

# Corentin Cadiou

Assistant professor  
*Chargé de recherche*

J 16/09/1992

H Male

☑ French

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## Science interests

galaxy formation  
cosmic web  
numerical simulations  
cosmology

## Languages

French (native)

English (C2)

German (B2)

Spanish & Swedish (A1)

## Numerical skills

### HPC

RAMSES

MPI

OpenMP

CUDA




### Programming

Fortran





C++

Linux

## Research experience









- 2025–now **Chargé de recherche (Assistant Professor)** IAP, France 
- Permanent, 100%-research position. Recruited on a interdisciplinary project to develop high-performance computing and data science in astronomy.
- 2022–25 **Post-doctoral research** Lund, Sweden 
- Working on the group of Prof. Agertz on the role of angular momentum in the formation of galactic disks. Start: 01/10/2022, end: 31/01/2025
- 2019–22 **Post-doctoral research** UCL, London, UK 
- With Profs. Pontzen and Peiris, on ERC grant.
- 2016–19 **Post-graduate research** IAP, Paris, France 
- Supervisors: C. Pichon and Y. Dubois.

## Education

- 2019 **PhD in Astrophysics** Sorbonne & IAP, Paris 
- “The impact of the large-scale structures of the Universe on dark matter halo and galaxy formation”. Refereed by S. White and A. Dekel.
- 2016 **Master’s degree (Master 2) in Astronomy and Astrophysics** Univ. Paris Diderot, Paris Observatory, Paris, France 
- 2015 Diploma of the École Normale Supérieure (ENS) ENS, Paris 
- Major in physics, minor in Computer Sciences
- 2013 Bachelor’s degree, Physics Univ. Paris Diderot & ENS, Paris 

## Time allocations

Over my career, I have been **PI or co-I of projects securing 140 MCPU hr** (1,400,000€, assuming a price of 0.01€/CPU hr). My developments also enabled additional projects for a total of more than 100 MCPU hr.

- 2024–now **(co-I) Harkonnens simulations**   
**60 MCPU hr allocation** (Spanish national call). Suite of high-resolution simulations to support ESA’s ARRAKIHs mission to investigate the nature of dark matter.
- 2024 **(PI) The role of mergers in shaping Milky-Way galaxies**   
**6 MCPU hr allocation** (Swedish national call). Suite of high-resolution simulations focused on the role played by mergers in the formation of our galaxy.
- 2024 **(PI) How the cosmological environment drives galaxy properties**   
**3.6 MCPU hr allocation** (local call). Suite of simulations to unravel the role played by the cosmological environment in setting the properties of galaxies.
- 2023–25 **(co-I) MEGATRON project**   
**Large 50 MCPU hr allocation** (UK national call), 15th DiRAC call (PI: H. Katz). Extreme-resolution cosmological simulation focused on circum-galactic physics.
- 2021–22 **(PI) Angular momentum project**   
**9.7 MCPU hr allocation** (UK national call), 13th DiRAC call. Demonstration of the feasibility of controlling the angular momentum of galaxies in a cosmological volume.
- 2021–24 **EDGE Project** (‘code builder’ status)   
Automatically co-author of all publications that use my contributed code. 40 MCPU hr obtained (UK national call, PI: J. Read). Suite state-of-the-art simulations of dwarf galaxies.
- 2020–21 **Obelisk simulation**   
Radiation-hydrodynamical cosmological simulation following the assembly of a proto-cluster. 50 MCPU hr obtained (Europe wide call, PI: M. Trebitsch).
- 2018–20 **CINES computational time allocation**   
Co-I of a 2 MCPU hr subproject, 25 MCPU hr obtained (France national call, PI: M. Volonteri). Investigation on the role of cosmological accretion on angular momentum accretion.

