Marco Dall'Amico

Postdoctoral Researcher – University of Padova

Personal Information

Vicenza, Italy
+39 3391851824
dallamico@pd.infn.it
Personal website

Education

January 2024 – Present

Postdoc position, University of Padova - Heidelberg University

- **Scientific Advisor:** Prof. Michela Mapelli.

October 2020 – April 2024

PhD in Astrophysics *cum laude*, University of Padova

- **Thesis:** *The impact of chaotic dynamics and binary evolution on the formation of compact binary systems* (Supervisor: Prof. Michela Mapelli, Co-Supervisors: Dr. Sara Rastello and Dr. Giuliano Iorio).

April 2023 – July 2023

Visiting Researcher, Institut d'Astrophysique de Paris

- Host researcher: Prof. Stephane Charlot.

- **Thesis:** *The impact of chaotic dynamics and binary evolution on the formation of compact binary systems* (Supervisor: Prof. Michela Mapelli, Co-Supervisors: Dr. Sara Rastello and Dr. Giuliano Iorio).
I study the role of dynamics on the generation of compact binary systems, focusing on how dynamical interactions couple with stellar and binary evolution processes in dense stellar environments. By means of numerical simulations, the main goal is to reconstruct the formation rate, the properties, and the observability of these systems as function of the host star cluster properties.

January 2018 – April 2020

Master in Physics, University of Padova

- **Final mark:** 110/110 cum laude (Grade point average: 29.8/30)
- **Thesis:** *Dynamical Formation of Intermediate-Mass Black Hole Binaries* (Supervisor: Prof. Michela Mapelli, Co-Supervisors: Dr. Ugo Niccoló Di Carlo).

August 2018 – June 2019

Erasmus+, Stockholm University

September 2014
December 2017

Bachelor Degree in Astronomy, University of Padova

- **Final mark:** 102/110 (Grade point average: 26.5/30)
- **Thesis:** *Pulsars at Very High Energy: Simulating Observations with the Cherenkov Telescope Array* (Supervisor: Prof. Luca Zampieri, Prof. Roberto Turolla, Co-Supervisor: Dr. Aleksandr Burtovoi).

September 2009
June 2014

ITIS Alessandro Rossi, Vicenza

- **Qualification:** Diploma in electronic and telecommunication technician.
- **Final mark:** 91/100 **Final project:** I built a Geiger counter from scratch.

Publications

First Author

Eccentric black hole mergers via three-body interactions in young, globular and nuclear star clusters
Dall'Amico, Marco; Mapelli, Michela; Torniamenti, Stefano; Arca Sedda, Manuel.
March 2023 - https://arxiv.org/abs/2303.07421 - A&A, Volume 683, Number A186

GW190521 formation via three-body encounters in young massive star clusters
Dall'Amico, Marco; Mapelli, Michela; Di Carlo, Ugo N.; Bouffanais, Yann; Rastello, Sara; Santoliquido, Filippo; Ballone, Alessandro; Arca Sedda, Manuel.
October 2021 - https://arxiv.org/abs/2105.12757 - MNRAS 508, pg. 3045

Co-Author

The boring history of Gaia BH3 from isolated binary evolution
Iorio, Giuliano ; Torniamenti, Stefano ; Mapelli, Michela ; **Dall'Amico, Marco** ; Trani, Alessandro A. ; Rastello, Sara ; Sgalletta, Cecilia ; Rinaldi, Stefano ; Costa, Guglielmo ; Dhal-Lahtinen, Bera A. ; Escobar, Gaston J. ; Korb, Erika ; Vaccaro, M. Paola ; Lacchin, Elena ; Mestichelli, Benedetta ; Di Carlo, Ugo N. ; Spera, Mario ; Arca Sedda, Manuel
April 2024 - https://arxiv.org/abs/2404.17568 - Arxiv pre-print

