

CURRICULUM VITAE

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CURRENT OCCUPATION

PostDoc researcher at the Department of Physics and Astronomy at the University of Bologna since 01/02/2024. Title of the project: *Dynamical evolution of globular clusters in a cosmological framework*.

EDUCATION

- **BSc in Astronomy, *magna cum laude***, 2015-2018, Alma Mater Studiorum, University of Bologna, Italy. 20/09/2018. Title: *Structure and kinematics of the Milky Way* (Supervisor: Prof. D. Dallacasa).
- **MSc in Astrophysics and Cosmology, *magna cum laude***, 2018-2020, Alma Mater Studiorum, Università di Bologna, Italia. 25/09/2020. Title: *Looking for intermediate mass black holes in globular clusters using action-based dynamical models* (Supervisor: Prof. C. Nipoti; co-supervisor: Dr. R. Pascale).
Link to my Master thesis: <https://amslaurea.unibo.it/21272/>
- **PhD in Astronomy**, 2020-2024, University of Padova. Title: *Star formation in young stellar clumps of ram-pressure stripped galaxies as seen by HST*. Supervisor: Dr. B.M. Poggianti; co-supervisors: Dr. M. Gullieuszik and Dr. A. Moretti.

RESEARCH VISITS

- 11/04-02/06/2023: University of Minnesota, Minneapolis (MN). Collaboration with Prof. Claudia Scarlata on the study of the clumps sample completeness and bayesian fitting to the clump mass function.

INTERNATIONAL CONFERENCES

Contributed talks

- 01-05/09/2025. *Bridging scales: star clusters and their host galaxies from the Local to the high-z Universe*, Matera (MT). Title: The dynamical evolution of the stellar clumps in the Sparkler galaxy.

- 30/06-04/07/2025. *Focusing Strong Lenses: star clusters and globular cluster progenitors at high redshift*, Sexten (BZ). Title: The dynamical evolution of the stellar clumps in the Sparkler galaxy.
- 23-27/06/2025. *EAS 2025*, Cork (IRL). Title: The dynamical evolution of the stellar clumps in the Sparkler galaxy.
- 16-20/06/2025. *STARS II: current challenges, upcoming solutions*, Bologna (BO). Title: The dynamical evolution of the stellar clumps in the Sparkler galaxy.
- 17/04/2025. *INAF/OAPD Seminar*, Padova (PD). Title: The dynamical evolution of the stellar clumps in the Sparkler galaxy.
- 16/04/2024. *Astrophysics Talk*, DIFA - Università di Bologna (BO). Title: Star Formation in Young Stellar Clumps of Ram-Pressure Stripped Galaxies as seen by HST.
- 23-27/10/2023. *GASP meeting*, New York (NY), Italy. Title: Star Formation in Young Stellar Clumps of Ram-Pressure Stripped Galaxies as seen by HST.
- 03-07/07/2023. *A multi-wavelength view on globular clusters near and far: from JWST to the ELT*, Sexten (BZ), Italy. Title: Star-forming clumps in the peculiar environment of jellyfish galaxies.
- 20-23/09/2022. *CLUSTER3*, Bologna (BO), Italy. Title: High-resolution imaging of 6 GASP ram-pressure stripping galaxies with HST.
- 29/08-02/09/2022. *GASP meeting*, Cagliari (CA), Italy. Title: High-resolution imaging of 6 GASP ram-pressure stripping galaxies with HST.

Posters

- 26-30/06/2023: *The physics of Star Formation-From Stellar Cores to Galactic Scales*, Lyon.
- 25-29/04/2022: 2022 Spring Symposium, *CLUSTERS 2022: Challenging Our Cosmological Perspectives Symposium Schedule*, virtual-only attendance.
- 27/06/2022-01/07/2022: *European Astronomical Society annual meeting*, Valencia.

SCIENTIFIC SKILLS and BACKGROUND

I studied the **dynamical processes** driving the **evolution of stellar systems**, like dynamical friction and tidal stripping, both analytically and by simulations. I studied models and theories about globular cluster formation and evolution at high- z .