## Awards and recognitions

2024-26	<b>eSENCE grant (1 100 000 kr ≈ 95 000 €)</b> Research grant for the project: “Galaxy formation in the exascale era”.	Lund University, Sweden
2024-26	<b>Fysiografen grant (110 000 kr ≈ 9 500 €)</b> Research grant for the project: “The formation of disk, from cosmic dawn to cosmic noon”.	Lund University, Sweden
2023-25	<b>Fysiografen grant (140 000 kr ≈ 2 000 €)</b> Research grant for the project: “The role of environment in driving galaxy spin”.	Lund University, Sweden
2018	<b>NumFOCUS New Contributor Award</b> In recognition of my contributions to the Y <sub>T</sub> project, the most widely-used Python package for analysing simulations.	
2016–19	<b>ILP fellowship (5000 € per annum)</b>	
2012–19	<b>ENS scholarship &amp; ENS doctoral fellowship</b> , prestigious full stipends awarded nationwide to 20 fellows.	

## Responsibilities

### — International collaborations & code development for open-science

2023–now	<b>ARRAKIHS mission</b> European Space Agency (ESA) space mission to shed light on the nature of dark matter, to be launched in 2030. Co-I of the Simulation Work Package to interpret the data.	
2023–now	<b>‘Agora’ collaboration</b> Code comparison project aimed at finding which galaxy properties are robust predictions from the different models.	
2022–now	<b>‘Ginea’ collaboration</b> Collaboration to develop the next-generation cosmological simulation code (DYABLO, to supersede RAMSES). Personal contributions include key insight into input/output formats and coupling with post-processing tools.	France
2019–24	Member of ERC GMGalaxies (2019–2022, PI: Pontzen).	
2016–24	Member of ANR Spine (2016–2017, PI: Pichon) and SEGAL (2019–2024, PI: Pichon).	
2017–now	<b>Y<sub>T</sub> team member</b> , in charge of support of the RAMSES code. Y <sub>T</sub> is now the most widely used library to analyse astrophysical simulations. Personal contributions include support for the RAMSES code, significant I/O performance improvements (× 100 faster for RAMSES), community support.	

### — Community service

2022–now	<b>Member of the EAS Advisory Committee on Sustainability</b> The European Astronomical Society (EAS) Sustainability Advisory Committee aims to investigate, communicate, and make recommendations to the Council on sustainability matters related to astronomy and astrophysics.	
2020–now	<b>Reviewer for Astronomy and Astrophysics, Monthly Notices of the Royal Astronomical Society, Scipy’s conference proceedings</b>	
2016–21	Organizer of IAP pre-seminar and the ‘Extragalactic Journal Club’	IAP, Paris, France & UCL, London, UK

### — Teaching and supervision

2020–24	<b>Master’s student supervisions</b> Supervision of 8 Master’s students. The work of the students in bold led to a submitted paper: T. Chérel (Lund, Master 2, 25–26); E. Larsson (Lund, Master 2, 24–25); Z. Khurij (Lund, Master 2, 24–25); A. Storck (Lund, Master 2, 23–24); A.-M. Söderman (Lund, Master, 23–24); <b>Z. Kocjan</b> (UCL, MSc, 21–23); J. Warbrick (UCL, MSci, 20–21); <b>E. Pharabod</b> (Polytechnique, France, Master 2, 20–21).	
2016–19	<b>Teaching Assistant</b> Courses included: concept and methods of Physics at B.Sc. level (192 hours). Graded all written work, oral and final written exams and assisted with labs.	Sorbonne Université, Paris, France

## Outreach activities

2019–now	<b>Outreach presentations in high-schools, museums, for the general public, for open house days.</b>	
2020–22	<b>Host and co-founder of the “Astronomy on Tap” London satellite</b>	

Fortnightly general public online presentations ([online](#) due to the pandemic, more than 4,600 views). Awarded £1,000 by UCL Astronomy department to carry our activities.

- 2020 Scientific expertise to translate the general public book 'A History of the Universe in 100 stars'.
- 2019 **Speaker at the "Pint of Science" festival** Paris, France
- 2017–19 **Journée de la Science (Open House days)** Sorbonne Université, France
- Presented activities of the IAP, set up and performed hand-based experiments.

## Visiting programs, schools and conferences

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So far, I have given **10 invited talks at conferences and seminars**, listed below. Poster presentations are highlighted as "X".

