Elbereth conference 2026

Rapport sur les contributions

https://indico.in2p3.fr/e/37758

ID de Contribution: **104** Type: **Non spécifié**

Gravitational radiation-reaction in compact binary systems at 4.5 post-Newtonian order in harmonic coordinates

vendredi 10 avril 2026 15:15 (15 minutes)

Compact binaries are the primary sources of gravitational waves observed by gravitational-wave detectors. In this context, obtaining the equations of motion in different approximation schemes is essential for producing waveform templates with the accuracy required by future detections. In this presentation, I review the post-Newtonian (PN) famework for compact binaries and discuss the derivation of the gravitational radiation-reaction force at 4.5PN order of general relativity. This represents a significant improvement, as harmonic coordinates are unique, provide a manifestly Lorentz-invariant formulation, and offer a much simpler expression than the Burke-Thorne coordinates in which the radiation-reaction was originally derived. This result also enables comparisons with other approximation schemes (such as post-Minkowskian) at 4.5PN order.

Discribe your work field

Compact binaries, General Relativity, Gravitational Waves

Auteur: SERAILLE, Emeric (LPENS)

Orateur: SERAILLE, Emeric (LPENS)

Classification de Session: Talk PhD Student

ID de Contribution: **107** Type: **Non spécifié**

Bayesian Inference with Differentiable Simulators for the Joint Analysis of Galaxy Clustering and CMB Lensing

vendredi 10 avril 2026 10:00 (15 minutes)

We present our work towards a field-level inference (FLI) pipeline for the joint analysis of DESI galaxy clustering and CMB lensing from Planck and ACT. Using synthetic data, we demonstrate an end-to-end Bayesian framework that jointly samples the posterior of the initial density field, galaxy bias, and cosmological parameters (Ω_m, σ_8).
Our differentiable forward model propagates Gaussian initial conditions through Lagrangian Perturbation Theory (2LPT), applies a Lagrangian bias expansion, and computes CMB lensing convergence along the LOS via the Born approximation. The joint likelihood combines galaxy number density with the convergence map observations, incorporating Planck PR4 reconstruction noise and analytically marginalizing over the unmodeled high-z lensing contribution beyond the simulation volume.
We demonstrate efficient exploration of the high-dimensional posterior using the MCLMC sampler. Preliminary results suggest that the joint analysis tightens parameter constraints. This work is a step toward applying FLI to real data to constrain large-scale physics, such as (local) primordial non-Gaussianity.

Discribe your work field

Field-Level Inference, CMB Lensing, DESI, Forward Modeling

Auteur: HAWLA, Jonathan

Orateur: HAWLA, Jonathan

Classification de Session: Talk PhD Student

ID de Contribution: **108** Type: **Non spécifié**

Extracting cosmology and baryonic physics from the cross-correlation between the CMB and Euclid probes

jeudi 9 avril 2026 11:00 (15 minutes)

The **cosmic microwave background (CMB)** traces the matter distribution through the imprints left by its interactions with **large-scale structure**. Together, the CMB and large-scale structure probes provide complementary insights into the matter distribution at different epochs of the Universe. Their distinct theoretical modelling and observational systematics make **cross-correlations** between them a particularly powerful probe.

More specifically, I will present how we can highlight and extract information about the underlying **cosmology** and **baryonic physics** thanks to the cross-correlations between the **thermal Sunyaev–Zel'dovich (tSZ)** effect and **Euclid observables** (galaxy clustering and weak gravitational lensing). The tSZ signal, originating from the CMB, is sensitive to the integrated thermal pressure of hot gas in the Universe. The galaxies trace the collapsed matter distribution, and the weak gravitational lensing reveals the total matter distribution along the line of sight.

Discribe your work field

cosmology, CMB, large scale structure, galaxies, baryonic physics

Auteur: Mme DUMILLY, Léa (Institut d'Astrophysique Spatiale)

Orateur: Mme DUMILLY, Léa (Institut d'Astrophysique Spatiale)

Classification de Session: Talk PhD Student

ID de Contribution: **109** Type: **Non spécifié**

Updating the Abell cluster catalog with new spectroscopic redshifts

mercredi 8 avril 2026 15:45 (15 minutes)

The Abell catalog is one of the most widely used catalogues of galaxy clusters and remains a key reference for studies of the low redshift Universe(z<0.2). However, a significant fraction of Abell clusters lack reliable redshift measurements, despite the availability of extensive modern spectroscopic galaxy surveys.
We present a method to estimate redshifts for Abell clusters using spectroscopic data from the Sloan Digital Sky Survey (SDSS) and the Dark Energy Spectroscopic Instrument (DESI). The method analyses the redshift distributions of galaxies within a projected radius of 1.5 Mpc around each cluster and identifies candidate redshift peaks. The most probable cluster redshift is selected based on the spatial concentration of galaxies relative to the Abell position. We show that the method performs well when tested on clusters with known redshifts and provides reliable redshifts for a large number of Abell clusters that did not previously have them.

Discribe your work field

Cosmology - Galaxy Clusters - Redshifts

Auteur: TANNOUS, Halim (CEA Paris-Saclay)

Orateur: TANNOUS, Halim (CEA Paris-Saclay)

Classification de Session: Talk PhD Student

ID de Contribution: **111** Type: **Non spécifié**

Gravitational lensing beyond the eikonal approximation

mercredi 8 avril 2026 15:30 (15 minutes)

Waves propagating through a gravitational potential exhibit wave-optics effects when their wavelength is not significantly smaller than the lensing scales. We study the propagation of a scalar wave, governed by the Klein-Gordon equation in curved spacetime, to focus on effects on amplitude and phase, while leaving aside the issue of wave polarization which affects electromagnetic and gravitational waves. Using the Newman-Penrose formalism, we obtain the first corrections beyond the geometric optics in the expansion in the inverse frequency. In vacuum, that is for Weyl tensor lensing, there is no wave effect at first order in G and wave effects start at order G^2. Conversely, if the wave travels through a non-vanishing matter density, the first corrections start at order G. We check these analytic results by solving numerically the equations dictating the evolution of the corrections either in the vicinity of a Schwarzschild black hole or through a transparent star.

Discribe your work field

General relativity, Gravitationnal waves

Auteur: BRUYERE, Emma (IAP)

Orateur: BRUYERE, Emma (IAP)

Classification de Session: Talk PhD Student

ID de Contribution: **112** Type: **Non spécifié**

Search of Primordial asteroids in the main belt using Gaia Spectral Catalog

mercredi 8 avril 2026 14:45 (15 minutes)

Spectrally red and featureless asteroids, taxonomically classified as D-, P-, T-, and Z-type in Bus-DeMeo and Mahlke taxonomies [1,2], have traditionally been found in the Jupiter's Trojans, Cybele, and Hilda. It is thought that they have an organic rich surface. They are thought to have formed in the outer Solar System [3]. A few have been detected in the main belt, including the inner one [4,5,6]. Using the Gaia Data Release 3 (DR3), we have analyzed bodies we classified as D-, Z-, or P-types, as well as the Cybele and Hilda populations as a whole.
The Gaia DR3 spectral catalog references 60.518 spectra of asteroids in the visible [7], where each spectrum is the average of several observations acquired at different epochs. The spectra are composed of 16 spectrophotometric points in the 0.37 - 1.03 micrometers wavelength range. We first did a pre-selection of the spectra by computing the signal-to-noise ratio (SNR), and kept only objects with SNR>20. In order to detect the D-, Z-, and P-types in the main belt, we applied a first automatic classification and kept the two "best fits", across all the objects in the main belt present in the catalog. Those that had a D-, Z-, or P-types were put aside. Then, we applied constraints on the albedo (dark objects) and the spectral slope (high slope for D- and Z-, or moderate slope for P-types). From this potential list, we visually inspected each object in order to give a final classification.
We have found in the main belt 318 D-types, 124 Z-types, and 265 P-types. D- and Z-types tend to be smaller and brighter in the inner belt than in the rest, which can hint at an implantation process through collisions or Yarkovsky effect.
We have analyzed 193 objects in the Hilda, and 180 in the Cybele. Both the Cybele and Hilda present a bimodal spectral slope distribution, and are dominated by D- and P-types. Moreover, in those populations, P-types are on average larger than D-types suggesting a more robust material.
We also drew a comparison between our total dataset and comets, by computing the Tisserand parameter. It is possible that some of those objects might have cometary origins (extinct comets for example), especially in the Hilda.

Acknowledgement : This work has received support from France 2030 through the project named Académie Spatiale d'Île-de-France (https://academiespatiale.fr/) managed by the National Research Agency under bearing the reference ANR-23-CMAS-0041, as well as the Centre National d'Etude Spatial (CNES).

References :

[1] DeMeo et al. (2009), Icarus, 202, 160-180
[2] Mahlke et al. (2022),A&A, 665, A26
[3] Levison et al. (2009), Nature, 460, 7253, 364-366.
[4] DeMeo et al. (2014), Icarus, 229, 392-399.
[5] Gartrelle et al. (2021), Icarus, 363.
[6] Humes et al. (2024), PSJ, 5,3, 80.
[7] Gaia Collaboration (2023), A&A, 674, A35.
[8] Lantz et al. (2017), Icarus, 285, 43-57.

Discribe your work field

Asteroids, Surface, Spectrophotometry

Auteur: EL-BEZ-SÉBASTIEN, Noémie (Observatoire de Paris - LIRA)

Co-auteurs: M. SEURAT, Antoine (Paris Saclay); Dr WARGNIER, Antonin (JAXA); Dr FORNASIER, Sonia (Paris Cité - Observatoire de Paris)

Orateur: EL-BEZ-SÉBASTIEN, Noémie (Observatoire de Paris - LIRA)

Classification de Session: Talk PhD Student

ID de Contribution: **113** Type: **Non spécifié**

Turning JWST/MIRI backgrounds into a survey of diffuse molecular hydrogen

vendredi 10 avril 2026 14:45 (15 minutes)

Understanding the formation, excitation and survival of H_2 requires a statistically representative observational dataset. To complement the ancillary detections of rotational lines in both emission and absorption, we analyzed the background observations of the JWST: from the roughly 1.8 million files in its database across all instruments and objects observed, we identified a sample of 276 MIRI-MRS backgrounds corresponding to pure diffuse ISM. Systematic inspection of the obtained spectra reveals widespread H_2 emission throughout the Galaxy. We report the first detections in emission of the S(4), S(5) and S(7) pure rotational lines in the diffuse gas, with detection rates of up to 42% for the S(1) line. The data is then analyzed in relation to the column densities of H and H_2 and dust emission derived from HI4PI, Planck, and WISE data, uncovering:
(I) a specific decreasing law of maximal integrated intensity with galactic latitude,
(II) robust constraints on the excitation conditions of H_2 through correlations between the T_{34} and T_{35} excitation temperatures and the column density of H_2,
(III) a previously unknown yet remarkably constant cooling rate per hydrogen atom for the S(1) line past the H-to-H_2 transition of around 4.10^{-27} erg s^{-1} H^{-1}.
Thanks to its high sensitivity and the amount of already-available JWST data, the statistical sample of H_2 rotational excitation in the diffuse ISM has been expended by leveraging otherwise set-aside observations, both complementing and strengthening the absorption measurements and their interpretations.

Discribe your work field

Methods: observational, ISM:H2 molecules, Techniques: spectroscopy

Auteur: Mme NIGOU, Emma (LPENS)

Co-auteurs: M. GODARD, Benjamin (LPENS / Obs. Paris); M. PINEAU DES FORÊTS, Guillaume (Obs. Paris / IAS); M. MIVILLE-DESCHÊNES, Marc-Antoine (LPENS); M. GUILLARD, Pierre (IAP); M. LESAFFRE, Pierre (LPENS)

Orateur: Mme NIGOU, Emma (LPENS)

Classification de Session: Talk PhD Student

ID de Contribution: **115** Type: **Non spécifié**

New Constraints from Complex Stellar Oscillation Patterns

mercredi 8 avril 2026 12:00 (15 minutes)

Through Asteroseismology, the study of stellar oscillations, we probe stellar interiors through their surface vibration patterns. These oscillations are described by several quantum numbers; in particular, the angular degree ℓ characterises the geometry of the oscillation on the stellar surface. In evolved solar-like stars, dipolar ($\ell = 1$) modes have revealed that stellar cores rotate much more slowly than predicted by hydrodynamical simulations, pointing to missing angular momentum transport mechanisms, which are essential to accurately infer stellar ages.
Quadrupolar ($\ell = 2$) modes, which sample the stellar interior in a different way than dipolar modes, have so far remained largely underexploited. This is due to their lower signal to noise and to distorted rotational signatures caused by near-degeneracy effects, which occur when oscillation modes with similar frequencies interact and no longer behave independently.
In this talk, I present a new analytical description of $\ell = 2$ modes that explicitly accounts for near-degeneracy effects on mode frequencies, enabling modelling of asymmetric rotational splittings without relying on numerical stellar models. Applied to two NASA *Kepler*-mission stars, this framework allows us to identify and fit near-degenerate $\ell = 2$ mixed modes, recover precise core and envelope rotation rates, and place stronger constraints on the internal rotation profile than was possible using $\ell = 1$ modes alone. This work paves the way to the novel and automated use of $\ell = 2$ mixed modes, providing improved observational benchmarks to enhance our understanding of the angular momentum redistribution in stars as they evolve.