Hierarchical binary black hole mergers in globular clusters: mass function and evolution with redshift
Torniamenti, Stefano; Mapelli, Michela; Périgois, Carole; Arca Sedda, Manuel; Artale, M. Celeste; **Dall'Amico, Marco**; Vaccaro, M. Paola
January 2024 - https://arxiv.org/abs/2401.14837 - Arxiv pre-print

Nebular emission from young stellar populations including binary stars
Lecroq, Marie; Charlot, Stéphane; Bressan, Alessandro ; Bruzual, Gustavo; Costa, Guglielmo; Iorio, Giuliano; Spera, Mario; Mapelli, Michela; Chen, Yang ; Chevallard, Jacopo; **Dall'Amico, Marco**
January 2024 - https://arxiv.org/abs/2312.08432 - MNRAS 527, pg. 9480

Impact of gas hardening on the population properties of hierarchical black hole mergers in AGN disks
Vaccaro, M. Paola ; Mapelli, Michela ; Périgois, Carole ; Barone, Dario ; Artale, M. Celeste ; **Dall'Amico, Marco** ; Iorio, Giuliano ; Torniamenti, Stefano
November 2023 - https://arxiv.org/abs/2311.18548 - Arxiv pre-print

One to many: comparing single gravitational-wave events to astrophysical populations
Mould, Matthew ; Gerosa, Davide ; **Dall'Amico, Marco** ; Mapelli, Michela
November 2023 - https://arxiv.org/abs/2305.18539 - MNRAS 525, pg. 3986

Compact object mergers: exploring uncertainties from stellar and binary evolution with SEVN
Iorio, Giuliano ; Costa, Guglielmo ; Mapelli, Michela ; Spera, Mario ; Escobar, Gastón J. ; Sgalletta, Cecilia ; Trani, Alessandro A. ; Korb, Erika ; Santoliquido, Filippo ; **Dall'Amico, Marco** ; Gaspari, Nicola ; Bressan, Alessandro.
September 2023 - https://arxiv.org/abs/2211.11774 - MNRAS 524, pg. 426

Study on the detectability of gravitational radiation from single-binary encounters between black holes in nuclear star cluster: the case of hyperbolic flybys
Codazzo, Elena; Di Giovanni, Matteo; Harms, Jan; **Dall'Amico, Marco**; Mapelli, Michela.
Jenuary 2023 - https://arxiv.org/abs/2207.01326 - Physical Review D, Volume 107, Issue 2

Intermediate mass black holes from stellar mergers in young star clusters
Di Carlo, Ugo N.; Mapelli, Michela; Pasquato, Mario; Rastello, Sara; Ballone, Alessandro; **Dall'Amico, Marco**; Giacobbo, Nicola; Iorio, Giuliano; Spera, Mario; Torniamenti, Stefano; Haardt, Francesco.
November 2021 - https://arxiv.org/abs/2105.01085 - MNRAS 507, pg. 5132

Hierarchical black hole mergers in young, globular and nuclear star clusters: the effect of metallicity, spin and cluster properties
Mapelli, Michela; **Dall'Amico, Marco**; Bouffanais, Yann; Giacobbo, Nicola; Arca Sedda, Manuel; Artale, M. Celeste; Ballone, Alessandro; Di Carlo, Ugo N.; Iorio, Giuliano; Santoliquido, Filippo; Torniamenti, Stefano
July 2021 - https://arxiv.org/abs/2103.05016 - MNRAS 505, pg.339

PROCEEDINGS

The dynamical origin of GW190521 in young massive star clusters
Dall'Amico, Marco; Contribution to the 2021 Gravitation session of the 55th Rencontres de Moriond
December 2021 - https://arxiv.org/abs/2112.02020

Awards & Prizes

Fellowships

Cariparo prize PhD fellowship by Fondazione Cariparo - 2020. The Cariparo PhD fellowship is awarded to the highest raked among the PhD candidates in Astronomy of the University of Padova every year.

External founding

PRIN MIUR (577.5k EUR for 3 years), Co-Investigator - 2021. Title: Multimessenger astronomy in the Einstein Telescope Era (METE); PI: Marica Branchesi; co-PIs: Enrico Cappellaro, Michela Mapelli, Michele Punturo. Success rate: 9.5%.

