets that we spotted on astro-ph during April 2018.

April 2018

astro-ph/1804.00071: **Temperate super-Earths/mini-Neptunes around M/K dwarfs Consist of 2 Populations Distinguished by Their Atmospheres** by *Xueying Guo et al.*

astro-ph/1804.00529: **Differences in the gas and dust distribution in the transitional disk of a sun-like young star, PDS 70** by *Zachary C. Long et al.*

astro-ph/1804.00574: **Thermal evolution and sintering of chondritic planetesimals IV. Temperature dependence of heat conductivity of asteroids and meteorites** by *Hans-Peter Gail, Mario Trieloff*

astro-ph/1804.00583: **The diverse lives of massive protoplanets in self-gravitating discs** by *Dimitris Stamatellos, Shu-ichiro Inutsuka*

astro-ph/1804.00662: **Exploring H2O Prominence in Reflection Spectra of Cool Giant Planets** by *Ryan J. MacDonald et al.*

astro-ph/1804.00699: **The direct imaging search for Earth 2.0: Quantifying biases and planetary false positives** by *Claire Marie Guimond, Nicolas B. Cowan*

astro-ph/1804.00763: **Constraining the climate and ocean pH of the early Earth with a geological carbon cycle model** by *Joshua Krissansen-Totton, Giada N. Arney, David C. Catling*

astro-ph/1804.00830: **MOA-2015-BLG-337: A Planetary System with a Low-mass Brown Dwarf/Planetary Boundary Host, or a Brown Dwarf Binary** by *S. Miyazaki et al.*

astro-ph/1804.00924: **How much does turbulence change the pebble isolation mass for planet formation?** by *S. Ataiee et al.*

astro-ph/1804.00937: **Solar wind interaction with the Martian upper atmosphere: Roles of the variable 3D cold thermosphere and hot oxygen corona** by *Chuanfei Dong et al.*

astro-ph/1804.01070: **Formation of close-in super-Earths in evolving protoplanetary disks due to disk winds** by *Masahiro Ogihara et al.*

astro-ph/1804.01093: **A sub-grid model for the growth of dust particles in hydrodynamical simulations of protoplanetary disks** by *Tomas Tamfal et al.*

astro-ph/1804.01094: **An Empirical Planetesimal Belt Radius - Stellar Luminosity Relation** by *L. Matrà et al.*

astro-ph/1804.01145: **The role of the general relativity on icy body reservoirs under the effects of an inner eccentric Jupiter** by *Macarena Zanardi et al.*

astro-ph/1804.01148: **Formation of Planetary Populations I: Metallicity & Envelope Opacity Effects** by *Matthew Alessi, Ralph E. Pudritz*

astro-ph/1804.01532: **Planetary population synthesis** by *Christoph Mordasini*

astro-ph/1804.01623: **HATS-39b, HATS-40b, HATS-41b, and HATS-42b: Three Inflated Hot Jupiters and a Super-Jupiter Transiting F Stars** by *J. Bento et al.*

astro-ph/1804.01869: **SOPHIE velocimetry of Kepler transit candidates XVIII. Radial velocity confirmation, absolute masses and radii, and origin of the Kepler-419 multiplanetary system** by *J.M. Almenara et al.*

astro-ph/1804.01913: **Thermal emission of WASP-48b in the Ks-band** by *B. J. M. Clark et al.*

astro-ph/1804.01997: **Transiting Disintegrating Planetary Debris around WD 1145+017** by *Andrew Vanderburg, Saul A. Rappaport*

astro-ph/1804.02001: **The First Naked-Eye Superflare Detected from Proxima Centauri** by *Ward S. Howard et al.*

astro-ph/1804.02019: **A HARDCORE model for constraining an exoplanet's core size** by *Gabrielle Suissa, Jingjing Chen, David Kipping*

astro-ph/1804.02145: **Mid-infrared Multi-wavelength Imaging of Ophiuchus IRS 48 Transitional Disk** by *Mitsuhiko Honda et al.*