Discribe your work field

Asteroseismology-rotation-data analysis

Auteur: LIAGRE, Bastien

Co-auteurs: M. DESAI, Aayush (ISTA); Dr BUGNET, Lisa (ISTA); M. EINRAMHOF, Lukas (ISTA)

Orateur: LIAGRE, Bastien

Classification de Session: Talk PhD Student

ID de Contribution: **117** Type: **Non spécifié**

Optical concept model of the future cosmology project BISOU

vendredi 10 avril 2026 10:15 (15 minutes)

We present an optical analysis of BISOU (Balloon Interferometer for Spectral Observations of the primordial Universe), a future balloon-borne pathfinder instrument developed as part of a preparatory study for a future space mission. The last and only measurement of the cosmic microwave background (CMB) spectrum was performed by COBE-FIRAS in 1991, showing that it is close to a perfect blackbody emission. However, small deviations, referred to as CMB spectral distortions, are expected, but due to its limited sensitivity, FIRAS could only provide upper limits. The scientific aim of BISOU is to perform the first measurement of one of these monopole CMB spectral distortion, while providing newer upper limits for the others. In addition, BISOU will allow for a much better characterisation of the Cosmic Infrared Background (CIB).

The BISOU optical system is based on a polarizing Fourier Transform Spectrometer (FTS) that receives inputs from both a sky-facing telescope and an internal calibration source. The FTS focal planes are equipped with bolometric detectors coupled to multimode feed horns, with separate focal planes dedicated to the low- and high-frequency bands covering the 90–1500 GHz range. During the CNES Phase A study, a laboratory breadboard of the instrument is being developed at the Institut d'Astrophysique Spatiale (IAS), enabling the characterization of subsystems and systematic effects, particularly in the optical system.

Our optical analysis begins with ray-tracing simulations to establish the overall system layout, followed by more advanced Gaussian beam and physical optics analyses to refine the design and achieve a realistic modeling of the instrument's performance. The optical configuration has been optimized considering key constraints such as size and thermo-mechanical limitations. We present the current concept and simulation results for co- and cross-polarization beam performance, including beam ellipticity, as well as the remaining steps needed to finalize the design and prepare for breadboard implementation.

Discribe your work field

Cosmology Instrumentation Optics

Auteur: LOQUET LE GALL, Morgane (IAS)

Orateur: LOQUET LE GALL, Morgane (IAS)

Classification de Session: Talk PhD Student

ID de Contribution: **119** Type: **Non spécifié**

Magnetic Activity Signatures of Spin-Down Stalling in Wide Binary Stars

mercredi 8 avril 2026 12:15 (15 minutes)

Stellar magnetic activity is generated by the interplay of rotation and convection. As they age, stars spin down and become less active. This was thought to be a monotonic behavior, but the *Kepler* mission revealed a phase of stalled spin-down, during which the rotation period remains nearly constant and magnetic activity appears enhanced. In this work, we investigate the signature of spin-down stalling in the magnetic activity of wide binaries. Comparing co-eval stars on either side of the transition allows us to study magnetic activity changes, independent of age and composition. We analyze a sample of 372 wide binaries observed by NASA *Kepler* and K2 missions, for which we recover rotation periods, magnetic activity indexes, and Rossby numbers, defined as the ratio of the rotation period to the convective turnover time. We compare their rotation–activity–color distributions to those of the full *Kepler* field population. First results show that wide binaries follow the overall distribution of rotation and magnetic activity. In addition, a subset of binaries crosses the gap, showing evidence of post-transition enhanced activity, which supports a change in magnetic activity regime. This study will help better understanding stellar evolution, as well as the environment around the stars.

Discribe your work field

Magnetic activity, Stellar rotation, Stellar evolution, Wide binary stars

Auteur: BORG, Lina (Université Paris Cité, Université Paris-Saclay, CEA, CNRS, AIM)

Co-auteurs: Dr SANTOS, Ângela R. G. (Université Paris-Saclay, Université Paris Cité, CEA, CNRS, AIM); Dr GARCÍA, Rafael A. (Université Paris-Saclay, Université Paris Cité, CEA, CNRS, AIM); Dr PALAKKATHARAPPIL, D.B. (Université Paris-Saclay, Université Paris Cité, CEA, CNRS, AIM)

Orateur: BORG, Lina (Université Paris Cité, Université Paris-Saclay, CEA, CNRS, AIM)

Classification de Session: Talk PhD Student

ID de Contribution: **120** Type: **Non spécifié**

Probing the Intergalactic Magnetic Field with Gamma-Ray Observations

mercredi 8 avril 2026 09:45 (15 minutes)

Our Universe is permeated by magnetic fields across a vast range of scales. The key to the origin of cosmic magnetism may lie in the emptiest regions of the Large Scale Structure, called the cosmic voids, where primordial fields from the early Universe are expected to have remained intact. The strength of this weak Intergalactic Magnetic Field (IGMF) can be constrained from below by observations of specific active galactic nuclei called blazars. The latter have jets pointing at the observer that produce high-energy gamma-rays which deposit electron-positron pairs in the intergalactic medium. These pairs are deflected by the IGMF, leading to a suppression of the secondary photon flux produced by inverse Compton scattering. The absence of this flux in current observations allows us to put a lower limit on the strength of the IGMF.
In this talk, I will introduce the motivations and methods behind the IGMF studies. I will present a revision of conservative lower bounds on the IGMF using joint observations from the Fermi Large Area Telescope (LAT) and ground-based Cherenkov telescopes, resulting in a lower limit of $B \simeq 2 \times 10^{-17}$ G. I will then discuss on the importance of the instrumental modelling, specifically the modelling of Fermi-LAT Point Spread Function (PSF) with pulsars and its impact on the study of extended emission around sources. Finally, I will outline further investigations and improvements for IGMF studies including the role of next-generation gamma-ray telescopes and cosmological simulations.

Discribe your work field

Magnetic field - Gamma-rays - Numerical methods

Auteurs: BLUNIER, Jeffrey (APC); NERONOV, Andrii (APC, EPFL); SEMIKOZ, Dmitri (APC)

Orateur: BLUNIER, Jeffrey (APC)

Classification de Session: Talk PhD Student

ID de Contribution: **121** Type: **Non spécifié**

Do Little Red Dots form a distinct class of astronomical objects?

mercredi 8 avril 2026 12:45 (15 minutes)

One of the most intriguing discoveries of the James Webb Space Telescope (JWST) has been the identification of the so-called Little Red Dots (LRDs). Since their discovery a few years ago, the community has tried to determine the dominant physical mechanisms driving these high-redshift sources, which exhibit three key observed properties:

- **Compact morphology**,
- **Red rest-frame optical and blue UV continuum** (V-shaped SED),
- **Broad Balmer lines** (Hα / Hβ).

Until early 2025, LRDs were primarily interpreted as either massive star-forming systems or dusty active galactic nuclei (AGNs). However, the discovery of two extreme LRDs challenged these interpretations, leading to the emergence of a new paradigm: the BH* model. In this talk, we will explore whether LRDs constitute a **distinct class of astronomical objects**, as suggested by this new paradigm, and address the potential **heterogeneity within the LRD "population"**.

Discribe your work field

Galaxy formation - Galaxy evolution - AGNs

Auteur: BILLAND, Jean-Baptiste (CEA-SACLAY)

Orateur: BILLAND, Jean-Baptiste (CEA-SACLAY)

Classification de Session: Talk PhD Student

ID de Contribution: **123** Type: **Non spécifié**

The Roman Coronagraph Instrument: paving the technological path toward Earth-like exoplanet detection

vendredi 10 avril 2026 12:45 (15 minutes)

Research aimed at obtaining images and characterizing Earth-like exoplanets requires a step forward toward extreme planetary-to-stellar flux ratios, a regime currently inaccessible to ground-based observatories due to atmospheric turbulence. The Coronagraph Instrument (CGI) on the Roman Space Telescope serves as a critical technology demonstrator between current state-of-the-art ground-based performance and the ambitious goals of the future Habitable Worlds Observatory (HWO). By validating the first space implementation of focal plane high-order wavefront control, Roman will pave the way for the potential future detection of an Earth-like exoplanet.

This presentation provides an overview of the CGI instrument, describing the main active correction principles that will be used after the instrument's launch into space, scheduled for late 2026. We will present the active wavefront control system, a closed-loop between Earth and the telescope, a technological prowess sent into space for the very first time.

Discribe your work field

Exoplanets, High-contrast imaging, High-order wavefront sensing and control

Auteur: DELAYE, Lukas (LIRA, Observatoire de Paris)

Co-auteurs: MAZOYER, Johan (LIRA, Observatoire de Paris); POTIER, Axel (LIRA, Observatoire de Paris)

Orateur: DELAYE, Lukas (LIRA, Observatoire de Paris)

Classification de Session: Talk PhD Student

ID de Contribution: **124** Type: **Non spécifié**

Probing Cosmic Web Structures with Generative Models

mercredi 8 avril 2026 12:30 (15 minutes)

The cosmic web, consisting of an intricate network of voids, filaments, walls, and clusters, contains key information about cosmological parameters and the evolution of large-scale structures in the universe. In this context, very large ensembles of cosmological simulations are required to analyse upcoming galaxy survey data. To circumvent the associated computational cost, we aim at constructing a generative diffusion model to emulate the cosmic web while preserving its statistical properties. In this context, we explore how self-attention maps, which are learnt neural network features embedded within the diffusion model, can offer a new way to probe the underlying structure of the cosmic web. In addition to emulating high-fidelity simulations, our approach could also provide a quantitative assessment of the performance of generative models.

Discribe your work field

Cosmic web, Large-scale structure, Diffusion models

Auteur: NOOR, Mehdi (Institut d'Astrophysique Spatiale)

Orateur: NOOR, Mehdi (Institut d'Astrophysique Spatiale)

Classification de Session: Talk PhD Student

ID de Contribution: **125** Type: **Non spécifié**

Modeling coronagraphic Observations with JWST/MIRI –Application to the debris disk HD181327

vendredi 10 avril 2026 14:30 (15 minutes)

Direct imaging of exoplanets is challenging due to the high contrast with their host stars and their small angular separations. The coronagraphs of MIRI on board the James Webb Space Telescop (JWST) offer a new opportunity to observe young exoplanetary systems at mid-infrared wavelengths, while preserving high-contrast imaging and angular resolution. In the mid-infrared range we expect better sensitivity than in the near-infared to detect protoplanets and circumplanetary disks (CPDs) in young systems, although the opacity of CPDs can reduce the luminosity of the embedded planets. To date, only a few young systems hosting protoplanets have been robustly detected in the near-infrared with the VLT/SPHERE (PDS 70 b & c,WISPIT 2b).
However, a new challenge arises from the thermal emission of the circumstellar disk (CSD) in these systems, and more specifically warm dust components in the inner regions (~10au) which are poorly resolved by MIRI. As a result, their image is dominated by the diffraction. To address this issue, we have developed a pipeline that combines DDiT+ thermal emission models with STPSF to simulate the JWST/MIRI 4QPM coronagraphic response.
We present the application of this method to the HD181327 debris disk, which was observed with MIRI as part of PID#3662. For the first time, we observe an inner disk, undected with ALMA and VLT/SPHERE, at ~20 AU, as well as formerly known planetesimals belt at ~85-90 AU. In a next step, this pipeline will be used to analyse coronagraphic images of younger systems where the central emission from the CSD is even more problematic to detect protoplanets and CPDs.

