BD30 - Submitted abstracts

Total submissions: 40

Title: Brown Dwarf Formation Through Gravitational Collapse: Insights From 3D MHD Simulations
Name: Ahmad, Adnan Ali
Type of contribution: talk

Abstract
Authors: Adnan Ali Ahmad, Benoît Commerçon, Gilles Chabrier, Antonin Borderies The formation mechanism of Brown Dwarfs (BDs), whether akin to stars or ejected planetary-mass objects, remains debated. We present the first 3D radiation-MHD simulations of magnetized, turbulent, gravitationally unstable low-mass cores ($0.05-0.1 mathrm{M_{odot}}$) collapsing into proto-BDs. Using the { tfamily RAMSES} code with adaptive mesh refinement, we model the full dynamical range ($10^{5}~-10^{22} mathrm{cm^{-3}}$), including radiative transfer (flux limited diffusion) and non-ideal MHD (ambipolar diffusion). Our simulations self-consistently follow the isothermal collapse, first hydrostatic core formation, H$_{2}$ dissociation, and BD birth. The resulting BDs have initial radii $approx 0.75 mathrm{R_{odot}}$ and masses $approx 0.8 mathrm{M_{J}}$, growing via accretion as we follow the early evolution of the object. Crucially, we find that BDs may form similarly to low-mass stars but with a prolonged first-core phase, supporting a star-like formation scenario.

Title: The substellar population of the most massive young clusters with JWST
Name: Almendros-Abad, Victor
Type of contribution: talk

Abstract
Understanding the formation and evolution of young stars and clusters requires exploring a broad range of environments, from low-density star-forming regions to the most massive and extreme stellar nurseries in the Milky Way. Theories predict that high stellar densities, and the presence of massive OB stars may alter brown dwarf formation efficiency, but this remains untested in massive young clusters. As part of the EWOCS (Extended Westerlund 1 and 2 Open Clusters Survey) project, we have used JWST/NIRCam's unprecedented sensitivity to study, for the first time, the substellar population in the supermassive clusters Westerlund 1 and 2. With total stellar masses exceeding 30,000 Msun, these clusters provide a unique laboratory to investigate how extreme conditions shape the low-mass end of the initial mass function. In this talk, I will present our JWST/NIRCam findings, including the detection and characterization of brown dwarfs straddling the planetary-mass regime in Westerlund 2, and the (sub)stellar initial mass function of Westerlund 1. I will then place these results in the context of studies in nearby star-forming regions and other massive young clusters. Taken together, these results allow us to establish the first systematic evidence for variations in brown dwarf demographics with environmental conditions.

Title: A New Spectral Class of Brown Dwarfs at the Bottom of the Initial Mass Function in IC 348
Name: Alves de Oliveira, Catarina
Type of contribution: talk

Abstract
Nearby star-forming regions offer the opportunity to probe the low-mass end of the initial mass function (IMF). Over the past decades, we have pursued a thorough survey of the members of IC 348 down to the lowest possible masses, recently extending this effort with the James Webb Space Telescope. Through deep imaging and spectroscopy, we have identified new cluster members with mass estimates as low as ~2 MJup, the least massive brown dwarfs known to date, providing a new empirical constraint on the minimum mass of the IMF. The faintest brown dwarfs in IC 348 exhibit strong absorption features at 3.4 µm attributed to an unidentified hydrocarbon, a spectral signature not predicted by existing brown dwarf or giant planet models. Saturn and Titan have the only other atmospheres in which similar hydrocarbons have been detected. The strength of this feature correlates with fainter magnitudes, suggesting that this hydrocarbon is a common constituent in the atmospheres of the coldest, youngest brown dwarfs. Based on the distinct spectral characteristics, we propose the establishment of a new spectral class, designated "H" (for hydrocarbon), defined by the presence of this 3.4 µm feature. Additionally, two of the newly discovered brown dwarfs (~2 and 10 MJup) display substantial infrared excesses consistent with circumstellar disks, indicating the potential for ongoing planet formation at these extremely low masses. Reference to article: https://iopscience.iop.org/article/10.3847/204

Title: Invited review talk on the census of brown dwarfs in open clusters and young associations
Name: Alves de Oliveira, Catarina
Type of contribution: talk

Abstract
Over the past three decades, the discovery and characterization of brown dwarfs have profoundly shaped our understanding of substellar objects and star formation. In this invited talk, I will present a retrospective overview of the progress made in identifying and characterizing brown dwarfs within open clusters and young stellar associations, and reflect on the remaining challenges. This contribution aims to honor the collective efforts of the community and inspire future directions in the study of brown dwarfs.

