

DAVID VALLÉS PÉREZ

Università di Bologna (UniBo).
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ACADEMIC AND PROFESSIONAL HISTORY

11.2025 - Present | Postdoctoral position | Università di Bologna, Dipartimento di Fisica e Astronomia
· *Contratto di ricerca* (research contract), funding by the ERC *B̃ELOVED* project (PI: Annalisa Bonafede).

07.2025 - 10.2025 | Postdoctoral position | Università di Bologna, Dipartimento di Fisica e Astronomia
· *Borsa di ricerca* (research grant), funding by the ERC Dranoel project (PI: Annalisa Bonafede).

09.2024 - 06.2025 | Postdoctoral position | Universitat de València (UV), Departament d'Astronomia i Astrofísica
· Extension of the PhD fellowship after defending the PhD Thesis, funded by the *Atracció de Talent* programme of UV.

11.2020 - 09.2024 | PhD Student in Physics | Universitat de València, Departament d'Astronomia i Astrofísica
· Research line: Observational, Theoretical and Computational Astrophysics → Computational Cosmology Group.
• Thesis title: **Unravelling the complexity of cosmic flows: strong gradients, shock waves and turbulence**
• Thesis advisors: **Susana Planelles** and **Vicent Quilis**.
• Thesis submitted on 22.04.2024. **PhD Viva** on 26.09.2024.
• **Grade:** Sobresaliente (maximum score), Unanimous cum laude. Extraordinary award (top-10% among the Unanimous cum laude theses).
· 11.2020 - 06.2021 — Senior Research Technician (PROMETEO/2019/071 excellence project)
· 06.2021 - 09.2024 — Predoctoral Fellowship *Atracció de Talent* (UV)

09.2019 - 07.2020 | Master's in Advanced Physics, specialization in Astrophysics | Universitat de València
· Weighted average grade: 9.85 out of 10. 4 out of 6 subjects graded with *Honors* (top-5% distinction). Extraordinary Masters' award (top-2%).

09.2015 - 07.2019 | Bachelor's in Physics | Universitat de València
· Weighted average grade: 9.80 out of 10. 34 out of 41 subjects graded with *Honors* (top-5% distinction). Extraordinary Bachelors' award (top-2%).

SCHOLARSHIPS AND RESEARCH GRANTS

15.06.2021 - 14.06.2025 | Predoctoral Fellowship *Atracció de Talent* (granted by UV)

2021 | ACIF2021 (Generalitat Valenciana) and FPU2020 (Ministerio de Universidades) predoctoral grants | (declined in favor of the *Atracció de Talent* fellowship)

11.2019 - 06.2020 | Research Initiation Grant in Astrophysics | Universitat de València

11.2018 - 06.2019 | Collaboration Grant at the *Departament d'Astronomia i Astrofísica* of Universitat de València | Spanish Ministry of Education

INTERNSHIPS AND VISITS AT RESEARCH INSTITUTIONS

02.06.2025-04.06.2025 | Research visit: Universidad Complutense de Madrid (UCM). Collaborators: **Patricia Sánchez-Blázquez**, Beatriz Callejas-Córdoba

26.05.2023-26.07.2023 | Doctoral visit: Universtäts-Sternwarte München (USM). Competitive funding through the *Atracció de Talent* programme. Supervisor: **Klaus Dolag**

17.05.2022-18.07.2022 | Doctoral visit: Università di Bologna. Competitive funding through the *Atracció de Talent* programme. Supervisor: **Franco Vazza**

06.2019-09.2019 | Extracurricular Internship: Astronomical Observatory of Aras de los Olmos

ADDITIONAL TRAINING: COURSES AND SCHOOLS

05.2024 | The road to a postdoc and beyond: from R1 to R3 (8h) | SFPIE, Universitat de València

02.2024 | Les agències d'avaluació: com i per què convertir-se en avaluador de la docència universitària (2h) | SFPIE, Universitat de València

04.2023 | Workshop: how to write a competitive MSCA-PF application (10h) | SFPIE, Universitat de València

03.2021 | Introduction to Statistics (10h) | Course for doctoral students, Facultat de Física-IFIC