Discribe your work field

image processing - high angular resolution - debris disk

Auteur: COURTOUX, Margot (LIRA - Observatoire de Paris (Meudon))

Orateur: COURTOUX, Margot (LIRA - Observatoire de Paris (Meudon))

Classification de Session: Talk PhD Student

ID de Contribution: **126** Type: **Non spécifié**

Kinetic Inductance Detectors for Line Intensity Mapping

jeudi 9 avril 2026 09:30 (15 minutes)

Antenna-coupled Microwave Kinetic Inductance Detectors (MKIDs) represent a promising approach for developing polarization-sensitive detectors for future cosmic microwave background experiments. However, initial measurements of our first-generation devices revealed a very low-quality factor, which we believe may stem from readout power leakage occurring within the microstrip-to-coplanar coupler.
For this reason, we chose to develop a fully coplanar spectrometer MKID.
In this work, we present the design of a back shorted dual quarter wavelength spectrometer.

Discribe your work field

Superconductivity, Resonator, Spectrometer

Auteur: TAGNON, Paul (APC, CNRS)

Orateur: TAGNON, Paul (APC, CNRS)

Classification de Session: Talk PhD Student

ID de Contribution: **127** Type: **Non spécifié**

Inferring 3D shapes and measuring intrinsic alignments from projected images of galaxies with UNIONS

mercredi 8 avril 2026 10:00 (15 minutes)

Galaxies are subject to intrinsic alignments, which correspond to the correlations between their 3D shapes and orientations and the underlying tidal field of dark matter across the large-scale structure of the Universe. This intrinsic galaxy alignment is traditionally measured with the two-point galaxy-density correlation function projected in the sky plane. However, the projection of 3D shapes introduces an important loss of information about the alignment along the line of sight. In this talk, I will present a novel method that recovers this information by inferring the distribution of 3D galaxy shapes from the observed 2D images using likelihood-free simulation-based inference. I use the AbacusSummit N-body simulation to extract dark matter halos, in which galaxies are populated using a Halo Occupation Distribution (HOD) model. This simulation serves as model for imaging data from the Ultraviolet Near-Infrared Optical Northern Survey (UNIONS). UNIONS is a multi-band optical survey which is going to cover 6250 deg^2 in the Northern sky. I obtain constraints on the 3D galaxy-halo connection and on the distribution of 3D galaxy shapes from 4800 deg^2 of observed sky. The fitted model allows me to make a preliminary theoretical prediction of the intrinsic alignment, which is in good agreement with the data for Luminous Red Galaxies. My model can hence provide powerful constraints on the physical properties about the 3D morphology of the galaxies that plays a crucial role to understand intrinsic galaxy alignment.

Discribe your work field

Cosmology, large-scale structure, intrinsic alignments of galaxies

Auteur: CORINALDI, Antonin (CEA Paris-Saclay / AIM / CosmoStat)

Orateur: CORINALDI, Antonin (CEA Paris-Saclay / AIM / CosmoStat)

Classification de Session: Talk PhD Student

ID de Contribution: **128** Type: **Non spécifié**

Characterizing the atmosphere of HIP 67522 b with transmission spectroscopy

jeudi 9 avril 2026 17:00 (15 minutes)

The characterization of exoplanetary atmospheres is a key challenge in today's astrophysics and a rapidly expanding fields. Currently, due to instrumental limitations in resolution and contrast, detailed atmospheric information is primarily accessible for transiting exoplanets. During a transit, a fraction of the stellar radiation passes through the planet's atmosphere before reaching us, enabling the identification of atmospheric molecules via their absorption features.

Data processing in transit spectroscopy varies depending on the spectral resolution of the observations. Low-resolution spectra (LRS), obtained from space, and high-resolution spectra (HRS), obtained from the ground, probe different atmospheric layers and offer complementary advantages. This presentation will explain these two approaches in details and show how the combination between LRS and HRS in joint retrievals can improve contraints on the abundances of atmospheric molecules. I will present my work on the exoplanet HIP 67522 b, a fascinating target with an extended atmosphere. I will then explain how I plan to combine both approaches and describe the challenges associated with this combination.

Discribe your work field

exoplanet, data analysis, atmosphere

Auteur: CHABROL, Estelle (LIRA)

Co-auteurs: Dr DUCROT, Elsa (CEA); Dr VINATIER, Sandrine (LIRA)

Orateur: CHABROL, Estelle (LIRA)

Classification de Session: Talk PhD Student

ID de Contribution: **129** Type: **Non spécifié**

Combining the Euclid and Roman space missions to measure the mass of cold terrestrial planets

jeudi 9 avril 2026 17:15 (15 minutes)

The study of exoplanets beyond the snow line is essential to understand planetary formation mechanisms. In this context, gravitational microlensing is a particularly effective indirect detection method to identify cold and faint planets located at distances of approximately 1 to 10 AU from their host star. This work is part of the Nancy Grace Roman space mission, dedicated to the detection of exoplanets via gravitational microlensing. It aims to improve the mass measurement of terrestrial exoplanets detected through this method. The adopted approach combines the modeling of microlensing photometric light curves with the analysis of high-angular-resolution images obtained several years before or after the event peak. The lens mass–distance relations derived from these two analyses allow us to tightly constrain its physical parameters, such as the planetary mass.
This approach, which can also be applied to Euclid observations and future Roman surveys, will contribute to a better demographic characterization of cold exoplanets in the Milky Way.

Discribe your work field

Exoplanets - Microlensing - High-Resolution Image Analysis

Auteur: GILLES, Manon (Institut d'Astrophysique de Paris)

Co-auteurs: Dr RANC, Clément (Institut d'Astrophysique de Paris); Dr BEAULIEU, Jean-Philippe (Institut d'Astrophysique de Paris)

Orateur: GILLES, Manon (Institut d'Astrophysique de Paris)

Classification de Session: Talk PhD Student

ID de Contribution: **130** Type: **Non spécifié**

Characterizing a 4.9 µm feature on trans-Neptunian objects observed by JWST/DiSCo-TNOs

mercredi 8 avril 2026 15:00 (15 minutes)

Trans-Neptunian objects (TNOs) are icy relics of planet formation orbiting beyond Neptune. They are valuable tools for understanding the conditions of the protoplanetary disk and the evolutionary mechanisms that shaped the outer Solar System.

In this study, we examine the possible molecular carriers responsible for the 4.9 µm feature detected in TNOs observed as part of the DiSCo-TNOs James Webb Space Telescope program. We analyze the band's profile, width, and central wavelength, and investigate how these spectral characteristics vary among the distinct compositional groups identified within the DiSCo-TNOs sample. Our preliminary results indicate that the 4.9 µm feature is strongest in TNOs that also display prominent CO_2 and CO ice absorptions, and that it cannot be attributed to a single molecular species. These findings have important implications for understanding the chemical and physical links between small bodies in the Solar System and their potential connections to interstellar material.

Discribe your work field

Observations, Spectroscopy, Astrochemistry

Auteur: CRYAN, Sasha (Institut d'Astrophysique Spatiale)

Orateur: CRYAN, Sasha (Institut d'Astrophysique Spatiale)

Classification de Session: Talk PhD Student

ID de Contribution: **131** Type: **Non spécifié**

Detailed Modeling of Stochastic Particle Acceleration and Multi-Messenger Emission in AGN Coronae

mercredi 8 avril 2026 10:30 (15 minutes)

Stochastic particle acceleration in magnetized turbulent plasmas, and its resulting multi-messenger signatures, has received increased attention in recent years. A detailed modeling of this process is however made complex by the need to treat simultaneously particle acceleration and radiative processes.

We present here a hybrid numerical code that couples AM3 [1], a state-of-the-art, open-source, time-dependent lepto-hadronic radiative modeling tool, with a particle acceleration solver based on a momentum-space transport equation. The acceleration module incorporates recent theoretical developments, in particular the non-linear feedback of accelerated particles on the turbulent cascade [2] and a generalized transport equation in momentum space to model particle acceleration in strong turbulence [3]. This new framework therefore enables a self-consistent modeling of particle acceleration and the associated multi-wavelength and multi-messenger emission, making it a powerful tool to study turbulence-driven acceleration and to produce predictive signatures for comparison with observations.

Recent observations by the Ice Cube collaboration of multi-TeV neutrinos associated with nearby Seyfert galaxies provide specific motivation for this tool [4]. The inferred neutrino flux is at least an order of magnitude larger than the photon flux at similar energies, indicating that neutrinos originate from a region opaque to γ-ray photons. A natural candidate for such an environment is the accreting corona surrounding the central supermassive black hole, where photo-hadronic interactions can occur between the intense radiation field and protons stochastically accelerated by turbulence [5].

Using the hybrid code, we model the coronal plasma including stochastic proton acceleration, feedback on the turbulent spectrum, interactions with the local photon field, and the flow dynamics. The model successfully reproduces the IceCube neutrino flux within a physically motivated corona scenario. This provides a self-consistent explanation for the neutrino emission from NGC 1068 and offers a general framework for studying turbulence-driven particle acceleration and multi-messenger signatures in other astrophysical sources.

[1] M. Klinger et al.: AM3: An open-source tool for time-dependent lepto-hadronic modeling of astrophysical sources, Astrophys.J.Supp. 275 (2024) 1, 4
[2] M. Lemoine, K. Murase, F. Rieger: Nonlinear aspects of stochastic particle acceleration, Phys. Rev. D109, 063006 (2024)
[3] M. Lemoine: First-Principles Fermi Acceleration in Magnetized Turbulence, Phys. Rev. Lett. 129, 215101 (2022)
[4] IceCube Collaboration: Evidence for neutrino emission from the nearby active galaxy NGC 1068, Science 378, 6619, 538-543 (2022)
[5] A. Das, T. Zhang, K. Murase: Revealing the Production Mechanism of High-Energy Neutrinos from NGC 1068, Astrophys.J. 972 (2024) 44

Discribe your work field

High Energy Astrophysics, Multi-Messenger Astrophysics

Auteurs: LE BIHAN, Sébastien (APC - CNRS,UPC); Dr LEMOINE, Martin (APC)

Orateur: LE BIHAN, Sébastien (APC - CNRS,UPC)

Classification de Session: Talk PhD Student

ID de Contribution: **132** Type: **Non spécifié**

SKYNET : a new model of galactic Supernova Remnants

vendredi 10 avril 2026 15:00 (15 minutes)

Supernova remnants (SNRs) are major drivers of turbulence in the Milky Way and play a central role in the exchange of mass and energy between the different phases of the interstellar medium (ISM). Yet, despite their importance, very few tracers of old, radiative SNRs have been identified, and their contribution to the global ionization of the ISM remains largely unquantified.

Following the identification of a potential tracer of old radiative SNRs (1), we performed detailed modeling of SNR evolution and their interaction with the surrounding medium using the Paris Durham shock code. The code was recently extended to compute the production of multi-ionized species, as well as both continuum emission and line emission across more than one million radiative transitions (2). To quantify the global impact of SNRs on the thermochemical state of the ISM and derive the statistical properties of potential tracers, we developed a Galaxy-wide distribution model that accounts for both core-collapse and thermonuclear supernovae, and incorporates key features such as spiral arms, Galactic flaring, and the variation of star formation rate, ambient density, UV radiation field, and magnetic field with galactocentric distance.

As a first application, the results of the model were compared with two infrared Galactic surveys of the fine-structure lines of N+ observed by COBE (3) and the Herschel Space Telescope (4). The analysis shows that SNRs make an unavoidable contribution to N+ emission along random lines of sight. Preliminary results indicate that at least 30% of the N+ in the Galaxy is produced by SNRs, primarily through collisional processes, suggesting that SNRs may be a significant source of ionization in Milky Way-like galaxies. This finding is remarkably robust, showing only a weak dependence on the specific parameters governing the SNR distribution.

(1) Godard, B., Pineau des Forêts, G., et al. 2024b, A&A, 689, A25
(2) Godard, B., Pineau des Forêts, G., et al. 2024a, A&A, 688, A169
(3) Bennett, C. L., Fixsen D. J., et al. 1994, ApJ, 434, 587
(4) Goldsmith, P. F., Yildiz, U. A., et al. 2015, ApJ, 814, 133

Discribe your work field

Interstellar medium, modeling, supernova remnants

Auteur: VIGOUREUX, Guillaume (ENS - LPENS)

Co-auteurs: M. GODARD, Benjamin (LPENS/Obs. Paris); M. GUSDORF, Antoine (LPENS/Obs. Paris); M. PINEAU DES FORÊTS, Guillaume (Obs. Paris/ IAS)

Orateur: VIGOUREUX, Guillaume (ENS - LPENS)

Classification de Session: Talk PhD Student

ID de Contribution: **133** Type: **Non spécifié**

Helium abundance in the solar corona with Solar Orbiter space mission

Because of its mass and abundance, helium plays a fundamental role in many astrophysical processes. The determination of the abundance of helium has consequences in a variety of fields including cosmology, stellar evolution models, or the study of the solar wind. However, if the properties of helium are characterized in the photosphere and in the solar wind, few observations exists in the corona of the star, where the still unexplained acceleration processes are taking place.

