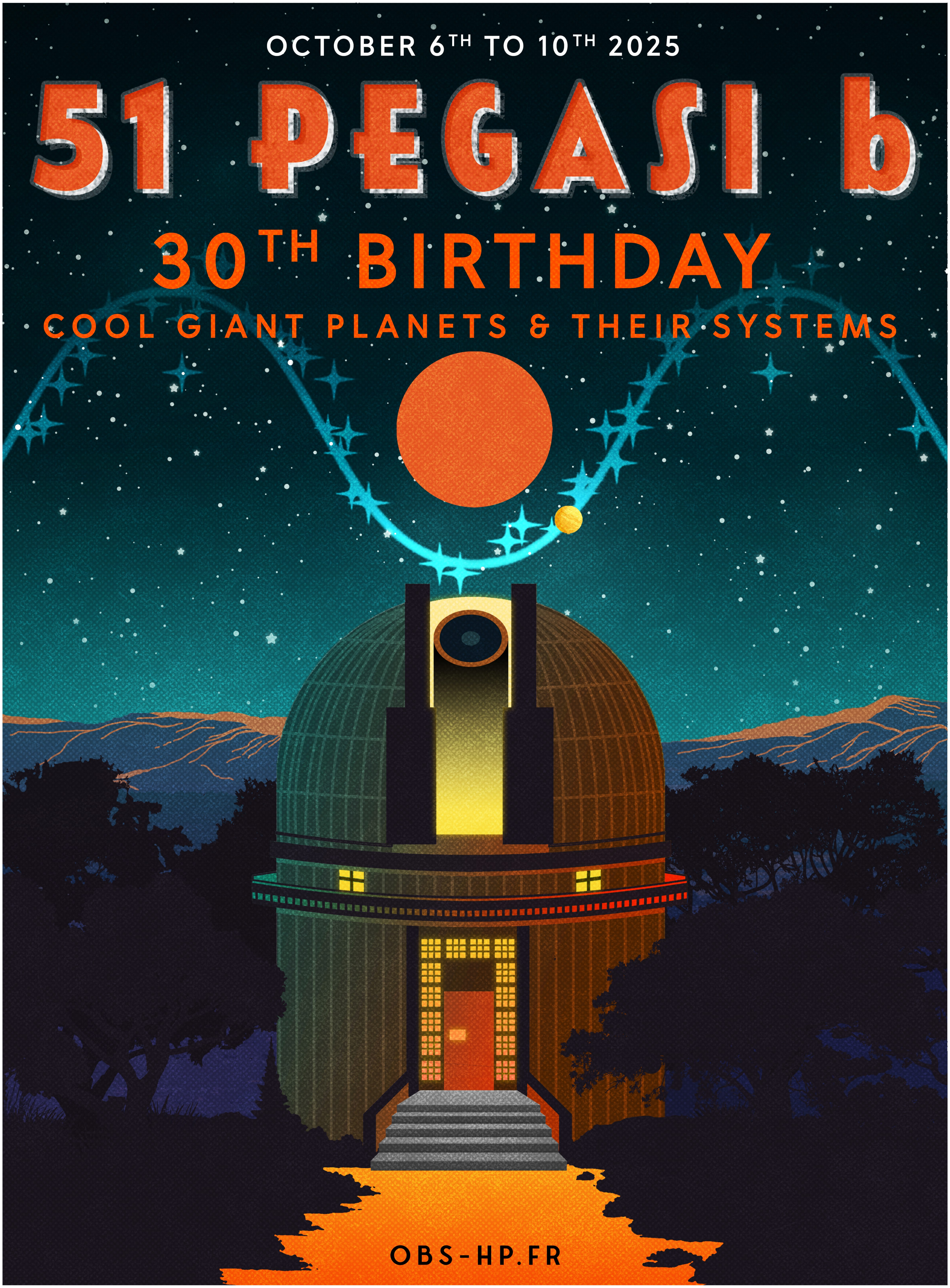

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OHP

OBSERVATOIRE DE GENÈVE FONDÉ EN 1772

FRANCE 2030 PROGRAMME DE RECHERCHE ORIGINES

Contents

Programme

OHP 2025 – 51 Pegasi b: Cool Giant Planets And Their Systems

	Sunday 5	Monday 6	Tuesday 7	Wednesday 8	Thursday 9	Friday 10
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9h			*Chair: Isabelle*		Session - RV and Gaia Feedback from Gaia splinter session	*Chair: Vincent Bourrier* J. Birkby & E. Matthews — Review on Atmospheric characterization
10h		Welcome of participants French institutional celebration for the 30th anniversary	Coffee break	Coffee break	Coffee break	W. Balmer — JWST Coronagraphic Imaging of Eccentric, Cold Giants: 14 Her c and HD 222237 b Coffee break
11h			*Chair: Arthur Vigan* J. Sahlmann — Review on Gaia M. Nowak — Dark hole + Interferometry: a winning combo enabled by GRAVITY+ O. Carrion-Gonzal — Characterizing cold giant exoplanets and their planetary systems in direct imaging		*Chair: Lucile Mignon* I. Mireles — A new 5-day super-Earth and 8-year brown dwarf in the warm Jupiter system TOI-201 D. Shaw — Updated Masses for the Gas Giants in the Eight-Planet Kepler-90 System Via Transit-Timing Variation and Radial Velocity Observations Session - Giant planets around M dwarfs	C. Hsu — Giant Planets and Low-mass Companions Show Different Spins but Similar C/O Ratios from Keck/KPIC High-resolution Spectroscopy M. Malin — Mid-infrared spectroscopy of directly imaged giant planets with JWST/MIRI. F. Millour — Hunting exoplanets spectra with MATISSE D. Ehrenreich — Two years of atmospheric characterization with The Near Infra-Red Planet Searcher (NIRPS)
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13h		Walk to conference room	Lunch @ OHP [13:00 - 14:00]	Lunch @ OHP [13:00 - 14:00]	Lunch @ OHP [13:00 - 14:00]	Lunch @ OHP [13:00 - 14:00]
14h		Welcome M. Mayor — Introduction to the conference	Walk to conference room A. Triaud & B. Bowler — Review on planetary systems, architecture, and dynamics	Outdoor activities	Walk to conference room M. Lambrechts & A. Ziampras — Review on formation	Walk to conference room R. Helled & J. Fortney — Review on interior modeling and evolution
15h	Welcome of participants	*Chair: Anne-Marie Lagrange* C. Mordasini & A. Howard — Review on planet demographics	*Chairs: Lauren Weiss & Stéphane Udry* J. Wang — Precise and novel orbital measurements for the imaged giant planet population using VLTI/GRAVITY K. Franson — Astrometric Accelerations as Dynamical Beacons: Efficiently Imaging Planets Around Young Accelerating Stars		*Chairs: Tristan Guillot & Gabriel Marleau* M. Houllé — Mid-infrared long-baseline interferometry of the PDS 70 protoplanets' circumplanetary disks K. Crotts — Exploration of the TWA 7 Planet-Disk System with JWST NIRCam	*Chair: Elisabeth Matthews* H. Knierim — Unraveling the origin of giant exoplanets – Observational implications of convective mixing S. Ulmer-Moll — Unveiling transiting temperate giants in multi-planetary systems
16h		Break & drinks L. Mignon — Thirty Years After 51 Peg b: A Global View of Giant Planet Occurence	Break & drinks A. Sanghi — Worlds Next Door: A JWST Imaging Search for Giant Planets Orbiting Alpha Centauri A		Break & drinks (30 min break instead of 45 min) J. Haochang — Ring-Driven Planets and Debris Disk Formation in HR 8799 and Other Directly-Imaged Planetary Systems	T. Guillot — Temperate transiting planets : discoveries and opportunities S. Mueller — Deep radiative zones in giant planets: Implications for interior and atmospheric characterisation Break & drinks
17h		J.-P. Beaulieu — 30 years of planet hunting via microlensing, entering the era of Roman and Euclid V. Squicciarini — Demographics of young super Jovian planets beyond the snowline J. Venturini — The emerging field of planets in binaries S. Blunt — A Hint that Typical Super-Jupiters are Eccentric	S. Jenkins — Probing the Population of Giant Planets Around White Dwarfs with JWST A. Adamson — Searching for Circumbinary Planets With BEBOP A. Smith — First results from the Warm Object Rossiter-McLaughlin Survey (WORMS) H. Osborn — A transiting solar system analogue discovered in TESS		D. Trevascus — Differentiating hot- and cold-start formation with new dynamical masses for the PDS 70 protoplanets C. Finley — Synthesizing Accretion and Circumplanetary Disk Properties of a Wide Orbit Planet with HST and JWST S. Schmidt — Most hot jupiters were cool giant planets for >1 Gyr J. Weder — Towards planetary population syntheses in MHD wind-driven discs	Feedback from the questionnaires + discussions
18h		M. Morgan — Constraining the Migration Channels of Warm Jupiters Using Population-Level Eccentricities S. Giacalone — The Transition from Giant Planets to Brown Dwarfs near the Ice Line from the Stellar Metallicity Distribution Poster pop-up 1 Poster session 1	J. Lillo-Box — The KOBE experiment: a radial velocity blind search survey 30 years after 51 Peg b G. Hébrard — Searching and studying cool giant planets and their systems with SOPHIE at OHP L. Weiss — The Kepler Giant Planet Search. I. A Decade of Kepler Planet-host Radial Velocities from W. M. Keck Observatory Poster pop-up 2		P. Griveaud — How to halt the inward migration of giant planets. M. Poon — Early evidence for isotropic planetary obliquities in young super-Jupiter systems Conference dinner	End of the conference
19h			Poster session 2 Cocktail dinner @ OHP and conference picture			
>20h						

White	Standard talk 12 min + 3 min for questions
Grey	Short talk 8 min + 2 min for questions
Blue-green	Review talk
Peach	Session with several short talks on a close topic
Purple	Splinter sessions
Light blue	Other
Light green	Lunches, breaks, etc

Session - Cold Jupiters and close-in small planets (8+2 min	
J. Faria	Probing the Correlation Between Outer Giant Planets and Inner Sub-Neptunes
J. Van Zandt	The Distant Giants Survey: Outer giants are more common in the presence of close-in small planets
A. Bonomo	Cold Jupiters and short-period small planets: friends, foes, or indifferent?
L. Naponiello	Cold Jupiters in systems with inner small planets: HARPS-N follow-up of Kepler and TESS systems
L. Parc	Outer giant planets shaping inner architectures: insights from two decades of CORALIE radial velocity monitoring
A. Ruggieri	Occurrence rates of small close-in planets in the presence of a Jupiter-like companion

Session - Giant planets around M dwarfs (8+2 min talks)	
A. Reiners	A Decade of CARMENES: Unveiling Planetary Systems Around M Dwarfs
F. Bouchy	Cool giant planets with NIRPS
D. Charbonneau	Low-Mass M Dwarfs Lack Jupiter Analogs
F. Destriez	A new population of giant planets around M dwarfs with Gaia
E. Bogat	Demonstrating Sensitivity to Exo-Saturns around Nearby Young M Dwarfs with JWST Coronagraphy

Session - RV and GAIA (8+2 min talks)	
D. Barbato	Unmasking the giants: Confirming Gaia candidates with HARPS-N
L. Handley	Joint Analysis of the California Legacy Survey RVs and Gaia Astrometry
G. Piccinini	True masses through Hipparcos and Gaia Astrometry
F. Kiefer	Characterization of Brown Dwarfs and Long-Period Giant Planets Observed by Radial Velocity with the Aid of Gaia Astrometry

Posters	
V. Fleury	C4Life: a space based mid-IR interferometer for investigating the solid-carbon particle abundance in telluric forming planet regions
L. Jiang	A Deep HST/WFC3/H-alpha Imaging Survey to Probe the Demographics of Accreting Planets at Wide Separations
C. Lammers	Forecasts for Gaia's Exoplanet Yield
N. Jones	The Gemini Planet Imager Exoplanet Survey: Analysis of Candidate Companions
W. Ceva	Constraining the masses of giant planets that correspond to long term trends in over 25 years of CORALIE data

Splinter - Atmospheric characterisation (12+3 min talks)	
N. Godoy Barraza	A JWST/MIRI view of kappa Andromedae b: Refining its mass, age, and physical parameters
L. Parker	Tracing the formation history of long-period companions with novel silicate abundance ratios in the M-band
J. Scigliuto	Exploring worlds with VLTI/MATISSE
R. Kiman	The Diversity of Cold Worlds: Age and Characterization of the Coconuts-2 T9 Brown Dwarf
M. Ravet	Panchromatic view of the Frigid Jovian Exoplanet COCONUTS-2 b
E. Nasedkin	The JWST Weather Report from SIMP-0136: Temperature changes, auroral heating and constant cloud coverage measured using time-resolved atmospheric retrievals.
G. Marleau	Medium- and high-resolution hydrogen-line spectroscopy of planetary accretion tracers: data and models for and with JWST
COFFEE BREAK	
C. Farret Jentink	NIGHT: Unveiling Atmospheric Evolution Across Planetary Systems Through Dedicated Helium Transit Observations
A. Radcliffe	A High- Spectral Resolution atmosphere Model
A. Denis	Pushing the limits of direct imaging with HiRISE : Characterization of 2 super Jovian exoplanets at low angular separation
Discussion	

Posters	
A. Taha	The spatial extent of polycyclic aromatic hydrocarbons emission in the Herbig star HD 179218
M. Friebe	Formation of Gaps in Self-Gravitating Debris Disks: Secular Resonances in a Two-Planet System
E. Greenfield	Formation and Astrometric Detection of Mean Motion Resonances in Giant Planets
H. Nabavinezhad	Exploring Planet Migration and Resonance Chain in Formation of the Kepler-80 System

Splinter - Gaia	
D. Ségransan & J.-B. Delisle	**Introduction to Gaia DR4 data and hands-on session** **1. Data & Processing** Improvements from Gaia DR3 to DR4 **2. Gaia Astrometric Time-Series Data Analysis** Pre-processing of astrometric data Searching for Keplerian signals in astrometric time series (hands-on) (Python 3.10 & later, with kemodel and spleaf packages - https://gitlab.unige.ch/delisle) **3. Exoplanet Candidate Catalogue and Dedicated Archive Tables** Catalogue description and structure Filtering and validation of candidate solutions
COFFEE BREAK	
	Hands-on session (continued)
Discussion	

Posters	
B. Rajpoot	Predict, Point, Probe: Mapping the Orbits of Long-Period Cool Gas Giants
Y. Frensch	HARPS search for long-period companions around Main-Sequence stars
V. Bourrier	Embarking on a trek across the exo-Neptunian landscape
P. Plavchan	The NASA Landolt mission

Monday 6 October

Thirty Years After 51 Peg b: A Global View of Giant Planet Occurrence

Lucile Mignon*[1]

[1]Institut de Planétologie et dÁstrophysique de Grenoble – Centre National de la Recherche Scientifique – France

Abstract

Thirty years after the discovery of 51 Peg b, nearly 6000 exoplanets have been confirmed in the solar neighborhood. But beyond the growing count, it is the remarkable diversity of these worlds that continues to challenge our understanding and paints a planetary taxonomy far more complex than that suggested by our own Solar System.
Beyond individual discoveries, studying the global properties of this exoplanet population, and particularly giant planets, provides essential insights into the processes of planet formation and evolution (accretion timescales, formation locations within protoplanetary disks, and migration mechanisms).