I developed a good knowledge of state-of-art observations and models regarding the properties and driving mechanisms of the **star-formation process** and clump formation, including turbulence, stellar feedback, dynamical and stellar evolution. I developed expertise in tracers and proxies of the properties of **star-forming clumps**, including mass, luminosity and size

distribution functions; luminosity, mass and SFR-size relations; morphological evolution. In particular I studied the properties of stellar clumps formed from gas stripped from cluster galaxies undergoing strong **ram-pressure stripping**, surrounded by the hot, high-pressure intracluster medium.

For my Master thesis I developed a sound knowledge of the evolution of the **internal structure of the globular clusters**, both from the stellar and dynamical point of view (mass segregation, equipartition and Intermediate Mass Black Holes, three-body interactions). In addition to that, I have a good background about distribution functions for dynamical systems, including in particular **action-based distribution functions**.

SCIENTIFIC INTERESTS

- High-z formation and evolution of **stellar clusters**, whether they are star-forming or (proto) **globular clusters**;
- processes driving **cluster formation**, especially when involving gas dynamics like turbulent cascade and stellar feedback;
- **star-formation process** as a whole, how the **environment** (at different scales, from the one surrounding the galaxy to the one surrounding the single clump) influences it and how this can be related to the evolution across cosmic time of scaling relations like the galactic SFR-stellar mass main sequence and the morphological evolution of star-forming galaxies;
- **galaxy evolution**, in particular from the dynamical point of view;
- morphological evolution of galaxies, **clump survivability** and disruption timescales, dynamical and orbital evolution of single stars.

TECHNICAL SKILLS

My scientific background includes the knowledge of state-of-art **simulations** and **N-body codes**, like Arepo and RAMSES. I know the peculiarities and differences of pure N-body, hydrodynamical, isolated and cosmological simulations. I know how to produce the simulation of a galaxy and its stellar clusters, of the large-scale structure, and how to implement time-varying external potentials.

I have skills in **HST** photometric **data reduction** and **analysis**, development of an objective algorithm for the **detection** and **selection** of star-forming **clumps** in ram-pressure stripped galaxies (mainly using the Astrodendro software package) and capabilities in **big datasets** statistical analysis. The study of the completeness of the sample of clumps let me develop a sound knowledge in the generation of clumps **mock images** starting from intrinsic properties like mass and age, to be translated into observables like the density flux in a certain photometric filter. I have also developed capabilities in exploring and using **MUSE datacubes**; basic knowledge of data reduction of

NIRCam (JWST), developed during the writing an **observation proposal** (to be submitted).

For my Master thesis I developed good skills in **parallel coding** with mpi, as well as the generation of self-consistent **dynamical models** for galaxies and globular cluster via the use of action-based distribution functions.

Programming languages: *Python* (numpy, scipy, matplotlib, seaborn, astrodendro, astropy), *Astrodrizzle* (HST photometric data reduction). Basic knowledge of *Fortran90* and *C*.

Software: *galfit*, *tinytim*, *Latex*, *topcat*, *SAO DS9*, *agama*, *arepo*, *ramses*.

IT skills: the strong interest in computational Astrophysics led to a good ability in using computers and calculators, with a quite strong knowledge in *Linux* and *Windows* systems.

PUBLICATIONS LIST

First author

4. **Giunchi, E.**; Marinacci, F.; Nipoti, C. *and 4 more*, "The dynamical evolution of the stellar clumps in the Sparkler galaxy", *Astronomy & Astrophysics*, Volume 701, id.A129, 21 pp., doi: 10.1051/0004-6361/202554669.

3. **Giunchi, E.**; Scarlata, C.; Werle, A. *and 8 more*, "Clump formation in ram-pressure stripped galaxies: evidence from mass function", *Astronomy & Astrophysics*, Volume 696, id.A228, 21 pp., doi: 10.1051/0004-6361/202452983.

2. **Giunchi, E.**; Gullieuszik, M.; Poggianti, B. M. *and 9 more*, "Morphology of star-forming clumps in ram-pressure stripped galaxies as seen by HST", *The Astrophysical Journal*, vol. 958, no. 1, 2023. doi: 10.3847/1538-4357/acfed6

1. **Giunchi, E.**; Gullieuszik, M.; Poggianti, B. M. *and 6 more*, "HST Imaging of Star-forming Clumps in Six GASP Ram-pressure-stripped Galaxies", *The Astrophysical Journal*, vol. 949, no. 2, 2023. doi:10.3847/1538-4357/acc5ee.