EUI and Metis on board the Solar Orbiter mission of the European Space Agency (launched in February 2020) are able for the first time map the spatial distribution of Helium in the solar corona by simultaneously observing the Lyman alpha lines of H0 et He+. IAS led the development of the EUI wide field imager and is collaborator of the Metis instrument. Preliminary analysis reveals bright structures located at the boundary between regions of open and closed magnetic field lines. Increases of temperatures are also measured in these areas. This morphology was unexpected, which shows that the existing models do not capture all the physics at play in the solar wind. In particular, these structures seem to be a signature of local helium abundance variations.

The aim of this thesis is to quantify these variations and to develop a coherent model of the solar wind propagation taking into account these new observational constraints. Building upon existing codes, it will be necessary to develop a comprehensive model of the coronal emission in the passband of the instrument. Then it will be interesting to compare our model to solar wind models.

Discribe your work field

Solar physics, plasma physics, solar wind

Auteur: GANESARATNAM, Ganushan (Institut d'Astrophysique Spatiale)

Co-auteurs: Dr AUCHÈRE, Frédéric (Institut d'Astrophysique Spatiale (Orsay/France)); Prof. BOCCHIALINI, Karine (Institut d'Astrophysique Spatiale (Orsay/France))

Orateur: GANESARATNAM, Ganushan (Institut d'Astrophysique Spatiale)

Classification de Session: Talk PhD Student

ID de Contribution: **134** Type: **Non spécifié**

First Look at Spatially Resolved H2 and AGN Feedback in BCGs with JWST/MRS

mercredi 8 avril 2026 14:15 (15 minutes)

Brightest Cluster Galaxies (BCGs) inhabit the deepest gravitational potential wells in the Universe and host extreme interstellar and circumgalactic environments, making them unique laboratories to study the interaction between the interstellar medium and active galactic nucleus (AGN) feedback. In cool-core clusters, some BCGs are surrounded by extended, multiphase filamentary structures whose molecular component remains poorly understood and appears largely unique to these systems, offering a new window into the ways AGN interact with and regulate their host galaxies.

Mid-infrared observations with Spitzer revealed exceptionally strong rotational H2 emission in several nearby BCGs, far exceeding that observed in normal star-forming galaxies, but lacked the spatial resolution needed to investigate its origin. JWST now enables these molecular filaments to be directly resolved.

In this talk, I present the first JWST/MIRI Medium Resolution Spectroscopy (MRS) IFU observations of warm molecular hydrogen in a sample of cool-core BCGs. These data provide unprecedented spatially resolved maps of H2 emission, allowing the distribution, excitation, and kinematics of the warm molecular gas to be explored for the first time. This work opens a new window onto AGN feedback in extreme environments and reveals filamentary molecular structures that were previously inaccessible to observation.

Discribe your work field

AGN, ISM, SF

Auteur: RIESCO, Clemente (Observatoire de paris)

Orateur: RIESCO, Clemente (Observatoire de paris)

Classification de Session: Talk PhD Student

ID de Contribution: **135** Type: **Non spécifié**

Looking for the onset of the RSG mass loss: VLTI imaging of Antares (alpha Sco)

jeudi 9 avril 2026 10:00 (15 minutes)

Red supergiant stars (RSG) are experiencing significant mass loss. It ultimately determines their late evolution into a type II supernova leading to a remnant that can be a neutron star or a black hole. Therefore, understanding the mass loss properties is key to predicting their final fate. Optical interferometry has previously shown that the surface of RSGs present prominent convective features. Further away from the photosphere, several direct images of RSG have revealed large clumps of dust in their surroundings, providing clear evidence of inhomogeneous mass loss. However, current radiative-hydrodynamics simulations of RSG fail to explain how such an amount of material leaves the star, although they do predict the strong convective activity. Antares, the closest RSG, is the ideal laboratory to better investigate the mass-loss phenomenon, its triggering mechanisms, and the processes by which material escapes from the star. Using a multi-epoch VLTI/GRAVITY dataset, we aim to link the convection on the star's photosphere to the material in the upper molecular layers, and ultimately unveil the physical mechanism that triggers mass loss.

Discribe your work field

evolved star, mass loss, convection, interferometry

Auteur: HAMEL, Lucie (LIRA observatoire de paris)

Orateur: HAMEL, Lucie (LIRA observatoire de paris)

Classification de Session: Talk PhD Student

ID de Contribution: **136** Type: **Non spécifié**

Hybrid radio and particle detection of air showers: potential for ultra-high-energy photon identification

mercredi 8 avril 2026 10:15 (15 minutes)

The autonomous radio-detection of extensive air showers initiated by ultra-high-energy (UHE) particles arriving with very inclined zenith angles has seen significant advancements in recent years, with several large-scale surface arrays planned and prototypes already in operation. Hybrid arrays combining radio antennas and scintillators, could serve as competitive UHE photon detectors. Indeed, for inclined showers, radio emissions can be detected by antennas for both cosmic-ray and photon primaries, while the muon-rich signatures of the former would typically trigger the scintillators. In this talk, I will show that effective separation between the two types of showers could be achieved in a hybrid radio antenna and scintillator setup, using two key observables —the total root mean square of the radio signal and the total energy deposit recorded in the scintillators. As a case study, I will apply this method to the layout of the prototype of the Giant Radio Array for Neutrino Detection (GRAND), GRANDProto300, complemented by Telescope Array-type scintillators. Such a hybrid array could set competitive upper limits on the integral photon flux in the energy range of 0.1 to 3 EeV, opening a yet uncharted territory for photon searches at UHE, by targeting very inclined air showers.

Discribe your work field

Cosmic rays, Gamma rays, Astro-particles, Radio detection

Auteur: MINODIER, Paul (Institut d'Astrophysique de Paris)

Orateur: MINODIER, Paul (Institut d'Astrophysique de Paris)

Classification de Session: Talk PhD Student

ID de Contribution: **137** Type: **Non spécifié**

Evolution of dust grain in the interstellar medium using simulations and JWST data

jeudi 9 avril 2026 11:30 (15 minutes)

Dense regions close to the star called Photo-Dominated Régions (PDR) are full-size laboratories, in which the physical conditions of matter vary a lot : density, temperature and irradiation. In this context, dust grains play a major role in the dynamics of the interstellar medium : they regulate the irradiation, the temperature of the gaz and can catalyse chemical reactions. Thus, knowing the local properties of the dust in the PDRs is crucial in understanding the local medium. My thesis focuses on the evolution of the dust grain in such a medium, by comparing different simulations of dust emission to real data, mainly JWST.

Discribe your work field

Interstellar Medium, Simulations, Grains, Data, JWST, MIRI, NIRCam

Auteur: BAYOURI, Lucas (IAS)

Orateur: BAYOURI, Lucas (IAS)

Classification de Session: Talk PhD Student

ID de Contribution: **138** Type: **Non spécifié**

Development of a New VLTI Instrument for high contrast exoplanet interferometry.

mercredi 8 avril 2026 17:30 (15 minutes)

Long baseline optical interferometry has become a powerful technique for probing astrophysical environments at angular separations beyond the reach of traditional direct imaging. Instruments such as VLTI/GRAVITY and VLTI/MATISSE have delivered landmark results, from characterizing the atmospheres of young giant exoplanets to resolving compact structures where planet formation, accretion, and disk-planet interactions occur.

We are now advancing this capability through the development of a new interferometric instrument operating in the J band. This addition will open a complementary near-infrared spectral window for exoplanet detection and characterization, providing higher angular resolution and access to key atmospheric and accretion tracers. Beyond its scientific reach, the instrument is conceived as a technological step forward, integrating improved metrology, enhanced phase stabilization, and optimized beam combination schemes to meet the demanding stability requirements of high-contrast interferometry at shorter wavelengths.

Discribe your work field

Instrumentation, exoplanets carachtarization, exoplanets formation

Auteur: BOUIKNI, Amira

Orateur: BOUIKNI, Amira

Classification de Session: Talk PhD Student

ID de Contribution: **139** Type: **Non spécifié**

Diffusion models to infer the density fields from SKA-Low maps

jeudi 9 avril 2026 14:30 (15 minutes)

When doing inference of cosmological fields, summary statistics are often used to compress simulations or images in order to analyse a lower dimensional dataset and thus decreasing the computational time of the analysis. However, in field-level inference, the entire cosmological field is used to extract information from it. With this method, besides constraining cosmological parameters, we can also recover the cosmological density distribution. Since the Squared Kilometre Array Observatory (SKAO) will be able to measure the brightness temperature map of the 21 cm line emitted during the Epoch of Reionization (EoR), in this project we use field-level inference to recover the matter density field from a mock observation of the EoR. For this purpose, we train diffusion models and we analyse the statistics of the generated density field, such as the power spectrum and high order moments, to evaluate the performance of the model.

Discribe your work field

Cosmology, Epoch of Reionization, Artificial Intelligence, Diffusion Models

Auteur: ALBANESE GUIDI, Pietro

Orateur: ALBANESE GUIDI, Pietro

Classification de Session: Talk PhD Student

ID de Contribution: **140** Type: **Non spécifié**

Exploring cosmic gas accretion : from cosmic filaments to galaxy clusters

jeudi 9 avril 2026 12:30 (15 minutes)

On large scales, matter flows from voids into filaments and then converges into clusters, the dense nodes of the cosmic web. The project aims to investigate the thermodynamics of gas transitioning from warm diffuse gas in filaments up to hot intracluster medium into clusters, by using advanced hydrodynamical cosmological simulations. Indeed, while gas in the core of a cluster tends toward hydrostatic equilibrium, conditions become multi-flow and highly inhomogeneous beyond the virial radius. We will focus on analyzing anisotropic gas accretion along filaments, with the goal of quantifying the detectability of key signatures in X-ray and SZ observations, such as warm gas clumps and diffuse gas filaments.

Discribe your work field

Galaxy clusters, Large scale structures, cosmic filaments

Auteur: PASTÉ, Jade (IAS / IAP)

Orateur: PASTÉ, Jade (IAS / IAP)

Classification de Session: Talk PhD Student

ID de Contribution: **142** Type: **Non spécifié**

Whole-Sun solar jet model to study switchback formation and properties

jeudi 9 avril 2026 15:00 (15 minutes)

Switchbacks, which are rapid magnetic field deflections first observed by the Parker Solar Probe, remain a puzzling phenomenon in solar wind physics. While their origins are still debated and several mechanisms are under study, recent work by Touresse et al., 2024 showed that a propagating solar jet can produce such magnetic deflections that can help in understanding switchback observations. We extend this investigation by developing new numerical experiments that intend to study the propagation of a self-induced coronal jet in a more realistic magnetic configuration including the whole 3D magnetic corona. The 3D MHD simulations rely on the Adaptive Refined MHD Solver (ARMS) code. After a relaxation phase, the jet is generated from a small bipolar active region located in an equatorial coronal hole. The system is energized by line-tied boundary motions. We present here the early results from these new simulations.