We present a comprehensive review of the occurrence rates of giant planets, compiled from multiple detection methods: radial velocity, transit, and direct imaging. By combining these complementary techniques and datasets, we draw up a coherent picture of massive planets across a wide stellar mass rangerange (from young B-type to late M-type).
We will discuss how current detection biases still shape our understanding and evaluate whether today's observational constraints are sufficient to fully inform formation models.

*Speaker

sciencesconf.org:ohp2025:645124

30 years of planet hunting via microlensing, entering the era of Roman and Euclid

Jean-Philippe Beaulieu*[1,2]

[1]Beaulieu (IAP) – IAP – France
[2]Institut d'Astrophysique de Paris – Institut National des Sciences de l'Univers, Sorbonne Universite, Centre National de la Recherche Scientifique, Institut national des sciences de lÚnivers, Institut national des sciences de lÚnivers – France

Abstract

The Nancy Grace Roman Space Telescope, this 2.4-meter space telescope, equipped with a wide field IR imager, will launch in october 2026. It will perform is a 6x62 day observation of 2 square degrees of the galactic Bulge to search for planets via microlensing. Data will be publicly available with no proprietary period.

For each campaign of 62-days observations, Roman will detect _˜200 bound planets down to the mass of Ganymède, including 30 with mass < 3 MEarth. While microlensing light curves themselves usually yield only the star-planet mass ratio, Euclid precursor observations of the Roman fields done in March 2025 will yield direct observations of the host star and the background source star, which can be used as a strong constraint in the light curve modelling to measure physical masses to 10 % from year-1 of the Roman galactic bulge survey. We will detect _˜200+ free-floating planets per campaign, half of which with masses mass < 1 MEarth.

I will comment on the latest results on the mass function for cold planets from the ground, before giving an update of the prospects of combining Euclid and Roman observations to study their demographics, whether they are bound or rogue.

*Speaker

sciencesconf.org:ohp2025:648959

Demographics of young super Jovian planets beyond the snowline

Vito Squicciarini*[1] and On Behalf Of The Sphere/shine Consortium

[1]Observatoire de Paris – Centre National de la Recherche Scientifique, Université Paris sciences et lettres – France

Abstract

The SpHere INfrared Survey for Exoplanets (SHINE) is a guaranteed-time observing program carried out with SPHERE on the VLT between 2015 and 2024. Our goals are to directly detect young giant exoplanets at very long periods, typically beyond 5 au, to constrain the frequency of substellar companions with masses between 1 and 75 Jupiter masses and semi-major axes between 5 and 300 au, and ultimately to understand their formation and early evolution processes. The sample of stars observed is composed of members of young, nearby associations with stars ranging in spectral type from B to M-type. Based on the survey's detection limits and discoveries, we are using a Bayesian inference tools to compare our observations with the predictions of parametric models of the planet and brown dwarf populations, and those from the advanced core accretion and gravitational instability planet population synthesis. In this talk, we will present the statistical results of our final analysis of a total of 400 young, nearby stars that reveal the existence of two overlapping populations of substellar companions, and the existence of a variation of their occurence with the stellar host mass.

*Speaker

sciencesconf.org:ohp2025:645060

The emerging field of planets in binaries

Julia Venturini*[1] and Arianna Nigioni[2]

[1]University of Geneva – Switzerland
[2]Univeristiy of Geneva – Switzerland

Abstract

Half of the Sun-like stars in our galaxy have a stellar companion. The number of detected planets orbiting binary stars is rapidly increasing thanks to the follow-up of TESS planet candidates by GAIA and direct imaging, which detect stellar companions in systems known to host planets. Important questions regarding the origin and demographics of planets in binaries are starting to be explored, namely, how does the presence of a stellar companion affects the outcome of planet formation? How does the occurrence rate of planets depend on the binary separation? Is there a radius valley for planets orbiting binary stars? In this presentation I will summarise the latest findings about S-type planets (planets orbiting one of the two stars in a binary system), and I will introduce the global planet formation model that we are developing for binary stars. I will show the first results of the population synthesis for S-type planets and discuss the link to the observed population.

*Speaker

sciencesconf.org:ohp2025:646566

A Hint that Typical Super-Jupiters are Eccentric

Sarah Blunt*[1] and Jason Wang

[1]Department of Astronomy and Astrophysics [Univ California Santa Cruz] – United States

Abstract

Most known giant planets (300-6000 M_earth) are "atypical;" the occurrence rate of giant planets peaks between 1 and 10 au, but very few have been discovered in this regime. However, as the baselines of Doppler surveys mature and statistics improve, we are beginning to resolve population-level features of these "typical" giants. In this presentation, I will show the completeness-corrected eccentricity distributions of giant exoplanets at the peak of occurrence, highlighting a preliminary result that the occurrence rate at e=0.3 is *higher* than the occurrence rate at e=0. This result places an interesting constraint on models of planet formation: the average super-Jupiter is eccentric.

*Speaker

sciencesconf.org:ohp2025:644617

Constraining the Migration Channels of Warm Jupiters Using Population-Level Eccentricities

Marvin Morgan*[1], Brendan P. Bowler[2], and Quang H. Tran[3]

[1]The University of Texas at Austin – United States
[2]University of California, Santa Barbara – United States
[3]Yale University – United States

Abstract

Giant planets are expected to predominantly form beyond the water ice line and occasionally undergo inward migration. Unlike hot Jupiters, which can result from high-eccentricity tidal migration, warm Jupiters between 0.1-1 AU are in many ways more challenging to explain because they reside outside the tidal influence of their host stars. Orbital eccentricities offer clues about the formation and evolution of warm Jupiters. Based on uniform Keplerian fits of 18,561 RVs targeting 200 warm Jupiters, we use hierarchical Bayesian modeling to evaluate the impact of host star metallicity, mass, and orbital separation on the reconstructed population-level eccentricity distributions. I will present results showing that ˜25% of warm Jupiters have eccentricities consistent with near-circular orbits, suggesting that most warm Jupiters detected are dynamically hot. Warm Jupiters orbiting metal-rich stars are more eccentric than those orbiting metal-poor stars but no differences are observed as a function of stellar host mass or orbital separation. These results are broadly consistent with planet scattering shaping the orbits of close-in giants.
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*Speaker

sciencesconf.org:ohp2025:636547

The Transition from Giant Planets to Brown Dwarfs near the Ice Line from the Stellar Metallicity Distribution

Steven Giacalone*[1], Andrew Howard[2], Gregory Gilbert[3], Judah Van Zandt[4], Erik Petigura[4], and Luke Handley[3]

[1]Caltech – United States
[2]Caltech – United States
[3]Caltech – United States
[4]UCLA – United States

Abstract

Giant planets and brown dwarfs are thought to form via a combination of pathways, including bottom-up mechanisms in which gas is accreted onto a solid core and top-down mechanisms in which gas collapses directly into a gravitationally-bound object. One can distinguish the prevalence of these mechanisms using host star metallicities. Bottom-up formation thrives in metal-rich environments, whereas top-down formation is weakly dependent on ambient metal content. Using a hierarchical Bayesian model and the results of the California Legacy Survey, a low-bias and homogeneously analyzed radial velocity survey that detected dozens of planetary-mass companions between 1 and 10 au, we find evidence for a transition in the stellar metallicity distribution at a companion mass of M_t = 25.5 {+18.7} {-12.3} M_Jup. Companions below and above this threshold tend to orbit stars with higher and lower metallicities, respectively. In addition, we find that the two populations have distinct orbital eccentricity distributions, with the low-mass population more strongly preferring low-eccentricity orbits. We compare our results to other estimates of M_t made in recent years.

*Speaker

sciencesconf.org:ohp2025:644653

Tuesday 7 October

Probing the Correlation Between Outer Giant Planets and Inner Sub-Neptunes

João Faria*[1], Jean-Baptiste Delisle[2], and Damien Ségransan[1]

[1]Université de Genève – Switzerland
[2]Université de Genève – Switzerland

Abstract

One critical test for planet formation theories is the relationship between the presence of long-period giant planets and the occurrence of close-in low-mass planets. Some in-situ formation models predict a positive correlation between these populations, while inward migration scenarios mostly favor an anti-correlation. Constraints from observational studies remain inconclusive because of small sample sizes and heterogeneous observing strategies. To address this, we have been conducting a long-term radial velocity survey with CORALIE, HARPS, and ESPRESSO, focused on a rigorously selected sample of stars with and without giant planets. Our uniform and homogeneous observing strategy minimizes potential biases, enabling a robust measurement of the occurrence rates.

In this talk, I will present the detection and characterisation of new low-mass planets, as well as the first results from a statistical analysis of the complete sample, comparing the occurrence rates of close-in super-Earths and sub-Neptunes in systems with and without cold giants.

*Speaker

sciencesconf.org:ohp2025:645204

The Distant Giants Survey: Outer giants are more common in the presence of close-in small planets

Judah Van Zandt*[1] and Erik Petigura[1]

[1]University of California, Los Angeles – United States

Abstract

We learned from NASA's Kepler mission that small inner planets are common around Sun-like stars (50–100%). Separately, ground-based radial velocity (RV) surveys have shown that long-period gas giants are somewhat rare (_˜16%). To find the *conditional* occurrence of distant giants in systems with a close-in small planet, I conducted the Distant Giants Survey, a three-year RV search for giant planets in 47 systems with an inner transiting planet. I detected six giant planets, incorporating partial orbit "trends" by combining RVs with HGCA astrometry. I accounted for missed planets with a rigorous target-by-target completeness correction procedure. I found that giants occur in _˜30% of systems with an inner small planet, twice as often as they occur around a random GK star. I also found that giant planets with inner companions have lower eccentricities than average, and their inner planets likewise have shorter periods, potentially pointing to a history of dynamical interaction. Finally, I discuss Gaia DR4's potential to reveal 3D system architectures, further elucidating the relationship between distant giants and close-in small planets.

*Speaker

sciencesconf.org:ohp2025:636854

Cold Jupiters and short-period small planets: friends, foes, or indifferent?

Aldo Stefano Bonomo*[1], Luca Naponiello*[1], Ester Pezzetta[2], Alessandro Sozzetti[1], and Matteo Pinamonti[1]

[1]INAF - Osservatorio Astrofisico di Torino – Italy
[2]Dipartimento di Fisica, Università di Torino – Italy

Abstract

The exoplanet population in close orbits (semi-major axis a< 0.4 AU) around solar-type stars (FGK dwarfs) is dominated by small planets (SPs) with mass Mp < 20 Mearth, i.e. super-Earths and sub-Neptunes. These planets are, however, missing in our Solar System, and the reason for that is unknown. By studying the impact of cold Jupiters (CJs) with a=1-10 AU and Mp=0.5-20 MJup on the formation and/or migration of SPs, several theoretical works have predicted either an anti-correlation or a weak or strong correlation between CJs and SPs, thus reaching somehow contradictory results. Here we report on the occurrence rate of CJs in the largest sample of SP systems ever considered, using high-precision radial velocities. We find an integrated occurrence rate of CJs in small-planet systems of f(CJ—SE)_˜11%, which is considerably lower than previous estimates reported by other groups, and a possible excess of CJs only at super-solar mass and metallicity. By investigating the SP-CJ relation with CJ properties, SP multiplicity, and SP composition, we provide important clues on both the formation of short-period SPs and their absence in our Solar System.

*Speaker

sciencesconf.org:ohp2025:644021

Cold Jupiters in systems with inner small planets: HARPS-N follow-up of Kepler and TESS systems

Luca Naponiello*[1]

[1]INAF - Osservatorio Astronomico ed Astrofisico di Torino – Italy

Abstract

Understanding the architecture of planetary systems is key to unveiling the processes governing planet formation and evolution. In this work, I revisit the occurrence rate of cold Jupiters (CJs) in systems hosting inner small planets (SPs), extending previous studies by incorporating TESS-detected planets that we have been following up within the HARPS-N Collaboration (HNC), for a total of more than 5000 radial velocities (RV). By expanding the sample and refining the treatment of detection biases, we aim to better quantify the correlation between the presence of CJs and inner SPs, shedding light on the influence of giant planets on the formation, migration, and dynamical evolution of smaller planets. I will discuss in detail the few systems that we have confirmed to host CJs (such as K2-312), as well as cases where long-period RV trends were revealed to originate from stellar activity. We further explore possible SP–CJ correlations as a function of stellar metallicity, stellar mass, and planet multiplicity and properties. These findings provide important constraints for models of planetary system architectures and their evolutionary pathways.

