

# Corentin Cadiou

Assistant professor  
*Chargé de recherche*

J 16/09/1992

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F French

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## Science interests

galaxy formation

cosmic web

numerical simulations

cosmology

## Languages

French (native)

English (C2)

German (B2)

Spanish & Swedish (A1)

## Numerics

### HPC

MPI OpenMP

Kokkos

### Programming

Fortran C++

Python

## 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 

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 400 MCPU hr** (4,000,000€, 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**

 

250 MCPU hr (EuroHPC) + 60 MCPU hr (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>eSSENCE grant (1 100 000 kr ≈ 95 000 €)</b>	Lund University, Sweden
	Research grant for the project: "Galaxy formation in the exascale era".	
2024-26	<b>Fysiografen grant (110 000 kr ≈ 9 500 €)</b>	Lund University, Sweden
	Research grant for the project: "The formation of disk, from cosmic dawn to cosmic noon".	
2023-25	<b>Fysiografen grant (140 000 kr ≈ 2 000 €)</b>	Lund University, Sweden
	Research grant for the project: "The role of environment in driving galaxy spin".	
2018	NumFOCUS New Contributor Award	
	In recognition of my contributions to the <code>Yt</code> project, the most widely-used Python package for analysing simulations.	
2016-19	ILP fellowship (5000 € per annum)	
2012-19	ENS scholarship & ENS doctoral fellowship, prestigious full stipends awarded nationwide to 20 fellows.	

## Responsibilities

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

#### 2023–now **ARRAKIHS mission**

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 **'Agora' collaboration**

Code comparison project aimed at finding which galaxy properties are robust predictions from the different models.

#### 2022–now **'Ginea' collaboration**

France

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.

#### 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 **Yt team member**, in charge of support of the RAMSES code.

`Yt` is now the most widely used library to analyse astrophysical simulations. Personal contributions include support for the RAMSES code, significant I/O performance improvements ( $\times 100$  faster for RAMSES), community support.

### — Community service

#### 2025–now **IAP Seminars**

In charge of the organization of IAP's seminars (weekly).

#### 2022–now **Member of the EAS Advisory Committee on Sustainability**

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 **Reviewer for Astronomy and Astrophysics, Monthly Notices of the Royal Astronomical Society, Scipy's conference proceedings**

#### 2016–21 Organizer of IAP pre-seminar and the 'Extragalactic Journal Club'

IAP, Paris, France & UCL, London, UK

### — Teaching and supervision

#### 2025–now **PhD student supervisions**

Supervision of 1 PhD student: The work of the students in bold led to a submitted paper: S. Errachi (IAP, Master 2, 25–26);

#### 2020–now **Master's student supervisions**

Supervision of 9 Master's students. The work of the students in bold led to a submitted paper:

- Y. Su (Master Calcul Haute Performance et Simulation, Université Saint-Quentin, Master 2 in HPC, 25–26);
- S. Errachi (Master Noyau Particule et Astroparticules, Univ. Paris Cité, 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);
- **Z. Kocjan** (UCL, MSc, 21–23);
- J. Warbrick (UCL, MSci, 20–21);
- **E. Pharabod** (Polytechnique, France, Master 2, 20–21).

2016–19	<b>Teaching Assistant</b>	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 ( <a href="#">online</a> 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	<b>Speaker at the “Pint of Science” festival</b>	Paris, France
2017–19	<b>Journée de la Science (Open House days)</b>	Sorbonne Université, France

## 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
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 **21** articles as lead or co-lead author (**20** already published in MNRAS and A&A). I also contributed to **26** other articles. My papers have been cited **938** times (*h*-index of 16 as of 10<sup>th</sup> November 2025), source: [NASA/ADS](#).

#### — Submitted articles

1. “**MEGATRON: The environments of Population III stars at Cosmic Dawn and their connection to present day galaxies**”, Storck, Katz, Devriendt, Slyz, **Cadiou**, Choustikov, Rey, Saxena, Agertz & Kimm, *submitted*, [arXiv:2510.06853](#), (2025).
2. “**MEGATRON: Disentangling Physical Processes and Observational Bias in the Multi-Phase ISM of High-Redshift Galaxies**”, Choustikov, Katz, Cameron, Saxena, Devriendt, Slyz, Rey, **Cadiou**, Blaizot, Kimm, Laseter, Matsumoto & Rosdahl, *submitted*, [arXiv:2510.06347](#), (2025).
3. “**MEGATRON: the impact of non-equilibrium effects and local radiation fields on the circumgalactic medium at cosmic noon**”, **Cadiou**, Katz, Rey, Agertz, Blaizot, Cameron, Choustikov, Devriendt, Hauk, Jones, Kimm, Laseter, Martin-Alvarez, Matsumoto, Nyhagen, Pearce, Rodríguez Montero, Rosdahl, Rufo Pastor, Sanati, Saxena, Slyz, Stiskalek, Storck & Yee, *submitted*, [arXiv:2510.05667](#), (2025).
4. “**MEGATRON: how the first stars create an iron metallicity plateau in the smallest dwarf galaxies**”, Rey, Katz, **Cadiou**, Sanati, Agertz, Blaizot, Cameron, Choustikov, Devriendt, Hauk, Ji, Jones, Kimm, Laseter, Martin-Alvarez, Matsumoto, Pearce, Revaz, Rodriguez Montero, Rosdahl, Saxena, Slyz, Stiskalek, Storck, Veenema & Yee, *submitted*, [arXiv:2510.05232](#), (2025).
5. “**MEGATRON: Reproducing the Diversity of High-Redshift Galaxy Spectra with Cosmological Radiation Hydrodynamics Simulations**”, Katz, Rey, **Cadiou**, Agertz, Blaizot, Cameron, Choustikov, Devriendt, Hauk, Jones, Kimm, Laseter, Martin-Alvarez, Matsumoto, Pearce, Rodríguez Montero, Rosdahl, Sanati, Saxena, Slyz, Stiskalek, Storck, Veenema & Yee, *submitted*, [arXiv:2510.05201](#), (2025).
6. “**Introducing NewCluster: the first half of the history of a high-resolution cluster simulation**”, Han, Yi, Dubois, Rhee, Jeon, Jang, Byun, **Cadiou**, Kim, Kimm & Pichon, *submitted*, [arXiv:2507.06301](#), (2025).
7. “**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*, [arXiv:2411.07282](#), (2024).