Discribe your work field

Solar Physics

Auteur: D'HERBOMEZ, Léa

Co-auteurs: PARIAT, Etienne; TOURESSE, Jade; ROMERO CASTAÑEDA, Jorge; MASSON, Sophie

Orateur: D'HERBOMEZ, Léa

Classification de Session: Talk PhD Student

ID de Contribution: **143** Type: **Non spécifié**

The importance of MIRI observations for the stellar mass function of z ≥ 5 galaxies

jeudi 9 avril 2026 14:15 (15 minutes)

The advent of the James Webb Space Telescope has opened up a window on the first billion years of the history of our Universe, allowing us to study large numbers of primordial sources for the very first time. The newly observed galaxy populations at high redshift are like we had never seen before: whether they are extremely bright, very massive or ultra-compact, these galaxies challenge our understanding of their formation and evolution. Before invoking a change of paradigms, however, it is worth considering how moving to high redshifts might affect our ability to measure the properties of these galaxies. Specifically, when going above redshift ~ 5 the rest-frame near-infrared emission of galaxies falls outside of the coverage of JWST's main imager, NIRCam. The resulting photometry of z > 5 sources will lack the rest-frame λ ~ 1 μm emission, which is known to best trace the bulk stellar mass of galaxies while also being less affected by dust attenuation; this leads to question the uncertainty of stellar mass estimates based on such observations. JWST/MIRI images, albeit less sensitive, provide the rest-frame near-infrared emission at higher redshifts, and can thus be used to better constrain galaxy masses (Wang+25). In this talk, I will present the results of the SED fitting of galaxies across different fields (JADES-GS, PRIMER, COSMOS-Web) using the BAGPIPES code, to explore the impact of adding the MIRI 5.6 μm and 7.7 μm bands on the final stellar mass estimate. We compare different models for the star-formation history (SFH) and dust extinction. To widen our sample to lower masses, we will use image stacking for the non-MIRI-detected galaxies. Finally, we use our results to better constrain the stellar mass function for galaxies at redshifts above 5.

Discribe your work field

massive galaxies, high z

Auteur: SANGALLI, Valentina (AIM - CEA Paris-Saclay)

Orateur: SANGALLI, Valentina (AIM - CEA Paris-Saclay)

Classification de Session: Talk PhD Student

ID de Contribution: **145** Type: **Non spécifié**

Impact of the large scale environment on galaxies properties

vendredi 10 avril 2026 14:15 (15 minutes)

There are now observational and simulated evidence that the cosmic web modulates galaxy properties. However, the measurements remain very noisy as soon as one bins by filament (or walls) since each of them only contains a handful of galaxies. To overcome this limitation, I will present in this talk a suite of cosmological simulations (in prep) that share the same large-scale structure while resampling the small scale, thus, allowing us to populate the same filament(s) and maximise the statistical signal.

Discribe your work field

Galaxy formation, Cosmic web, Cosmological simulation

Auteur: ERRACHDI, Sabri (Institut d'astrophysique de Paris)

Orateur: ERRACHDI, Sabri (Institut d'astrophysique de Paris)

Classification de Session: Talk PhD Student

ID de Contribution: **146** Type: **Non spécifié**

Scattering of the suprathermal electrons in the solar wind : diagnostic with Parker Solar Probe data

jeudi 9 avril 2026 14:45 (15 minutes)

The solar wind shows different electrons populations, namely, the core, a thermalized isotropic component, and the suprathermals, at energies larger than a few kT, which exhibit non-gaussian energy tails. The latter is divided among an isotropic halo and the strahl population which we can describe as an excess of electrons aligned with the magnetic field line direction.

For this study, we aim at characterizing the strahl electrons distributions and their radial evolution in the close neighborhood of the Sun. For this purpose we study their pitch angle width (PAW) and look for correlations between this quantity and other local plasma or magnetic field parameters. Using the data of the 17th first encounters from Parker Solar Probe plasma analyzers (SPAN-e and SPAN-i) and magnetometers (FIELDS-MAG).

We explore the repartition of the SPAW in a parameter space including distance to the Sun, plasma moments (n, T, v, …) and magnetic fluctuations properties (alfvenicity, intensity of fluctuations, etc.).
First, we show that Coulomb collisions are the main scattering process closer than 35 solar radii, a region where the SPAW decreases with distance to the Sun - this is a first unambiguous and quantitative observation of the effect of coulomb collisions on suprathermals.
Further away from the Sun, we identify two solar wind type of streams : one in which SPAW are very small, and one characterized by large SPAW. The characteristics of magnetic fluctuations and background plasma properties in these two type of streams are identified, and we discuss the possible reasons of the existence of these low and high scattering regimes.

Discribe your work field

Solar wind - Plasma - Heliosphere

Auteur: CHERIER, Erwan (LIRA - Observatoire de Paris)

Co-auteur: Dr ZASLAVSKY, Arnaud (LIRA - Observatoire de Paris)

Orateur: CHERIER, Erwan (LIRA - Observatoire de Paris)

Classification de Session: Talk PhD Student

ID de Contribution: **147** Type: **Non spécifié**

Disentangling Heating Mechanisms in the Interstellar Medium of Extremely Metal-Deficient Galaxies

jeudi 9 avril 2026 11:15 (15 minutes)

Low-mass, extremely metal-deficient (XMD) galaxies offer a unique opportunity to probe star formation and interstellar medium (ISM) conditions reminiscent of the early Universe. In these environments, the processes responsible for gas heating, such as photoionization by UV and X-ray photons, cosmic ray interactions, and interstellar shocks, remain poorly constrained and difficult to separate. By combining shock models with existing photoionization frameworks, we hope to identify key spectroscopic tracers observable with the James Webb Space Telescope and future infrared facilities. This work aims to assess the relative importance of shocks compared to other energetic mechanisms in the heating of the low metallicity ISM, ultimately, clarifying how the interplay between heating and feedback governs the thermal state of the ISM and controls star formation in the most primitive galactic environments.

Discribe your work field

interstellar medium, low metallicity, shocks

Auteur: SAMPSON OLALDE, Georgina (AIM (CEA DAp))

Orateur: SAMPSON OLALDE, Georgina (AIM (CEA DAp))

Classification de Session: Talk PhD Student

ID de Contribution: **148** Type: **Non spécifié**

Linking star formation histories, morphologies and environment of galaxies with the Euclid space telescope

vendredi 10 avril 2026 12:30 (15 minutes)

This thesis aims to investigate the physical processes that drive galaxy formation from a joint analysis of stellar morphology, star formation history and environment of galaxies. The datasets used for this study are the deep fields observed by the Euclid space telescope. The environment of galaxies is explored by extracting the filamentary 'cosmic web', and the complexity of stellar morphology is fully captured through pixel-level machine learning classifications and parametric measurements. The star formation histories is extracted from the galaxies photometry, using simulation based inference. Resolved high resolution hydrodynamical simulations will provide the link between complex stellar morphologies, galaxy formation processes and how gas and stars evolve together in galaxies to build the observed galaxy populations across cosmic time.
Another field observed by Euclid is the UltraDeep Field (EUDF). It corresponds to more than 3 square degrees of the sky and it is 3 magnitudes deeper than the Euclid Deep fields in the optical band, making it the deepest optical image to date at this sky coverage. A goal of the thesis is to detect the galaxies in this field and build a catalogue containing photometry and physical measurements (magnitude, mass, redshift, etc⋯) of all the detected galaxies. This work will be followed by a study of the size-mass relation of galaxies in EUDF.

Discribe your work field

Galaxy formation and evolution

Auteur: WOZNY, Nicolas (Institut d'Astrophysique de Paris)

Orateur: WOZNY, Nicolas (Institut d'Astrophysique de Paris)

Classification de Session: Talk PhD Student

ID de Contribution: **150** Type: **Non spécifié**

Projection effects in kinematic modeling of barred galaxies: implications for AGN fueling studies

jeudi 9 avril 2026 17:30 (15 minutes)

The loss of angular momentum from circumnuclear gas required to fuel the central supermassive black hole (SMBH) in active galactic nuclei (AGN) remains a key unresolved problem at sub-kiloparsec scales. While gas must lose several orders of magnitude of angular momentum to reach the accretion disk, the multiscale transport mechanisms connecting the outer galactic disk to the central engine are poorly constrained. Non-axisymmetric potentials, and specifically gravitational torques exerted by stellar bars on the gas, are thought to be primary drivers of this transport from kiloparsec to 100 pc scales, yet reliably detecting the associated radial flows remains a major observational challenge. We characterize the impact of projection effects on kinematic modeling in barred galaxies, where radial flows and elliptical orbits due to the barred potential can be difficult to distinguish. Using mock observations of a barred spiral galaxy from the GalMer simulation database, we quantify the spurious radial velocities recovered by 3D-Barolo when purely circular orbits are assumed, for different disk inclinations and bar orientations. We find that projection effects alone can produce apparent radial flows with significant radial velocities within the bar region, and cause incorrect estimation of the rotation curve. These results highlight the need for a careful approach when interpreting kinematic signatures of AGN fueling in barred galaxies, and provide a framework for future studies combining ALMA and JWST observations.

Discribe your work field

Galaxies, kinematics, AGN

Auteur: SALIBUR, Estelle (LUX, Observatoire de Paris)

Co-auteurs: Dr HALLÉ, Anaëlle (LUX, Observatoire de Paris); Prof. COMBES, Françoise (LUX, Observatoire de Paris)

Orateur: SALIBUR, Estelle (LUX, Observatoire de Paris)

Classification de Session: Talk PhD Student

ID de Contribution: **151** Type: **Non spécifié**

Spectral properties of fresh crater ejecta on Mercury

mercredi 8 avril 2026 17:45 (15 minutes)

High-albedo crater rays are among the most prominent features on the surface of Mercury. Associated with craters less than 300 Myr old, they are brighter than the surrounding terrains due to the low maturity of material excavated from the sub-surface by the primary and secondary impacts, which has been exposed to the darkening effect of Space Weathering (SpWe) for less time.

Having created maps of crater ejecta both with a fully manual approach and with the aid of a deep learning tool, I now present the preliminary results of a systematic analysis of the spectra of these ejecta. This can show how maturation progresses across an ejecta pattern, provide more precise estimates of crater age and highlight possible disuniformities in the Space Weathering process across the planet.

Discribe your work field

Mercury, spectroscopy, geospatial, deep learning

Auteur: LISSONI, Michele (LIRA, Observatoire de Paris, Université PSL)

Co-auteurs: Dr DORESSOUNDIRAM, Alain (LIRA, Observatoire de Paris); Mlle KEFA, Maria; Dr BESSE, Sebastien (ESAC, European Space Agency)

Orateur: LISSONI, Michele (LIRA, Observatoire de Paris, Université PSL)

Classification de Session: Talk PhD Student

ID de Contribution: **153** Type: **Non spécifié**

Modelling the Milky Way through its last major merger

jeudi 9 avril 2026 17:45 (15 minutes)

The last major merger of the Milky Way (MW) occurred 9-10 Gyr ago with an incoming galaxy known as the Gaia-Sausage Enceladus (GSE). We present the first hydrodynamical modelling of this collision as a 3:1 major merger using GIZMO. Our simulation reproduces the observed kinematic signatures of the merger. Furthermore, the merger model successfully recovers key structural and dynamical properties of the present-day MW, such as, the bulge, disk, bar and its rotation, spiral arms, surface mass density, rotation curve, gas fraction, and star formation history. We also show that Globular Clusters from the incoming GSE will trace the merger epochs.

Discribe your work field

Galaxy Formation, Galaxy Evolution, Milky Way, Numerical Simulation

Auteur: AKIB, Istiak Hossain (Paris Observatory - PSL)

Orateur: AKIB, Istiak Hossain (Paris Observatory - PSL)

Classification de Session: Talk PhD Student

ID de Contribution: **154** Type: **Non spécifié**

Forecasting SKA Constraints on the Epoch of Reionisation with the Triangle Correlation Function

jeudi 9 avril 2026 10:45 (15 minutes)

The Square Kilometre Array (SKA) will provide the first direct measurements of the 21cm signal from the Epoch of Reionisation (EoR). This data will contain a wealth of information about the physics of structure formation, the spatial distribution of ionised regions and their connection to the underlying density field, but will also be highly complex and dominated by noise. While the power spectrum is a standard tool for studying large-scale structure in the universe, it is inherently limited to Gaussian statistics and cannot capture the highly non-linear and non-Gaussian morphology that emerges during reionisation. To fully characterise the EoR signal, higher-order statistics are needed. Here, I present the Triangle Correlation Function (TCF), a phase-based, three-point correlation function, and demonstrate its potential as a novel cosmological probe of the EoR for upcoming SKA data. This approach provides complementary information to the power spectrum, directly tracing the topology and characteristic scales of ionised structures, and thus significantly enhancing our ability to reconstruct the reionisation history and infer cosmological parameters from future SKA data.