*Speaker

sciencesconf.org:ohp2025:644039

Outer giant planets shaping inner architectures: insights from two decades of CORALIE radial velocity monitoring

Léna Parc*[1], François Bouchy[2], Solène Ulmer-Moll , Louise Nielsen , Marion Neveu-Vanmalle[3], and Stéphane Udry[2]

[1]Observatoire Astronomique de lÚniversité de Genève – Switzerland
[2]Université de Genève – Switzerland
[3]Université de Genève – Switzerland

Abstract

Long-period giant planets are key to tracing the dynamical evolution and architecture of planetary systems. Their presence in systems with short-period planets offers clues about the origin and migration history of these systems.
Since the early 2000s, we have been conducting a long-term radial velocity monitoring of several tens of Hot Jupiter systems using the CORALIE spectrograph on the 1.2m Euler telescope. We present this unique dataset, spanning over two decades, which reveals several outer companions and long-term RV trends, providing statistical and dynamical constraints on the role of cold giant planets in shaping the orbital evolution of Hot Jupiters.

In parallel, since 2021, we have extended this effort to planets located in the hot Neptunian desert-a region likely sculpted by photoevaporation, tidal effects, or dynamical interactions. Among the systems currently followed, several already show signs of long-period perturbers. These programs, when combined with the upcoming Gaia DR4 release, will provide a powerful synergy to constrain the period, true mass, and orbital inclination of these outer companions shaping planetary architectures.

*Speaker

sciencesconf.org:ohp2025:643128

Occurrence rates of small close-in planets in the presence of a Jupiter-like companion

Alessandro Ruggieri*[1], Silvano Desidera[2], Matteo Pinamonti[3], Domenico Barbato[2], Alessandro Sozzetti[4], Aldo Stefano Bonomo[3], Luca Naponiello[5], Mario Damasso[6], Serena Benatti[7], Ilaria Carleo[6], Raffaele Gratton[2], and Katia Biazzo[8]

[1]INAF - Osservatorio Astrofisico di Catania – Italy
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[3]INAF - Osservatorio Astrofisico di Torino – Italy
[4]Osservatorio astrofisico di Torino – Italy
[5]INAF - Osservatorio Astronomico ed Astrofisico di Torino – Italy
[6]INAF - Osservatorio Astrofisico di Torino – Italy
[7]INAF - Osservatorio Astronomico di Palermo – Italy
[8]INAF - Osservatorio Astronomico di Roma – Italy

Abstract

Despite the great advancements made in the exoplanetary field over the last decades, it is not yet clear whether our Solar System's architecture is common. To shed light on this topic, the GAPS team in 2012 started a program aimed at monitoring 16 systems known to host giant planets on a Jupiter-like orbit to detect potential inner smaller companions. After 13 years of observations and a few new planets detected, we are working on a statistical analysis of these systems. To expand on that, we selected a larger and homogeneous sample of Sun-like stars hosting a Jupiter-like object suited for the search for small inner planets. The target list includes 138 stars for which we gathered all the available RV data and fitted them homogeneously, finding evidence for 6 new convincing candidates. We derived completeness maps and occurrence rates of small and close-in planets, obtaining results in agreement with the literature. We also split our catalog into various sub-samples to test the importance of different physical parameters in determining the link between outer gas giants and their internal low-mass companions.

*Speaker

sciencesconf.org:ohp2025:644893

Dark hole + Interferometry: a winning combo enabled by GRAVITY+

Sylvestre Lacour*[1], Mathias Nowak , Kammerer Jens , and Roberto Abuter

[1]LESIA, Observatoire de Paris – Observatoire de Paris – Meudon, 5 Place Jules Janssen, France

Abstract

The ExoGRAVITY project has already observed numerous exoplanets, discovered new ones, and continues to deliver valuable insights into the atmospheric properties and orbital dynamics of exoplanetary systems. With the advancement of GRAVITY+ and its enhanced adaptive optics (AO) capabilities, a new observational mode-known as the "dark hole" technique-has been enabled. This method addresses the challenge of photon noise at small angular separations, opening new observational windows that will be crucial for detecting the rich population of exoplanets that should be detected by Gaia. In this presentation, we provide a brief overview of the dark hole technique, highlight key results from the ExoGRAVITY project, and discuss future prospects enabled by this powerful new mode.

*Speaker

sciencesconf.org:ohp2025:644941

Characterizing cold giant exoplanets and their planetary systems in direct imaging

Oscar Carrion-Gonzalez*[1]

[1]MPIA – Germany

Abstract

Thirty years after the discovery of 51 Peg b, the direct-imaging technique is now reaching the sensitivity levels required to detect and characterize cold giant exoplanets on long-period. This population of exoplanets has remained inaccessible for atmospheric characterization, but will be unveiled with the upcoming direct-imaging facilities. The Nancy Grace Roman Space Telescope, to be launched in 2026 or 2027, will carry the first coronagraph ever capable of imaging cold giant exoplanets in reflected starlight. Roman will pave the way for the Habitable Worlds Observatory, which might be complemented by the proposed Large Interferometer For Exoplanets. On the ground, ELT instruments such as METIS or PCS will image not only cold giant planets, but also lower-mass planets in their systems. In this talk we will discuss the science yield of the direct imaging facilities becoming online in the next years and decades, their potential for atmospheric characterization, and their synergies.

*Speaker

sciencesconf.org:ohp2025:649232

Theia's Astrometric Power for Giant Exoplanets

Fabien Malbet*[1], Manon Lizzana[2], and Alain Leger[3]

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[2]Institut de Planétologie et d'Astrophysique de Grenoble – Centre National d'Études Spatiales [Toulouse], Centre National de la Recherche Scientifique - CNRS, uniersité de grenoble alpes – France
[3]Alain LEGER – IAS, univ. Paris-Saclay – France

Abstract

Theia is an ESA astrometry mission designed to achieve a precision of 0.3 μas, enabling ultra-precise measurements of stellar positions. When focused on giant planet detection, Theia can carry out a large-scale census of Jupiter-like planets orbiting stars at 150 parsecs and beyond, including systems that are inaccessible to radial velocity due to high stellar activity or youth. This provides a valuable insight into the early dynamical evolution of planetary systems and offers important constraints on the formation and migration mechanisms of giant planets. Theia's astrometry complements radial velocity (RV) measurements by providing true planetary masses and full orbital inclinations. It can also reveal mutual inclinations in multi-planet systems, helping to map the three-dimensional architecture of planetary systems. Furthermore, its 0.33 deg^2 field enables the astrometric monitoring of stars up to ten magnitudes fainter than the primary targets, greatly increasing its statistical reach. Theia can also identify prime targets for direct imaging and atmospheric characterisation for future missions.

*Speaker

sciencesconf.org:ohp2025:649172

Updated Yield Predictions of Cold Giant Planets for Roman Galactic Exoplanet Survey

Farzaneh Zohrabi*[1] and Matthew Penny[1]

[1]Department of Physics Astronomy [Louisiana State University] – United States

Abstract

One of the primary objectives of NASA's Nancy Grace Roman Space Telescope is to conduct a comprehensive statistical survey of cold exoplanet demographics using gravitational microlensing - requiring not only detection but also characterization of exoplanets. Incorporating Roman's latest technical specifications, we compute updated yield predictions for cold giant planets, based on realistic simulations over a full range of survey designs endorsed by Galactic Bulge Time Domain Survey definition committee. We compare survey architectures based on cadence and exposure-time, science filters, and colour-cadence; exploring how these parameters influence the planetary detection rate and Roman's ability to constrain the physical properties of lens systems, particularly their masses and distances.

*Speaker

sciencesconf.org:ohp2025:645590

From Asgard/NOTT to LIFE : grasping the power of nulling interferometry

Romain Laugier*[1] and Denis Defrère[2]

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[2]Institute of Astronomy [Leuven] – Celestijnenlaan 200D BUS 2401, 3001 Leuven, Belgium

Abstract

High-contrast observations have been contributing to the long-period part of the exoplanet landscape. The advent of nullers such as Asgard/NOTT at VLTI, functioning as coronagraphs for interferometers, should unlock comparable performance at angular separations smaller by a factor 20, opening up resolved observations of giant planets at the snow line of young stars, and even hot Jupiters around nearby stars. Farther in the future, the LIFE space mission will open the door to characterizing temperate rocky planets in the thermal infrared.
We typically rely on data reduction techniques to obtain the final x10 gain performance gain towards astrophysical interpretation. A new data exchange standard called NIFITS was recently introduced to power the development of these techniques.
In this presentation, we will go over the basics of the nulling data, before describing how these advances unlock the exploitation of Asgard/NOTT and its different modes. Furthermore, we will give some perspective on how this carries forward in the development of the LIFE space mission, including elements that also apply to coronagraph data reduction.

*Speaker

sciencesconf.org:ohp2025:645539

Precise and novel orbital measurements for the imaged giant planet population using VLTI/GRAVITY

Jason Wang*[1], Jonathan Roberts , Sylvestre Lacour , Amanda Chavez , and Exogravity Team

[1]Northwestern University [Chicago, Ill. USA] – United States

Abstract

The orbits of giant exoplanets encode key clues on the formation history of planetary systems. However, it is difficult to determine the orbits of imaged giant planets that have orbital periods between decades and millennia with only measurements spanning _˜10 years. The recent breakthrough for long-baseline interferometry to directly detect gas giant exoplanets has enabled a revolutionary 20-100x improvement in the astrometry of directly imaged exoplanets. I will present a uniform orbital analysis of all 17 exoplanets and 19 brown dwarf companions observed by the VLTI/GRAVITY interferometer through the ExoGRAVITY team. I will show how the unprecedented precision of GRAVITY has enabled precise orbits for companions from 3 to 300 AU. I will highlight some new measurements that are only possible with 50-microarcsecond GRAVITY astrometry: measuring planet masses through perturbations on the visual orbits of other planets in the system and searching for binary planets and moons through astrometry. Finally, I will present our analysis of the population-level orbital distribution of giant planets between 3-300 AU and how it compares to other samples.

*Speaker

Probing the Population of Giant Planets Around White Dwarfs with JWST

Sydney Jenkins*[1], Andrew Vanderburg[1], and Mary Anne Limbach[2]

[1]Massachusetts Institute of Technology – United States
[2]University of Michigan – United States

Abstract

Though giant planets are relatively common around main-sequence stars, little is known about how stellar evolution sculpts the giant planet population. JWST's direct imaging capabilities provide a unique opportunity to probe the demographics of evolved systems by searching for giant planets around white dwarf stars. We will present findings from the MIRI Exoplanets Orbiting White dwarfs (MEOW) Survey, and first results from the Planet Authentication in White-dwarf Systems (PAWS) Survey. The MEOW Survey mapped 16 nearby white dwarf systems by searching for thermal excesses and directly imaged companions. MEOW successfully detected an infrared excess around WD 0310-688 consistent with a $\approx$3 MJup planet. While this program also identified many directly imaged planet candidates, additional data is needed to differentiate between true planets and background sources. The follow-up PAWS Survey will measure the proper motions of these candidates relative to their host star, providing confirmation of any true giant planets. Any confirmed planets will be among the coldest worlds known, and will be ideal targets for additional follow-up with MIRI LRS and MRS.

*Speaker

sciencesconf.org:ohp2025:645122

Searching for Circumbinary Planets With BEBOP

Aleyna Adamson*[1], Amaury Triaud[1], and Bebop Consortium

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Abstract

BEBOP is a radial velocity survey searching for circumbinary planets using high resolution spectrographs, including SOPHIE here at the OHP. Circumbinary planets are planets that orbit both stars in a binary system. They challenge what we know about exoplanets and are vital for understanding planet formation, evolution, and migration in unique dynamic environments. In this talk I will explain how we managed to detect these planets and show results of the survey where we find many Saturn-mass planets at long orbital periods.

*Speaker

First results from the Warm Object Rossiter-McLaughlin Survey (WORMS)

Alexis Smith*[1]

[1]DLR Institute of Space Research – Germany

Abstract

The origins of warm Jupiters (WJs) are unclear. If they formed beyond the snow line, then they must have migrated, but we don't know which migration mechanism(s) are the most important. Stellar obliquity is a key tracer of migration history. Dynamically violent, high eccentricity migration leads to planets in significantly misaligned orbits with large obliquities, whereas disc-driven migration should result in orbits coplanar with the stellar equator. In contrast to the hot Jupiters, the imprint of dynamical migration in WJs should not be erased through tidal interactions with the convective zone of their stars, because they are tidally detached. Our VLT/ESPRESSO programme to measure the obliquities of an unbiased sample of eleven WJs, alongside other recent results, will greatly increase the size of the measured sample. The first observations were made last year, and here we present the data gathered so far, and our preliminary interpretation. As already seen, there are hints of an unexpected correlation with orbital eccentricity, as well as tentative evidence for the orbits of lower-mass planets to be preferentially misaligned w.r.t. the stellar spin axis.

*Speaker

sciencesconf.org:ohp2025:648873

A transiting solar system analogue discovered in TESS

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Abstract

Although our own solar system features close-in small planets and far-out giant planets, this is not the norm for exoplanetary systems. This is especially true for transiting planets, for which the vast majority of known multiplanetary systems are compact and seem to show a "peas in the pod" architecture. This is a shame as transiting planets are unique in allowing full planetary characterisation with radius, mass & even atmospheric information from transmission spectroscopy. I will present a newly-detected transiting multi-planet system featuring two low-mass (< 20Me) inner planets - with radii of 3.2 & 4.9Re - and a 80$\pm$7Me outer giant planet with a Saturn-like radius and an equilibrium temperature of only 315K. The system was found via a combination of TESS photometry and ground-based follow-up photometry. I will present how the transiting nature of the system and high expected JWST SNR will enable tests of planet formation via the detailed atmospheric characterisation of both inner and outer planets.