Title: Complex Periodic Variables: an approach for planetary formation at the substellar frontier

Name: Béjar, Víctor J. S.
Type of contribution: talk

Abstract
Complex Periodic Variable (CPV) stars, are a fascinating new class of young, fast rotating very low-mass stars recently identified with Kepler and TESS (Bouma et al. 2024), which shows transit-like dips related to the presence of dust or gas material at the co-rotation radius. Although the physical mechanism of these dips is currently unknown, they could be related to the presence of dust material in a disk or evaporated from a planet, or to the ejection of coronal gas material from the stars. Here we present the last results of a photometric, spectroscopic, radial velocity and astrometric monitoring campaign both in the optical and radio of two of them, 2M0508-21 and DG CVn. 2M0508 is a young, fast rotating (6.7h) M5 belonging to ? Pic (~20 Myr), while DG CVn is a fast rotating (6.44h) M4, that it is the closest (18pc) known CPV, and has an estimated age below 150 Myr. Both CPVs are very low mass young binaries close to the substellar borderline. Their dynamical mass determination and understanding of the transiting material can shed light of the brown dwarf frontier at these young ages and planetary formation at very low masses.

Title: High-resolution and high-contrast studies of substellar companions
Name: Béjar, Víctor J. S.
Type of contribution: talk

Abstract
In this talk, I will review the early applications and the recent advances of high-resolution and high-contrast techniques in the searches for substellar companions. Since the discovery of the first brown dwarf companion, Gl229B, using adaptive optics and coronography, more than a hundred of substellar companions have been identified, including the first directly imaged planetary mass companion 2M1207b, multiplanetary systems such as HR8799 and beta Pic, and some the coolest brown dwarfs. With the advent of extreme adaptive optics, phase-mask and vortex coronographs, and new near-infrared and radio interferometers, high resolution (better than 10 mas) and high contrast images up to 10-6 have been obtained in ground- and space-based facilities, allowing us to identify newborn sub-Saturn planets, characterize the atmosphere of close substellar companions and identifying the rings and substructures of protoplanetary disks in early stages of formation. Astrometric monitoring of these systems combined with radial velocity measurements allows accurate determination of the masses of planet and brown dwarf masses.

Title: Brown dwarfs as probes of the particle nature of dark matter: a provocative exploration
Name: Benito Castaño, María
Type of contribution: talk

Abstract
I will present a recent study (Benito et al. 2024, JCAP 07, 038) that explores the potential of using brown dwarfs as astrophysical laboratories to study the particle nature of dark matter. Although the underlying assumptions about the structure and cooling of brown dwarfs are highly idealised and do not reflect the current state of substellar models, my goal is to discuss how and why brown dwarfs could serve as sensitive detectors of new physics, initiating a dialogue between the brown dwarf and astroparticle communities.

Title: Investigating the Cloudy (or not) Atmosphere of the Planetary-Mass Ross 458c
Name: Bull, Jared
Type of contribution: talk

Abstract
Ross 458c is a planetary-mass (~9 M_Jup) T8 spectral type brown dwarf (~700 K). Prior studies suggest that the near-IR spectrum of Ross 458c is best described by cloudy models, in contrast to the expected clear atmospheres of such late-T dwarfs, with resurging sulfide clouds proposed as the source of such features. Ross 458c is also a known variable brown dwarf, with a measured spectrophotometric variability of ~2% in the J-band light curve (Manjavacas et al. 2019), further suggesting the presence of non-homogenous cloud cover. Previous observations using HST/WFC3 and Spitzer lacked in wavelength range and simultaneous multi-wavelength observations, limiting the pressure levels probed and determinations of the dominant variability mechanism. We present the results of JWST/NIRSpec + PRISM time-resolved spectroscopy of Ross 458c, covering two full rotations of the object across the 0.6-5.3 micron wavelength range to confirm the predictions outlined in Morley et al. (2014). Results reveal wavelength-dependent evolution, suggesting multiple mechanisms operating throughout its atmosphere. Results from this work may provide guidance for understanding atmospheres for similar late-T dwarfs and exoplanets of similar effective temperatures.

Title: Irradiated brown dwarfs
Name: Casewell, Sarah
Type of contribution: talk

Abstract
Brown dwarfs orbiting white dwarfs are relatively rare, with only around 10 close and 10 wide systems known to date. These systems represent the end point of directly imaged and transiting systems. In this talk I will discuss what we know about both types of systems and how these can help us understand both irradiated and un-irradiated brown dwarf atmospheres.

Title: Brown dwarfs in the era of the Nancy Grace Roman Space Telescope

Name: De Furio, Matthew
Type of contribution: talk

Abstract
Since the discovery of the first brown dwarf thirty years ago, many infrared space telescope missions have uncovered profound information about sub-stellar objects. The Hubble Space Telescope identified many young brown dwarfs into the planetary mass regime, the Wide-field Infrared Survey Explorer detected the Y-dwarf class of objects, and the farthest brown dwarfs have been discovered with the James Webb Space Telescope. With the coming launch of the Nancy Grace Roman Space Telescope (Roman), brown dwarf science will vastly expand with the unprecedented field of view (0.28 square degrees) and angular resolution of Roman's Wide-field Instrument (WFI) providing both imaging and slitless spectroscopy modes across 0.48-2.3 ?m. Roman will operate as a community-defined survey telescope with preselected programs already planned and an opportunity to submit new surveys coming later this year. In this talk, I will describe the many brown dwarf science cases that will be explored with the currently planned Roman surveys including: spectral characterization across a broad range of temperatures and metallicities, expected detections in the Galactic halo, characterization of the initial mass function across various Milky Way environments, Galactic archaeology, young brown dwarfs, and more. I will also describe potential brown dwarfs science cases for new Roman surveys and synergies with other observatories such as JWST, Euclid, and LSST.

