

Federica Tarsitano

Observational astrophysicist investigating the co-evolution of galaxies and supermassive black holes through next-generation astronomical surveys and multi-messenger astrophysics.

Science communicator through radio broadcasting (Swiss RSI), European Space Agency (ESA) interviews, digital media and science comics

International scientific coordinator

Galaxy Evolution • AGN and dual AGN • Large-scale surveys • Machine Learning

Digital communication • Scientific storytelling • International community coordination

Federica Tarsitano is a senior scientist who develops data-driven methodologies for the identification and characterization of AGN and dual AGN systems, aiming at advancing our understanding of the co-evolutionary path of SMBH and their host galaxies, and investigating the link of dual supermassive black-holes to theoretical models for LISA-detectable gravitational wave sources. Her work is embedded in major international collaborations, where she holds scientific leadership roles, and coordinates community efforts and survey development. She is a member of the Euclid Collaboration, where she leads the galaxy SED reconstruction in the photometric redshift processing function, working at the interface with the cosmic-shear community to deliver products required to control chromatic-PSF systematics. She co-led the Euclid team focused on the AGN photometric analysis, and she currently co-leads the *Euclid* AGN morphology working group, coordinating collaborative projects, supporting the group members in the use of Euclid data products and image-processing tools, and guiding analyses towards publication-ready scientific results. Furthermore, she serves as co-leader of HSC-Niji, a new medium-band international survey with the Subaru telescope, connecting researchers across Japan, continental Europe, and the United States, and developing synergies with other observational facilities (CFHT, Keck). She is an active member of NASA's Roman Science Community and the LISA Consortium.

She is also a science communicator, experienced in translating complex scientific topics into accessible visual and digital content, coordinating scientific communities, organizing events and communicating space-related science both to specialists and public audiences.

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Current Position

01/04/2026 - Present Postdoctoral Researcher

Kobayashi-Maskawa Institute, Nagoya University, Japan

Previous Appointments

01/07/2025 – 31/03/2026 Postdoctoral Researcher / Scientific Collaborator I

ETH Zürich, Institute of Particle Physics and Astrophysics, Switzerland

01/03/2022 – 30/06/2025 Postdoctoral Researcher

University of Geneva, Department of Astronomy, Switzerland

01/09/2021 – 28/02/2022 Research Assistant

ETH Zürich, Institute of Particle Physics and Astrophysics, Switzerland

Leadership and Major Scientific Responsibilities

- Co-leader of the development of a new set of 16 medium-band filters for the Subaru telescope, and the design of a new international survey, HSC-Niji, using this instrumentation
- Co-leader of the *Euclid* AGN morphology working group
- Leading the reconstruction of galaxy SEDs in the *Euclid* photo-z pipeline
- Co-Investigator of the first Subaru intensive program with the HSC-Niji survey
- Co-Investigator of a NASA Roman proposal targeting the Euclid Deep Fields

Competitive Funding

Principal Investigator, 2026 JSPS KAKENHI Research Activity Start-up Grant, ¥ 2 million awarded for exploring international synergies within the HSC-Niji survey.

Shortlists and Competitive Selections

- Shortlisted candidate, MSCA COFUND Fellowship Programme, University of Oslo, 2025.
- **EduGame** — project shortlisted in 2022 by the ETH AI Center. EduGame is conceived as an adaptive learning framework combining Knowledge Space Theory, artificial intelligence and gamification to personalise learning pathways according to each student's needs.

International Collaborations

Euclid Consortium • Subaru HSC • Roman Science Community • LISA Consortium • Rubin LSST • Dark Energy Survey

Research Methodology

Data Analysis: Large-scale astronomical surveys, Bayesian inference, template fitting, statistical inference. Computational and AI Methods: machine learning and deep learning, including variational autoencoders, probabilistic random forest, and UMAP; advanced use of LLM-assisted workflows for scientific synthesis and technical communication, with critical expert validation. Image Analysis: galaxy morphology, AGN-host decomposition, PSF modelling, SED reconstruction, and image simulations. Software: Python, C++, HTML/CSS, software development for image decomposition, SExtractor, PSFEx.

Education

2015 - 2021 PhD in Physics

ETH Zürich, Institute for Particle Physics and Astrophysics, Switzerland

Galaxy morphology and cosmological predictions for wide-field survey analyses.