### — Invited talks

- 03/2023 ★ Connecting Galaxies to Cosmology visiting Program KITP, Santa Barbara, USA
- 10/2022 ★ 10th Workshop on Cosmology and Structure Formation KIAS, Seoul, South Korea
- 03/2022 ★ Cosmic Cartography *online*, Kavli IPMU, Kashiwa, Japan
- 01/2021 ★ LCDM: Dark Matter In Cosmology *online*, Monthly meeting of London-based cosmologists
- 11/2019 ★ Yonsei-IAP Workshop *online*
- 03/2019 ★ Yt workshop University of Illinois, Urbana, USA

### — Invited seminars

- 04/2023 ★ Kavli Institute for Theoretical Physics blackboard talk KITP, Santa Barbara, USA
- Prestigious talks intended to explain the science of one program to the other KITP program participants, locals, and scientists outside of a specialized field.
- 02/2022 ★ Berkeley Cosmology Seminar *online*, Berkeley, USA
- 11/2021 ★ Oxford Cosmology Seminar Oxford, UK

### — Contributed talks

- 03/2024 Building Galaxies from Scratch University of Vienna, Austria
- 01/2024 X D-LOCKS Meeting Technical University of Denmark, Copenhagen, Denmark
- 12/2023 New Simulations for New Problems in Galaxy Formation Institut d'Astrophysique de Paris, France
- 08/2023 Santa Cruz Galaxy Workshop University of California Santa Cruz, USA
- 07/2022 X National Astronomy Meeting (NAM) Warwick, UK
- 06/2022 X EAS Meeting Valencia, Spain
- 06/2022 Journées du PNCG (cosmology & galaxies) Observatoire Astronomique de Strasbourg, France
- 09/2021 RAMSES User Meeting *online*, Strasbourg Observatory, France
- 07/2021 Scipy 21: data analysis and code development in Python (900 participants) *online*
- 12/2020 RHytHM: ResearchH using Yt Highlights Meeting. *online*
- 11/2020 KIAS Cosmology Workshop. *online*
- 10/2019 KIAS Internal Workshop KIAS, Seoul, South Korea
- 09/2018 West Coast Swings workshop ICRAR, Perth, Australia
- 05/2018 SPIN(E) ANR Meeting ROE, Edinburgh, UK
- 09/2017 SPIN(E) ANR Meeting Agay, France
- 09/2017 RAMSES User Meeting Nice Observatory, Nice, France
- 09/2016 RAMSES User Meeting CRAL, Lyon, France

### — Contributed seminars and journal clubs

- 12/2021 'FLAT' talk Durham, UK
- 11/2021 Cosmology Journal Club IAP, Paris, France
- 11/2021 Astrophysics Journal Club Racah Institute of Physics, Jerusalem, Israel

10/2021	Galaxy Coffee	MPIA, Heidelberg, Germany
09/2021	Cambridge Cosmology Seminar	online, Institute of Astronomy, Cambridge, UK
12/2018	Journal club & visiting program	Astrophysics Department, Oxford, UK
04/2018	CRAL journal club	CRAL, Lyon, France
10/2017	KIAS journal club	KIAS, Seoul, South Korea
04/2017	CITA Journal Club	CITA, Toronto, Canada

## Publication list

I have submitted **13** articles as lead or co-lead author (**12** already published in MNRAS and A&A). I also contributed to **15** other articles. My papers have been cited **728** times (*h*-index of 14 as of 6<sup>th</sup> April 2025), [source: NASA/ADS](#).

### — Submitted articles

1. “**EDGE: The emergence of dwarf galaxy scaling relations from cosmological radiation-hydrodynamics simulations**”, Rey, Taylor, Gray, Kim, Andersson, Pontzen, Agertz, Read, **Cadiou**, Yates, Orkney, Scholte, Saintonge, Breneman, McQuinn, Muni & Das, *submitted to Monthly Notices of the Royal Astronomical Society*, (2025).
2. “**The Impact of Star Formation and Feedback Recipes on the Stellar Mass and Interstellar Medium of High-Redshift Galaxies**”, Katz, Rey, **Cadiou**, Kimm & Agertz, *submitted to Monthly Notices of the Royal Astronomical Society*, (2024).
3. “**The causal effect of cosmic filaments on dark matter halos**”, Storck, **Cadiou**, Agertz & Galárraga-Espinosa, *submitted to Monthly Notices of the Royal Astronomical Society*, (2024).