Title: Spectroscopic search, classification and analysis of ultracool dwarfs in Euclid Q1 data
Name: Dominguez-Tagle, Carlos
Type of contribution: talk

Abstract
We present our work on Euclid Q1 spectroscopic data to identify L- and T-type dwarfs from direct identification through the H2O and CH4 absorption bands. We confirm also the ultracool dwarf nature of more than 160 candidates from the photometric catalogs prepared by our group. We present the first spectral analysis of confirmed ultracool dwarfs from Q1 data, including spectral classifications, determination of effective temperatures, H2O, CH4 and NH3 spectral indices, and measurements of the KI absorption doublet.

Title: Dynamical Masses & Fundamental Tests of Substellar Physics
Name: Dupuy, Trent
Type of contribution: talk

Abstract
At the heart of brown dwarf astrophysics is the theory that mass governs a (moderately metallicity-dependent) limit to the main sequence, somewhere between about 0.07 and 0.08 solar masses for solar metallicity. Approximately one decade after the discovery of the first brown dwarfs, the first dynamical mass measurements, of late-M and early-L dwarf binaries, were made. Another decade yielded a sample of individual dynamical masses from binaries capable of testing the fundamental theory that mass governs a boundary between stars and brown dwarfs. And today, masses come from a growing sample of both binaries and companions that induce astrometric and RV accelerations on their host stars. I will review this unprecedented empirical census of model-independent mass measurements across a wide range of spectral types and ages. I will discuss where they are in agreement or tension with the state-of-the-art substellar evolutionary models that underpin the physical characterization of all other substellar objects.

Title: Ultracool companions to Gaia high proper motion stars within 100 pc
Name: Gauza, Bartosz
Type of contribution: poster

Abstract
In a quest to complete the census of ultracool dwarfs within 100 pc we exploit the Gaia DR3 to detect companions to Gaia high proper motion stars (μ > 100 mas/yr). From 124 identified candidates, a list of 75 yet unknown objects was built. Here, we focus on 40 of these for which we obtained optical spectroscopy with the GTC/OSIRIS. Collected data serve us to verify the candidates and characterize their SEDs, Teff, and estimate masses. Combined with parallactic distances, and other available physical properties of the primaries, each of the newly found ultracool companion becomes valuable for improving our understanding of the demographics of the least massive stars and brown dwarfs. Outcomes of our searches provide useful insights to optimize such explorations of the forthcoming DR4 data.

Title: Across the Orbits: Substellar Companions to Stars
Name: Gauza, Bartosz
Type of contribution: talk

Abstract
Substellar companions to stars — spanning both the brown dwarf and giant planet regimes — offer a unique window into the properties and possible formation pathways of objects at the star–planet boundary. Sharing well-constrained parameters with their host stars, such as age, distance, and metallicity, they enable detailed characterization rarely possible for isolated substellar objects. From the landmark detections of Gliese 229B and 51 Peg b to the latest high-contrast imaging studies, these companions have greatly helped to shape our understanding of substellar diversity. In this talk, I will review the pivotal role of wide substellar companions in revealing the complex physical and atmospheric properties within the substellar regime, and discuss how the latest observations are refining our view of these intriguing populations.

Title: Probing radio emission mechanisms in substellar magnetospheres
Name: Guirado, Jose Carlos
Type of contribution: talk

Abstract
Models and empirical relationships suggest that the cool and neutral atmospheres of brown dwarfs are generally unable to sustain strong magnetic fields; however, a fraction of brown dwarfs exhibit high levels of magnetic activity. In the last years, sensitive radio observations reveal a growing population of ultracool dwarfs with coherent, highly polarized radio bursts consistent with electron cyclotron maser emission, as well as a persistent quiescent emission likely originated from (gyro)synchrotron processes. The periodicity, polarization, and morphology of these radioemissions emphasize the similarity between the magnetic phenomena in substellar objects and those observed in planets of our solar system. These findings establish brown dwarfs as valuable laboratories for advancing our understanding of planetary magnetism.

Title: Yakiv Pavlenko - a life dedicated to spectroscopy
Name: Jones, Hugh
Type of contribution: talk

Abstract
Yakiv Pavlenko was a Chief Research Fellow at the Main Astronomical Observatory of the National Academy of Sciences of Ukraine and a visiting fellow at both the Instituto de Astrofísica de Canarias and the University of Hertfordshire. A passionate spectroscopist, Yakiv had a profound understanding of the limitations of theoretical models and paradigms. He dedicated his career to bridging theory and observation, developing, collaborating, and applying a wide range of theoretical models to interpret astronomical data. His work provided fundamental insights into a broad range of astronomical objects though with a focus on the physics of cool astronomical objects. This talk will focus on Yakiv's legacy in 30 years of substellar science, and will reflect on his ideas for future research directions. We deeply mourn the loss of his prolific ingenuity, his inspiring presence as a researcher, and his dedication as a mentor especially to young Ukrainian astrophysicists.