*Speaker

The KOBE experiment: a radial velocity blind search survey 30 years after 51 Peg b

Jorge Lillo-Box*[1]

[1]Centro de Astrobiologia [Madrid] – Spain

Abstract

The story behind the detection of 51 Peg b includes both intensive and state-of-the-art technical development and scientific perseverance, mixed, as most great discoveries, with a little bit of luck. It was the product of a RV blind search survey of FGK stars started several months before. With the launch of space-based high-precision photometers hunting for transiting planet candidates, their ground-based follow-up using high-resolution spectroscopy now occupies an important part of telescope time, relegating RV blind searches to GTO programs of instrument consortia. There is thus few room for the community to design such scientifically rich surveys. However, the Calar Alto Observatory opened a call for this in 2020, in a unique opportunity to design niche-oriented legacy programs. The KOBE experiment was awarded with 35 nights/semester with CARMENES to look for planets in the habitable zone of late-type K-dwarfs, a very unpopulated parameter space. Since then, more than 2000 spectra of 50 K4-M0 stars were taken, representing optimal environments for planet detectability and life development. In this talk, I will present the status and results of KOBE.

*Speaker

sciencesconf.org:ohp2025:646561

Searching and studying cool giant planets and their systems with SOPHIE at OHP

Guillaume HÉbrard*[1]

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Abstract

SOPHIE is the stabilized échelle spectrograph dedicated to high-precision radial-velocity measurements at Observatoire de Haute-Provence. It succeeded to ELODIE at the focus of the 193-cm OHP Telescope. Several programs are ongoing with SOPHIE with the goal to detect and characterize long-period giant planets and their systems. This includes (i) a radial-velocity volume-limited survey of Solar-type stars targeting giant planets, (ii) the search of extra low-mass planets in systems known to host cool giant planets, and (iii) the radial-velocity follow-up of photometric surveys for transiting planets, that now also reaches the domain of long-period giant planets. Those programs will be presented, as well as their latest results.

*Speaker

sciencesconf.org:ohp2025:627486

The Kepler Giant Planet Search. I. A Decade of Kepler Planet-host Radial Velocities from W. M. Keck Observatory

Lauren Weiss*[1], Howard Isaacson , Andrew Howard[2], Benjamin Fulton[3], Erik Petigura[4], Daniel Fabrycky[5], Daniel Jontof-Hutter , Jason Steffen[6], Hilke Schlichting , Jason Wright[7], Corey Beard , Casey Brinkman , Ashley Chontos , Steven Giacalone[8], Michelle Hill , Molly Kosiarek , Mason Macdougall , Teo Mocnik , Alex Polanski , Emma Turtelboom , Dakotah Tyler , and Judah Van Zandt

[1]University of Notre Dame [Indiana] – United States
[2]California Institute of Technology – United States
[3]Infrared Processing and Analysis Center – United States
[4]Department of Physics and Astronomy [UCLA, Los Angeles] – United States
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[6]University of Nevada [Las Vegas] – United States
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[8]Caltech – United States

Abstract

To investigate the relationship between close-in, small and distant, giant planets, we conducted the Kepler Giant Planet Survey (KGPS). Using the W. M. Keck Observatory High Resolution Echelle Spectrometer, we spent over a decade collecting 2844 radial velocities (RVs) of 63 Sunlike stars that host 157 transiting planets. We had no prior knowledge of which systems would contain giant planets beyond 1 au, making this survey unbiased with respect to previously detected Jovians. We announce RV-detected companions to 20 stars from our sample. These include 13 Jovians, 8 nontransiting sub-Saturns, and 3 stellar-mass companions. We also present updated masses and densities of 84 transiting planets. The KGPS project leverages one of the longest-running and most data-rich collections of RVs of the NASA Kepler systems yet, and it will provide a basis for addressing whether giant planets help or hinder the growth of sub-Neptune-sized and terrestrial planets.

*Speaker

sciencesconf.org:ohp2025:646648

Wednesday 8 October

A JWST/MIRI view of Andromedae b: Refining its mass, age, and physical parameters

Nicolas Ignacio Godoy Barraza*[1], Elodie Choquet , Eugene Serabyn , Mathilde Mâlin , Pascal Tremblin , Camilla Danielski , Pierre-Olivier Lagage , Anthony Boccaletti , Benjamin Charnay , and Michael Ressler

[1]Laboratoire d'Astrophysique de Marseille – Aix Marseille Université (Aix-en-Provence) – France

Abstract

Andb is a planetary-mass companion orbiting a B9IV star at a wide separation of _˜50–100 au. Its age, mass, and atmospheric properties have been debated for over a decade due to differences in atmospheric models and inhomogeneous datasets. To address this, we obtained new JWST/MIRI coronagraphic observations in 3 mid-infrared filters-F1065C, F1140C, and F1550C-complemented by a homogeneous recalibration of all existing NIR data using a modern ATLAS stellar model. Our analysis reveals that Andb is best described by cloudy atmosphere models, consistent with its L0/L2 spectral type and silicate-dominated features suggested by MIRI color-magnitude diagrams. From atmospheric modeling, we derive a Teff of 1791±68 K, a radius of 1.42±0.06 Rj, and log(g) = 4.35±0.07 dex, significantly improving previous constraints. Using evolutionary and atmospheric models, we derive a mass of 17.3±1.8 MJup and age of 47±7 Myr, supporting Andb's membership in the Columba association and its position at the planet/brown dwarf boundary.

*Speaker

sciencesconf.org:ohp2025:645009

Tracing the formation history of long-period companions with novel silicate abundance ratios in the M-band

Luke Parker*[1]

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Abstract

To understand the mechanisms that drive planet formation, we must link the present-day atmospheric composition of exoplanets to their formation history. High resolution spectroscopy (HRS; R_˜100,000) is a powerful technique which can provide precise abundance ratios of key volatile molecules (e.g. C/O) in exoplanet atmospheres but has previously lacked access to the refractory content of long-period giant atmospheres, resulting in predictions of degenerate formation scenarios. Here, we present the first results from our CRIRES+/VLT survey of directly imaged companions at M-band wavelengths (3.5-5 microns), pioneering the widescale use of this spectral range. The M-band provides a unique sensitivity to gaseous SiO, which traces the rock/vapour accretion history of giant exoplanets across a wide range of temperatures. Through precise measurements of the refractory silicon abundance, we constrain the formation pathway of our first survey target, the young brown dwarf companion TWA 5B. First light ELT instrumentation (e.g. METIS) will observe at M-band wavelengths, and exploration of this new parameter space with HRS is vital preparation for the ELTs.

*Speaker

sciencesconf.org:ohp2025:645084

Exploring worlds with VLTI/MATISSE

Jules Scigliuto*[1], Florentin Millour*[2], Mathis Houllé*[3], and Bruno Lopez*[4]

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[3]Institut de Planétologie et d'Astrophysique de Grenoble – Institut National des Sciences de l'Univers, Centre National d'Études Spatiales [Toulouse], Centre National de la Recherche Scientifique, observatoire des sciences de l'univers de Grenoble, Université Grenoble Alpes – France
[4]Observatoire de la Cote d'Azur (OCA) – CNRS : UMS2202 – B.P. 4229 06304 Nice Cedex 4, France

Abstract

Pushing the limits of high-angular-resolution spectroscopy, MATISSE enables us to retrieve LM-band spectra of exoplanets and brown dwarfs at small angular separations (down to 100 mas), with a medium spectral resolution of R $\approx$ 500. I will focus on two benchmark companions: HD 72946 B, a brown dwarf, and HR 8799 e, a directly imaged exoplanet with a low L-band flux (0.3 mJy). Observing such faint sources remains challenging, but post-processing tools have been developed to allow spectral extraction below the mJy level. My research involve also optimization and the investigation of methods improving the planet signal extraction.
The mid-IR spectral window, includes molecular features such as H2O, CH4, and CO, which help constrain or refine atmospheric parameters like the C/O ratio (formation mechanism), temperature, log(g) and vertical mixing. These physical features are indicators of the chemistry at play in their atmospheres.
In this context, we present a comparative analysis in order to better understand the physico-chemical processes shaping their atmospheres as well as their formation mechanism.

*Speaker

sciencesconf.org:ohp2025:649194

The Diversity of Cold Worlds: Age and Characterization of the Coconuts-2 T9 Brown Dwarf

Rocio Kiman*[1], Charles Beichman[2], Jacqueline Faherty[3], Azul Ruiz Diaz[3], and Genaro Suarez[3]

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[3]American Museum of Natural History [New York, USA] = Musée américain d'histoire naturelle [New York, USA] – United States

Abstract

Studying cold brown dwarfs (BD) is key to understanding the diverse characteristics of Jupiter-like atmospheres. Coconuts-2, a wide binary system composed of a T9 BD and an M3 star, presents a unique opportunity to study these cool objects. As part of a JWST program to study the coldest BDs, we obtained NIRSPEC G395H high resolution spectra and MIR F1000W, F1280W, and F1800W photometry for the T9 component. In this work, we performed a detailed analysis of the age of the system by studying the membership of the M3 star to moving groups. We found that the system is relatively young (414 Myr). We confirmed this age by measuring rotation periods and metallicity of the stars in the group. With this new information, we estimated precise parameters for the T9 BD. In this talk, we will present our age analysis, the resulting parameters for the BD, the atmospheric composition obtained from the JWST spectra, and discuss the apparent discrepancy between the derived age and the T9 component's photometric colors, which suggest it might be older. This comparison will help us interpret BD characteristics in the context of their atmospheric and evolutionary states.

*Speaker

sciencesconf.org:ohp2025:648327

Panchromatic view of the Frigid Jovian Exoplanet COCONUTS-2 b

Matthieu Ravet*[1,2,3], Mickael Bonnefoy[2], Gaël Chauvin[3], Maël Voyer[4], Benjamin Charnay[5], Polychronis Patapis[6], and Jacqueline Faherty[7]

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[5]LESIA, OBSPM – LESIA, Observatoire de Paris – France

[6]ETH – Switzerland

[7]American Museum of Natural History – United States

Abstract

Despite the relatively small number of planetary-mass companions detected via direct imag-ing (∼80), they offer a window into the diverse outcomes of planet formation. Among them,COCONUTS-2 b stands out as an extreme outlier-an adolescent super-Jupiter (Teff∼434 K) orbiting its M3 host star at an extraordinary separation of ∼7500 au. The companion's wide orbit challenges conventional formation models, suggesting either outward migration after disk-based formation or formation via cloud fragmentation akin to stellar binaries. Building on prior photometric and spectroscopic studies, we present new JWST/MIRI observations of COCONUTS-2 b, re-analyzed alongside archival data using our updated Forward Modeling Spectral Analysis tool, ForMoSA. By jointly fitting self-consistent atmospheric models, we aim to refine estimates of the companion's physical and chemical properties and assess its likely formation pathway. This work contributes to our understanding of planet formation at the boundary between planetaryand stellar regimes.

*Speaker

sciencesconf.org:ohp2025:644728

The JWST Weather Report from SIMP-0136: Temperature changes, auroral heating and constant cloud coverage measured using time-resolved atmospheric retrievals.

Evert Nasedkin*[1] and Johanna Vos[1]

[1]Trinity College Dublin – Ireland

Abstract

SIMP-0136 is a T2.5 UCD whose youth and low mass make it an ideal analogue for the giant, long period exoplanet population. It is variable in both the infrared and the radio, which has been attributed to changes in the cloud coverage and the presence of an aurora respectively. We obtained time-series spectra of SIMP-0136 covering one full rotation with both NIRSpec/PRISM and MIRI/LRS, and performed a series of time-resolved atmospheric retrievals using petitRADTRANS to measure changes in the thermal structure, chemistry, and cloudiness. We inferred the presence of a 250 K thermal inversion above 10 mbar, and propose that this is due to the deposition of energy into the upper atmosphere by an aurora. The primary driver of the variability was found to be changes in the temperature profile at pressures deeper than 10 mbar, which resulted in variation of Teff by 5 K. Patchy silicate clouds were required to fit the spectra, but the cloud properties were not found to systematically vary with phase. This work paints a portrait of an L/T transition object whose primary variability mechanisms are magnetic and thermodynamic in nature, rather than due to inhomogeneous cloud coverage.

*Speaker

sciencesconf.org:ohp2025:647733

Medium- and high-resolution hydrogen-line spectroscopy of planetary accretion tracers: data and models for and with JWST and ELT

Gabriel-Dominique Marleau*[1,2]

[1]Universität Duisburg-Essen – Germany
[2]Max-Planck-Institut für Astronomie – Germany

Abstract

In just the last few years, an exciting new field has opened up: accreting planetary-mass objects studied with ground- and space-based imaging and spectroscopy. This yields a new and unique perspective on long-proposed formation scenarios, with hopes of answering open questions concerning the physical processes at play. The accretion shocks at the surface of the planet and its circumplanetary disc can be sources of hydrogen-line emission, detected at several low-mass accretors. Separately, if a young forming planet has a strong magnetic field, magnetospheric accretion can take place as for young stars. This too is expected to lead to line emission.

We show how JWST can be used to study accretion at planetary-mass objects even at low accretion rates, focussing on the NIRSpec observations of TWA27B (2M1207b). This gives tantalising clues about the mass reservoir that must be present but is yet unobserved. We put this in context of the not mutually exclusive accretion frameworks. We also predict high-resolution profiles of the hydrogen lines accessible to METIS, the first-generation L- and M-band spectrograph on the ELT, and discuss their expected observability.