Discribe your work field

Epoch of Reionisation, Cosmology

Auteur: CRASCALL-KENNEDY, Lilian (Institut d'Astrophysique Spatiale)

Orateur: CRASCALL-KENNEDY, Lilian (Institut d'Astrophysique Spatiale)

Classification de Session: Talk PhD Student

ID de Contribution: **155** Type: **Non spécifié**

Towards understanding nuclear ring formation in barred galaxies with hydrodynamical simu- lations.

mercredi 8 avril 2026 17:15 (15 minutes)

Nuclear rings are common and remarkable structures of gas and stars, found in the circum-nuclear regions of ~50% of massive barred galaxies, such as NGC 1512. Usually sites of strong star formation, they are believed to play an active role in secular evolution, especially in the context of starburst activity or Active Galactic Nucleus (AGN) feeding. It is now well established that the presence of nuclear rings in barred galaxies is connected to the existence of different orbit families due to the perturbed gravitational potential. However, the current proposed models still differ in the details of the precise formation process, which overall remains unclear. Some numerical works have already explored such models, but their simulations are generally based on idealized simulations with non-self-gravitating gas and imposed barred potentials, and are thus far from realistic astrophysical conditions. Moreover, no study of nuclear ring formation in galaxies that dynamically form stellar bars with grid-based hydrodynamical simulations yet exists.

In this talk, I will first introduce the main ideas of confronting ring formation models and the importance of nuclear rings for AGN feeding. I will then present preliminary results about the simulation of barred galaxies with nuclear rings using the Adaptive Mesh Refinement (AMR) RAMSES code. I will address the main requirements for an isolated gaseous disk galaxy to form a stellar bar in a cold dark matter halo and the respective theoretical aspects, the usual methods to derive bar properties and how to relate them to the predictions from different models of nuclear ring formation, alongside the impact of some numerical limitations peculiar to the field of galaxy simulations, like artificial fragmentation or the necessity to use sub-grid models.

Discribe your work field

Numerical Galactic Dynamics

Auteur: DEDIEU, Florian (Observatoire de Paris - LUX)

Co-auteurs: Dr HALLÉ, Anaëlle (Observatoire de Paris - LUX); Prof. COMBES, Françoise (Observatoire de Paris - LUX)

Orateur: DEDIEU, Florian (Observatoire de Paris - LUX)

Classification de Session: Talk PhD Student

ID de Contribution: **156** Type: **Non spécifié**

Euclid Q1, Spitzer and ACT view on Planck galaxy protocluster candidates

jeudi 9 avril 2026 15:45 (15 minutes)

As the largest and most massive gravitationally bound structures in the Universe, galaxy clusters stand at the crossroads between astrophysics and cosmology. Before they reach dynamical equilibrium, gravitational collapse and matter accretion from the cosmic web dictate their internal dynamics, which are inherently different from that of galaxy clusters. Such objects are called galaxy protoclusters and are usually detected at $z > 1.5$, way further than galaxy clusters themselves.

Galaxy protoclusters play a central role during the Cosmic Noon ($2 < z < 3$), the peak of star formation history. Another point of interest is that these structures are deeply impacted by the values of cosmological parameters such as H_0 and σ_8. Finally, they lie at an intermediate era between the CMB and the late Universe, which still has to be looked at in detail for obtaining constraints on the cosmology. Therefore, they could ultimately act as novel cosmological probes once a solid theoretical model will have been developed for their accretion history. All these points make galaxy protoclusters very interesting objects and motivate us to understand them better.

Since the beginning of my PhD thesis, I have worked with multiple datasets to study galaxy protoclusters in detail, mainly Euclid, Planck, Spitzer and ACT. I will first present how I used combined data from Euclid Q1 and Spitzer to identify several solid counterparts to galaxy protocluster candidates, which were established from Planck maps of the Cosmic Infrared Background. This study revealed that multiple overdensities of galaxies are indeed lying in these fields at high redshift. I will also explain how I detected the full mass of Planck protocluster candidates for the very first time using the CMB lensing maps from ACT.

Discribe your work field

Large scale structures - galaxy protoclusters

Auteur: DUSSERRE, Tanguy (Institut d'Astrophysique Spatiale)

Orateur: DUSSERRE, Tanguy (Institut d'Astrophysique Spatiale)

Classification de Session: Talk PhD Student

ID de Contribution: **157** Type: **Non spécifié**

Numerical simulations of polarimetric products from full-polarimetric Ground Penetrating Radars: Mapping the Lunar and Martian subsurface

vendredi 10 avril 2026 12:00 (15 minutes)

Introduction:
The presence of water ice at the surface and subsurface of the Moon and Mars has represented a major scientific question in the history of their exploration [1, 2]. Both Martian and Lunar subsurface were studied by Ground Penetrating Radars: among others, RIMFAX on the Perseverance Rover on Mars, and the Lunar Penetrating Radar (LPR) on board the Chang'E 3 and 4 rovers, on the Moon. However, they lack polarimetric capabilities, which have proven to be useful for the analysis of planetary surface properties from radar data. In particular, the Circular Polarization Ratio (CPR) is a polarimetric product that is commonly used in the analysis of SAR data, as the Mini-RF instrument, on board the Lunar Reconnaissance Orbiter. It has revealed anomalously high CPR values inside of craters at the Lunar South Pole, which were partly attributed to the presence of water ice [3]. However, its interpretation as a radar signature of water ice remains debated: roughness and corner reflectors at the crater's surface could also explain high CPR values [4]. Fortunately, many future exploration missions plan a full-polarimetric GPR as part of their rover payload. Such instruments will carry richer information: geomorphologic, geoelectric, and polarimetric. This work presents numerical simulations of CPR resulting from full-polarimetric wideband GPR measurements like WISDOM, from the ExoMars Rosalind Franklin rover payload. Simulations allow us to investigate a variety of terrains, and examine the evolution of the CPR with depth and frequency.

Investigating the presence of water ice using the Circular Polarization Ratio:
The presence of water ice at the surface of the Moon has been identified at the Lunar Poles, in the Permanently Shadowed Regions (PSR) [2]. These are regions that remain in the darkness because of the currently low lunar obliquity with respect to the ecliptic plane, and the geomorphology of the craters. Thermal models show that temperatures can go as low as 20K [6], and enable the presence of water ice, over the span of geological eras.

Mini-RF, which is a S-band SAR, has mapped these regions with the Circular Polarization Ratio (CPR). The CPR is the ratio of the same-sense and opposite-sense normalized radar backscattering coefficients. Hence, a high CPR is a sign of depolarization of the incident wave, due to the surface properties. This depolarization can originate from water ice: it can contain small cracks and inclusions of air, that will scatter the incident wave and cause the change of polarization. But the slope of the craters, the roughness of their surface, and the rock abundance also play a key role in the depolarization of the incident wave, by acting as corner reflectors. This debate is still on-going, and shows that the CPR cannot be interpreted as a clear radar signature of the presence of water ice, as for now.

Full-Polarimetric GPR:
In order to combine the information from GPR measurements, and the polarimetric information from imaging radars, more and more Martian and Lunar missions develop full-polarimetric GPR. In this work, we will focus on WISDOM (Water Ice and Subsurface Deposit Observation on Mars), the full-polarimetric GPR part of the Rosalind Franklin rover payload, for the ExoMars Mission. The ExoMars mission aims at investigating former traces of life, at the subsurface of Mars, where they would be protected from radiation, extreme temperature changes, and the overall hostile conditions at the surface.

WISDOM is a full-polarimetric step-frequency radar, that operates in the frequency domain, between 0.5 and 3 GHz. This large bandwidth guarantees a vertical resolution of approximately 3 cm,

and a penetration depth of at least 2 - 3 m, required to fulfill the science objectives of the mission [7]. It has 2 Vivaldi antennas, which can transmit and receive in 2 linear orthogonal polarizations called Horizontal and Vertical (or 0 and 1). The GPR therefore has 4 polarimetric configurations: 00, 01, 10 and 11.

Working on WISDOM is also relevant for lunar exploration, as another full-polarimetric GPR, inherited from WISDOM, is currently in development: the Lunar Ground Penetrating Radar (LGPR). It will operate at lower frequencies than WISDOM, and aims at investigating the subsurface of the Lunar South Pole, aboard a future lunar exploration mission. The next Chang'E 7 mission also plans to have a GPR with full-polarimetric capacities, called the LPR [8].

Simulations allow us to prepare for the scientific return of these missions, with a different analysis of the CPR, resulting from full-polarimetric GPR measurements instead of SARs.

FDTD Simulations:
To simulate the CPR obtained by full-polarimetric GPR measurements, we use Finite Difference Time Domain (FDTD) simulations, with the TEMSI-FD software, developed by Xlim. The FDTD is a discretized method: it solves Maxwell's equations for each step in time and space. The inputs of the simulations are the description of the geological medium (permittivity and geometry), the source signal and the polarimetric configuration.Their output is the electromagnetic field received for each frequency of WISDOM's bandwidth.

In this work, we will present a variety of terrains, which we can divide in two sub-categories, relevant to the Lunar and Martian context:

- Icy media, with spheric inclusions of air. The parameters of these simulations are the radii of the spheres and the filling densities of the medium.
- Homogeneous and heterogeneous media with multiple layers, with either rough or smooth interfaces.

CPR calculations:
To extract the CPR from the FDTD simulations, we need to compute all 4 polarimetric configurations. We can then convert our electromagnetic field from a quad-polarization to a circular polarization basis, using conversion formula [5].

The CPR is then calculated, from all 4 polarimetric configurations. The input of that calculation is a window in time delay and in number of soundings, which we use to select our signal of interest. The CPR is calculated for each frequency of the GPR's bandwidth. With such methodology, we can retrieve different types of information on the CPR:

- The global evolution of the mean CPR with respect to the parameters of our media (the radii of the spheres or the filling density of the medium, the surface roughness etc.)
- The evolution of the CPR with respect to the frequencies of the instrument.
- The spatial evolution of the CPR, by modifying the window in time and number of soundings. By sliding that window across the subsurface, we can compute a CPR map of the subsurface, and have access to the CPR locally, at a given depth reachable by the instrument.

Results:
Global evolution of the mean CPR: The study of icy media with spheric inclusions of air, for different radii and filling densities, shows that the mean CPR increases with the filling density, and reaches above-unity values. This seems consistent with the increase of multiple reflections and scattering events with the number of spheres. The CPR values cease to increase for densities around 50-60%, for which the media are almost homogeneous.

Spectral evolution of the CPR: The CPR strongly varies with frequency. WISDOM being a wide-band instrument, we have access to the values of the CPR for each simulated frequency of the bandwidth. Current preliminary results show that the CPR increases with frequency, but displays

a strong oscillatory behavior. These oscillations could originate from the constructive/destructive interferences from the scatterers in the subsurface, and needs to be further investigated.

Spatial evolution of the CPR: The simulations allow to select a window in time and number of soundings, upon which we average our calculations to obtain the CPR. By modifying the size of this window, we can study maps of the subsurface with CPR values, and access local depolarization information. First results show that the CPR subsurface maps seem to correctly detect the presence of heterogeneities and/or rough interfaces. These CPR maps are complementary to the RGB radargrams, which are false-color radargrams, with each color representing one polarimetric configuration (00, 11 and 01/10). The color-wheel of the RGB radargrams therefore gives a qualitative information on whether the incident signal stayed in the same polarization, or if it was partly/totally depolarized, while the CPR maps bring quantitative information on that depolarization.

Conclusion:
The study of the CPR using FDTD simulations allows for new types of analysis of this polarimetric product. The spectral and spatial evolution of the CPR should help identifying new and complementary signatures of the CPR, for different depolarizing phenomena. FDTD simulations also enables the injection of orbital sources. This paves the way for a comparative analysis of the CPR obtained by orbital radars, and CPR obtained by full-polarimetric GPRs. This comparative study is conceivable for future Lunar South Pole missions, which will embark full-polarimetric GPRs.

References:
[1] Zheng N. et al. (2024), Remote Sens., 16, 824 [2] Li S. et al. (2018), Proc. Natl. Acad. Sci., 115, 8907-8912, [3] Spudis P.D. et al (2013), JGR, 118, 2016-2029, [4] Fa W. and Cai Y. (2013), J. Geophys. Res., 118, 1582–1608, [5] Raney R. K. (2007), IEEE, 45, 3397-3404, [6] Shearer C.K. et al. (2021), Proc. Natl. Acad. Sci. U.S.A., 121, [7] Ciarletti V. et al (2017), Astrobiology, 17(6-7), 565–84, [8] Shen, S. et al (2025), Space Sci. Rev., 221, 98.