03.2021 | Group Theory (16h) | Course for doctoral students, Facultat de Física-IFIC

02.2021 | Time-Domain Cosmology with Strong Gravitational Lensing (10h) | Course (online), Kavli IPMU

01.2021 | De la igualtat a la diversitat: una aproximació en l'àmbit universitari (10h) | Universitat de València

01.2021 | Astronomy Winter School: High-Energy Astrophysics (33h) | NTCS-NTHU (Taiwan, online)

11.2020 | 15th IYR Workshop on Geometry, Mechanics, and Control (20h) | Utrecht Geometry Center (online)

11.2019 | **Winter School of Astrophysics: Computational Fluid Dynamics in Astrophysics** (50h) | IAC (Tenerife)
11.2018 | **IV ASTERICS Virtual Observatory School** (3 days) | Strasbourg Astronomical Observatory (France)
07.2017 | **Severo Ochoa Summer Student Programme** | IFIC (Valencia)
07.2016 | **Summer Student Programme** | IFIC (Valencia)
06.2016 | **Machine Learning** (Andrew Ng) | Online course (Coursera) with certificate

PUBLICATIONS IN SCIENTIFIC JOURNALS

14 accepted publications in peer-reviewed journals (9 as the first author). 3 submitted publications. h-index: 7. i10-index: 6. Including 1 in Nature Astronomy, 1 in ApJ Letters, 2 in Computer Physics Communications (first decile – D1) as first author.

Full publication list included at the end of this document.

PRESENTATIONS AT NATIONAL AND INTERNATIONAL CONFERENCES

1 invited talk, 9 contributed talks and 4 contributed posters at conferences as first/presenting author.

07.07.2025 | **Accretion shocks as a tool to measure the mass of galaxy clusters** (poster), *Tracing cosmic evolution with galaxy clusters V* (Sesto).

13.05.2025 | **The shocking life of galaxy clusters: Updates on the topics of cluster assembly, shocks and turbulence**, *FOGLESS 2nd coordinated project meeting* (València).

16.10.2024 | **Accretion shocks as a tool to measure the mass of galaxy clusters**, *X Meeting on Fundamental Cosmology* (Sevilla; invited).

16.07.2024 | **On the assembly state of dark matter haloes through cosmic history**, *XVI Reunión científica de la Sociedad Española de Astronomía* (Granada), session ‘Cosmología y Astropartículas’. Proceedings in ISBN:978-84-09-70321-0, p. 14-19.

15.07.2024 | **The public codes ASOHF and vortex for the post-processing of cosmological simulations** (poster), *XVI Reunión científica de la Sociedad Española de Astronomía* (Granada). Proceedings in ISBN:978-84-09-70321-0, pp. 5.

21.02.2024 | **The public codes ASOHF and vortex for the post-processing of cosmological simulations** (poster), *Building Galaxies from Scratch 2024*, Vienna (Austria).

06.02.2024 | **Unravelling the complexity of cosmic flows: strong gradients, shock waves and turbulence**, *FOGLESS coordinated project meeting*, València (Spain).

10.07.2023 | **The public codes ASOHF and vortex: Application to DIANOGA simulations**, *Hydrosim 2023 meeting: designing the next generation of cosmological simulations*, Sesto (Italy).

21.11.2022 | **The halo-finding problem revisited: a deep overhaul of the ASOHF code**, *Challenges and Innovation in Computational Astrophysics IV meeting*, IAU B1 panel, online.

08.09.2022 | **Can matter enter voids? Inflows in underdense regions**, *XV Reunión científica de la Sociedad Española de Astronomía* (Tenerife), session ‘Cosmología y Astropartículas’. Proceedings in ISBN:978-84-09-50197-7, pp. 135-140.

01.07.2022 | **Can matter enter voids? Inflows in underdense regions**, *European Astronomical Society* (EAS2022, Valencia), session ‘Voids: Cosmology, Cosmic Web and Void Galaxies’.

09.09.2021 | **Characterising the temporal and spatial distribution of mass accretion flows around simulated galaxy clusters** (poster), *A multiwavelength view of galaxy clusters: Deriving masses in the era of wide-field surveys*, ESAC.