*Speaker

sciencesconf.org:ohp2025:645562

Towards Doppler Eclipse Mapping of Hot Jupiters

Vincent Yariv*[1], Xavier Bonfils[1], Thierry Forveille[1], and Nicolas Cowan[2]

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[2]Department of Physics [McGill University] – Canada

Abstract

A planet's rotation rate and axial tilt result from the transfer of angular momentum throughout its formation and dynamical evolution, thus acting as fossil signatures of its evolutionary history. While such measurements have been achieved for a few large outer companions (eg. Beta-Pic: Snellen 2014, AB Pic: PAlma-Bifani 2023), it remains a challenge for planets which can't be spatially separated from their stars. As close-in giants are generally expected to have formed further out, measuring their rotation parameters could provide valuable clues into possible migration histories. A unique way to do this could be to exploit secondary eclipses. As portions of a planet's surface are occulted by its host star, the associated velocity components are removed from its spectrum, enabling to map rotation and wind velocities over the occulted surface. In a pilot program using SPIRou, we demonstrate the feasibility of detecting this eclipse signal on a Hot Jupiter for the first time, stacking multiple eclipses to reach a rotation constraint. Based on these promising results, we show how the ELT will expand the range of feasible targets to a wide set of close-in giants.

*Speaker

sciencesconf.org:ohp2025:649060

NIGHT: Unveiling Atmospheric Evolution Across Planetary Systems Through Dedicated Helium Transit Observations

Casper Farret Jentink*[1], Francesco Pepe[1], Christophe Lovis[1], and Vincent Bourrier[1]

[1]Observatoire de Geneve – Switzerland

Abstract

We will present the first results of NIGHT – the Near Infrared Gatherer of Helium Transits. NIGHT is the first instrument fully dedicated to studying exoplanetary atmospheres, newly installed on the OHP152. It studies atmospheric escape from close-in exoplanets, from sub-Neptunes to hot-Jupiters. Their evolutionary history is shaped by atmospheric escape and migration. Theory suggests a complex interplay between dynamical and atmospheric evolution explains observed demographics across planetary systems. This understanding extends to cold giant planets, whose formation and evolution link to warmer counterparts through migration pathways and system-wide dynamics. Through systematic monitoring of atmospheric escape across many planetary systems, NIGHT aims to disentangle the role of atmospheric escape in giant planet evolution. This time-demanding campaign complements existing near-IR high-resolution spectrographs that lack time to search large samples. NIGHT will repeat transits of many planets, screening for mass loss, identifying targets for larger spectrographs, and monitoring mass loss variability.

*Speaker

sciencesconf.org:ohp2025:644175

A High- Spectral Resolution atmosphere Model

Alice Radcliffe*[1]

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Abstract

Direct imaging of exoplanets remains a challenge, but with new instruments we are beginning to observe long-period giants in unprecedented detail. Observed high-res spectra of these giants act as Rosetta stones for planetary history, providing insights into their chemistry and orbital characteristics. Much of this information is imprinted in their atmospheres, and to harness it, we need models that match the precision of these observations.I've developed a new high-res model based on Exo-REM –a well-established tool for simulating atmospheres, previously limited to low resolutions–by incorporating the latest high-res molecular data and updated isotopologue abundances. This new model extracts properties in detail often inaccessible with lower-res observations. I'll present the results from applying it to specific enigmatic exoplanets, demonstrating how high-res spectra can refine our understanding of atmospheres. As we move towards bridging the gap between long- and short-period period objects, these techniques will be crucial in paving the way for studying smaller and cooler worlds, furthering our understanding of the diversity of systems.

*Speaker

Pushing the limits of direct imaging with HiRISE : Characterization of 2 super Jovian exoplanets at low angular separation

Allan Denis*[1], Arthur Vigan[1], Gaël Chauvin[2], William Balmer[3,4], Steven Martos[5], Jean Costes[6], Alice Radcliffe[7], Matthieu Ravet[8,5], Paulina Palma-Bifani[7], and Simon Petrus[9,10,11,12]

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[4]Space Telescope Science Institute, Baltimore – United States
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[9]Institut de Planétologie et d'Astrophysique de Grenoble – Université Grenoble Alpes – France
[10]Universidad Diego Portales [Santiago - Chili] – Chile
[11]NASA Goddard Space Flight Center – United States
[12]Millenium Nucleus on Young Exoplanets and their Moons (YEMS), Santiago – Chile

Abstract

Direct imaging of exoplanets is fundamentally limited by 2 important factors: angular separation and luminosity contrast between the planet and the host star. To overcome these challenges, the HiRISE instrument recently installed at the VLT combines the high-contrast capabilities of the SPHERE instrument with the very high spectral resolution of the CRIRES+ instrument (R = 140,000), offering a new approach to finely characterizing planetary atmospheres.
We present HiRISE spectroscopic observations of the exoplanets AF Lep b and 51 Eri b, and demonstrate the complementarity between high-resolution data, low-resolution spectroscopy and astrometry. This synergy provides a better constraint on their atmospheres, 3D orbits and phase curves, as well as on the possible presence of an inner planet at 51 Eri b.

HiRISE thus paves the way for the study of planets closer to their star and of lower mass, in preparation for future missions targeting reflected light and radial velocity tracking, which will notably provide important constraints on the possible presence of inner planets or exolunes in the systems studied.

*Speaker

sciencesconf.org:ohp2025:644931

Thursday 9 October

Realizing the Full Potential of Gaia Astrometry for the Characterization of the Population of Cool Giant Planets

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Abstract

The astrometric detection of giant exoplanets with orbital periods in the range 1 yr < P_orb < 10 yr using Gaia data is one of the most promising opportunities in exoplanet science. Indeed, thousands of cool giant exoplanet systems are expected to be revealed as part of Gaia Data Release (DR) 4 in 2026. This population of cool giant exoplanets will be obscured by a much larger population of unresolved equal-mass stellar binaries that mimics the low-amplitude astrometric wobbles produced by cool giant exoplanets orbiting single stars. To this point, observationally expensive follow-up observations have been necessary to differentiate between these two possibilities. I'll outline a new approach to the differentiation of the cool giant exoplanet/equal-mass stellar binary scenarios that uses existing Gaia astrometry and archival multiwavelength photometry. This approach scales easily to the tens of thousands of candidates that will be produced as part of Gaia DR4 and will enable a maximally efficient follow-up program with the goal of increasing by an order of magnitude the number of known cool giant planets with 1 yr < P_orb < 10 yr.

*Speaker

sciencesconf.org:ohp2025:643630

Unmasking the giants: Confirming Gaia candidates with HARPS-N

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Abstract

The occurrence rate of planetary systems resembling the mass and separation hierarchy of our Solar System is a central question in exoplanetology. However, observational efforts to determine these occurrence rates have yielded conflicting results, often due to limitations in detecting and characterizing outer companions such as the mass degeneracy intrinsic to the radial velocity method. While the release of astrometric candidates from Gaia DR3 represents a key asset in solving RV mass degeneracy, astrophysical false positives among such candidates still undermine the full exploitation of astrometric measurements. In this talk we present the first results of an ongoing follow-up HARPS-N campaign focusing on a selected sample of stars hosting in the outer regions either a known massive companion with astrometry-derived true mass or a Gaia DR3 astrometric candidate. We identify binary stars masquerading as substellar companions and the first confirmation of astrometric candidates in the sample, as well as new low-mass planetary companions on inner orbits representing the first steps towards an improved determination of ordered system occurrence rates.

*Speaker

Joint Analysis of the California Legacy Survey RVs and Gaia Astrometry

Luke Handley*[1], Aniket Sanghi[1], Andrew Howard[1], and Dimitri Mawet[1]

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Abstract

Detection of long-period giant planets requires dedicated radial velocity (RV) observations over years or decades. The California Legacy Survey (CLS) is a high-precision RV program (_˜2 m/s precision) of 700 stars with a median baseline of 21 years and nearly 200 confirmed exoplanets. It stands out as one of the few uniform surveys sensitive to planets with _˜decade-long orbits. However, CLS alone cannot paint a composite picture of cool giants due to persisting orbital degeneracies. Precision astrometry from Gaia DR4 will complement the CLS RV data, enabling a more complete interpretation of these rich datasets. We simulated realistic Gaia epoch astrometry for the CLS sample and show that joint modeling with CLS RVs is sensitive to the full 3D orbits and true masses of _˜80 known giant planets. When DR4 arrives, this analysis will clarify the distinct formation pathways of giant planets and brown dwarfs in the outer regions of protoplanetary disks. Additionally, our initial injection-recovery tests suggest that mutual inclinations will be constrained in more than 10 systems hosting multiple giant planets, granting a unique glimpse into their dynamics.

*Speaker

sciencesconf.org:ohp2025:645351

True masses through Hipparcos and Gaia Astrometry

Giulia Piccinini*[1], Antonino Petralia[1], Davide Gandolfi[2], Alessandro Sozzetti[3], and Giuseppina Micela[1]

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Abstract

Thanks to the high precision of Gaia observations, numerous stellar companions have been investigated over the past decade, particularly through astrometric techniques. Long-period companions have been detected and characterized through long-term radial velocity surveys. In this work, we re-analyze a small sample of targets using a combined approach that integrates radial velocity data with astrometry. By merging Hipparcos and Gaia astrometry, specifically through the proper motion anomaly method, with radial velocity measurements, we are able to tightly constrain orbital inclinations and accurately determine the true masses of long-period companions. Additionally, we compare our results with the sensitivity curve, a tool that identifies the range of companion masses capable of inducing astrometric signals as a function of orbital separation and stellar mass. This comparison serves as a validation of our results and as to gain new information about the planetary system. Our revised analysis reveals that some targets previously classified as brown dwarfs or low-mass stars have, in fact, a planetary nature.

*Speaker

sciencesconf.org:ohp2025:647780

Characterization of Brown Dwarfs and Long-Period Giant Planets Observed by Radial Velocity with the Aid of Gaia Astrometry

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Abstract

The search for substellar companions using radial velocities faces two main challenges: the indeterminacy of orbital inclination and the partial coverage of long-period orbits > 10 years. The Gaia telescope, with 3 years of astrometric data published in 2021, and, by the end of 2026, the release of 6 years of data, provides solutions to both issues. I will show how it is already possible to use DR3 data to constrain the inclination of orbits with known periods, and to identify long-period companions, either stellar or substellar using Gaia astrometry. I wish to present a tool called GaiaPMEX, introduced in 2 recent papers (Kiefer et al. 2024 a, b). It characterizes the mass and semi-major axis of any possible companion around any source observed with Gaia. One of my goals is to exploit the billions of Gaia sources to find new samples of exoplanet candidates. With GaiaPMEX, I thus identified a sample of 9,698 planet candidate hosts. I will conclude by discussing the prospects opened by the upcoming release of Gaia's full astrometric dataset expected by the end of 2026, and the arrival of all those new exoplanetary targets at the disposal of future follow-up projects.

*Speaker

sciencesconf.org:ohp2025:643903

A new 5-day super-Earth and 8-year brown dwarf in the warm Jupiter system TOI-201

Ismael Mireles*[1], Solène Ulmer-Moll[2], Diana Dragomir[1], Judith Korth[3], Alexander Venner[4], Antoine Petit[5], Donald Liveoak[6], Sarah Millholland[6], Amaury Triaud[7], Tristan Guillot[5], Karen Collins[8], and Theron Carmichael[9]

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Abstract

We report the discovery of two new companions to a warm Jupiter first discovered by TESS. TOI-201 c is a super-Earth orbiting a young active F star on a 5.85 d orbit interior to the warm Jupiter TOI-201 b. We also identify a long-period brown dwarf, TOI-201 d, exterior to TOI-201 b thanks to a single transit event in TESS sector 64. We confirm the 8-year orbital period of this eccentric brown dwarf using RVs from CORALIE and HARPS and find it is by far the longest-period transiting brown dwarf ever discovered. Combined with Hipparcos and Gaia astrometry, we are able to characterize the full 3-dimensional orbit of the brown dwarf. The brown dwarf is also responsible for the transit timing variations seen for the warm Jupiter. The system is a rare case of one with substellar companions spanning a wide range of masses and adds to the growing list of warm Jupiters with nearby companions as well as warm Jupiters with very distant companions. Furthermore, this dynamically active system is ideal for follow-up observations to further characterize their orbits and compositions, which should give insight into the formation and evolutionary history of these types of planetary systems.

*Speaker

sciencesconf.org:ohp2025:645564

Updated Masses for the Gas Giants in the Eight-Planet Kepler-90 System Via Transit-Timing Variation and Radial Velocity Observations

David Shaw*[1], Lauren Weiss[1], Eric Agol[2], Karen Collins[3], Khalid Barkaoui[4,5,6], Cristilyn Watkins[3], Richard Schwarz[3], Howard Relles[3], Chris Stockdale[7], John Kielkopf[8], Fabian Frustaglia[9], Allyson Bieryla[3], Joao Gregorio[10], Owen Mitchem[11], Katherine Linnenkohl[11], Adam Popowicz[12], Norio Narita[6,13,14], Akihiko Fukui[13,6], Michael Gillon[4], Ramotholo Sefako[15], Avi Shporer[5], Adam Lark[16], Amelie Heying[16], Isa Khan[16], Beibei Chen[16], Kylee Carden[17], Donald Terndrup[17], Robert Taylor[17], Dasha Crocker[17], Sarah Ballard[18], and Daniel Fabrycky[19]

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Abstract

The Kepler-90 (K90) system exhibits the greatest multiplicity (8) of planets found to date. All eight planets transit and were discovered by the NASA Kepler primary mission. The two outermost planets, g (P = 211 d) and h (P = 332 d), exhibit significant transit-timing variations, but were only observed 6 and 3 times respectively by Kepler. To determine masses and orbital properties for planets g and h, we combined 34 radial velocities (RVs) of K90 collected over a decade with the Kepler data. We jointly modeled the transit times

*Speaker

sciencesconf.org:ohp2025:648760

of planets g and h and the RV time series, then used our two-planet model to predict their future times of transit. These predictions led us to recover a transit of K90g with ground-based observatories in May 2024. We then combined the 2024 transit and several previously unpublished transit times of planets g and h with the Kepler transits and RV data to update the masses and linear ephemerides of the planets, finding $M_g = 15.0 \pm 1.3\ M_\oplus$, and $M_h = 203 \pm 16\ M_\oplus$. These results enable further insights into the K90 system and pave the way for atmospheric characterization with space-based facilities.