Discribe your work field

Planetary Sciences, Ground Penetrating Radars, Polarization, Moon, Mars

Auteur: HARRAR, Lucy (LATMOS - UVSQ)

Co-auteurs: LE GALL, Alice (LATMOS - SU); CIARLETTI, Valérie (LATMOS - UVSQ); BRIGHI, Emile (LGL-TPE); HERVÉ, Yann (Scienteama); OUDART, Nicolas (LATMOS - UVSQ); REINEIX, Alain (Xlim); GUIFFAUT, Christophe (Xlim); GILLES, Manon (IAP)

Orateur: HARRAR, Lucy (LATMOS - UVSQ)

Classification de Session: Talk PhD Student

ID de Contribution: **158** Type: **Non spécifié**

Geant4 Modeling of X-ray Induced Charge Clouds for High-Precision Sub-pixel PSF measurement in infrared detectors

jeudi 9 avril 2026 09:45 (15 minutes)

In the context of dark matter studies via weak gravitational lensing and galaxy distortion measurements, modern space-borne astrophysics missions demand unprecedented performance from infrared (IR) detectors in under sampled imaging. These new challenges demand a detailed understanding of detectors, down to the individual pixel scale. In particular, characterizing the intra-pixel spatial response is becoming a critical parameter.
This study focuses on HgCdTe photo-detectors with a cutoff wavelength of 2.1µm , with 15µm pixels based on P+/N photo-diodes. These detectors exhibit excellent noise performance, with dark currents of the order of a few electrons/pixel/s and read noise of approximately 20 electrons. However, characterizing the intra-pixel response relies on complex optical techniques, such as spot scanning or CSIG (Continuous Sinusoidal Illumination Gradient), which are difficult to implement experimentally, especially at the detectors' cryogenic operating temperatures. Furthermore, processing the data resulting from these measurements is not straightforward.
We therefore propose an innovative method to measure the spatial response of infrared detectors using X-ray photons. This approach overcomes the constraints associated with classical optics by bypassing the diffraction and cryogenic-coupling constraints of classical optical systems. The interaction of X-ray photons with the semiconductor generates a high number of carriers in a spatially localized volume, forming a charge cloud. The characteristics of this cloud determine the measurement precision as well as the choice of the X-ray source.
Consequently, simulation and theoretical calculations were made in order to determine the shape, dimensions and orientation of such a cloud and the impact of its various experimental parameters, such as the X-ray photons energy, the different materials used in the detector and its fixture, the various de-excitation effects such as fluorescence or auger electrons. We also simulated the individual electron cloud produced by the impact of a single X-ray. All those simulations were made using Geant4, a Monte-Carlo based simulation tool developed by CERN. This presentation will focus on those simulations, specifically the simulation of the interaction be-tween X-ray photons and the infrared detector.

Discribe your work field

Semiconductor physics Radiation-matter interaction Space instrumentation

Auteur: DELILLE, Nolane (University Paris-Saclay,University Paris-Cité, CEA, CNRS, AIM, 91191 Gif-sur-Yvette, France ; Centre national d'études spatiales (CNES), 2, Place Maurice Quentin, 75039, Paris, France)

Co-auteurs: Dr PICHON, Thibault (University Paris-Saclay,University Paris-Cité, CEA, CNRS, AIM, 91191 Gif-sur-Yvette, France); Dr BAIER, Nicolas (University Grenoble Alpes –CEA LETI, 17 Avenue des martyrs 38054 Grenoble, France); Dr GRAVRAND, Olivier (University Grenoble Alpes –CEA LETI, 17 Avenue des martyrs 38054 Grenoble, France)

Orateur: DELILLE, Nolane (University Paris-Saclay,University Paris-Cité, CEA, CNRS, AIM, 91191 Gif-sur-Yvette, France ; Centre national d'études spatiales (CNES), 2, Place Maurice Quentin, 75039, Paris, France)

Classification de Session: Talk PhD Student

ID de Contribution: **159** Type: **Non spécifié**

Perturbative analysis of the Shock of Core-Collapse Supernovae

vendredi 10 avril 2026 15:30 (15 minutes)

When a massive star dies, its core collapses, and a small fraction of the gravitational potential energy released during the collapse is transferred to the envelope, essentially via neutrino emission. It creates a growing hydrodynamical shock, that stalls after a few hundred milliseconds.
As the matter keeps falling on the proto-neutron star, an instability called SASI develops and the stalled shock starts to oscillate. The frequency of this instability can be observed through gravitational waves emission and variations in the neutrino flux.
I will discuss how the internal g-modes of the newly formed proto-neutron star influence the SASI frequency, using a perturbative analysis of a simplified model.

Discribe your work field

Core-Collapse Supernova - High Energy Astrophysics - Gravitational Waves

Auteur: MOREAU, Alphonse (AIM / APC)

Orateur: MOREAU, Alphonse (AIM / APC)

Classification de Session: Talk PhD Student

ID de Contribution: **160** Type: **Non spécifié**

Study of stellar and exoplanetary radio bursts with next-generation radio interferometers

vendredi 10 avril 2026 10:30 (15 minutes)

Over the past decades, thousands of exoplanets have been detected primarily via radial velocity and transit methods, uncovering a diversity of planetary systems. Low-frequency radio emissions from such systems, driven by processes like the electron cyclotron maser instability (ECMI), provide a unique window into planetary magnetic fields and their plasma environment. This approach reveals complementary information inaccessible through traditional methods.
In this talk, I will introduce the Radio Interferometric Multiplexed Spectroscopy (RIMS) technique, which synthesises hundreds of thousands of dynamic spectra from the Low Frequency Array (LOFAR) data. It has already uncovered highly polarized bursts likely tied to signatures of star-planet interactions.
RIMS generates a vast number of dynamic spectra making manual analysis impractical. To address this, we use a scoring system to discriminate spectra likely to exhibit signals. In my work, I improve this score by incorporating source proximity, addressing the challenge of creating a relevant score without first synthesizing dynamic spectra. By refining this score, we can significantly increase detection efficiency by reducing false positives. RIMS sets the stage for exploring rarer and fainter phenomena with upcoming upgrades like LOFAR 2.0 and future instruments such as the SKA.

Discribe your work field

Radioastronomy; Exoplanets; Magnetic Fields

Auteur: POUX–BOURET, Benjamin (Observatoire de Paris)

Orateur: POUX–BOURET, Benjamin (Observatoire de Paris)

Classification de Session: Talk PhD Student

ID de Contribution: **161** Type: **Non spécifié**

Exploring LGRB host galaxy through mock observations and radiative transfer

mercredi 8 avril 2026 14:30 (15 minutes)

The afterglow spectroscopy of Long Gamma Rays Bursts (LGRBs) is a major tool to study the chemical properties of their host galaxies even at very high redshift. When the afterglow illuminates the galaxy as a background source, it reveals non-radiating elements present in the gas, along the line of sight, through absorption lines in the spectra. This offers unique information on the gas in, and surrounding, the GRB star forming region, as well as of the warm gas in the interstellar medium of the galaxy. Combined with typical observations integrated over the entire galaxy, from photometry or emission line spectroscopy, LGRBs bring a broad view of the physical property of its host. That makes LGRBs unique tools to better understand the chemical enrichment of the Universe and galaxy evolution.

I will present ongoing work comparing results of the observations of LGRB host galaxies and of a zoom-in hydrodynamical simulation of a potential LGRB host at redshift z=3. In particular, I will focus on the Lyman alpha emission and absorption, as well as the escape of hydrogen photons so as to physically interpret LGRB spectra, to investigate the impact of LGRBs on the progenitor environment, and test galaxy simulations. I will discuss the results of this exploration, and I will also present some preliminary results I obtained on metal absorption lines.

Discribe your work field

galaxy evolution, gamma ray bursts, chemical enrichment

Auteur: GARNICHEY, Marine (LUX - Observatoire de Paris)

Orateur: GARNICHEY, Marine (LUX - Observatoire de Paris)

Classification de Session: Talk PhD Student

ID de Contribution: **162** Type: **Non spécifié**

Chemistry and IR emission of acetylene in planet-forming disks

jeudi 9 avril 2026 12:45 (15 minutes)

Despite the tremendous number of exoplanets detected, planet-forming scenarios are not yet able to fully explain the large diversity of planets. They form and obtain their composition from gas and dust in protoplanetary disks. The elemental composition of disks is known to vary spatially due to physical and chemical processes. Thus, the elemental composition of planetary atmospheres is expected to give valuable insight about their formation, in particular the C/O ratio. In this context, the James Webb Space Telescope revealed an active chemistry in protoplanetary disks, detecting plenty of molecules, especially H2O and C2H2.
I will highlight a work based on the thermo-chemical model Dust And LInes (DALI) to investigate the relationship between the observed variation of H2O and C2H2 emission and the C/O ratio. After mentioning several modelling improvements, especially a refined carbon chemistry, I will show that the C2H2/ H2O line flux ratio is very sensitive to the elemental abundances, in particular the C/O ratio and the oxygen abundance O/H. Therefore, these results put strong constraints on the elemental composition of disks, fundamental to interpret exoplanet atmosphere.

Discribe your work field

Planet formation - protoplanetary disks - exoplanets

Auteur: ESTEVE, Pacôme (Institut d'Astrophysique Spatiale)

Orateur: ESTEVE, Pacôme (Institut d'Astrophysique Spatiale)

Classification de Session: Talk PhD Student

ID de Contribution: **163** Type: **Non spécifié**

Automated Identification of Mars' Bowshock Crossings Using Machine Learning Techniques Applied to MAVEN Measurements

vendredi 10 avril 2026 12:15 (15 minutes)

Since 2014, the MAVEN mission has provided an unprecedented volume of measurements of Mars' plasma environment, offering a suitable framework for the development of automatic techniques for detecting spatial structures. This work explores machine learning-based methodologies for the automated identification of Martian shock wave crossings, using only the orbital position of the probe and the magnetic field module measured by the MAG instrument. Autoencoders based on multilayer perceptrons and Gated Recurrent Units were trained to obtain latent representations of 180-second time windows, which were subsequently used as input for Support Vector Machine classifiers. The models were trained with catalogs of existing crossings and evaluated independently, qualitatively analyzing their performance and sensitivity to different feature selection strategies. The results show that it is possible to robustly detect the presence of crossings without the need to resolve the fine structure of the magnetic field, and that the information contained in the loss functions of the autoencoders can improve the performance of the classifiers. This work constitutes a first approach to the systematic use of machine learning techniques in the Martian environment and establishes a methodological basis for more accurate and generalizable future developments.

Discribe your work field

Mars MAVEN Plasma Planetary Space Machine Learning, Neural Networks

Auteur: MATÍAS, Notonica (LATMOS)

Co-auteurs: M. BERTUCCI, César (IAFE); Mlle MORALES, Laura (INFIP)

Orateur: MATÍAS, Notonica (LATMOS)

Classification de Session: Talk PhD Student

ID de Contribution: **164** Type: **Non spécifié**

Uncertainty Quantification for Generative Models in Astrophysics

jeudi 9 avril 2026 15:30 (15 minutes)

As astronomy enters a new era of big data, machine learning, and novel generative models enable inference in high-dimensional spaces and help tackle previously intractable problems. In this context, defining and measuring the accuracy of inferred posteriors, especially in high-dimensional parameter spaces such as images, has become increasingly pressing. Specifically, two questions need to be answered: For a given inference pipeline that provides a posterior estimator for potentially high-dimensional variables, how can we assess the accuracy of this pipeline? And if generative models are used as components of such an inference pipeline, how do we quantify the accuracy with which these models represent their underlying training distribution? I will introduce PQMass and MIRA, two likelihood-free, sample-based statistical approaches designed to tackle these challenges directly. PQMass evaluates the quality of generative models and their ability to learn the underlying data distribution without assuming the data distribution or performing dimensionality reduction, making it highly effective for detecting subtle distributional shifts and validating generative models in cosmological data analyses. MIRA, on the other hand, compares posterior distributions from Bayesian models solely through simulated joint samples, enabling direct model comparisons without evidence computation and quantitative calibration validation. PQMass and MIRA provide new avenues for scalable accuracy assessment and for improving the reliability of data-driven astronomical analysis.

