Curriculum Vitae

Personal Information

Family name, First name: Bugli, Matteo
ORCID ID: 0000-0002-7834-0422
Date of birth: April 25, 1986
Nationality: italian

E-mail: matteo.bugli@unito.it
Personal webpage: matteobugli.notion.site

Education

2013-2017 PhD
Physics Department, Technische Universität München, Germany
Supervisor: Ewald Müller
Thesis: *Non-axisymmetric modes in 3D magnetized tori accreting onto black holes*

2009-2013 Master degree
Physics and Astronomy Department, Università degli Studi di Firenze, Italy
Supervisor: Luca del Zanna
Thesis: *Simulations of kinematic dynamo in magnetized disks around rotating black holes*

2005-2009 Bachelor degree
Physics and Astronomy Department, Università degli Studi di Firenze, Italy
Supervisor: Luca del Zanna
Thesis: *Interactions between pulsar wind and supernovae remnants*

Research positions

2022-present Marie-Curie Fellow
Physics Department, Università di Torino, Italy
Advisor: Andrea Mignone

2018-2022 Postdoc
Astrophysics Department, CEA-Saclay, France
Advisor: Jérôme Guilet

2017 Postdoc
Max Planck Institut für Astrophysik, Germany
Advisor: Ewald Müller

Fellowships and awards

2022 Marie-Curie Postdoctoral Fellowship (*GR-PLUTO*)
2022 PSL Fellowship (Observatoire de Paris - Université Paris) - declined
2017 *Leibniz Large Scaling Award 2017* for the development of the `ECHO` code
2013-2017 IMPRS fellowship (Max Planck Institut für Astrophysik)

Supervision of students

2023- **Edoardo Lopresti** (Master student, Università degli Studi di Torino, Italy)
Co-supervision with Andrea Mignone
Resistive relativistic MHD, numerical techniques

2023- **Vittoria Berta** (PhD student, Università degli Studi di Torino, Italy)
Co-supervision with Andrea Mignone
Relativistic MHD, HPC techniques

2018-2022 **Niccolò Tomei** (PhD student, Università degli Studi di Firenze, Italy)
Co-supervision with Luca del Zanna
Physics of accretion, GRMHD framework, HPC techniques, data post-processing and visualization, `git` *repositories.*

2019 **Sebastian Paine** (bachelor student, CEA-Saclay, France)
Co-supervision with Thierry Foglizzo
Numerical techniques, data post-processing and visualization.

Teaching activities

2021 Certification for *Maître de Conferences*

2014-2015 Tutor for the master course *Computational Physics 1*
Responsible: prof. Stefan Recksiegel

2013-2014 Tutor for the master course *Computational Physics 2*
Responsible: prof. Stefan Recksiegel

Institutional responsibilities

2018-2022 Organizer of the DAp general seminars, CEA-Saclay

Reviewing activities

2019-present Project reviewer for the Gauss Center for Supercomputing (GCS), Germany
2016-present Reviewer for MNRAS, ApJ, PASJ

Major collaborations

2021-present Einstein Telescope
2020-present LEAK project (APC, Observatoire de Paris, CEA-Saclay)
2018-present EHT Code Comparison Project (Event Horizon Telescope collaboration)

Research interests

- Magnetohydrodynamics simulations in general relativity
- Accretion discs around compact objects
- Relativistic reconnection and dynamos
- Numerical schemes for stiff hyperbolic equations
- Parallel environments and High Performance Computing
- Core-collapse supernovae (CCSN) and magnetorotational explosions
- Magnetar formation
- Gravitational waves and neutrino emission from CCSN

Languages

Italian: Mother tongue
English: Level C2 (proficient user)
French: Level B2 (independent user)
German: Level B1 (independent user)

Technical competences

Scientific programming:	Fortran, C/C++, Python, IDL, VisIt, Yt, LaTeX
Libraries & Utilities:	MPI, OpenMP, bash-shell, HDF5 serial/parallel, GIT
Operating systems:	Linux/Unix, MacOs, Windows