A Decade of CARMENES: Unveiling Planetary Systems Around M Dwarfs

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Abstract

The CARMENES survey, designed to detect exoplanets orbiting low-mass stars, has conducted nearly a decade of dedicated observations of M dwarfs using dual spectrographs operating in the visible and near-infrared wavelengths. Over this period, the survey has led to the discovery of numerous exoplanets, including several rare and intriguing cool giant planets orbiting M dwarfs-challenging conventional models of planet formation. Beyond detections, CARMENES has provided valuable insights into the wavelength dependence of radial velocity signals, stellar activity signatures, and elemental abundances in low-mass stars. A significant portion of the program has also been devoted to the characterization of planetary atmospheres. In this presentation, I will summarize key scientific outcomes from the CARMENES program, including new constraints on planet occurrence rates around M dwarfs-the most common stars in our galaxy-and how the presence of cool giant planets correlates with stellar mass.

*Speaker

sciencesconf.org:ohp2025:648800

Cool giant planets with NIRPS

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Abstract

The Near-InfraRed Planet Searcher (NIRPS – Bouchy et al. 2025) is a new high-resolution, high-stability near-infrared spectrograph. Optimized for detecting and characterizing exoplanets around M dwarfs, NIRPS operates in tandem with HARPS. The NIRPS consortium started a GTO program in April 2023, totaling 725 nights over 5 years. Part of the GTO is dedicated to search for cold giant planets around M dwarfs, as part of the blind radial-velocity (RV) survey and the long-term monitoring of transiting planets. Giant planets around M dwarfs are relatively rare compared to FGK dwarfs, but they do exist. The 20-year HARPS survey gives an occurrence rate of a few % for giant planets with wide separation around M dwarfs (Mignon et al. 2025). We will give an overview of NIRPS performance and first results, including the planetary system TOI-756b,c (Parc et al. 2025) with a cold eccentric giant. We will discuss the strong synergy between NIRPS RVs and Gaia astrometry to refine the orbital solution of cold giant planets. We will also discuss the uniqueness of the HARPS-NIRPS tandem for the RV follow-up of cold giant candidates transiting M-dwarf to be revealed by PLATO.

*Speaker

sciencesconf.org:ohp2025:645452

Low-Mass M Dwarfs Lack Jupiter Analogs

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Abstract

For the terrestrial planets of our solar system, Jupiter was an important influence: it sculpted the dynamical environment in which these worlds formed, affecting the delivery of volatiles, the terrestrial refractory budget, and potentially, Earth's overall habitability. To investigate the occurrence of Jupiter-like planets around inactive, low-mass (0.1-0.3M) M dwarfs-which may host the only terrestrial planets amenable to atmospheric study with JWST-we monitored a volume-complete sample of 200 such stars over six years, collecting four high-resolution spectra per star. We did not detect any Jupiter-mass planets at Jupiter-like instellations, yielding a 95%-confidence upper limit of 1.7% on the occurrence rate of Jupiter analogs. In contrast, surveys of Sun-like stars have found that their giant planets are most common just beyond the snow line, at these Jupiter-like instellations. Our results indicate that solar-system-like architectures are rare around low-mass M dwarfs, with implications for the evolution and habitability of their terrestrial worlds.

*Speaker

sciencesconf.org:ohp2025:649223

A new population of giant planets around M dwarfs with Gaia

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Abstract

M-type stars, the most common in the universe, are ideal targets for detecting low-mass planets in the habitable zone. However, little is known about long-period giant planets (GPs) in these systems, as their detection is challenging with transits and radial velocities (RV) due to M stars' faintness and high activity. This limitation can be addressed by combining RV, high-contrast imaging (HCI), and absolute astrometry from Gaia-Hipparcos. Using the GaiaPMEX tool (Kiefer et al. 2024) with Gaia DR3 data, I searched for GPs around all M stars within 15 pc. GaiaPMEX builds a two-dimensional confidence map of companion mass and semi-major axis, which, when combined with RV and HCI limits, allows us to rule out binaries and identify planetary companions. I constructed a catalog of nearby M dwarfs and conducted a systematic GP search, yielding hundreds of candidates. I will present the results of this survey which allows the study of a new population of long period GPs and in particular, to derive the radial distribution of GPs around M dwarfs beyond 1au.

*Speaker

sciencesconf.org:ohp2025:644358

Demonstrating Sensitivity to Exo-Saturns around Nearby Young M Dwarfs with JWST Coronagraphy

Ellis Bogat*[1,2], Joshua Schlieder[2], Kellen Lawson[2], Yiting Li[3], Charles Beichman[4,5], Jarron Leisenring[6], Michael Meyer[3], Marie Ygouf[4], Thomas Barclay[2], Geoff Bryden[4], Per Calissendorff[3], Matthew De Furio[7], Tyler Groff[2], Michael Mcelwain[8], Jorge Llop-Sayson[9], Marcia Rieke[6], Aarynn Carter[10], Julien Girard[10], Jens Kammerer[11], William Balmer[10], and Tom Greene[12]

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Abstract

The discovery and characterization of giant planets on wide orbits around low-mass M dwarf stars is key to understanding the architectures and evolution of M dwarf planetary systems. While current ground-based imaging struggles to probe below a Jupiter mass at large separations, the unprecedented sensitivity of JWST NIRCam coronagraphic imaging provides direct access to planets significantly less massive than Jupiter beyond 10 AU around the closest, youngest M dwarfs. This work presents the survey design, observations, and results of JWST GTO Program 1184, a NIRCam coronagraphic imaging survey of 9 nearby and young low-mass stars. We have demonstrated sensitivity to Saturn-mass (and in some cases sub-Saturn-mass) exoplanets beyond 10 AU for the first time, and we have identified a marginally detected "F356W dropout" candidate whose photometry may be consistent with significantly sub-Jupiter-mass exoplanets. Finally, we present lessons learned for NIRCam coronagraphy and lay the groundwork for the continued JWST direct imaging of young M dwarfs to discover planets in a previously inaccessible region of mass-separation space.

*Speaker

sciencesconf.org:ohp2025:645249

Mid-infrared long-baseline interferometry of the PDS 70 protoplanets' circumplanetary disks

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[2]Observatoire de la Côte dÁzur – Université Côte d'Azur – France

Abstract

The dusty environment feeding the growth of protoplanets is poorly constrained, as disentangling the thermal emission of protoplanet photospheres and their circumplanetary material is challenging. Evidence has however recently accumulated for the existence of circumplanetary disks (CPDs) around the only two confirmed protoplanets, PDS 70 b and c, thanks to mid-infrared and sub-mm photometric imaging. The warm CPD material becomes indeed the dominant emission source longward of 4 μm, making its differentiation from photospheric emission easier. In this talk, we will present our recent (March-April 2025) mid-infrared observations of PDS 70 b and c with the VLTI/MATISSE spectro-interferometer. The ability to characterize exoplanets with MATISSE was recently demonstrated on Beta Pictoris b (Houllé et al. in review). The aim of our program is to provide a first wide-band, low-resolution (R=30) spectrum of PDS 70 b and c's CPDs from 3 to 13 μm, and to possibly angularly resolve their geometry for the first time. This would provide strong constraints on the size, temperature, mass and composition of these disks.

*Speaker

sciencesconf.org:ohp2025:649079

Exploration of the TWA 7 Planet-Disk System with JWST NIRCam

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Abstract

The young M-star TWA 7 hosts a bright and near face-on debris disk, imaged over several decades. The disk displays multiple complex substructures such as three disk components and spiral arms, suggesting the presence of planets to actively sculpt these features. The evidence for planets in this disk was further strengthened with the recent detection of a point-source compatible with a Saturn-mass planet companion using JWST/MIRI. This detection is significant, as the candidate would be the smallest planet ever to be directly-imaged and is also at the same location a planet was predicted to reside based on the disk morphology. Here, we present new observations of the TWA 7 system with JWST/NIRCam in the F200W and F444W filters. In the F444W, we are able to detect faint emission coinciding with the location of the planet candidate imaged with MIRI. Measurements of the candidate's flux with NIRCam further support the candidate as a sub-Jupiter mass planet companion, rather than a background galaxy or brown dwarf. Therefore, TWA 7 provides a rare opportunity to directly study planet-disk interactions and the imprints that planets leave on their debris disks.

*Speaker

sciencesconf.org:ohp2025:645069

Ring-Driven Planets and Debris Disk Formation in HR 8799 and Other Directly-Imaged Planetary Systems

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Abstract

The HR 8799 system is iconic among wide-orbit multi-planet systems, but how did its planets form? Core accretion struggles to form _˜10 Earth-mass cores beyond 10 au within disk lifetimes. Yet, a debris belt at _˜120 au hints at a rich planetesimal reservoir. We propose the planets originated in a dense "pebble ring" at this location-analogous to axisymmetric substructures seen in ALMA images. Multi-wavelength analyses suggest these rings contain mm–cm grains, ideal for planetesimal formation and rapid growth via pebble accretion. Using an N-body model for ring-driven formation (Jiang & Ormel 2023), we show that protoplanets form sequentially and migrate inward, reproducing HR 8799's architecture. Our MCMC analysis confirms this pathway matches constraints on planet masses, locations (likely in 8:4:2:1 resonance), and the outer belt. This model links ALMA rings to planetary architectures and will inspire future planet searches and further our understanding of the formation of giant planets in wide orbits.

*Speaker

sciencesconf.org:ohp2025:648162

Differentiating hot- and cold-start formation with new dynamical masses for the PDS 70 protoplanets

David Trevascus*[1]

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Abstract

Hot- and cold-start planet formation models predict differing luminosities for the young, bright planets that direct imaging surveys are most sensitive to. However, precise mass estimates are required to distinguish between these models observationally. The presence of two directly imaged planets, PDS 70 b and c, in the PDS 70 protoplanetary disk provides us a unique opportunity for dynamical mass measurements, since the masses for these planets are currently poorly constrained. Fitting orbital parameters to new astrometry of these planets, taken with VLTI/GRAVITY in the K-band, we are able to tighten their dynamical mass estimates. Using these new mass estimates we are able to rule out the coldest-start formation models for both planets, placing PDS 70 b and c on the growing list of directly-imaged planets inconsistent with cold-start formation.

*Speaker

sciencesconf.org:ohp2025:645683

Synthesizing Accretion and Circumplanetary Disk Properties of a Wide Orbit Planet with HST and JWST

Claire Finley*[1], Brendan Bowler[2], and Ya-Lin Wu[3]

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[2]University of California, Santa Barbara – United States
[3]National Taiwan Normal University – Taiwan

Abstract

Many details of giant planet formation and evolution remain untested due to limited observational constraints on when they assemble and grow through gas accretion. Two key diagnostics-ultraviolet (UV) accretion signatures and mid-infrared (IR) circumplanetary disk excess-offer critical insight into this process, but are rarely accessible for the same system due to practical challenges. I will present new UV and mid-IR direct imaging of the wide planetary-mass companion SR 12 c with HST/WFC3-UVIS and JWST/MIRI. These data expand SR 12 c's spectral energy distribution (SED) to span 0.2–21 microns, making it one of the most complete SEDs of a young imaged giant planet to date. UV photometry shows a strong Balmer continuum excess, and hydrogen slab models yield an accretion luminosity and mass accretion rate. In the mid-IR, we detect substantial thermal excess from a circumplanetary disk and search for signs of grain growth. This snapshot of active accretion onto SR 12 c adds to the growing sample of distant planets with detailed accretion and disk constraints, helping to establish the timescales and physical processes that govern giant planet formation.

*Speaker

sciencesconf.org:ohp2025:649966

Most hot jupiters were cool giant planets for > 1 Gyr

Stephen Schmidt*[1] and Kevin Schlaufman[1]

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Abstract

It has been proposed that at least some hot Jupiters were once cool giant planets, though the difficulty of observing the time evolution of exoplanet systems has made this proposal impossible to directly evaluate. Using the Galactic velocity dispersion of their host stars, we quantify the typical ages of the hot Jupiter subpopulations inside, near, and outside the hot Jupiter period peak. We show that the subpopulations inside and near the peak are older than the outer subpopulation. We argue that most of the inside- and near-peak subpopulations were once cool giant planets that became hot Jupiters due to late-time dynamical instabilities no less than 1 Gyr after the dissipation of their parent protoplanetary disks. On the other hand, the subpopulation outside the period peak has both young and old hot Jupiters that arrived at their observed locations early in their systems' histories via disk migration.

*Speaker

sciencesconf.org:ohp2025:645242

Towards planetary population syntheses in MHD wind-driven discs

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Abstract

Magnetohydrodynamic (MHD) wind-driven disc evolution has proven to be a viable alternative to the traditional viscous disc evolution paradigm. Understanding the evolution of protoplanetary discs is crucial for understanding planet formation as they deliver the material from which planets form. Additionally, gravitational interactions between forming planets and the protoplanetary disc lead to planetary migration. Recent 3D hydrodynamical simulations including the effects of a wind-driven accretion layer have shown that in MHD wind-driven discs, planetary accretion and migration can differ significantly from the classical viscous scenario. So far, however, global models for planet formation still rely on the viscous disc evolution paradigm. Here, we present the first global model for planet formation that integrates MHD wind-driven disc evolution and recent insights into planetary migration within wind-driven discs. We find that the thickness and evolution of the accretion layer has a big influence on the emerging planet population.

*Speaker

sciencesconf.org:ohp2025:649030

How to halt the inward migration of giant planets.

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Abstract

In MHD-disc winds accretion models of protoplanetary discs, the disc's midplane would maintain very low viscosity levels. Using 2D hydrodynamical simulations, we assess how a low-viscosity midplane influences the migration of multiple giant planets.
While in high viscosity, pairs of giants are often found locked in a 3:2 mean motion resonance (MMR) and migrating outwards, we find them locking in a 2:1 MMR and migrating slowly inwards. Although the migration is still inwards, we find that the pair of planets migrates slower than a single giant planet migrating in the same disc. It thus seems that multiple planetary systems could be the key to stop giant planets from becoming hot Jupiters.
Exploring this study further, we consider systems composed of four or five planets. We find that building stable resonant chains of giant planets in a low-viscosity disc is quite challenging. Nonetheless, we find that, under some reasonable condtions, a system composed of four giant planets can revert their migration and move outwards.
Once again this shows that multiplanetary dynamics and resonant chain formation is decisive in the preservation of long-period giants.