19.07.2021 | **Characterising the temporal and spatial distribution of mass accretion flows around galaxy clusters**, *National Astronomy Meeting 2021* (NAM2021, online), session ‘Galaxy Clusters: where observations and simulations meet’.

SEMINARS AT RESEARCH INSTITUTIONS

6 invited seminars at different research institutions.

04.03.2025 | **The shocking life of galaxy clusters: A scaling relation for the outermost shocks of galaxy clusters & Turbulence in simulated clusters**, *Harvard-Smithsonian Centre for Astrophysics (CfA) – Galaxy Clusters Group Seminars*.

18.07.2023 | **Turbulence in galaxy clusters & A Helmholtz-Hodge + Reynolds decomposition algorithm for SPH simulations**, *Max Planck Institute for Astrophysics (MPA Garching) – Cosmology seminar*.

17.07.2023 | **Helmholtz-Hodge (& Reynolds) decomposition in multi-resolution data**, *Max Planck Institute for Astrophysics (MPA Garching) – Multiphase group seminar*.

19.06.2023 | **Unravelling cosmic velocity flows: a Helmholtz-Hodge + Reynolds decomposition algorithm for particle-based simulations**, *Universtäts-Sternwarte München (USM) – Joy of Hydrosims seminar*.

13.12.2021 | **Void replenishment: how voids accrete matter over cosmic history**, *Universidad Autónoma de Madrid (UAM) – Cosmo-Galaxies Journal Club*.

18.10.2021 | **Untangling the complexity of cosmic flows (in galaxy clusters): accretion, mergers, shock waves and turbulence**, *INAF/OAS Bologna – Astrophysics Talks*.

INVITED OUTREACH ACTIVITIES

7 invited outreach & awareness-raising talks. Participation in 3 round tables.

03.02.2025 | **Cosmic diversity: LGTBQ+ inclusion in Academia**, *Flavourful Physics Workshop*, Instituto de Física Corpuscular (València). Invited talk + Round table

07.09.2023 | **Computational Cosmology: Simulating the formation of cosmic structures**, E³F2023, Universitat de València.

10.02.2023 | **Cosmología computacional: desde los orígenes del espacio y el tiempo hasta las estructuras más**

colosales del Cosmos, *IES Balears (Valencia)*.

09.02.2023 | ¿Hay algún doctor en la sala? (round table), *PHOTONETS student chapter, Facultat de Física, Universitat de València*.

05.07.2022 | **Diversity in Science: a Path to Inclusivity**, E³F2022, *Universitat de València*.

15.11.2021 | **Políticas de diversidad en la Universidad** (round table), *PRISMA: resilient voices for difficult times*.

04.10.2021 | **Desde los orígenes del espacio y del tiempo hasta las estructuras más colosales del Cosmos**, *IES Districte Marítim (Valencia)*.

08.01.2021 | **Un viaje de ida y vuelta: Desde los orígenes del espacio y del tiempo hasta las estructuras más colosales del Cosmos... Y aquellxs que las estudian**, *IES El Grao (Valencia)*.

14.07.2020 | **Computational Cosmology: the Universe in a computer**, E³F2020, *Universitat de València*.

UNIVERSITY TEACHING

167.4 hours of teaching at undergraduate level

Classical Mechanics I (*Bachelor's Degree in Physics, Universitat de València*; in Catalan) | Problem-solving classes for second-year Bachelor students. Autumn 2023. Total of 45 hours.

General Physics I (*Bachelor's Degree in Physics, Universitat de València*; in Catalan) | Problem-solving classes for first-year Bachelor students. Autumn 2021 and 2022. Total of 90 hours.

Classical Mechanics I (*Double Degree in Physics and Mathematics, Universitat de València*; in Spanish) | Problem-solving classes for second-year Bachelor students. Spring 2022 and 2023. Total of 30 hours.

SUPERVISION OF PROJECTS

Co-supervisor of 5 Bachelor's theses (1 ongoing), 1 Master's thesis, and 3 research scholarships and projects.

2026 (ongoing) | **Bachelor's Thesis Supervision** (*Student: Joan Cuquerella*) | Title: *Numerical integration of the two-body problem: comparison of integrators and conservation properties*. Co-supervisor: Susana Planelles.