Conferences & workshops

2023: *26*ème *Congres Général de la SFP*, Paris, France (**invited talk**);
ASTRONUM 2023, Pasadena, USA (**invited talk**);
Journées SF2A 2023, Strasbourg, France (contributed talk);

2022: *ASNUM 2022*, Lyon, France (contributed talk);
Supernova 2022, Melbourne, Australia (**invited talk**);
2022 Arcetri Workshop on Plasma Astrophysics, Florence, Italy (contributed talk);
*6*ème *GdR Ondes Gravitationnelles*, Toulouse, France (contributed talk);
*31*st *Texas Symposium*, Prague, Czech Republic (contributed talk);
Journées SF2A 2022, Besançon, France (**invited talk**);
GdR QCD Workshop: Progress in algorithms and numerical tools for QCD,
Orsay, France (**invited talk**);
Pharos Conference 2022, Rome, Italy (contributed talk);

2021: *IAU Symposium 363*, virtual conference (contributed talk);
XX Workshop on Nuclear Astrophysics, Ringberg, Germany (contributed talk);
*5*ème *GdR Ondes Gravitationnelles*, Annecy, France (contributed talk);
European Astronomical Society Annual Meeting, virtual conference (E-poster);

2019: 30th *Texas Symposium on Relativistic Astrophysics*, Portsmouth, UK (contributed talk);
4M-COCOS, Fukuoka, Japan (**invited talk**);
YITP Workshop: Multi-messenger astrophysics in the GW era, Kyoto, Japan (contributed talk);
XIX Workshop on Nuclear Astrophysics, Ringberg, Germany (contributed talk);

2018: *CoCoNut Meeting*, Saclay, France (contributed talk);
*26*th *Euromicro PDP International Conference*, Cambridge, UK (contributed talk);

2017: 29th *Texas Symposium on Relativistic Astrophysics*, Cape Town, SA (contributed talk);
CoCoNut Meeting, Garching, Germany (contributed talk);
Arcetri Workshop on Plasma Astrophysics, Florence, Italy (contributed talk);

2016: *CoCoNut Meeting*, València, Spain (contributed talk);
Super-Eddington accretion onto compact objects, Arbatax, Italy (contributed talk);

2015: 28th *Texas Symposium on Relativistic Astrophysics*, Geneva, Switzerland (contributed talk);
CoCoNut Meeting 2015, Màlaga, Spain, (contributed talk).

Invited Seminars

2023: *Informal discussion - ESO*, Garching, Germany;
Séminaire IPAG, Grenoble, France;
Séminaire Artémis - Observatoire de la Côte d'Azur, Nice, France;
2022: *AstroCoffee seminar - University of Frankfurt*, Frankfurt, Germany;
GReCO seminar - IAP, Paris, France;
Seminario di Astrofisica - UniTo, Torino, Italy;
AEI Seminar, Potsdam, Germany;
2020: *IAP Journal Club*, Paris, France;
LEAK Meeting, Paris, France;
Séminaire du LUTh, Meudon, France;
2019: *Seminario all'Osservatorio Astronomico d'Arcetri*, Firenze, Italy;
Theorie-Seminar at Theoriezentrum, Darmstadt, Germany;
2018: *Seminari del DDA*, València, Spain;
2015: *MPA Institute Seminar*, Garching, Germany.

Outreach activities

27/09/2023 SumoScience matches (high-school outreach events):
Marie Curie Championship Sharper 2022/23
25/07/2023 Outreach article - Forum della Ricerca di Ateneo UniTo:
Supercomputer, campi magnetici e buchi neri: una miscela esplosiva!
25/02/2022 Video-seminar for OPC - Osservatorio Polifunzionale del Chianti:
Esplosioni stellari: come da una supernova nasce una stella di neutroni
07/11/2021 Presentation of CEA research activity on core-collapse supernovae (Mountrouge, France)
Festival Explor'Espace
17/06/2020 Video-seminar for the Lions Club of Munich:
"Dal collasso di una stella alla sua rinascita: come si formano le stelle di neutroni"
10/04/2017 Seminar at the Rotary Club of Munich:
"Black holes: ravenous and self-centered protagonists of the Universe"
09/04/2016 Seminar at the Lions Club of Munich:
"Buchi neri: famelici ed egocentrici protagonisti dell'Universo"
2014-present Member of Astronomical Society Galileo Galilei
Scientific advisor of the San Martino Observatory, Castagno d'Andrea (Italy)