*Speaker

sciencesconf.org:ohp2025:646487

Early evidence for isotropic planetary obliquities in young super-Jupiter systems

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Abstract

This decade has seen the first measurements of planetary obliquities – the tilt between a planet's rotational and orbital axes – for directly-imaged super-Jupiters, enabling new constraints on their formation and evolutionary pathways. With only four measurements to date, we develop a hierarchical Bayesian framework to extract population-level constraints and test whether super-Jupiters form like scaled-up planets or scaled-down stars. Using a single-parameter Fisher distribution, we compare two models: a brown dwarf-like formation scenario predicting isotropic obliquities, versus a planet-like formation scenario favouring obliquities concentrated near 20 – 30 degrees, as in our Solar System. Among the four young super-Jupiters with measured obliquities, we find evidence favouring brown dwarf-like formation. These preliminary results suggest that super-Jupiters may form through fundamentally different processes than Solar System planets, motivating further observations to strengthen this emerging population-level inference.

*Speaker

sciencesconf.org:ohp2025:643605

Friday 10 October

Giant Planets and Low-mass Companions Show Different Spins but Similar C/O Ratios from Keck/KPIC High-resolution Spectroscopy

Chih-Chun Hsu*[1], Jason Wang[2], Jerry W. Xuan[3], Luke Finnerty[4], Katelyn Horstman[5], Yapeng Zhang[5], Julianne Cronin[2], Yinzi Xin[5], Ben Sappey[6], Daniel Echeverri[5], Jean-Baptiste Ruffio[6], Dimitri Mawet[5], Nemanja Jovanovic[5], Ashley Baker[5], Randall Bartos[7], Geoffrey Blake[5], Benjamin Calvin[5], Sylvain Cetre[8], Jacques-Robert Delorme[9], Gregory Doppmann[9], Michael Fitzgerald[4], Joshua Liberman[10], Ronald A. Lopez[4], Evan Morris[11], Jacklyn Pezzato[5], Tobias Schofield[5], Andrew Skemer[11], Kent Wallace[12], and Ji Wang[13]

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Abstract

I will highlight recent science results from Keck/KPIC (R_˜35000) K-band high-resolution spectroscopy. KPIC has detected 32 giant exoplanets and low-mass companions, including HR 8799 bcde, AF Lep b, and PDS 70 b. First, KPIC enables the first detection of atmospheric CO and water species in PDS 70b. PDS 70b atmosphere shows a stellar-like C/O ratio and metallicity consistent with its host star, in contrast with that of the gas-rich outer disk. This implies that the PDS 70 b accretions were dominated by dust and ice, or the disk became carbon-enriched after its formation. Next, our survey for young substellar companions (_˜10-30 MJup) along with PDS 70 b indicates that their metallicities and C/O ratios are broadly consistent with the solar compositions. Finally, we find a tentative spin trend versus mass that separates the imaged giant exoplanet and brown dwarf companion populations, with giant planets exhibiting faster spins than more massive brown dwarf companions, demonstrating that spins can be a powerful probe to differentiate the formation between giant planets and brown dwarf companions.

*Speaker

sciencesconf.org:ohp2025:645385

JWST Coronagraphic Imaging of Eccentric, Cold Giants: 14 Her c and HD 222237 b

William Balmer*[1], Daniella Bardalez Gagliuffi[2], Laurent Pueyo[3], Timothy Brandt[4], Mark Giovinazzi[2], Sarah Millholland[5], Brennen Black[5], Tiger Lu[6], Malena Rice[6], James Mang[7], Caroline Morley[7], Brianna Lacy[8], Julien Girard[4], Elisabeth Matthews[9], Aarynn Carter[4], Brendan Bowler[10], Jacqueline Faherty[11], Clemence Fontanive[12], and Emily Rickman[13]

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[8]University of California, Santa Cruz – United States
[9]Max-Planck-Institut für Astronomie – Germany
[10]University of California, Santa Barbara – United States
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[13]ESA Office, Space Telescope Science Institute – United States

Abstract

Most observed multi-planet systems are coplanar, in a dynamically "cold" configuration of concentric orbits like our own Solar System. I will present the first images of 14 Herculis c with the James Webb Space Telescope (JWST) NIRCam coronagraph. This mature, cold gas giant is the first exoplanet directly imaged in a dynamically "hot" system. With large eccentricities and a nonzero mutual inclination, the architecture of this system points to a turbulent past and dramatic ongoing angular momentum exchange between the planetary orbits. The temperature of the planet (~275K) rivals both the coldest imaged exoplanets and the coldest known brown dwarfs, while its photometry at 4.4 microns is consistent with the presence of carbon disequilibrium chemistry and water ice clouds in the atmosphere. 14 Her c presents a unique laboratory to study many aspects of giant planet formation and evolution simultaneously, and is an exciting demonstration of the mid-infrared high contrast performance of JWST. I will also present on preliminary work to image HD 222237 b, a cold (~200K), nearby, eccentric giant planet with JWST.

*Speaker

sciencesconf.org:ohp2025:644527

Mid-infrared spectroscopy of directly imaged giant planets with JWST/MIRI.

Mathilde Mâlin*[1]

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Abstract

The James Webb Space Telescope is revolutionizing our understanding of exoplanetary systems by opening a new observational window onto giant, long-period planets. Its MIRI instrument uniquely provides medium-resolution spectroscopy in the mid-infrared, ideally suited to probing the atmospheres of cold, giant exoplanets. I will present MIRI spectroscopic observations of two directly imaged systems: the multiplanetary system HR 8799 and one of the coldest planetary-mass companions, GJ 504 b. By carefully subtracting the host star's diffraction pattern, we extracted spatially resolved spectra for each planet. The medium-resolution data enable detailed atmospheric characterization, revealing key molecules such as NH, a proxy for surface gravity and thus planetary mass, and CO, a tracer of atmospheric metallicity. These results highlight how MIRI is enabling direct atmospheric studies of widely separated giant planets, offering new insights into the formation and evolution of planetary systems.

*Speaker

sciencesconf.org:ohp2025:645368

Hunting exoplanets spectra with MATISSE

Florentin Millour*[1]

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Abstract

In this talk, I will present the work done on exoplanet science with the MATISSE instrument. MATISSE can be used in the same way as GRAVITY to achieve a high-dynamic range separation between a star and its planetary companion, allowing for medium-resolution spectroscopy of the companion. MATISSE covers the 3-5 microns wavelength domain, a very sought-after one, as it contains signatures of water, CO2, CO and of course thermal emission, allowing us to characterize the atmosphere of the observed planets (leading to new C/O abundances estimates), and detect possible infrared excesses related to the presence of a circumplanetary disk. These new features, enabled by MATISSE, will be illustrated through observations of exoplanetary systems, including the emblematic beta Pictoris planetary system.

*Speaker

sciencesconf.org:ohp2025:649127

Two years of atmospheric characterization with The Near Infra-Red Planet Searcher (NIRPS)

David Ehrenreich*[1], Romain Allart[2], Stefan Pelletier[3], Valentina Vaulato[3], Luc Bazinet[2], Ana Rita Costa Silva[4], Frédéric Genest[2], Olivia Pereira[5], Georgia Mraz[5], Eduardo Cristo[4], Etienne Artigau[2], François Bouchy[3], and Rene Doyon[2]

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[5]Department of Physics [McGill University] – Canada

Abstract

NIRPS is a new fiber-fed high spectral resolution spectrograph assisted by adaptive optics installed on the 3.6m telescope of ESO at La Silla, Chile. Operated simultaneously with HARPS, NIRPS covers the Y, J, and H bands. In this talk, I will describe the objectives of the NIRPS consortium that has been allocated 725 GTO nights over 5 years. A third of this time is dedicated to in-depth spectral characterizations to provide detailed high-fidelity high signal-to-noise transmission and emission spectra as well as large comprehensive atmospheric and orbital architecture surveys that will be done for more than 75 exoplanets from ultra-hot Jupiters to temperate terrestrial planets. Over the program's first two years, we have prioritized the best exoplanets, including many JWST targets. I will present the first results obtained since the start of operation, including the detections of escaping atmospheres and the presence of molecules and atoms in the atmospheres of warm Neptunes to hot Jupiters. These results showcase the potential of NIRPS to deliver high-fidelity atmospheric spectra to constrain the formation and evolution of exoplanets at the statistical level.

*Speaker

sciencesconf.org:ohp2025:645549

The chemical and isotopic characterisation of Super-Jupiters, Brown Dwarfs and free-floating planets

Ignas Snellen*[1]

[1]Leiden Observatory, Leiden University – Netherlands

Abstract

We have embarked on the challenging task to characterize the spectra of a large sample of Super-Jupiters, Brown Dwarfs, and free floating planets using ground-based high-dispersion spectroscopy at high precision, retrieving the abundances of many spectroscopically active atoms, molecules and isotopologues, deriving atmospheric temperature-pressure profiles and constraining the presence of clouds. We have already analysed dozens of objects and it is now time to analyse trends in their chemistry and explain them in terms of atmospheric processes and possible formation and evolutionary pathways. In addition, some of the spectra reach S/n> 100 per resolution element, equal or better than the best exoplanet spectra we can ever expect for more challenging targets - even with the ELT. What have we learned from the very complex analysis techniques and what limits their interpretation?

*Speaker

sciencesconf.org:ohp2025:629230

Unraveling the origin of giant exoplanets – Observational implications of convective mixing

Henrik Knierim*[1] and Ravit Helled[1]

[1]University of Zürich [Zürich] – Switzerland

Abstract

The connection between the atmospheric composition of giant planets and their origin remains elusive. We explore how convective mixing can link the planet's primordial state to its atmospheric composition. We simulate the long-term evolution of gas giants with masses from 0.3 to 3 M_J, considering various composition profiles and primordial entropies and show that when convective mixing is considered, the atmospheric metallicity increases over time, encoding information about the planetary primordial structure. Moreover, mixing affects the planet's radius, altering its evolution in a measurable way. We demonstrate that a combination of the planetary radius and atmospheric composition can constrain the planetary formation history. Young systems emerge as prime targets, with lower-mass gas giants being particularly susceptible to mixing-induced changes. Our findings highlight convective mixing as a key mechanism to probe the primordial state of giant planets, offering new constraints on formation models and demonstrating that the primordial conditions of giant planets are not erased, but instead leave a lasting imprint on their evolution.

*Speaker

sciencesconf.org:ohp2025:647220

Unveiling transiting temperate giants in multi-planetary systems

Solène Ulmer-Moll*[1]

[1]Leiden Observatory [Leiden] – Netherlands

Abstract

Most detected transiting planets have orbits of a few tens of days, exposing them to intense stellar irradiation and interactions that significantly alter their properties. In contrast, colder planets with longer orbital periods are less affected, offering crucial insights into their formation and migration histories. In this talk, I report the detection and characterization of two multi-planetary systems hosting a transiting temperate Jupiter with orbital periods larger than 100 days and an inner non-transiting planet, thanks to a four-year ground and space-based photometric and radial velocity survey. Combining precise masses, radii, and ages with a state-of-the-art planetary evolution model, I infer the metal enrichment of the newly discovered temperate giants and explore their influence on the mass-metallicity correlation of giant planets.

*Speaker

sciencesconf.org:ohp2025:645556

Temperate transiting planets : discoveries and opportunities

Tristan Guillot*[1]

[1]Laboratoire Lagrange – Université de Nice-Sophia Antipolis, Observatoire de la Cote d'Azur (OCA) – France

Abstract

The discovery of transiting planets with effective temperatures lower than about 500K is an opportunity to test our understanding of atmospheric dynamics: At these temperatures, several crucial species including water condense. In hydrogen atmospheres, at high-enough metallicity, moist convection is inhibited, a phenomenon linked to the fact that latent heat release maintains a higher concentration of high molecular weight vapor in raising plumes than in the environment. The process, which should lead to a potentially much warmer interior, is still poorly understood. The discovery of a statistically-significant number of long-period transiting planets and the characterization of their atmosphere offers new opportunities by measuring the abundances of disequilibrium species. Prior to that, identifying these planets is crucial. I will show how the observation of solar system planets such as Jupiter and Saturn with Juno and Cassini, the identification of new long-period transiting planets from Antarctica with ASTEP and the future launch of PLATO should help to make decisive progress in this domain.

*Speaker

sciencesconf.org:ohp2025:648297

Deep radiative zones in giant planets: Implications for interior and atmospheric characterisation

Simon Müller*[1] and Ravit Helled[1]

[1]Department of Astrophysics, University of Zürich – Switzerland

Abstract

Recent observational and theoretical work suggests that Jupiter could have a deep radiative zone that creates a boundary layer between the upper envelope (atmosphere) and the deeper interior. A mechanism that can generate such a layer is an opacity window, caused by a depletion in alkali metals. Here, we explore how the presence of a deep radiative zone affects the evolution and inferred composition of giant exoplanets. Our models cover a large range of planetary masses and equilibrium temperatures. We show that a deep radiative zone significantly changes the predicted radii of giant exoplanets and allows the atmospheric metallicity to be higher than in the envelope. This strongly affects the characterisation of gaseous planets and has implications for interpreting atmospheric measurements. We show that understanding the role of deep radiative zones in giant exoplanets is crucial for their characterisation and for comprehending the atmosphere-interior connection.