astro-ph/1804.02183: **Giant planets: good neighbors for habitable worlds?** by *Nikolaos Georgakarakos, Siegfried Eggl, Ian Dobbs-Dixon*

astro-ph/1804.02290: **Low mass planet migration in magnetically torqued dead zones - II. Flow-locked and runaway migration, and a torque prescription** by *Colin P. McNally, Richard P. Nelson, Sijme-Jan Paardekooper*

astro-ph/1804.02361: **Formation of the terrestrial planets in the solar system around 1 au via radial concentration of planetesimals** by *Masahiro Ogihara et al.*

astro-ph/1804.02434: **The nitrogen cycles on Pluto over seasonal and astronomical timescales** by *T. Bertrand et al.*

astro-ph/1804.02775: **Exploring the Atmosphere of Neoproterozoic Earth: The Effect of O2 on Haze Formation and Composition** by *Sarah M. Hörst et al.*

astro-ph/1804.02882: **New disk discovered with VLT/SPHERE around the M star GSC 07396-00759** by *E. Sissa et al.*

astro-ph/1804.02892: **Saturn's formation and early evolution at the origin of Jupiter's massive moons** by *Thomas Ronnet et al.*

astro-ph/1804.03006: **Small impacts on the giant planet Jupiter** by *R. Hueso et al.*

astro-ph/1804.03075: **Investigating hot-Jupiter inflated radii with hierarchical Bayesian modelling** by *Marko Sestovic*

astro-ph/1804.03076: **Applying a Particle-only Model to the HL Tau Disk** by *Maryam Tabeshian, Paul A. Wiegert*

astro-ph/1804.03218: **Finding and Characterizing Other Worlds: the Thermal-IR ELT Opportunity** by *Michael R. Meyer , Thayne Currie , Olivier Guyon , Yasuhiro Hasegawa , Markus Kasper , Christian Marois , John Monnier , Katie Morzinski , Chris Packham , Sascha Quanz*

astro-ph/1804.03249: **Non-linear hydrodynamic instability and turbulence in eccentric astrophysical discs with vertical structure** by *Aaron F. Wienkers, Gordon I. Ogilvie*

astro-ph/1804.03352: **The KMTNet 2016 Data Release** by *H.-W. Kim et al.*

astro-ph/1804.03471: **The Excited Spin State of 1I/2017 U1 'Oumuamua** by *Michael J. S. Belton et al.*

astro-ph/1804.03476: **The HADES RV Programme with HARPS-N@TNG VIII. Gl15A: A multiple wide planetary system sculpted by binary interaction** by *M. Pinamonti et al.*

astro-ph/1804.03478: **Synthesis of molecular oxygen via irradiation of ice grains in the protosolar nebula** by *O. Mousis et al.*

astro-ph/1804.03573: **Solar System Ice Giants: Exoplanets in our Backyard** by *Abigail Rymer et al.*

astro-ph/1804.03735: **Confirming Variability in the Secondary Eclipse Depth of the Super-Earth 55 Cancri e** by *Patrick Tamburo et al.*

astro-ph/1804.03748: **The Silurian Hypothesis: Would it be possible to detect an industrial civilization in the geological record?** by *Gavin A. Schmidt, Adam Frank*

astro-ph/1804.04008: **Planets around the evolved stars 24 Booties and γ Libra: A 30d-period planet and a double giant-planet system in possible 7:3 MMR** by *Takuya Takarada et al.*

astro-ph/1804.04070: **Connecting Planetary Composition with Formation** by *Ralph E. Pudritz, Alex J. Cridland, Matthew Alessi*

astro-ph/1804.04138: **Earth as an Exoplanet** by *Tyler D. Robinson, Christopher T. Reinhard*

astro-ph/1804.04233: **Mars' Growth Stunted by an Early Giant Planet Instability** by *Matthew S. Clement et al.*

astro-ph/1804.04265: **X-Ray Ionization of Planet-Opened Gaps in Protostellar Disks** by *Stacy Y. Kim et al.*

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