Advisors: Prof. A. Refregier, Prof. A. Amara

- December 2019: Visiting student at Stanford University
- March - July 2017: Internship in nuclear and particle physics, ETH Zürich, Institute for Particle Physics and Astrophysics, Switzerland
- 2012 - 2014: MSc in Nuclear, Subnuclear and Biomedical Physics, University of Turin, Italy
- July - August 2013: CERN Summer student, CERN, Geneva, Switzerland
- 2009 - 2012: BSc in Physics, University of Turin, Italy

- 2004 - 2009: High school Diploma, Liceo Classico C. Cavour, Turin, Italy

Student Supervision and Mentoring

2024 - 2025 Supervisor of Dóra Takács' Semester Project

Dual and Binary supermassive black holes in the Euclid Survey

2020

- Supervisor of Silvan Fishbacher's Semester Project
Constraining Cosmological Parameters with PyCosmo using KiDS+VIKING-450
- Supervisor of Paul Moser Röggl's Bachelor Thesis
The effect of Intrinsic Alignment on cosmological parameter constraints

2019

- Supervisor of Imelda Romero's Semester Project: *Testing PyCosmo on JupyterHub*
- Supervisor of Beatrice Moser's Master Thesis: *Neutrino Cosmology*

2018 Supervisor of Ralf Aeberhard's Semester Project

Semesterproject in Cosmology

Teaching

Fall Semester 2020	Physics III, ETH Zürich
Spring Semester 2020	Astrophysics II, ETH Zürich
Spring Semester 2019	Astrophysics II, ETH Zürich
Fall Semester 2018	Astrophysics I, ETH Zürich
Fall Semester 2018	Statistical Methods in Astrophysics, ETH Zürich
Spring Semester 2018	Astrophysics II, ETH Zürich
Fall Semester 2016	Physics I, ETH Zürich
Spring Semester 2016	Physics II, ETH Zürich
Fall Semester 2015	Physics I, ETH Zürich

Selected Conferences and Seminars

Coordinating Roles

- **LOC** of the 4th HSC medium band workshop, 29 June-1 July, University of Nagoya, Japan
- **SOC** of the IAU symposium *Innovative Research and Techniques in Astronomy Communication*, 2-6 November 2026, NAOJ, Tokyo
- Third HSC medium band workshop, 6-8 August 2025, University of Nagoya, Japan: **Co-leader of the new HSC-Niji survey and co-chair (LOC) of the workshop:** <https://sites.google.com/view/hsc-mb-survey3/>
- Second HSC medium band workshop, 27-28 November 2024, University of Nagoya, Japan: **Co-leader of the new HSC-Niji survey and co-chair (LOC) of the workshop:** <https://sites.google.com/view/hsc-mb-workshop/home>

Invited Talks

- **Invited talk** at the *12th Galaxy Evolution Workshop*, SNU, South Korea, August 2026
- **Invited to the workshop** *Settling the Dust: Obscured AGN in Galaxy Evolution*, Lorentz Center, the Netherlands, scheduled for July 2026
- **Invited talk** at *Astrometing*, Osservatorio di Capodimonte, Naples, 3 June 2026
- **Invited online talk** at OPINAS, Max-Planck for Extraterrestrial Physics, 16 March 2026
- **Invited talk** at Tokyo IPMU, 4 August 2025 : *Dual and Binary Supermassive Black Holes in Stage IV surveys: Pathways to LISA-detected Gravitational Waves*.
- **Invited Seminar** at the Nagoya University, Japan, 30 August 2025
- ESLAB/EC meeting, Leiden, 24-28 April 2025 - **Invited plenary talk:** *Euclid Quick Data Release (Q1): First study of red quasars selection*
- **Invited talk** at the Japanese Euclid Meeting, 25-26 November 2024, University of Kyoto, Japan: *Euclid photometric redshift*
- Euclid Collaboration Meeting, Rome, June 2024 - **Invited plenary talk:** *Euclid OU-PHZ: https://youtu.be/7lxD48__iiU?si=uiIAw4m2KLaQzD6e&t=2985*
- *First HSC medium band workshop*, University of Nagoya, Japan, 28 August- 1 September 2023. **Invited talk:** *Accurate SED Reconstruction in the Euclid Survey*
- **Invited Seminar** at the Nagoya University, Japan, 30 August 2023
- **Invited Seminar** at the University of Turin, Italy, 30 July 2023
- Kinetic Field Theory (KFT) Workshop, 3-6 April, Heidelberg University
Invited talk: *KFT in PyCosmo*