Title: Discovering and characterising brown dwarfs via their magnetic fields
Name: Kavanagh, Rob
Type of contribution: talk

Abstract
Over the past two decades, brown dwarfs have been discovered to emit powerful radio waves. This emission is interpreted as being driven by electrons trapped in the brown dwarf's magnetic field. These radio signatures are the sole pathway for studying magnetism on brown dwarfs, providing a unique probe into their interior structure. Major progress is now being made with wide-field radio surveys, which have recently led to the discovery of a previously unknown T6 dwarf. In this talk, I will give an overview of the demographics of radio-detected brown dwarfs and our recent progress on characterising their magnetic fields using numerical models. I will also highlight the benefits of studying radio-emitting brown dwarfs contemporaneously in the infrared with facilities such as JWST.

Title: Cloudy with a chance of silicates: Equator-to-pole variations in brown dwarf atmospheres with JWST
Name: Lam, Madeline
Type of contribution: talk

Abstract
Atmospheres of brown dwarfs are complex, with clear structural variations as they cool from early L to late T spectral types. At the LT transition, silicate clouds form and condense, which affects the overall atmospheric dynamics of the brown dwarfs and causes observed variability. Probing brown dwarf atmospheres provides an insight into gas giant atmospheres, as mid-to-late L dwarfs have similar fundamental properties to exoplanets (eg. Teff, radius, mass), however they don't orbit a bright host star. We have observed a sample of six young coeval brown dwarfs in the AB Doradus moving group with JWST (PID 3486). These objects span the mid-L to early-T spectral sequence, and by identifying the temperatures at which molecular absorption features appear, we put our sample into a broad evolutionary context. We present the first full 0.6 – 14 micron spectrum of our sample that we analyse in depth. The silicate absorption feature at 7 – 11 microns is the only direct probe of clouds in the LT atmosphere, and we are particularly interested in how this varies across our sample. Our objects have different viewing angles, providing the unique opportunity to identify any trends determining whether there are any equator-to-pole atmospheric variations within a coeval sample. Our analysis with this sample will aid in future 3D atmospheric studies of brown dwarfs and exoplanets as we reveal how silicate clouds are spatially distributed in brown dwarf atmospheres.

Title: Defining Physical Parameter Scales for Metal-Poor M Dwarfs Using X-Shooter Spectroscopy
Name: Lodieu, Nicolas
Type of contribution: talk

Abstract
We present an empirical calibration of metallicity, gravity, and effective temperature scales for metal-poor M dwarfs using intermediate-resolution (R ~ 3300–5400) UV, optical, and near-IR spectra of 43 subdwarfs (sdM), extreme subdwarfs (esdM), and ultra-subdwarfs (usdM) spanning spectral types M0–M9.5. Observations were obtained with X-shooter on the ESO VLT, covering 0.45–2.5 micron We compare our sample to BT-Settl model spectra across a wide range of physical parameters to derive temperatures, surface gravities, and abundances. We find that metal-poor M dwarfs are typically warmer by ~200 ± 100 K and exhibit higher gravities (log g ~ 5.0–5.5) than their solar-metallicity counterparts. Best-fit metallicities are [Fe/H] ~ –0.5, –1.5, and –2.0 dex for sdM, esdM, and usdM, respectively, with significant variation in individual elemental abundances (Fe, Na,

K, Ca, Ti). Our results show that a single metallicity parameter is insufficient to fully describe these atmospheres. This work provides a physically calibrated spectral atlas for metal-poor M dwarfs, expanding current metallicity scales relevant to low-mass planet-host stars and offering a key benchmark for upcoming surveys and missions focused on ultracool populations in the Galactic halo.

Title: Discoveries of brown dwarf in large-scale surveys
Name: Lodieu, Nicolas
Type of contribution: talk

Abstract
In this talk, I will review the discoveries of ultracool dwarfs and brown dwarfs from major ground-based surveys such as DENIS, 2MASS, Sloan, UKIDSS, PanStarrs and WISE.

Title: Anatomies of Brown Dwarf Atmospheres: a compilation of the Brown Dwarf Light Curves across L, T and Y spectral types
Name: Manjrawala, Kieran
Type of contribution: talk

Abstract
In this paper, we present a compilation of photometric and spectroscopic brown dwarfs light curves available in the literature. Our sample includes 305 light curve observations at 3.6 ?m, 4.5 ?m, and in the J-band for 113 brown dwarfs: 63 L dwarfs, 47 T dwarfs, and 3 Y dwarfs observed for variability. Many have multiple observations at different wavelengths and epochs. We detect variability in 45% of L dwarfs, 34% of T dwarfs, and all of the Y dwarfs. We present fits for each of the light curves presented and derive relevant parameters such as rotational period and percent variability. Our spectral type dependent results show that we observe the highest amplitude of variability in the L/T transition (L7.5 – T4.5), with J-band observations on average showing >5% levels of variability. Light curves observations also give insight into the potential cloud features we observe in varying pressure levels of brown dwarf atmospheres. In particular, we observe mid- to late-T dwarfs exhibiting simpler cloud features, indicated by light curves that are well-fit by single sine waves—consistent with planetary-scale brightness bands. By contrast, L/T transition dwarfs show more complex variability, often requiring multi-sine fits and exhibiting non-flat residuals, suggesting the presence of both banded structures and localized spots. Finally, we consider the role of viewing angle and other physical parameters in shaping observed variability.