### — Published articles

1. “**RAMSES-yOMP: Performance Optimizations for the Astrophysical Hydrodynamic Simulation Code RAMSES**”, Han, Dubois, Lee, Kim, **Cadiou** & Yi, in *The Astrophysical Journal*, 978, 1, 96-106, (2025).
2. “**EDGE-INFERNO: Simulating Every Observable Star in Faint Dwarf Galaxies and Their Consequences for Resolved-star Photometric Surveys**”, Andersson, Rey, Pontzen, **Cadiou**, Agertz, Read & Martin, in *The Astrophysical Journal*, 978, 2, 129-139, (2025).
3. “**How complex are galaxies? A non-parametric estimation of the intrinsic dimensionality of wide-band photometric data**”, **Cadiou**, Laigle & Agertz, in *Monthly Notices of the Royal Astronomical Society*, 537, 2, 1869-1879, (2025).
4. “**Running with the bulls: The frequency of star-disc encounters in the Taurus star-forming region**”, Winter, Benisty, Shuai, D uchene, Cuello, Anania, **Cadiou** & Joncour, in *Astronomy and Astrophysics*, 691, A43, (2024).
5. “**The AGORA High-resolution Galaxy Simulations Comparison Project. IV. Halo and Galaxy Mass Assembly in a Cosmological Zoom-in Simulation at  $z \leq 2$** ”, Roca-F abrega, Kim, Primack, Jung, Genina, Hausammann, Kim, Lupi, Nagamine, Powell, Revaz, Shimizu, Strawn, Vel azquez, Abel, Ceverino, Dong, Quinn, Shin, Segovia-Otero, Agertz, Barrow, **Cadiou**, Dekel, Hummels, Oh, Teyssier & AGORA Collaboration, in *The Astrophysical Journal*, 968, 2, 125-154, (2024).
6. “**Probing cosmology via the clustering of critical points**”, Shim, Pichon, Pogosyan, Appleby, **Cadiou**, Kim, Kraljic & Park, in *Monthly Notices of the Royal Astronomical Society*, 528, 2, 1604-1615, (2024).
7. “**Hot gas accretion fuels star formation faster than cold accretion in high-redshift galaxies**”, Kocjan, **Cadiou**, Agertz & Pontzen, in *Monthly Notices of the Royal Astronomical Society*, 534, 1, 918-930, (2024).
8. “**Estimating major merger rates and spin parameters ab initio via the clustering of critical events**”, **Cadiou**, Pichon-Pharabod, Pichon & Pogosyan, in *Monthly Notices of the Royal Astronomical Society*, 531, 1, 1385-1398, (2024).
9. “**Evolution of cosmic filaments in the MTNG simulation**”, Gal arraga-Espinosa, **Cadiou**, Gouin, White, Springel, Pakmor, Hadzhiyska, Bose, Ferlito, Hernquist, Kannan, Barrera, Maria Delgado & Hern andez-Aguayo, in *Astronomy and Astrophysics*, 684, A63, (2024).
10. “**Hot gas accretion fuels star formation faster than cold accretion in high redshift galaxies**”, Kocjan, **Cadiou**, Agertz & Pontzen, in *American Astronomical Society Meeting Abstracts*, 243, 306.02, (2024).
11. “**Stellar angular momentum can be controlled from cosmological initial conditions**”, **Cadiou**, Pontzen & Peiris, in *Monthly Notices of the Royal Astronomical Society*, 517, 3, 3459-3469, (2022).