Selected Talks

- **Accepted talk** at *New Frontiers in Cosmology 2026*, La Coruña, Spain, August 2026
- **Selected talk** at *Evolution Near and Far*, Osservatorio di Capodimonte, Naples, 8-12 June 2026
- Cosmic Cartography with Roman, 14-18 July 2025, STScI Baltimore - **Selected talk:** *Dual AGN and the status of photo-z: synergies across Euclid, Roman and a new HSC medium band survey*
- *AGN workshop* in Bologna, February 2024 - **Selected Talk:** *AGN-host decomposition with Euclid first light*
- Python in Astronomy, 20-24 April 2020, virtual conference
Selected talk: *Cosmological predictions with PyCosmo*
- Cosmology on Safari, South Africa, 3-9 March 2019 - **Selected talk:** *Cosmological observables with PyCosmo*
- Cosmo-18, Daejeon, South Korea, 27-31 August 2019 - **Selected poster:** *Precision cosmology with PyCosmo*

Contributed Talks

- Contributed talk at the Euclid Consortium Meeting, Barcelona 2026
- *OU-PHZ workshop in Garching*, München, May 2024

- Euclid Collaboration Meeting, Copenhagen, 19-23 June 2023
- Euclid Collaboration Meeting (online participation) Oslo, 25-29 April 2022
- Scipy 2020, 6-12 July 2020, virtual conference
- Dark Energy Survey (DES) Collaboration Meeting, Penn State University, 17-21 June 2019
- DES Collaboration Meeting, SLAC/Stanford University, 9-13 May 2016
- DES Collaboration Meeting, University of Michigan, 11-14 May 2015

Scientific Community Service

Referee for A&A (Astronomy and Astrophysics) and MNRAS (Monthly Notices for the Royal Astronomical Society).

Post-graduate training

- [Django Girls workshop](#), online, CERN, Geneva, 22-24 April 2021
- [Deep learning meets \(Astro\)Physics](#), workshop on Tensor Flow 2.0, 22 Jan. 2020, ETH Zürich
- Advanced Machine Learning lectures, 16/09/2019 - 20/12/2019, ETH Zürich
- [AICosmo2019](#) workshop, Ascona, Switzerland, 9-12 June 2019
- [Machine Learning for High Energy Physics](#) workshop, University of Zürich, 4-5 February 2019
- [Advanced C++ for HPC](#) - CSCS Supercomputing Centre, Lugano, Switzerland, 26-30 September 2016
- Observer for DES at Blanco Telescope, Cerro Tololo CTIO, Chile 27/08/2016 - 06/09/2016.

Publications

Selected Research Highlights (top 20)

Refereed papers in primary journals

(1) *Galaxy SED reconstruction in the PHZ processing function: impact on the PSF and the role of medium-band filters*

Tarsitano et al., 2026, accepted for publication in Astronomy & Astrophysics (A&A), arXiv:2601.10795.

Contribution: I led the implementation of galaxy SED reconstruction in the Euclid photometric-redshift processing function and quantified the impact of medium-band photometry.

(2) *Euclid. Discovery of 31 new quasars at $6.6 < z < 7.8$*

D. Yang et al., 2026, A&A, 711, A104.

Contribution: I provided scientific review and expert input related to quasar identification and host properties.

(3) *Euclid Quick Data Release (Q1): XL. The impact of AGN emission on SED-derived physical properties*

EC: B. Laloux, A. Bongiorno, M. Salvato, V. Allevato, M. Mezcua, W. Roster, T. Matamoro Zatarain, S. Paltani, R. Shirley, F. Tarsitano et al., 2026, A&A, 712, A182.

Contribution: As co-leader of the Euclid AGN photometric-analysis team, I contributed scientific input and review on the analysis.

(4) *Euclid Quick Data Release (Q1): XIX. First study of red quasars selection*

EC: F. Tarsitano et al., 2026, A&A, 711, A19. A&A Special Issue (SI) Euclid Q1.

Contribution: I developed the photometric and machine-learning selection for red quasars, led the analysis, and produced the catalogue subsequently used for the DUALIS proof of concept.

(5) *Euclid Quick Data Release (Q1): XX. The active galaxies of Euclid*

EC: Matamoro Zatarain et al., 2026, A&A, 711, A20. SI Euclid Q1.

Contribution: as co-leader of the Euclid AGN photometric-analysis team, I contributed to the scientific development and validation of the AGN analysis.

(6) *Euclid Quick Data Release (Q1): V. Photometric redshifts and physical properties of galaxies through the PHZ processing function*

M. Tucci, S. Paltani, W. G. Hartley, F. Dubath, N. Morisset, M. Bolzonella, S. Fotopoulou, F. Tarsitano, Saulder, C., et al., 2026, A&A, 711, A5. SI Euclid Q1.