July 2025 | **Bachelor's Thesis Supervision** (*Student: Jordi Barberà*) | Title: *Structure finding in cosmological simulations: dark matter halo finders*. Co-supervisor: Susana Planelles. Student also awarded a scholarship for introduction to research under my co-supervision.

July 2025 | **Bachelor's Thesis Supervision** (*Student: Cristina López*) | Title: *Observations of galaxy clusters across the electromagnetic spectrum*. Co-supervisor: Susana Planelles.

June 2025 | **Research stay** (*Student: Joan Balmon*) | Title: *Study on the asymmetry, projection effects and self-similarity of the pressure profiles of galaxy clusters from cosmological simulations*. Co-supervisor: Susana Planelles.

July 2024 | **Master's Thesis Supervision** (*Student: Isac Barranco*) | Title: *Is hydrostatic equilibrium a reliable description of galaxy clusters?*. Co-supervisors: Susana Planelles and Vicent Quilis. Student also awarded a scholarship for introduction to research under my co-supervision.

July 2024 | **Bachelor's Thesis Supervision** (*Student: Marc Cuenca*) | Title: *Tracking DM haloes in cosmological simulations: the hierarchical paradigm and halo mergers*. Co-supervisor: Susana Planelles

September 2023 | **Bachelor's Thesis Supervision** (*Student: Isac Barranco*) | Title: *Identification of dark matter halos in high-resolution cosmological simulations*. Co-supervisor: Susana Planelles

OTHER UNIVERSITY ACTIVITIES

09.2023-06.2024 | **Participation in the Teaching TalkInn**. Project of teaching innovation at the Facultat de Física (UV).

04.03.2022 | **Supervision of the Preliminary PLANCKS2022 exam**. Organized by the RSEF.

03.2020 | **Grant for organizing socio-cultural activities on diversity issues**. GVA and UV's *diversitats* program. Project: "Espectre Visible" contest for artistic production to raise awareness of affective-sexual and gender diversity in scientific fields. Funding amount: €1000.

COLLABORATION IN ORGANIZATIONAL, MANAGEMENT, AND REPRESENTATION TASKS

11.2023 - 06.2025 | **Representative of Early Stage Researchers (PIF) in Department Council** (by election). Departament d'Astronomia i Astrofísica, Universitat de València.

12.2022 - 06.2025 | **Representative of Early Stage Researchers (PIF) in Faculty Board** (by election). Facultat de Física, Universitat de València.

11.2020 - 01.2024 | **Organizer of seminars among PhD students**. PhD Programme in Physics, Universitat de València.

10.2020 - 01.2024 | **Organizer of weekly seminars "Journal Club"**. Departament d'Astronomia i Astrofísica, Universitat de València.

PARTICIPATION IN ORGANISING COMMITTEES

13-14.05.2025 | **Organising committee of the 2nd FOGLESS Coordinated Project Meeting**, held in València.

06-07.02.2024 | **Organising committee of the 1st FOGLESS Coordinated Project Meeting**, held in València.

ARTICLE REVIEWING FOR JOURNALS

Since **11.2025** | Referee for *Physical Review D* (PrD).

Since **06.2025** | Referee for *The Astrophysical Journal* (ApJ).

Since **04.2025** | Referee for *Astronomy & Astrophysics* (A&A).

Since **10.2023** | Referee for *Monthly Notices of the Royal Astronomical Society* (MNRAS).

Since **01.2023** | Referee for *The Astrophysical Journal: Supplement Series* (ApJS).

CODE DEVELOPMENT AND PUBLIC REPOSITORIES

AVISM | Void finder for simulation and observational data. [GitHub link](#).
vortex-p | Helmholtz-Hodge and Reynolds decomposition of velocity fields from particle-based/meshless/unstructured data (Fortran + OpenMP). [GitHub link](#).
ASOHF | Adaptive (multi-scale) Spherical Overdensity Halo Finder and Galaxy Finder (Fortran + OpenMP). [GitHub link](#).
vortex | Helmholtz-Hodge & Reynolds decomposition of velocity fields on AMR grids (Fortran + OpenMP). [GitHub link](#).
masclet_framework | Multi-purpose analysis tools for grid (AMR) and particle data stemming from MASCLET simulations (Python). [GitHub link](#).