12. **“Forecasts for WEAVE-QSO: 3D clustering and connectivity of critical points with Lyman- $\alpha$  tomography”**, Kraljic, Laigle, Pichon, Peirani, Codis, Shim, **Cadiou**, Pogosyan, Arnouts, Pieri, Iršič, Morrison, Oñorbe, Pérez-Ràfols & Dalton, in *Monthly Notices of the Royal Astronomical Society*, 514, 1, 1359-1386, (2022).
13. **“Gravitational torques dominate the dynamics of accreted gas at  $z > 2$ ”**, **Cadiou**, Dubois & Pichon, in *Monthly Notices of the Royal Astronomical Society*, 514, 4, 5429-5443, (2022).
14. **“The causal effect of environment on halo mass and concentration”**, **Cadiou**, Pontzen, Peiris & Lucie-Smith, in *Monthly Notices of the Royal Astronomical Society*, 508, 1, 1189-1195, (2021).
15. **“Angular momentum evolution can be predicted from cosmological initial conditions”**, **Cadiou**, Pontzen & Peiris, in *Monthly Notices of the Royal Astronomical Society*, 502, 4, 5480-5487, (2021).
16. **“The clustering of critical points in the evolving cosmic web”**, Shim, Codis, Pichon, Pogosyan & **Cadiou**, in *Monthly Notices of the Royal Astronomical Society*, 502, 3, 3885-3911, (2021).
17. **“EDGE: a new approach to suppressing numerical diffusion in adaptive mesh simulations of galaxy formation”**, Pontzen, Rey, **Cadiou**, Agertz, Teyssier, Read & Orkney, in *Monthly Notices of the Royal Astronomical Society*, 501, 2, 1755-1766, (2021).
18. **“Tracing the simulated high-redshift circumgalactic medium with Lyman  $\alpha$  emission”**, Mitchell, Blaizot, **Cadiou**, Dubois, Garel & Rosdahl, in *Monthly Notices of the Royal Astronomical Society*, 501, 4, 5757-5776, (2021).
19. **“The OBELISK simulation: Galaxies contribute more than AGN to H I reionization of protoclusters”**, Trebitsch, Dubois, Volonteri, Pfister, **Cadiou**, Katz, Rosdahl, Kimm, Pichon, Beckmann, Devriendt & Slyz, in *Astronomy and Astrophysics*, 653, A154, (2021).
20. **“When do cosmic peaks, filaments, or walls merge? A theory of critical events in a multiscale landscape”**, **Cadiou**, Pichon, Codis, Musso, Pogosyan, Dubois, Cardoso & Prunet, in *Monthly Notices of the Royal Astronomical Society*, 496, 4, 4787-4822, (2020).
21. **“Dense gas formation and destruction in a simulated Perseus-like galaxy cluster with spin-driven black hole feedback”**, Beckmann, Dubois, Guillard, Salome, Olivares, Polles, **Cadiou**, Combes, Hamer, Lehnert & Pineau des Forets, in *Astronomy and Astrophysics*, 631, A60, (2019).
22. **“Accurate tracer particles of baryon dynamics in the adaptive mesh refinement code RAMSES”**, **Cadiou**, Dubois & Pichon, in *Astronomy and Astrophysics*, 621, A96, (2019).
23. **“Galaxies flowing in the oriented saddle frame of the cosmic web”**, Kraljic, Pichon, Dubois, Codis, **Cadiou**, Devriendt, Musso, Welker, Arnouts, Hwang, Laigle, Peirani, Slyz, Treyer & Vibert, in *Monthly Notices of the Royal Astronomical Society*, 483, 3, 3227-3255, (2019).
24. **“Galaxy evolution in the metric of the cosmic web”**, Kraljic, Arnouts, Pichon, Laigle, de la Torre, Vibert, **Cadiou**, Dubois, Treyer, Schimd, Codis, de Lapparent, Devriendt, Hwang, Le Borgne, Malavasi, Milliard, Musso, Pogosyan, Alpaslan, Bland-Hawthorn & Wright, in *Monthly Notices of the Royal Astronomical Society*, 474, 1, 547-572, (2018).
25. **“How does the cosmic web impact assembly bias?”**, Musso, **Cadiou**, Pichon, Codis, Kraljic & Dubois, in *Monthly Notices of the Royal Astronomical Society*, 476, 4, 4877-4907, (2018).