Title: Probing magnetic activity and atmospheric dynamics in the L3.5 dwarf LSPM J0036+1821.
Name: Martín Carrero, Diego
Type of contribution: talk

Abstract
The L3.5 dwarf LSPM J0036+1821 offers a rare opportunity to probe magnetic activity and atmospheric dynamics in ultracool dwarfs. We report on over 15 epochs of radio observations of this ultra-cool dwarf, collected using the VLA, EVN, and VLBA between 2019 and 2022. These data offer a unique opportunity to refine the object’s radio rotation period. This refined period will allow us to apply an auroral ring model to disentangle the magnetic field structure of this ultracool dwarf, leveraging the full set of radio light curves. We also compare the derived radio rotation period with the TESS optical period, aiming to measure the latitudinal atmospheric winds of the dwarf, taking into account that radio and optical periods originate in different layers of the dwarf (magnetosphere and photosphere, respectively). This study is part of a broader effort to characterize the magnetic and atmospheric dynamics of ultracool dwarfs across radio, optical, and infrared wavelengths.

Title: Brown dwarfs with the Euclid space mission
Name: Martin, Eduardo
Type of contribution: talk

Abstract
This invited talk will present an overview of the main results of the first year of observations obtained wirh the Euclid space mission in the field of brown dwarf science and the prospects until the end of the surveys.

Title: Exoplanet search and characterization with the proposed POET Canadian space mission
Name: Metchev, Stanimir
Type of contribution: talk

Abstract
The Photometric Observations of Exoplanet Transits (POET) is a proposed micro-satellite mission dedicated to the characterization and discovery of transiting exoplanets. POET has been identified as a top priority small-sat space mission in the Canadian Astronomy Long Range Plan 2020-2030. POET is being proposed as Canada's next astronomy space mission, with launch possible in late 2029. POET is an iteration on the designs of the Canadian MOST and NEOSSat space missions, which had 15 cm-sized telescopes and observed only in the visible band pass. POET will have a larger 20 cm telescope aperture and three band passes: near-ultra-violet (nUV; 300-400 nm), visible near-infrared (VNIR; 400-900 nm), and short-wavelength infrared (SWIR; 900-1700 nm). All mission components either already have significant space heritage or are seeing rapid adoption in commercial space missions. POET's simultaneous tri-band 300-1700 nm photometric monitoring will allow it to separate the impact of star spots on the transmission spectrum of extended atmospheres on super-Earth or larger exoplanets. POET's SWIR band is optimally sensitive to the emission peak of ultracool dwarf stars and would enable a systematic search for Earth-sized planets around them. POET aims to discover some of the nearest potentially habitable

Earth-sized exoplanets that could be scrutinized for biosignatures with JWST or future telescopes.

Title: Ultra-cool dwarfs in the era of Euclid
Name: Mohandasan, Anjana
Type of contribution: talk

Abstract
Ultra-cool dwarfs (UCDs) are the lowest-mass, coldest, and faintest products of star formation. Despite their abundance in the Milky Way, UCDs remain an elusive population, as most of them are too faint for Gaia and ground-based telescopes. However, Euclid's wide and deep near-infrared surveys are expected to revolutionise the field, enabling the detection of an unprecedented number of new objects. In this study, I analyse Euclid Quick Release 1 data of 20 square degrees in the Euclid deep field north to investigate a large sample of UCDs. I explore the spectral features of UCD candidates selected as contaminants in the QSO search. By identifying known UCDs within the Euclid dataset, I refine the photometric and spectroscopic criteria for UCD selections. Additionally, fluxes appropriate for point-like objects are filtered from Euclid MER photometry, and the UCDs are characterised in various colour-colour diagrams. Deviations observed in the spectroscopic features and photometric diagrams reveal intriguing candidates, many of which exhibit high proper motions, potentially indicating nearby, low-gravity objects. Combining Euclid observations with Gaia reveals interesting features. As the Euclid mission progresses, the UCD dataset will expand significantly, promising to improve our understanding of very low-mass stars, refining substellar mass and luminosity functions, and offering new insights into the history of substellar formation and the chemical evolution of the Galaxy.