LANGUAGES

Spanish: native	Catalan: native, C2 level certification	English: C2 level certification	Italian: basic competence, A2 level certification
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AWARDS AND HONORS

11.2025 – National Award for Academic Excellence (Physical sciences), Third Prize, granted by the Spanish Ministry of Science to the three top-performing Bachelor graduates in each academic discipline.

07.2025 - PhD “Extraordinary award”, granted by the Doctorate School of Universitat de València (top-10% distinction among all *cum laude* PhD Thesis in the area of Physics).

07.2025 - “Premio SEA Tesis 2025”. Award to the best PhD Thesis in Astronomy & Astrophysics, defended in Spanish institutions or by Spanish researchers, granted by the *Sociedad Española de Astronomía*.

11.2024 - “Mavi Dolç i Gastaldo” award, for the usage of Catalan and the linguistic quality in PhD Theses. Servei de Política Lingüística, Universitat de València.

04.2021 - Second Prize in the “Jordi Porta i Jué” Award, for the best Master’s Thesis in Physics. Societat Catalana de Física.

03.2021 - Scholarship for the promotion of academic excellence for the Bachelor’s Degree in Physics (top-2%). Generalitat Valenciana.

12.2020 - Extraordinary Award for academic performance in the Master’s Degree in Advanced Physics (top-2% distinction).

11.2020 - First Prize “Xavier Gómez i Font” for linguistic quality of Master’s Thesis written in English.

12.2019 - Extraordinary Award for academic performance in the Bachelor’s Degree in Physics (top-2% distinction).

11.2019 - Second Prize in the “Xavier Gómez i Font” Award for linguistic quality of Bachelor’s Thesis written in English.

MEDIA APPEARANCES

Several of my works have been highlighted in different mass media: some examples below.

Mass inflows from cosmic voids open new scenarios in the understanding of the formation and evolution of the Universe (in Spanish). In [El Periòdic](#) and [Europa Press](#).

Researchers from UV suggest a new way to detect and measure the presence of dark matter in the Universe (in Spanish). In [La Vanguardia](#) and [Europa Press](#).

COMPLETE LIST OF PUBLICATIONS OF DAVID VALLÉS-PÉREZ

Università di Bologna. Postdoc at the *Dipartimento di Fisica e Astronomia*.
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Below, I provide a numbered list of my publications to date (in refereed journals; or submitted or to be soon submitted to refereed journals), in chronological order, with doi or arXiv links where applicable.
They can be additionally checked in ADS (query ‘author: “vallés-pérez, d”’), my Google Scholar profile, my ORCID: 0000-0003-2656-5985 or my website (including a short summary for each one).

ACCEPTED PUBLICATIONS AS A FIRST AUTHOR

9 accepted publications as first author in peer-reviewed journals.

