Corentin Cadiou

Assistant professor
Chargé de recherche

J 16/09/1992

Ḥ 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)

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

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 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 **eSSENCE grant (1 100 000 kr ≈ 95 000 €)** Lund University, Sweden

Research grant for the project: "Galaxy formation in the exascale era".

2024-26 **Fysiografen grant (110 000 kr ≈ 9 500 €)** Lund University, Sweden

Research grant for the project: "The formation of disk, from cosmic dawn to cosmic noon".

2023-25 **Fysiografen grant (140 000 kr ≈ 2 000 €)** 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 Yt 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 (× 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 **Teaching Assistant** Sorbonne Université, Paris, France

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.

Outreach activities

2019–now **Outreach presentations in high-schools, museums, for the general public, for open house days.**

2020–22 **Host and co-founder of the "Astronomy on Tap" London satellite**

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: ResearcH 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 **917** times (h-index of 16 as of 22nd October 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, Martín Álvarez, 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-INFERNO: 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, Dûchene, 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 ≤ 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**, svstopyra, 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, philosaph & 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, mihaimt, 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-α 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**, Svstopyra, 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 α 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/genetIC: Version 1.3**", Pontzen, **Cadiou**, Svstopyra, Nroth0815, Rey & Rc-Softdev-Admin, *–999*, (2021).
32. "**pynbody/genetIC: 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).