Title: Unveiling a brown dwarf binary resolved with Euclid
Name: Muñoz Torres, Sara
Type of contribution: talk

Abstract
In the framework of my PhD thesis project on substellar binaries, the first such system identified with Euclid Q1 data is presented here. The object is clearly resolved in the Euclid VIS image with an angular separation of half an arcsecond (about 5 pixels), while in the NISP images (Y, J, H) its not fully resolved owing to the lower spatial resolution. The flux ratios between the components in all the Euclid passbands is similar within a factor of 1.3, 1.1, 1.0, and 1.3 respectively, supporting the hypothesis of a binary system with two ultracool dwarf components. The Euclid NISP spectrum of the combined light of both components has a spectral type between L4 and T0, suggesting that its a blend of an L dwarf with a T dwarf. To further characterise this binary, complementary observations have been carried out with the long-slit low-resolution spectroscopic modes of OSIRIS (optical) and EMIR (NIR) instruments of the Gran Telescopio Canarias (GTC) in June 2025. At the time of writing this abstract those spectra are under analysis and I expect to show some results at the conference.

Title: Young brown dwarfs in the JWST era
Name: Muzic, Kora
Type of contribution: talk

Abstract
JWST is revolutionizing brown dwarf science through its unprecedented infrared sensitivity. It enables the detection of brown dwarfs in young clusters at large distances, allowing for the characterization of their populations in previously unexplored environments, such as starburst regions and low-metallicity clusters. In nearby star-forming regions, JWST can spectroscopically confirm free-floating, Jupiter-mass objects, offering new insights into the low-mass end of the initial mass function. Its wide wavelength coverage facilitates detailed studies of brown dwarf atmospheres, as well as the properties of circumstellar disks and envelopes around brown dwarf and planetary-mass objects. This talk will present key early results and outline future prospects for JWST in advancing our understanding of brown dwarf formation and early evolution.

Title: Heterogeneous clouds and thermochemical instabilities as the source of WISE1049AB's spectroscopic variability
Name: Oliveros Gomez, Natalia
Type of contribution: talk

Abstract
We present an analysis of the spectroscopic variability of WISE 1049AB (L7.5+T0.5) as observed with the NIRSpec instrument on the James Webb Space Telescope. We explored the variability of the dominant molecular bands present in the 0.6–5.3 ?m spectra of H?O, CH?, and CO, finding that the B component exhibits a higher maximum deviation than the A component across all tested wavelength ranges. The light curves reveal variability that depends on wavelength (i.e., atmospheric depth) and possibly chemistry. Notably, the variability of the A component's light curves at wavelengths associated with CH? and CO molecular absorption features is greater than that of H?O, even when both trace similar pressure levels. We concluded that clouds alone are most likely unable to explain the increased variability of CO and CH? with respect to H?O. This suggests that an additional physical mechanism is necessary to explain the observed variability. This mechanism is likely due to thermochemical instability. Finally, we present an artistic depiction of the 3D atmospheric map reconstructed for both components, incorporating the contributions of molecular bands at various pressure levels and the planetary-scale wave fit.

Title: Proper Motion as a Tool for Identifying Ultracool Objects in Deep Sky Surveys
Name: Perez Garrido, Antonio
Type of contribution: talk

Abstract
The identification of ultracool astronomical objects, such as brown dwarfs and planetary-mass candidates, is a fundamental step

toward understanding the low-mass end of the stellar and substellar population. However, photometric selection alone often leads to significant contamination by high-redshift quasars and unresolved extragalactic sources, whose colors can mimic those of nearby ultracool objects. In this talk, I will highlight the importance of proper motion as a key discriminant for separating true nearby objects from distant contaminants. I will present an overview of past and recent efforts in the field, including previously published results and new findings based on cross-matching Euclid data with the VISTA Hemisphere Survey (VHS). These recent correlations allow us to exploit multi-epoch astrometry over large areas of the sky, enabling the detection of objects with significant proper motion even at faint magnitudes.

Title: The low-mass stellar and substellar IMF of the young galactic star cluster Trumpler 14
Name: Rom, Tamara
Type of contribution: talk

Abstract
The Initial Mass Function (IMF) is a fundamental outcome of the star formation process, yet its universality remains debated. In this study, we investigate the IMF in the young and massive Galactic cluster Trumpler 14 (Tr14), situated in the Carina Nebula at 2.37 kpc. As one of the most massive, young clusters, rich with OB stars, Tr14 offers an ideal laboratory to examine how high stellar densities and intense ultraviolet radiation influence the IMF. We present deep near-infrared photometry from the GeMS/GSAOI instrument on Gemini South in the J, H, and Ks bands and focus on the low-mass IMF, detecting objects down to 0.01 MSun. While some theories suggest that OB stars and dynamical interactions could enhance brown dwarf production, our results do not find a significant excess of low-mass objects relative to the field IMF. Instead, the observed flattening of the IMF below ~0.03 MSun may reflect suppressed formation or reduced survival of substellar objects under the intense radiation and high stellar densities of Tr14. These results provide the first constraint on the substellar IMF in this cluster and offer insight into how environmental conditions may shape the low-mass end of the mass function.