Contribution: as a member of the Euclid PHZ processing function where I lead the galaxy SED reconstruction, I contributed methodology, validation and shared pipeline products.

(7) *Euclid Quick Data Release (Q1): XXXVIII. Euclid spectroscopy of quasars. 1. Identification and redshift determination of 3500 bright quasars*

EC: Y. Fu et al., 2026, A&A, 711, A285. SI Euclid Q1.

Contribution: I contributed to the cross-comparison of the quasar sample with my red quasar catalogue (publication 4).

(8) *Euclid Quick Data Release (Q1): VIII. Exploring galaxy morphology across cosmic time through Sérsic fits*

Quilley et al., 2026, A&A, 711, A8. SI Euclid Q1.

Contribution: I contributed my expertise in galaxy structure and morphology, with particular input on the calibration of structural measurements tracing galaxy light concentration.

(9) *Euclid Quick Data Release (Q1): XXIV. Extending the quest for little red dots to $z < 4$*

Bisigello et al., 2026, A&A, 711, A24. SI Euclid Q1.

Contribution: I provided key scientific input and review related to the sample selection and interpretation.

(10) *Euclid: Early Release Observations – Overview of the Perseus cluster and analysis of its luminosity and stellar mass functions*

Cuillandre et al., 2025, A&A, 697, A11. SI Euclid on Sky

Contribution: I provided input from my ongoing AGN–host decomposition work using the Perseus data and contributed to the scientific review of the manuscript.

(11) *Euclid: Early Release Observations – A preview of the Euclid era through a galaxy cluster magnifying lens*

Atek et al., 2025, A&A, 697, A15. SI Euclid on Sky

Contribution: I ran validation tests as part of the main analysis.

(12) *Assessing theoretical uncertainties for cosmological constraints from weak lensing surveys*

T. Tan, D. Zürcher, I. Fluri, A. Refregier, F. Tarsitano, T. Kacprzak, 2023, MNRAS 522, 3766.

Contribution: I contributed PyCosmo calculations used in the main analysis (see publication 14).

(13) *Image feature extraction and galaxy classification: a novel and efficient approach with automated machine learning*

F. Tarsitano et al., 2022, MNRAS 511, 3330.

Contribution: I developed the automated methodology combining image-feature extraction and machine learning for galaxy morphological classification.

(14) *Predicting cosmological observables with PyCosmo*

F. Tarsitano et al., 2021, *Astronomy and Computing* 36, 100484.

(15) *Pushing automated morphological classifications to their limits with the Dark Energy Survey*

Vega-Ferrero et al., 2021, *MNRAS* 506, 1927

Contribution: I provided key scientific input and review related to the methodology.

(16) Monte Carlo control loops for cosmic shear cosmology with DES Year 1 data

T. Kacprzak, J. Herbel, A., Nicola, R. Sgier, F. Tarsitano, C. Bruderer, A., Amara, A., Refregier, S. L. Bridle et al., 2020, *Phys. Rev. D* 101, 082003

Contribution: I contributed implementing models for the matter power spectrum in PyCosmo (see publication 14) as part of the main analysis.

(17) *A catalogue of structural and morphological measurements for DES Y1*

F. Tarsitano et al., 2018, *MNRAS* 481, 2018

Contribution: I designed and validated the pipeline measuring the structural properties of DES Y1 galaxies. I led the production and scientific interpretation of the catalogue. **Book chapters:** this work was featured in *The Dark Energy Survey: The Story of a Cosmological Experiment* - O. Lahav, L. Calder, J. Mayers, J. Friedman, World Scientific Connect, September 2020, Chapter 17, as one of the most important research outputs in galaxy evolution conducted with the Dark Energy Survey.

(18) *Evidence for Dynamically Driven Formation of the GW170817 Neutron Star Binary in NGC 4993*

A. Palmese, W. Hartley, F. Tarsitano, C. Conselice et al., 2017, *ApJL* 849L34

Contribution: I performed the multi-wavelength morphological analysis of NGC 4993, identifying structural signatures consistent with a past merger and contributing to their physical interpretation.

Preprints

(19) *A Path to an All-Sky Survey with Roman*, J.J. Han et al., 2026, arXiv:2602.21280.

Contribution: I contributed to the discussion of viable synergies between the Euclid and Roman surveys.

(20) *Euclid Quick Data Release (Q1): Identification of massive galaxy candidates at the end of the Epoch of Reionisation*, Navarro-Carrera et al., 2025, arXiv:2511.11943.