*Speaker

sciencesconf.org:ohp2025:649753

Posters

The spatial extent of polycyclic aromatic hydrocarbons emission in the Herbig star HD 179218

Anas Taha*[1]

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Abstract

We investigate, in the mid-infrared, the spatial properties of the polycyclic aromatic hydrocarbons (PAHs) emission in the disk of HD 179218. We obtained mid-infrared images in the PAH-1, PAH-2 and Si-6 filters centered at 8.6, 11.3, and 12.5 μm, and N-band low-resolution spectra using CanariCam on the Gran Telescopio Canarias. We compared the point spread function (PSF) profiles measured in the PAH filters to the profile derived in the Si-6 filter, where the thermal continuum emission dominates. We performed radiative transfer modeling of the (SED) and produced synthetic images in the three filters to investigate different spatial scenarios. Our data show that the disk emission is spatially resolved in the PAH-1 and PAH-2 filters, while unresolved in the Si-6 filter. TWe have spatially resolved the PAHs emission in the disk of HD 179218 and set constraints on its spatial extent. Based on spatial and spectroscopic considerations as well as on qualitative comparison with IRS 48 and HD 97048, we favor a scenario in which PAHs extend out to large radii across the flared disk surface

*Speaker

sciencesconf.org:ohp2025:630141

Exploring Planet Migration and Resonance Chain in Formation of the Kepler-80 System

Hadiseh Nabavinezhad*[1], Yousef Sadeghi[1], and Sareh Ataiee[1]

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Abstract

Recent discoveries reveal tightly packed inner planets near their host star. To understand their formation and evolution, we study the Kepler-80 system, a K-dwarf star hosting six super-Earths. Using N-body simulations, we analyze migration mechanisms and the impact of disc parameters on resonance chains and system stability. Our results show that gaps at the inner disk edge cause instability, requiring consideration of unsaturated torques. Systems like Kepler-80 typically form with an aspect ratio of _˜0.03, but our simulations indicate enhanced stability at 0.05, reducing to 0.03 due to disk flaring. This research emphasizes Lindblad torque's role in slowing migration, enabling stable resonance chains.

*Speaker

sciencesconf.org:ohp2025:637589

The NASA Landolt mission

Peter Plavchan*[1]

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Abstract

The NASA Landolt mission is an astrophysics PIONEERS program small satellite that will provide significant improvement in the accuracy of photometric measurements of absolute stellar fluxes. This will be accomplished with a NIST-calibrated suite of single-mode fiber-fed laser beacons. The satellite will be placed in a near-geosynchronous orbit with a one-year primary mission with launch no earlier than October 2028. After commissioning, Landolt will point to scheduled ground-based observatories for calibration observations. Landolt has a level 1 mission requirement to improve the photometric accuracy to $< 0.5\%$ at visible and near-infrared wavelengths for > 65 target stars. Such measurements can only be achieved by a space-based orbiting artificial "star", where the emitted physical photon flux is accurately known. Accuracy of absolute flux zero points is now the leading error budget term in the characterization of stars, be they standard stars or exoplanet hosts. Landolt will enable the refinement of dark energy parameters, improve our ability to assess the properties of terrestrial worlds, and advance fundamental constraints on stellar astrophysics and evolution.

*Speaker

sciencesconf.org:ohp2025:643233

Embarking on a trek across the exo-Neptunian landscape

Vincent Bourrier*[1]

[1]Observatoire de Geneve – Switzerland

Abstract

Close-in exoplanets are shaped by a complex interplay between atmospheric and dynamical processes. The Desert, Ridge, and Savanna (a lack, overoccurrence, and mild deficit of Neptunes with increasing period) illustrate the sensitivity of these worlds to such processes. Determining how many Neptunes are brought close-in by early disk-driven (maintaining primordial spin-orbit alignment) or late high-eccentricity (generating large misalignments) migration is essential to understand how much atmosphere they lost. This is the goal of the ATREIDES collaboration, which carries out a Rossiter-McLaughlin census of 60 close-in Neptunes with the VLT/ESPRESSO to measure their 3D spin-orbit angle distribution, correlate its shape with the system properties, and relate the fraction of aligned/misaligned Neptunian systems to their migration and erosion histories. I will present the first results of ATREIDES, and our prospects to relate the inner architecture of Neptunian systems with the presence of outer massive companions through RV monitoring programs, in particular with the SOPHIE spectrograph on OHP historical 193cm telescope.

*Speaker

sciencesconf.org:ohp2025:643563

The Gemini Planet Imager Exoplanet Survey: Analysis of Candidate Companions

Nathalie Jones*[1], Jason Wang[1], and Gpi Exoplanet Survey Team

[1]Northwestern University – United States

Abstract

The Gemini Planet Imager Exoplanet Survey (GPIES) is a direct imaging campaign which targeted 600 young, nearby stars between 2014-19. GPI is designed to search for and spectroscopically characterize young-Jovian exoplanets. Results from the first 300 stars survey were presented in Nielsen et al. 2019. I will present my work on the analysis of candidates detected via forward-model matched filtering (FMMF) from the second half of the survey. The FMMF planet detection algorithm allows for increased sensitivity by incorporating instrumental PSF. To definitively rule out detections as real bound objects or background, I developed a spectral fitting routine using empirical and theoretical models of brown dwarfs and stars. Each GPI spectrum was fit against a catalogue of H-band spectra with known spectral type then plotted against output chi-squared. Lastly, I will discuss how the final categorization of all detected objects of interest allows us to produce contrast curves for the entire survey. These contrast curves, set by the false positive rate, provide insights on population statistics of Jovian exoplanets and on the impact of GPI in the direct imaging field.

*Speaker

sciencesconf.org:ohp2025:645058

Constraining the masses of giant planets that correspond to long term trends in over 25 years of CORALIE data

William Ceva*[1], Damien Ségransan[1], Carles Cantero[1], Jean-Baptiste Delisle[1], and Stéphane Udry[1]

[1]Geneva Observatory – Switzerland

Abstract

Following the discovery of 51 Pegasi b, the CORALIE spectrograph on the 1.2 meter Leonhard Euler telescope was commissioned in 1998, order to continue searching for exoplanets around Sun-like stars. Since then, CORALIE has continually measured the radial velocities (RVs) of over 1600 FGK-type stars. This 25+ year baseline of RV data provides orbital coverage for exoplanets and brown dwarfs that lie at wide separations (10s of AU) from their host stars. Such companions also induce astrometric perturbations on their host stars, that can be detected in astrometry surveys such as Hipparcos and Gaia. By combining RV and Hipparcos-Gaia proper motion anomaly (PMa) data in orbit fits, we are able to overcome the mass-inclination degeneracy inherent to RV data. We therefore present the precise dynamical masses of 5 gas giant exoplanets, 3 of which are in multiplanetary systems. Additionally, with the results from our RV + PMa orbit fits for all 1600+ targets, we are able to determine the feasibility of detecting numerous companions in direct imaging. This includes companions we have already imaged with SPHERE on VLT, as well as prospects for other direct imaging instruments.

*Speaker

sciencesconf.org:ohp2025:645211

Formation of Gaps in Self-Gravitating Debris Disks: Secular Resonances in a Two-Planet System

Marc F. Friebe*[1] and Antranik A. Sefilian[2]

[1]University of Jena – Germany
[2]University of Arizona – United States

Abstract

Planetary systems often host belts of debris, akin to the Solar System's asteroid and Kuiper belts. Observations frequently reveal intricate morphologies, including gapped or double-ringed structures. While such gaps are often attributed to unseen planets residing within them, an alternative explanation involves secular resonances in single- or multi-planet systems, where distant planets sculpt the disk structure. Crucially, many models neglect the disk's self-gravity. In this work, we explore how incorporating the disk's mass alters this picture. We show that two low-eccentricity planets orbiting interior to a coplanar, self-gravitating disk can establish up to four secular apsidal resonances, inducing gap formation through eccentricity excitation. Using both analytical and numerical approaches from secular Laplace-Lagrange theory, we examine how the disk's mass modifies the eigenmodes of the two-planet system and shifts resonance locations compared to models with either a single planet or a massless disk. Finally, we discuss how these results provide new insights into the detection of unseen planets in observed gapped debris disks.

*Speaker

sciencesconf.org:ohp2025:645560

A Deep HST/WFC3/H-alpha Imaging Survey to Probe the Demographics of Accreting Planets at Wide Separations

Lillian Jiang*[1]

[1]University of California [Santa Barbara] – United States

Abstract

Traditional direct imaging surveys of exoplanets are limited by their reliance on thermal emission, potentially biasing our understanding of exoplanet demographics at wide separations. Hot-start planets, with higher luminosities during formation, are favored over cold-start giants, which are fainter and harder to detect. Sub-Jovian-mass planets at wide separations also remain largely unexplored. Hα emission from accreting planets offers an alternative method to estimate occurrence rates regardless of thermal evolution and, with sufficient sensitivity, enables searches for lower-mass planets. We present results from a deep HST/WFC3-UVIS Hα imaging survey of over 200 members in the _˜2 Myr-old IC 348 region. Using a deep learning-based image classification model to separate real sources from cosmic-ray-induced false positives, we identify one new brown dwarf companion candidate and provide upper limits on Hα luminosities, accretion luminosities, and mass accretion rates for non-detections. Ultimately this study provides the most precise demographic constraints on an otherwise hidden population of long-period accreting protoplanets.

*Speaker

sciencesconf.org:ohp2025:647835

Predict, Point, Probe: Mapping the Orbits of Long-Period Cool Gas Giants

Bhavesh Rajpoot*[1] and Elisabeth Matthews

[1]Max Planck Institute for Astronomy – Germany

Abstract

Combining RV and high-contrast imaging techniques will be crucial in the coming decades: in an ideal case, RVs can allow us to predict planets' on-sky locations and then target these with high-contrast imaging and spectroscopy to understand their atmospheres. However, for systems where RV coverage spans less than one period, this introduces biases which limit our ability to reliably predict orbital solutions. One such case is Eps Ind Ab, first seen in RVs, but then, Matthews et al. (2024) imaged it with JWST and found it to be at the opposite location relative to prior orbital solutions from RV + astrometry orbital fitting. I will present our work to understand whether this discrepancy arises from orbit-fitting methodology or from biases in the observational data. With joint RV + astrometry + imaging modelling and analyses, we aim to quantify how dataset selection and prior assumptions shape posterior distributions. I will also discuss our ongoing HARPS program to monitor eight nearby long-period planets, aiming to improve their orbital constraints in preparation for dedicated imaging & spectroscopic follow-up.

*Speaker

sciencesconf.org:ohp2025:648637

HARPS search for long-period companions around Main-Sequence stars

Yolanda Frensch*[1], Gaspare Lo Curto[2], and François Bouchy[1]

[1]Observatoire Astronomique de lÚniversité de Genève – Switzerland
[2]European Southern Observatory – Chile

Abstract

There are various theories on the formation of our solar system, with Jupiter playing a crucial role. According to the Nice model (Morbidelli et al. 2018), the presence and evolution of Jupiter and Saturn in the solar system might have been critical to allow the existence of the inner planets in their current orbits. Zhu & Wu (2018), Bryan et al. (2018), and Rosenthal et al. (2022) show that outer (> 3 AU) giant planets enhance the occurrence of inner small planets (0.03-1 AU, 2-30 M⊕). Stars with long-period Jupiter mass companions are thus a good place to start searching for habitable planets like ours and to put our solar system into context. However, of the currently 5903 known exoplanets, only 5.7% have periods longer than 3 years, and 2.5% longer than 10 years. The long-term HARPS RV survey of extra-solar planets provides data with a baseline of 20 years, which allows for the detection of long-period RV variations. We present some of the most recent results (Frensch et al. 2023), plus the cross-match of the survey with identified TESS Objects of Interest.

*Speaker

sciencesconf.org:ohp2025:649173

C4Life: a space based mid-IR interferometer for investigating the solid-carbon particle abundance in telluric forming planet regions

Valentin Fleury*[1], Bruno Lopez[1], Alexis Matter[1], and Eric Pantin[2]

[1]Observatoire de la Côte dÁzur – Université Côte d'Azur – France
[2]CEA Paris-Saclay – IRFU – France

Abstract

The inner Solar System exhibits a significant carbon deficit, approximately three orders of magnitude lower compared to the Sun and the interstellar medium. This characteristic has profoundly influenced Earth's internal dynamics and the silicate-carbonate cycle-processes essential for habitability. The question of the universality of carbon deficit remains open and is challenging in evaluating the habitability of planets.
To address this scientific goal, it is necessary to observe the inner disk regions around young stars, in particular in the 3 to 9 μm domain, to access the carbon-carbon resonances of the small population of carbon particles. For this aim, we are proposing a space interferometer to investigate the reservoir of carbon particles that will feed the planet embryos in those inner disk regions where telluric planets should be formed.

Such observations involve a survey which could be performed on an ensemble of 200-300 sources. We are studying a space mission aligned with our scientific ambition. The C4Life project, proposed to ESA, will contribute to advancing our understanding of the conditions necessary for the emergence of life.

*Speaker

sciencesconf.org:ohp2025:649196

Formation and Astrometric Detection of Mean Motion Resonances in Giant Planets

Emmanuel Greenfield* and James Owen[1]

[1]Department of Physics [Imperial College London] – United Kingdom

Abstract

Exoplanets like the giant planets in our solar system are difficult to detect with our current observational methods. However, Gaia DR4 detecting _˜1,000-10,000 giant planets at large orbital separations will provide the first demographic constraints on their origins. There is also a prevalence of near resonant systems amongst known close-in planets, motivating the exploration of resonances.
First we explore the formation of such resonances. Resonant giant planet systems are prone to dynamical instabilities and using long-term hydrodynamical simulations coupled with disc photoevaporation we notice that these instabilities become weaker, leading to more prevalent resonances in cool giant planet populations.
We also study is the astrometric impact of an additional non-detectable planet on a detectable planet. We simulate this signal through N-body integrations for systems close to and far from resonance. We fit the astrometric signal using nested sampling, allowing for a Bayes evidence comparison for 1 or 2 planets as fits to the data. We find that resonances generate a regular pattern, enhancing the detection of close in resonant pairs with Gaia.

*Speaker

sciencesconf.org:ohp2025:649231