Title: Hints of Disk Substructure in the First Brown Dwarf with a Dynamical Mass Constraint
Name: Santamaría Miranda, Alejandro
Type of contribution: talk

Abstract
We present high-resolution ALMA observations of the Class II brown dwarf 2MASS J04442713+2512164 (2M0444), one of the brightest and best-studied BD disks. Our 0.89 mm continuum and 12CO (3–2) line data reach a spatial resolution of 0.046? (~6.4 au), enabling the first dynamical mass measurement in the substellar regime from ALMA data. We constrain the central mass to 0.043–0.092 M?, confirming the object as a brown dwarf, and reveal a gas-to-dust disk size ratio >6, indicating efficient radial drift. Despite the expected loss of large grains due to drift, we detect tentative evidence for substructure in the dust continuum: a gap and ring pair at ~14–16 au, consistent with the presence of a dust trap. Visibility fitting with frank and galario supports this scenario. If caused by an embedded planet, the gap would be consistent with a low-mass (0.3–7.7 M?) rocky planet formed via core accretion. These results challenge current models of disk evolution and planet formation in the very low-mass regime. Our study opens a new window into the early evolution of brown dwarf disks and emphasizes the importance of high angular resolution to characterize their architecture.

Title: JWST Weather Report: Unraveling the atmospheric variability of Isolated Substellar Worlds using Principal Component Analysis
Name: Schrader, Merle Anna
Type of contribution: talk

Abstract
Understanding cloud evolution in substellar atmospheres is essential for interpreting spectral diversity across brown dwarf populations. The L/T transition marks a key evolutionary phase, associated with rapid changes in cloud structure and atmospheric dynamics. SIMP J013656.5+093347 (SIMP 0136) is a highly variable T2.5 dwarf that lies within this transition and exhibits both long-term brightness evolution and rotational spectral variability. Its atmospheric variability provides a unique opportunity to study cloud behaviour during this transitional stage. We analyze one full rotation of JWST/NIRSpec time-series spectroscopy of SIMP 0136 using Principal Component Analysis (PCA). PCA identifies the dominant spectral variability modes and defines a low-dimensional plane capturing the primary axes of variability. We track the spectral evolution across this plane over time. To interpret the physical meaning of this variability space, we project atmospheric forward models into it, recovering directions along which temperature, cloud sedimentation efficiency (f_sed), metallicity, and C/O ratio vary. This method allows a qualitative, model-informed interpretation of time-variable spectra and provides a framework for comparing atmospheric variability across L/T transition objects. This PCA-based approach is broadly applicable to current and future time-resolved spectroscopic datasets, offering a scalable method for characterizing substellar atmospheres across evolutionary stages.

Title: Unveiling Ultracool Dwarfs with Euclid and ATMO
Name: Sedighi, Nafise
Type of contribution: talk

Abstract
Ultracool dwarfs (UCDs) bridge the gap between stars and planets, offering key insights into substellar atmospheres, low-mass star formation, and free-floating planetary-mass populations. Historically, their low luminosities made them difficult to detect in large numbers. The ESA Euclid mission is now transforming this landscape. With wide-field, near-infrared spectroscopy (R ? 450, 1200–1900 nm) and high-resolution imaging, Euclid is delivering an unprecedented UCD dataset, revealing thousands of new objects across the sky. To fully exploit this, we present an updated grid of ATMO atmospheric models, spanning 200–3000 K, log g = 2.5–5.5, and [M/H] from –0.5 to +0.5. These models include both equilibrium and non-equilibrium chemistry and

improved opacities. Applying ATMO to early Euclid spectra, we extract key physical parameters and demonstrate the power of this synergy to characterize UCDs at scale. This work opens the door to large-scale population studies, offering fresh constraints on brown dwarf formation, evolution, and atmospheric processes.

Title: I Can See for Kiloparsecs: Surveying Ancient, Metal-Poor Brown Dwarfs at Large Vertical Distances from the Galactic Plane Using JWST
Name: Softich, Emma
Type of contribution: poster

Abstract
Ancient, metal-poor brown dwarfs in the local neighborhood are highly outnumbered by more recently formed, solar-metallicity objects. Only ~5% of local stars originate from the halo, and studies of the metal-poor thick disk and halo populations have poor constraints in the low-mass regime. This leads to an incomplete picture of how brown dwarfs in the oldest, most metal-depleted populations of the Milky Way formed and evolved. One means of building a statistically robust sample of old, metal-poor brown dwarfs is to look into the Galactic halo itself, at large vertical distances (~kpc) from the Galactic plane, a challenge given the significant faintness of these objects even in the infrared. Thanks to the infrared sensitivity of JWST, distant brown dwarfs are now being found and spectroscopically measured in growing numbers in deep JWST extragalactic surveys. In this poster, I report a sample of approximately 50 late M- through T-type brown dwarfs based on data obtained in the UNCOVER, JADES, CEERS, and RUBIES surveys, among others. I present initial characterization and analysis of their atmospheres and a first estimate of the spatial density of low-mass stars and brown dwarfs beyond 1 kpc.