## — Published 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, *Monthly Notices of the Royal Astronomical Society*, 541, 1195, (2025).
2. “**RAMSES-yOMP: Performance Optimizations for the Astrophysical Hydrodynamic Simulation Code RAMSES**”, Han, Dubois, Lee, Kim, **Cadiou** & Yi, *The Astrophysical Journal*, 978, 96, (2025).
3. “**Exploring the causal effect of cosmic filaments on dark matter haloes**”, Storck, **Cadiou**, Agertz & Galárraga-Espinosa, *Monthly Notices of the Royal Astronomical Society*, 539, 487, (2025).
4. “**EDGE-INFERN: Simulating Every Observable Star in Faint Dwarf Galaxies and Their Consequences for Resolved-star Photometric Surveys**”, Andersson, Rey, Pontzen, **Cadiou**, Agertz, Read & Martin, *The Astrophysical Journal*, 978, 129, (2025).
5. “**How complex are galaxies? A non-parametric estimation of the intrinsic dimensionality of wide-band photometric data**”, **Cadiou**, Laigle & Agertz, *Monthly Notices of the Royal Astronomical Society*, 537, 1869, (2025).
6. “**Running with the bulls: The frequency of star-disc encounters in the Taurus star-forming region**”, Winter, Benisty, Shuai, Dùchene, Cuello, Anania, **Cadiou** & Joncour, *Astronomy and Astrophysics*, 691, A43, (2024).
7. “**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-Fàbrega, Kim, Primack, Jung, Genina, Hausammann, Kim, Lupi, Nagamine, Powell, Revaz, Shimizu, Strawn, Velázquez, Abel, Ceverino, Dong, Quinn, Shin, Segovia-Otero, Agertz, Barrow, **Cadiou**, Dekel, Hummels, Oh, Teyssier & AGORA Collaboration, *The Astrophysical Journal*, 968, 125, (2024).
8. “**Probing cosmology via the clustering of critical points**”, Shim, Pichon, Pogosyan, Appleby, **Cadiou**, Kim, Kraljic & Park, *Monthly Notices of the Royal Astronomical Society*, 528, 1604, (2024).
9. “**Hot gas accretion fuels star formation faster than cold accretion in high-redshift galaxies**”, Kocjan, **Cadiou**, Agertz & Pontzen, *Monthly Notices of the Royal Astronomical Society*, 534, 918, (2024).
10. “**Estimating major merger rates and spin parameters ab initio via the clustering of critical events**”, **Cadiou**, Pichon-Pharabod, Pichon & Pogosyan, *Monthly Notices of the Royal Astronomical Society*, 531, 1385, (2024).
11. “**Evolution of cosmic filaments in the MTNG simulation**”, Galárraga-Espinosa, **Cadiou**, Gouin, White, Springel, Pakmor, Hadzhiyska, Bose, Ferlito, Hernquist, Kannan, Barrera, Maria Delgado & Hernández-Aguayo, *Astronomy and Astrophysics*, 684, A63, (2024).
12. “**pynbody/genetic: Version 1.5.0**”, Pontzen, **Cadiou**, svstoprya, nroth0815, Rey & rc-softdev-admin, -999, (2024).
13. “**Hot gas accretion fuels star formation faster than cold accretion in high redshift galaxies**”, Kocjan, **Cadiou**, Agertz & Pontzen, *American Astronomical Society Meeting Abstracts #243*, 243, 306.02, (2024).
14. “**pynbody/tangos: Version 1.9.1**”, Pontzen, Tremmel, **Cadiou**, Rey, Wright, Davies, philosoph & Quinn, -999, (2023).
15. “**pynbody/pynbody: Version 1.5.2**”, Pontzen, Roškar, **Cadiou**, Stinson, Mastropietro, Rey, Keller, Duffy, mkrets, Tremmel, Davies, Franck, Quinn, Sarmento, Bovy, nroth0815, Coles, Ji, Applebaum, Zana, Biernacki, Herpich, mihamit, Woods, EthTay, Altay, Winkler, Shaw & Moon, -999, (2023).
16. “**Yt-project/yt\_astro\_analysis: yt\_astro\_analysis-1.1.3**”, Smith, Turk, ZuHone, Robert, Skory, Hummels, Myers, Kowalik, Eganhila, Skillman, Warren, **Cadiou**, Gsiisg, Wise, Madcpf, Leitner, Scopatz, De Val-Borro, Stark, Meng-Yuan, Keller, Dong, Richardson, Krafczyk, Goldbaum, Sankar & Stonnes, -999, (2023).
17. “**Stellar angular momentum can be controlled from cosmological initial conditions**”, **Cadiou**, Pontzen & Peiris, *Monthly Notices of the Royal Astronomical Society*, 517, 3459, (2022).
18. “**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, *Monthly Notices of the Royal Astronomical Society*, 514, 1359, (2022).
19. “**Gravitational torques dominate the dynamics of accreted gas at  $z > 2$** ”, **Cadiou**, Dubois & Pichon, *Monthly Notices of the Royal Astronomical Society*, 514, 5429, (2022).
20. “**Matplotlib label lines**”, **Cadiou**, -999, (2022).
21. “**Matplotlib label lines**”, **Cadiou**, -999, (2022).
22. “**FyeldGenerator**”, **Cadiou**, -999, (2022).
23. “**On the causal origin of the angular momentum of dark matter halos and galaxies**”, **Cadiou**, EAS2022, *European Astronomical Society Annual Meeting*, 476, (2022).
24. “**pynbody/genetic: Version 1.3.5**”, Pontzen, **Cadiou**, Svstoprya, Nroth0815, Rey & Rc-Softdev-Admin, -999, (2022).
25. “**The causal effect of environment on halo mass and concentration**”, **Cadiou**, Pontzen, Peiris & Lucie-Smith, *Monthly Notices of the Royal Astronomical Society*, 508, 1189, (2021).