Contribution: I contributed to the comparison between the massive-galaxy candidates and my red-quasar catalogue and provided scientific review and expert input.

Softwares

PyCosmo: Multi-purpose cosmology calculation tool

F. Tarsitano et al., 2021, ASCL Code Record: <http://ascl.net/2004.007>

Accompanying publications:

- *Predicting cosmological observables with PyCosmo*, F. Tarsitano et al., 2021, *Astronomy and Computing* 36 (2021) 100484
- *Symbolic implementation of extensions of the PyCosmo Boltzmann solver*, B. Moser, C.S. Lorenz, U. Schmitt, A. Réfrégier, J. Fluri, R. Sgier, F. Tarsitano, L. Heisenberg, 2022 *Astronomy and Computing* 40 (2022) 100603

Outreach, innovation and awards

Examples of these activities are available through the links below.

ESA interview series: I contributed to an ESA interview series to communicate the research conducted by Euclid scientists to wider audiences. In this interview, I present my publication on red quasars using the Euclid Quick Release 1 data, and talk about the search for dual AGN systems using a multi-survey approach, introducing HSC-Niji, the international survey that I co-lead [1]. I also highlight the importance of teamwork within a large collaboration such as Euclid, and the privilege of working with a mission dataset whose primary focus is cosmology but whose exceptional legacy value enables impactful research in many areas of astrophysics. I also encourage early-career scientists to engage with Euclid data, broaden their expertise, embrace interdisciplinary research and contribute actively to shape the mission's future scientific discoveries.

Science Comics: I wrote two comic books to teach math and physics [2], and I am preparing a new story describing the Universe at different scales, as seen by the Euclid telescope, using my own illustrations and the original Euclid Early Release Observations images. The project is currently underway within the domain of the Euclid Consortium, in collaboration with Prof. Jean Charles Cuillandre.

I also created an illustrated short story about the upcoming NASA Roman telescope, following my participation in the *Cosmic Cartography with Roman*, STScI Baltimore, July 2025 (available for NASA's Roman Science Community members, and at this link [3]).

I made comics for *Treffpunkt Science City*, a public science program by ETH Zürich [4].

Other outreach and communication events: I contributed to *Scientifica*, a biennial scientific outreach event organised by ETH Zürich and the University of Zürich, which welcomes more than 25000 visitors every year. Recently, I served on the SOC of the *IAU Symposium Innovative Research and Techniques in Astronomy Communication*, NAOJ, 2026 [5].

Guest on Swiss Radio-television (RSI): I am often invited to the Swiss Radio television program *Mille voci*, to discuss topics related to space missions, cosmology and astrophysics, together with the journalist Nicola Colotti and internationally recognised scientists [6].

Digital content and web management: alongside co-leading HSC-Niji, I curate its digital presence. I created and currently manage the survey website, producing scientific content and infographics for an extended audience, including both professionals and the public [7].

Science writing: I am an author of original popular-science articles on astronomy and space missions published on Medium, including stories on JWST, Euclid and the visual communication of astrophysics [8].

Awards: invited to see in person the launch of the space shuttle STS-120 in Cape Canaveral, Florida, after winning a La Stampa/Thales Alenia Space science competition [9].

[1] ESA interview series: <https://www.cosmos.esa.int/web/euclid/interview-federica-tarsitano> .

[2] Preview of science comic books: <https://www.federicatarsitano.com/outreach-and-awards> .

[3] Comics for Roman: https://drive.google.com/file/d/1esPVWH7D6Aa_cMvD6-dg60RAbP-UUMLv/view?usp=share_link

[4] Comics for Treffpunkt Science City: https://static.wixstatic.com/media/dd2a18_c7a3ecb9737b4a10ba8343e61b2c85dc~mv2.jpg .

[5] IAU Symposium on Astronomy Communication: <https://iau-oao.nao.ac.jp/iaus409/about/> .

[6] F. Tarsitano, N. Colotti, *Euclid e le sue prime immagini dell'Universo*, RSI, 2023: <https://www.rsi.ch/info/scienza-e-tecnologia/Euclid-e-le-sue-prime-immagini-dell'Universo--1988018.html> .

[7] HSC-Niji website: <https://hsc-niji.github.io/> .

[8] My space and physics-related stories on Medium: <https://medium.com/@AstroFederica> .

[9] Article on national newspaper La Stampa: https://www.federicatarsitano.com/_files/ugd/dd2a18_d92dd0178bf74bb1b823ed9378480deb.pdf?index=true .