Title: DUNE: A new infrared exoplanet hunter
Name: Suárez Mascareño, Alejandro
Type of contribution: talk

Abstract
Performing astronomy from ground-based observatories on Earth is limited by the filtering and distortion of electromagnetic radiation (scintillation or twinkling) due to the atmosphere. By avoiding the Earth's atmosphere, space observatories open the possibility of reaching much higher precision in photometry. DUNE will be an exoplanet-focused space observatory capable of performing high-precision photometry in the near-infrared. It will use a 24 cm primary mirror, with a 30' FOV, to project the light into an extended InGaAs detector, with a resolution of 1.7"/pixel, covering a wavelength rage of 500-1700 nm. The telescope will be mounted on a platform to achieve high-precision pointing (up to 2" RMS). DUNE will perform sub-mmag photometry of stars up to Jmag 13, making it capable of obtaining a 5 sigma detection of an Earth-size planet orbiting a mid M-dwarf up to 20 pc, or a late M-dwarf up to 13 pc, in a single transit. In addition, its infrared capabilities will open the possibility of detecting transits of Earth-size planets orbiting brown dwarfs. The project, currently in phase B, is aiming for a launch in 2030.

Title: Probing the ultracool dwarf population around the Horsehead nebula
Name: Tsilia, Styliani
Type of contribution: talk

Abstract
Recent Euclid Early Release Observations have revealed ultracool dwarf (UCD) candidates down to ~4 MJup in the ? Orionis cluster, which is a young (~3 Myr), nearby (~400 pc) star-forming region. The high-reddening areas of the same Euclid field —shaped by the edge of the Orion B molecular cloud, including the Horsehead Nebula— remain largely unexplored in Euclid data. These dusty zones include active star formation sites and may host an embedded, very young low-mass population potentially connected to nearby regions such as NGC 2023. This work focuses on extending substellar searches into these complex environments using Euclid photometry in combination with ancillary optical and infrared data. By refining benchmark-based color–magnitude selection criteria, we aim to identify new UCD candidates in regions with strong background emission and variable extinction. Preliminary results indicate the presence of new UCD candidates in this region, supporting the scenario of recent or ongoing substellar formation. This embedded population shows spatial clustering and density enhancements compared to the low-reddening field. These findings point to a potentially distinct formation mode in the dusty outskirts of ? Orionis, where star formation might be influenced by the expanding ionization front and molecular cloud interaction. The characterization of this population will provide input for understanding the role of feedback and local cloud structure in shaping the substellar IMF.

Title: Present and future of high-resolution spectroscopy of exoplanets around ultracool dwarfs
Name: Varas, Roberto
Type of contribution: talk

Abstract
Ultracool dwarfs (UCDs) include M-dwarfs later than M6.0 and extend into the sub-stellar regime (Martín et al. 1999; Reid et al. 2001; Hurt et al. 2024). These objects are fully convective, very faint in the optical – their emission peaks in the near-infrared –, often magnetically active, and typically fast rotators. Because of their low mass, UCDs are especially interesting for exoplanetary studies (Sabotta et al. 2021; Kaminski et al. 2025); smaller planets can be found close to the star, and the habitable zone is also closer to the star due to their low temperature. Nevertheless, only four systems have been confirmed. We present the CARMENES NIR channel RV precision improvement after the upgrades of CARMENES-PLUS (R. Varas et al. 2025). Our work focuses now on the pipeline reduction (serval) optimisation for these challenging objects, by extracting the most RV information possible from the CARMENES spectral orders. This results in a significant decrease in the number of CARMENES observations needed to detect companions around ultracool dwarfs. Based on the empirical data and results coming from CARMENES and other instruments, we can estimate the capabilities of present and future facilities that have and

will have significant time dedicated to search for earth-like planets around ultracool dwarfs, such as CARMENES, ANDES and MARCOT. This will help to understand the occurrence rate of exoplanets around UCDs, also giving constraints to planet formation models.

Title: Photometric Ultracool dwarf catalogue in Euclid's Q1 data release
Name: Žerjal, Maruša
Type of contribution: talk

Abstract
Euclid's unprecedented photometric and spectroscopic capabilities allow search for ultracool dwarfs over a wide area of the sky. I will present the first photometric catalogue of ultracool dwarf candidates in Euclid's Q1 data release. Many of them have been spectroscopically confirmed using Euclid's spectra, and serve as a reference set to determine photometric properties of ultracool dwarfs in Euclid.

Title: Detection of methane and metallicity constraints on the nearest extreme T subdwarf
Name: Zhang, Jerry
Type of contribution: talk

Abstract
We recently improved the NIR spectrum of the benchmark extreme T subdwarf WISE1810-1010 and successfully detected methane in the atmosphere, which is thought to be absent. Using ATMO2020++ model and the H-band methane feature, the metallicity of this object can be constrained to an unprecedented precision of +/-0.2 dex. We claim that this approach can be used for all the metal-poor T dwarfs.

Title: Spectral Classification of Brown Dwarfs Across the Full Metallicity Range
Name: Zhang, Zenghua
Type of contribution: talk

Abstract
In this talk, I will provide a concise review of spectral classification methods for field brown dwarfs. I will then discuss the classification and characterization of L subdwarfs. Finally, I will present our latest research on the classification and characterization of T subdwarfs, highlighting key findings and their implications for our understanding of metal-poor brown dwarf populations.