Conferences & Talks

23-24 May 2024 — **Spring Workshop on Physics of Data 2024 -** Venice, *Invited* Talk.

29 April-3 May 2024 — 1st **Padova - Buenos Aires Workshop on Massive Stars and Interacting Binaries -** La Plata, Online *Invited* Talk.

11-15 September 2023 — **Two in a million - The interplay between binaries and star clusters -** ESO Garching, Contributed Talk.

10-14 July 2023 — **Gravitational-wave populations: what's next? -** Milan, Flash Talk.

22-26 May 2023 — **10th Microquasar Workshop -** Heraklion, Greece, Contributed Talk.

5-9 December 2022 — **Gravitational Wave Physics and Astronomy Workshop 2022 (GWPAW) -** Ozgrav Melbourne, Online Contributed Talk.

13-26 November 2022 — **The fundamental role of stellar multiplicity in stellar dynamics and evolution -** Miapbp Garching, Contributed Discussion.

29 April-3 May 2022 — **2022 Intermediate-Mass Black Holes: New Science from Stellar Evolution to Cosmology -** Cuartel de Ballaja Puerto Rico, Contributed Talk.

25-28 April 2022 — **765th WE-Heraeus-Seminar "Gravitational Wave and Multimessenger Astronomy" -** Physikzentrum Bad Honnef, Poster.

30 January - 6 February 2022 — **American Physical Society April Meeting 2022 -** New York, Online Contributed Talk.

9-12 April 2022 **56th Rencontres de Moriond Gravitation -** La Thuile, Contributed Talk.

8-12 November 2021 **IAU Symposium 362: The predictive power of computational astrophysics as discovery tool -** Chamonix, France, Online Contributed Talk.

28 October 2021 **TEONGRAV Monthly Seminar -** University of Padova, Contributed Talk.

20-24 September 2021 **9th Microquasar Conference: Celebrating over 50 years of discovery 2021 -** INAF Cagliari, Online Poster presentation.

19-23 July 2021 **14th Edoardo Amaldi Conference on Gravitational Waves -** Swinburne University of Technology, Online Contributed Talk.

28 June - 2 July 2021 **European Astronomical Society Annual Meeting 2021 -** Leiden University, Online Poster presentation.

22-25 March 2021 **Triple Evolution and Dynamics workshop TRENDY3 -** Northwestern University, Online Poster presentation.

9-11 March 2021 **55th Rencontres de Moriond Gravitation -** Online Poster presentation.

Schools

7-14 September 2022 **Officina di Narrazione della Scienza (Outreach and communication of Science summer school) -** University of Bologna

7-9 June 2021 **First INFN Machine Learning Hackaton -** INFN

1-5 June 2021 **Summer School in Statistics for Astronomers XVI -** PennState University

1-5 February 2021 **SIGRAV International School 2021: Gravity of compact astrophysical objects and gravitational waves** - Online

Teaching

October 2023 - December 2023 **Computational Astrophysics, SCP9087518, A.A. 2023/2024**, Teaching Assistant - Prof. Giuliano Iorio

October 2022 - December 2022 **Computational Astrophysics, SCP9087518, A.A. 2022/2023**, Teaching Assistant - Prof. Michela Mapelli

October 2021 - December 2021 **Computational Astrophysics, SCP9087518, A.A. 2021/2022**, Teaching Assistant - Prof. Michela Mapelli

March 2021 - June 2021 **Laboratory of Computational Physics (Mod. B), SCP8082526, A.A. 2020/2021**, Teaching Assistant - Prof. Marco Baiesi, Prof. Michela Mapelli

Research Advising

Fall 2022 **Master Thesis External Scientific Collaborator**
I collaborated with Sabrina Trevisan to develop her thesis project "*The Simplification of Abstract Realities*" for the Master in Visual Communication and Iconic Research at the FHNW, Basel. The project is about the interaction between science and visual communication in designing information for the public. The outcome is an informative animated video on the topic of black holes that can be seen here.