26. “Angular momentum evolution can be predicted from cosmological initial conditions”, **Cadiou**, Pontzen & Peiris, *Monthly Notices of the Royal Astronomical Society*, 502, 5480, (2021).
27. “The clustering of critical points in the evolving cosmic web”, Shim, Codis, Pichon, Pogosyan & **Cadiou**, *Monthly Notices of the Royal Astronomical Society*, 502, 3885, (2021).
28. “EDGE: a new approach to suppressing numerical diffusion in adaptive mesh simulations of galaxy formation”, Pontzen, Rey, **Cadiou**, Agertz, Teyssier, Read & Orkney, *Monthly Notices of the Royal Astronomical Society*, 501, 1755, (2021).
29. “Tracing the simulated high-redshift circumgalactic medium with Lyman  $\alpha$  emission”, Mitchell, Blaizot, **Cadiou**, Dubois, Garel & Rosdahl, *Monthly Notices of the Royal Astronomical Society*, 501, 5757, (2021).
30. “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, *Astronomy and Astrophysics*, 653, A154, (2021).
31. “pynbody/geneticIC: Version 1.3”, Pontzen, **Cadiou**, Svstopyra, Nroth0815, Rey & Rc-Softdev-Admin, -999, (2021).
32. “pynbody/geneticIC: Version 1.2”, Pontzen, Svstopyra, **Cadiou**, Nroth0815, Rey & Rc-Softdev-Admin, -999, (2021).
33. “The clustering of critical points in the evolving cosmic web”, Shim, Codis, Pichon, Pogosyan & **Cadiou**, *The Bulletin of The Korean Astronomical Society*, 46, 47.2, (2021).
34. “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, *Monthly Notices of the Royal Astronomical Society*, 496, 4787, (2020).
35. “pynbody/pynbody: Version 1.0.2”, Pontzen, Roškar, Stinson, **Cadiou**, Keller, Duffy, Mkrets, Tremmel, Mastropietro, Sarmento, Quinn, Nroth0815, Coles, Ji, Biernacki, GFG-CHAOS, Herpich, Mihaimt, Woods, Bovy, Emapple, Altay, De Val-Borro, Shaw, Moon, TobiBu, Mueslo & Perret, -999, (2020).
36. “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, *Astronomy and Astrophysics*, 631, A60, (2019).
37. “Accurate tracer particles of baryon dynamics in the adaptive mesh refinement code RAMSES”, **Cadiou**, Dubois & Pichon, *Astronomy and Astrophysics*, 621, A96, (2019).
38. “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, *Monthly Notices of the Royal Astronomical Society*, 483, 3227, (2019).
39. “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, *Monthly Notices of the Royal Astronomical Society*, 474, 547, (2018).
40. “How does the cosmic web impact assembly bias?”, Musso, **Cadiou**, Pichon, Codis, Kraljic & Dubois, *Monthly Notices of the Royal Astronomical Society*, 476, 4877, (2018).