Discribe your work field

Uncertainty Quantification, Machine Learning, Generative AI, Cosmology

Auteur: SHARIEF, Sammy

Orateur: SHARIEF, Sammy

Classification de Session: Talk PhD Student

ID de Contribution: **165** Type: **Non spécifié**

How do the first Massive Black Holes Grow?

jeudi 9 avril 2026 12:00 (15 minutes)

JWST observations up to z ≈ 11 have uncovered unexpected populations of high-redshift AGN, suggesting a much higher abundance of massive black holes (MBH) in the early Universe than predicted by prior extrapolations of observations. However, state-of-the-art simulations of MBH accretion yield results inconsistent with these findings: they suggest that massive black holes grow too inefficiently in low-mass galaxies—systems similar in mass to the hosts of high-redshift AGN detected by JWST—to explain such observed abundance at these early times. Indeed, star formation and supernova feedback cause gas to become very turbulent, and it is continuously stirred and ejected by stellar explosions, hence suppressing MBH growth.
Hence, the goal of my PhD thesis is to assess how stellar feedback influence MBH growth, galactic structure, and the stellar-to-halo mass relation in high-redshift dwarf galaxies. Feedback from massive stars is not just SNe: Cosmic Rays, pre-heating by OB stars and modeling of star formation itself are important.
To try to comprehensively study these phenomenons, I run zoom-in cosmological simulations focusing on individual galaxies at z ≥ 4 in their environment, with increasing physical complexity, which will lead to "full-physics"models with radiative and magneto-hydrodynamical simulations. I do not want to artificially enhance MBH growth to make my simulations consistent with JWST observations but instead try to better understand the concerned parameter space. Depending on the conclusions, it could indicates that perhaps some observational results on high-z black hole masses and the number of AGN have to be taken with a grain of salt.

Discribe your work field

MBH growth - Stellar Feedback - Cosmological Simulations

Auteur: M. DOSSO, Emile (Institut d'Astrophysique de Paris)

Orateur: M. DOSSO, Emile (Institut d'Astrophysique de Paris)

Classification de Session: Talk PhD Student

ID de Contribution: **166** Type: **Non spécifié**

Neural Networks for Gamma-Ray Burst Localization with COMCUBE-S

jeudi 9 avril 2026 12:15 (15 minutes)

Gamma-ray bursts (GRBs) are the most violent explosions in the universe and much remains to be understood about them. These events are promising probes for multi-messenger astrophysics through the detection of gravitational waves and potentially high-energy neutrinos associated with them. GRBs can also provide insight into the early universe as they can occur at very high redshifts. Their use as standard candles is currently under debate and needs deeper studies of the physical processes involved in these explosions.

It is therefore very important to detect as many GRBs as possible and to localize them as rapidly as possible, enabling follow-up observations for multi-wavelength studies. COMCUBE-S is a space mission that aims to study GRBs by polarimetry and also provide alerts for transient gamma-ray events. It proposes a constellation of 28 CubeSats in an equatorial low Earth orbit providing continuous full-sky coverage. Each CubeSat is equipped with a Compton telescope composed of 32 detectors arranged into two main layers. The first one is a scattering layer which favors Compton interactions. The second one is the absorbing layer placed below and on the sides of the first layer in order to detect the scattered photon.

In the alert system, the primary method for localizing sources relies on relative count rate measurements. For the COMCUBE-S mission, an average of 18 satellites are expected to be within sight of any given source. For each satellite, a GRB arriving from a given direction illuminates its 32 detectors differently. Each detector has a response function that describes the dependence of count rates on the source direction. We can therefore estimate the location of the source by comparing the count rates measured by all detectors across the constellation. The currently used estimation method is the chi-squared minimization. However with such a large number of inputs across all satellites and detectors (around 576 count rate measurements), machine learning is expected to outperform classical methods. I aim to implement neural networks to achieve higher localisation precision (better than 1° for bright GRBs) in order to identify the host galaxy, as well as a faster computation in order to rapidly send alerts for follow-up observations.

Discribe your work field

Compact Objects, GRB, Compton Telescope, Machine Learning, Neural Networks

Auteur: HANKACHE, Sally

Orateur: HANKACHE, Sally

Classification de Session: Talk PhD Student

ID de Contribution: **167** Type: **Non spécifié**

Detection and characterization of galaxies with deep-learning in radio continuum surveys, preparation to SKAO

mercredi 8 avril 2026 17:00 (15 minutes)

The upcoming Square Kilometer Array Observatory (SKAO) will revolutionize the field of radio astronomy, but its projected data flow (exceeding 700 PB/year) demands a shift toward exascale-ready pipelines. In this Big Data era, machine learning stands out for efficient astronomical data processing.
During this talk, I will present ongoing work on developing a robust and fast pipeline for radio-galaxy detection and characterization in 2D continuum images for SKAO, using precursor instruments (such as LOFAR, ASKAP, MeerKAT, etc.) for methodological developments.
Building on the MINERVA team's success with the YOLO-CIANNA deep learning method during SKA Data Challenges (SDC) 1 and 2, I will show how we generalized the method to train a new source detector model on the SDC3a simulated dataset and how we deploy it on real data from the LOFAR Two-metre Sky Survey (LoTSS). The results presented in this talk show that our approach with YOLO-inspired models allows us to detect sources with high precision down to low SNR regimes but also with low computing time. Furthermore, the networks demonstrate high reliability in parameter estimation, such as apparent or integrated flux measurements. They show strong performance on the LoTSS data compared to typical PyBDSF analysis.
Following this, I will discuss our current work regarding the implementation of a custom simulation pipeline integrating, in particular, T-RECS and OSKAR, to further enhance detection capabilities. Finally, I will discuss the exploration of new possible machine learning strategies that will follow to improve recall and characterization accuracy for the faintest sources.

Discribe your work field

Convolutional neural networks, simulations, radio-galaxies, SKAO

Auteur: ZARKA, Adam (LUX - Observatoire de Paris)

Orateur: ZARKA, Adam (LUX - Observatoire de Paris)

Classification de Session: Talk PhD Student

ID de Contribution: **168** Type: **Non spécifié**

Modeling the turbulent convection in stellar evolution code

jeudi 9 avril 2026 10:15 (15 minutes)

The treatment of convection can have a significant impact on the determination of stellar ages, for which stellar evolution models remain the primary method. Nevertheless, convection remains one of the principal challenges in stellar evolution modeling, as it is a highly turbulent process operating on timescales many orders of magnitude shorter than stellar lifetimes.

Classically, stellar evolution codes employ the mixing-length theory (MLT) to describe convective transport; however, MLT neglects the inherently non-local nature of convection. One proposed improvement is the Kuhfuß convection model, which accounts for non-local effects. This work implements the one-equation Kuhfuß model in the stellar evolution code *Cesam2k20*, solving the turbulent kinetic energy equation alongside the stellar structure equations. The resulting convective profiles differ significantly from those predicted by MLT and can be constrained using asteroseismic data.

Discribe your work field

stars: interiors; stars: evolution; methods: numerical

Auteur: LU, Ducheng (LIRA)

Orateur: LU, Ducheng (LIRA)

Classification de Session: Talk PhD Student

ID de Contribution: **169** Type: **Non spécifié**

The dynamic response of Mercury's magnetosphere to solar wind forcing: consequences for the acceleration of charged particles in a telluric planetary environment

vendredi 10 avril 2026 09:45 (15 minutes)

Most global simulations of Mercury's magnetosphere assume a steady solar wind. However, this planet is the closest to the Sun in the Solar System and it's extremely small magnetosphere responds on characteristic timescales of only a few minutes, making it inherently sensitive to solar-wind variability. Such rapid temporal forcing is expected to generate a highly dynamic magnetospheric environment, favorable to the development of plasma instabilities.

These processes can facilitate electron entry into the magnetosphere, their subsequent trapping and acceleration, and, in some cases, their direct interaction with Mercury's exosphere and surface. To investigate these effects, we perform global magnetohydrodynamic (MHD) simulations of Mercury's magnetospheric response to both steady and time-dependent solar-wind conditions using the spherical code PLANET MAG AMRVAC. These simulations are designed to support the upcoming science phase of the BepiColombo mission, scheduled to begin in less than a year, by predicting magnetospheric and exospheric observables accessible to instruments onboard both Mio and MPO under a broad range of solar-wind conditions.

As a first step, the model was tested through comparisons with electron density measurements obtained by the MEA1 instrument onboard Mio during Mercury's three firsts flybys. The simulations include a planetary plasma source driven by the photoionization of exospheric neutrals, allowing for a more realistic representation of plasma populations in Mercury's near-planet environment. In parallel, the model was used to predict the quasi-thermal noise spectra measurable by the SORBET instrument during flybys, when the antennas cannot be fully deployed during the cruise phase.

Building on this foundation, the focus of this work is the impact of transient solar-wind structures —for now magnetic holes or vortical perturbations—on Mercury's magnetosphere. Particular attention is paid to their transmission through the bow shock, their evolution within the magnetosheath, and the conditions under which they can penetrate into the magnetosphere. To address these questions, we first adopt a global MHD approach to capture the large-scale dynamics and overall morphology of these events. We then aim to confront these results with kinetic or particle-in-cell (PIC) simulations in order to explore the associated small-scale physics beyond the MHD framework. Finally, we outline ongoing and future work involving the injection of test particles, treated within the guiding-center approximation, in selected regions of interest. This approach will allow us to investigate particle transport, acceleration, and loss processes in Mercury's magnetosphere under different solar-wind disturbance scenarios.

Discribe your work field

Magnetosphere, Mercury, Plasma Physics

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Classification de Session: Talk PhD Student

ID de Contribution: **170** Type: **Non spécifié**

Gaëlle Vitali-Derrien

mercredi 8 avril 2026 11:00 (45 minutes)

Working in academia with disabilities

Classification de Session: Invited Talk

ID de Contribution: **171** Type: **Non spécifié**

Tristan Dequaire

mercredi 8 avril 2026 16:00 (45 minutes)

Planetariums and Planetarians: From Practice to Socio-Historical Research in France

Tristan DEQUAIRE
Laboratoire Histoire des TechnoSciences en Société HT2S, Conservatoire des Arts et Métiers CNAM/Musée de l'Air et de l'Espace MAE

Abstract:
Planetariums are immersive environments dedicated to the representation and dissemination of astronomical knowledge, at the crossroads of science, technology, and storytelling. They play a key role in public engagement and are structured through professional networks such as the Association des Planétariums de Langue Française (APLF) and the Planétariums Indépendants Associés francophones (PIAf).
In this talk, I will introduce the planetarium as a scientific and cultural device, drawing on my experience as a planetarist at the Musée de l'Air et de l'Espace to illustrate the diversity of practices involved.
I will then present my ongoing PhD research, which adopts a socio-historical approach to the profession of planetarium operator in France, from its emergence in 1937 to the present day.
This work aims to better understand how technological and institutional changes have shaped the practices, identities, and possible professionalization of planetarians, highlighting an often overlooked interface between astronomy and society.

Classification de Session: Invited Talk

ID de Contribution: **172** Type: **Non spécifié**

Daniel Reese

jeudi 9 avril 2026 16:00 (45 minutes)

Asteroseismology

Classification de Session: Invited Talk

ID de Contribution: **173** Type: **Non spécifié**

Guillaume Brault

vendredi 10 avril 2026 11:00 (45 minutes)

Space Entrepreneurship

Classification de Session: Invited Talk

ID de Contribution: **174** Type: **Non spécifié**

Searching for planetary companions around solar-type stars within 25 pc using Gaia astrometry

vendredi 10 avril 2026 09:30 (15 minutes)

Context:
The hunt for exoplanets is a thriving field thanks to next-generation instruments such as the James Webb Space Telescope (JWST) and upcoming projects including the Extremely Large Telescope (ELT) and the Habitable Worlds Observatory (HWO). Detecting giant exoplanets around solar-type stars will enable direct imaging and spectroscopic characterisation of planetary systems that may host potentially habitable worlds.

Aims:
This work surveys nearby solar-type stars and aims to detect new giant exoplanets using stellar astrometric excess noise, complemented by archival direct imaging and radial velocity data. The targets studied in this investigation are limited to a 25-pc sphere to ensure possible direct detection with the ELT.

Methods:
The Fifth Catalogue of Nearby Stars (CNS5) is used to select eligible solar-type stars within 25 pc. We search for bound companions using the GaiaPMEX tool, which makes use of the renormalized unit weight error (RUWE) from Gaia and the proper motion anomaly (PMa) between Hipparcos and Gaia.

Results:
The results from GaiaPMEX for 413 targets indicate the presence of bound companions around many stars in our sample. To follow up on these signals, we will exclude the previously known companions and analyse archival radial velocity and direct imaging data with an MCMC framework to characterise new planetary companions and constrain their masses and semi-major axes.

Conclusion:
The newly identified planetary candidates will be prime targets for future follow-up observations with JWST and HWO, offering opportunities to study giant planets that may influence potentially habitable exoplanets.

Discribe your work field

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Classification de Session: Talk PhD Student