Fall 2022 **Master Thesis Co-Supervisor**
Francesco Flora - Supervisor Prof. Michela Mapelli

Fall 2021 **Bachelor Thesis Co-Supervisor**
Daria Murgia - Supervisor Prof. Michela Mapelli
Filippo Simonato - Supervisor Prof. Michela Mapelli

Outreach

11 June 2022 **Festival dell'Astronomia at Castellaro Lagusello**,
I designed the outreach laboratory activity "Illuminiamo un buco nero" for the Outreach Astronomy festival at Castellaro Lagusello https://www.astronomiacastellaro.oapd.inaf.it/il-programma/i-laboratori-2022

24 September 2021 **VenetoNight, The night of the researchers - "La Giovane Astronomia"**,
I presented "Briscola di buchi neri: onde gravitazionali ed incontri tripli" at the researcher night in Padova https://meetmetonight.oapd.inaf.it/programma

Memberships

April 2022 - Present Einstain Telescope Observation Science Board
https://www.et-gw.eu/index.php/observational-science-board

April 2021 - Present — Junior member of the European Astronomical Society (EAS)
https://eas.unige.ch/

December 2020 - Present — Member of the TEONGRAV experiment - Theory of Gravitational Wave Sources
https://web.infn.it/CSN4/index.php/it/17-esperimenti/195-teongrav-home

December 2020 - Present — Affiliated to the Italian nuclear physics institution (INFN)
https://home.infn.it/it/

October 2020 - Present — Member of the ERC funded DemoBlack research group at University of Padova
http://www.demoblack.com/

Observing Experience

May 2019 — **Stockholm University -** Three night of observations with the **Nordic Optical Telescope** used remotely from the Stockholm Astronomy department. I performed long-slit spectroscopic observations for ten recently-discovered supernovae exploiting the ALFOSC spectrograph in the $3200 - 9600$ Å bandwidth. The aim was to reduce their absolute magnitude, redshift and Spectral Type using dedicated tools as GELATO and SNID.

April 2019 — **Stockholm University -** Temperature and column density measurements of six molecular clouds derived from the observations of the Methyl acetylene rotational emission lines at 102 GHz. The observations have been performed with the 3mm receiver and the OSA Fast Fourier Transform Spectrometer mounted on the **20m Antenna of the Onsala Space Observatory**, Göteborg.

February 2019 — **Stockholm University -** Estimate of the age of the open star cluster M34 derived from the turn-off point in the HR diagram. The aperture photometry observations in the B and V bands have been carried out with the AlbaNova 1m telescope at the Astronomy department of the Stockholm University.

Employments & volunteering

October 2021 - Present — **Cultural Center LAGOrá -** Member of the organizing and planning committee (https://www.lagoravicenza.it/).

April 2015 - June 2017 — **Pantarhei SRL -** Box office and handyman emplyee at the Municipal and Olympic UNESCO heritage Theaters of Vicenza.

2010 - 2011

Agesci - Volunteer with the AGESCI Scout association as IT support in Bertoliana Library of Vicenza and in the fair trade shop *Altromercato*, Vicenza.

Skills

Software

Advanced - Python (e.g. *Numpy*, *Matplotlib*, *Scipy*, *Pandas*, *Astropy*, *Scikit-learn*, *Dask*, *RegEx*), TensorFlow, Git, Linux, LaTeX, PBS/SLURM (Queue schedulers for HPC), Direct N-Body codes such as ARWV and Tsunami.

Intermediate - IRAF, PyRAF, SAOImage DS9, Ctools software for Cherenkov Telescopes Analysis, C, C++, Assembly, sh/bash.

Basic - Stellar Evolution Software MESA, XS Radio Data Reduction, Supernovae classification tools such as SNID and Gelato, Arduino.

Languages

	Listening	Reading Interaction	Spoken Production	Spoken	Writing
English	C1	C1	C1	C1	C1
Italian	Native	Native	Native	Native	Native