Co-author

7. Khoram, A.; Poggianti, B. M.; Moretti, A.; *9 more*; **Giunchi, E.** *and 1 more*, "Stripped and Enriched: The Role of Ram-Pressure in Shaping Chemical Enrichment of Galaxies at Intermediate Redshift", *Monthly Notices of the Royal Astronomical Society: Letters*, Advance Access, doi: 10.1093/mnrasl/slaf034. Collaboration on the comparison with previous works and on the right selection of the sample.

6. Akerman, N.; Tonnesen, S.; Poggianti B. M.; 2 more; **Giunchi, E.** and 2 more, *Astronomy & Astrophysics*, Volume 698, id.A151, 17 pp., doi: 10.1051/0004-6361/202553966. Collaboration on the mock image generation and comparison with observations.

5. Ignesti, A.; Brunetti, G.; Gullieuszik, M; 7 more; **Giunchi, E.** and 5 more, "Investigating the Intracluster Medium Viscosity Using the Tails of GASP Jellyfish Galaxies", *The Astrophysical Journal*, Volume 977, Issue 2, id.219, 21 pp., doi: 10.3847/1538-4357/ad919b. I worked on the comparison between the small scales of the turbulence and the stellar clumps observed with HST.

4. Werle, A.; **Giunchi, E.**; Poggianti, B. M. and 7 more, "The history of star-forming regions in the tails of 6 GASP jellyfish galaxies observed with the Hubble Space Telescope", *Astronomy & Astrophysics*, Volume 682, id.A162, 18 pp., doi: 10.1051/0004-6361/202348055.

3. Della Croce, A.; Pascale, R.; **Giunchi, E.** and 3 more, "The most stringent upper limit from dynamical models on the mass of a central black hole in 47 Tucanae", *Astronomy & Astrophysics*, Volume 682, id.A22, 9 pp., doi: 10.1051/0004-6361/202347569.

In this paper I worked on testing the dynamical models by changing the distribution function and the available dataset, working on a set of globular cluster mock data.

2. Ignesti, A.; Vulcani, B.; Botteon, A., Poggianti B. M., **Giunchi E.** and 5 more, "Radio continuum tails in ram pressure-stripped spiral galaxies: Experimenting with a semi-empirical model in Abell 2255", *Astronomy and Astrophysics*, vol. 675, 2023. doi:10.1051/0004-6361/202346517.

In this paper I mainly worked in developing and tuning the mathematical framework to obtain the direction of the tails given the available information (Sec. 4.2.3).

1. Gullieuszik, M.; **Giunchi, E.**; Poggianti, B. M. and 17 more, "UV and H α HST Observations of Six GASP Jellyfish Galaxies", *The Astrophysical Journal*, vol. 945, no. 1, 2023. doi:10.3847/1538-4357/acb59b.

In this paper I worked on the whole data reduction of the images, developed the cosmic rays cleaning procedure and implemented the H α -line extraction.

PHD SCHOOLS AND WORKSHOPS

- 04-21/10/2022: MIAPP (Garching, Munich) program "Star-Forming Clumps and Starbursts across Cosmic Time", in-person attendance, one plot presentation.

- 23/09-01/12/2021: XXXII Winter School of Astrophysics, “*Formation and evolution of galaxy clusters across cosmic time*”, organized by the “Instituto de Astrofísica de Canarias” (IAC), online attendance.
- 12-23/07/2021: International Summer School on the *Interstellar Medium of Galaxies, from the Epoch of Reionization to the Milky Way*, organized by “Le Centre pour la Communication Scientifique Directe”, online-only attendance was available.

Native language: Italian

Other languages:

- C1 skills in English listening, reading, speaking and writing developed independently by working in team with people from many different countries and at international conferences, schools and workshops.
- B1 skills in Spanish listening, reading, speaking and writing developed independently and during high-school.

OUTREACH ACTIVITIES

- 05/2017-08/2017: guide at the Loiano telescope (Bologna, BO), developing confidence in talking in public about astronomical topics;
- 29/09/2023: science communication talk and speed talk to a public of adults and high school students;

PROFESSIONAL ACTIVITIES

- 2023: member of the Seminar organization group at the Astronomical Observatory of Padova.

Other skills: ability to work in group, collaborating with team mates in order to obtain the best division of tasks, essential skill in modern Astronomy. Ability to work under pressure.