1. **Vallés-Pérez, D.**, Planelles, S. & Quilis, V.* (2020):
On the Accretion History of Galaxy Clusters: temporal and spatial distribution.
Monthly Notices of the Royal Astronomical Society (MNRAS), Volume 499-2, 2303-2318
[doi:10.1093/mnras/staa3035](https://doi.org/10.1093/mnras/staa3035).
2. **Vallés-Pérez, D.***, Planelles, S. & Quilis, V. (2021):
Unravelling cosmic velocity flows: a Helmholtz-Hodge decomposition algorithm for cosmological simulations.
Computer Physics Communications (CPC), Volume 263, 107892
[doi:10.1016/j.cpc.2021.107892](https://doi.org/10.1016/j.cpc.2021.107892).
3. **Vallés-Pérez, D.***, Planelles, S. & Quilis, V. (2021):
Troubled cosmic flows: turbulence, enstrophy and helicity from the assembly history of the intracluster medium.
Monthly Notices of the Royal Astronomical Society (MNRAS), Volume 504-1, 510-527
[doi:10.1093/mnras/stab880](https://doi.org/10.1093/mnras/stab880).
4. **Vallés-Pérez, D.***, Quilis, V. & Planelles, S. (2021):
Void Replenishment: How Voids Accrete Matter Over Cosmic History.
The Astrophysical Journal Letters (ApJL), Volume 920-1, L2
[doi:10.3847/2041-8213/ac2816](https://doi.org/10.3847/2041-8213/ac2816).
5. **Vallés-Pérez, D.***, Planelles, S. & Quilis, V. (2022):
The halo-finding problem revisited: a deep revision of the ASOHF code.
Astronomy & Astrophysics (A&A), Volume 664, A42
[doi:10.1051/0004-6361/202243712](https://doi.org/10.1051/0004-6361/202243712).
6. **Vallés-Pérez, D.***, Planelles, S., Monllor-Berbegal, Ó. & Quilis, V. (2023):
On the choice of the most suitable indicator for the assembly state of dark matter haloes through cosmic time.
Monthly Notices of the Royal Astronomical Society (MNRAS), Volume 519-4, 6111–6125
[doi:10.1093/mnras/stad059](https://doi.org/10.1093/mnras/stad059).
7. **Vallés-Pérez, D.***, Quilis, V. & Planelles, S. (2024):
Cosmic accretion shocks as a tool to measure the dark matter mass of galaxy clusters.
Nature Astronomy, Volume 8, 1195–1204
[doi:10.1038/s41550-024-02303-x](https://doi.org/10.1038/s41550-024-02303-x).
8. **Vallés-Pérez, D.***, Planelles, S., Quilis, V., Groth, F., Marín-Gilabert, T. & Dolag, K. (2024):
VORTEX-P: A Helmholtz-Hodge and Reynolds decomposition algorithm for particle-based simulations.
Computer Physics Communications (CPC), Volume 304, 109305
[doi:10.1016/j.cpc.2024.109305](https://doi.org/10.1016/j.cpc.2024.109305).
9. **Vallés-Pérez, D.***, Planelles, S. & Quilis, V. (2025):
The eventful life journey of galaxy clusters – I. Impact of DM halo and ICM properties on their full assembly histories.
Astronomy & Astrophysics (A&A), Volume 699, A1
[doi:10.1051/0004-6361/202453483](https://doi.org/10.1051/0004-6361/202453483).

ACCEPTED PUBLICATIONS AS A CO-AUTHOR

5 accepted publications as co-author in peer-reviewed journals.

10. Monllor-Berbegal, Ó.*, **Vallés-Pérez, D.**, Planelles, S., & Quilis, V. (2024):
The imprints of galaxy cluster internal dynamics on the Sunyaev-Zeldovich effect.
Astronomy & Astrophysics (A&A), Volume 686, A243
[doi:10.1051/0004-6361/202348967](https://doi.org/10.1051/0004-6361/202348967).

11. Marín-Gilabert, T.*, Steinwandel, U. P., Valentini, M., **Vallés-Pérez, D.** & Dolag, K. (2024):
Density fluctuations in the intracuster medium: an attempt to constrain viscosity with cosmological simulations.
The Astrophysical Journal (ApJ), Volume 976(1), 67
[doi:10.3847/1538-4357/ad8127](https://doi.org/10.3847/1538-4357/ad8127).
12. Groth, F.*, Valentini, M., Steinwandel, U. P., **Vallés-Pérez, D.** & Dolag, K. (2025):
Turbulent Pressure Support in Galaxy Clusters – Impact of the Hydrodynamical Solver.
Astronomy & Astrophysics (A&A), Volume 693, A263
[doi:10.1051/0004-6361/202451803](https://doi.org/10.1051/0004-6361/202451803).
13. Monllor-Berbegal, Ó.*, **Vallés-Pérez, D.**, Planelles, S., & Quilis, V.:
AVISM: Algorithm for Void Identification in coSMology.
Accepted for publication in Astronomy & Astrophysics. [arXiv:2509.25329](https://arxiv.org/abs/2509.25329)
14. Barranco-Llorca, I.*, **Vallés-Pérez, D.**, Planelles, S. & Quilis, V.:
The signature of major merger on the hydrostatic mass bias of galaxy clusters.
Accepted for publication in Astronomy & Astrophysics. [arXiv:2511.10730](https://arxiv.org/abs/2511.10730)