List of main publications (first author)

[1] **M. Bugli**, J. Guilet, T. Foglizzo, M. Obergaulinger (2023), *Three-dimensional core-collapse supernovae with complex magnetic structures - II. Rotational instabilities and multi-messenger signatures*, MNRAS, 520(4), 5622-5634

[2] **M. Bugli**, J. Guilet, M. Obergaulinger (2021), *Three-dimensional core-collapse supernovae with complex magnetic structures - I. Explosion dynamics*, MNRAS, 507(1), 443-454

[3] **M. Bugli**, J. Guilet, M. Obergaulinger, P. Cerdá-Durán, and M. A. Aloy (2020), *The impact of non-dipolar magnetic fields in core-collapse supernovae*, MNRAS, 492(1), 58–71

[4] **M. Bugli**, L. Iapichino, F. Baruffa (2018), *Advancing the Performance of Astrophysics Simulations with ECHO-3DHPC*, Intel®Parallel Universe Magazine, 34, 49

[5] **M. Bugli**, J. Guilet, E. Müller, L. Del Zanna, N. Bucciantini and P. J. Montero (2018), *Papaloizou-Pringle instability suppression by the magnetorotational instability in relativistic accretion discs*, MNRAS, 475(1), 108-120

[6] **M. Bugli** (2017), *ECHO-3DHPC: Relativistic Magnetized Disks Accreting onto Black Holes*, Innovative Supercomputing In Deutschland, 15(2), 86-88

[7] **M. Bugli**, L. Del Zanna and N. Bucciantini (2014), *Dynamo action in thick discs around Kerr black holes: high-order resistive GRMHD simulations*, MNRAS, 440, L41-L45

Other publications in peer-reviewed scientific journals

[1] V. Berta, A. Mignone, **M. Bugli** and G. Mattia (2023), *A 4th-order accurate finite volume method for ideal MHD and RMHD based on pointwise reconstructions*, submitted to JCP

[2] G. Mattia, L. Del Zanna, **M. Bugli**, A. Pavan, R. Ciolfi, G. Bodo and A. Mignone (2023), *Resistive relativistic MHD simulations of astrophysical jets*, submitted to A&A

[3] J. Guilet, A. Reboul-Salze, R. Raynaud, **M. Bugli** and B. Gallet (2022), *MRI-driven dynamo at very high magnetic Prandtl numbers*, MNRAS, 516(3), 4346

[4] A. Reboul-Salze, J. Guilet, R. Raynaud and **M. Bugli** (2022), *MRI-driven $\alpha\Omega$ dynamos in protoneutron stars*, A&A, 667, A94

[5] S. Cielo, A. Pöpple, L. Del Zanna, **M. Bugli** (2022), *DPEcho: General Relativity with SYCL* for the 2020s and Beyond*, Intel®Parallel Universe Magazine, 51, 14

[6] L. Del Zanna, N. Tomei, K. Franceschetti, **M. Bugli** and N. Bucciantini (2022), *General Relativistic Magnetohydrodynamics Mean-Field Dynamos*, Fluids, 7(2), 87

[7] N. Tomei, L. Del Zanna, **M. Bugli** and N. Bucciantini (2021), *Are GRMHD Mean-Field Dynamo Models of Thick Accretion Disks SANE?*, Universe, 7(8), 259

[8] A. Reboul-Salze, J. Guilet, R. Raynaud and **M. Bugli** (2021), *A global model of the magnetorotational instability in protoneutron stars*, A&A, 645, A109

[9] S. Cielo, L. Iapichino, F. Baruffa, **M. Bugli** and C. Federrath (2020), *Honing and proofing Astrophysical codes on the road to Exascale. Experiences from code modernization on many-core systems*, FGCS, 112, 93-107

[10] N. Tomei, L. Del Zanna, **M. Bugli** and N. Bucciantini (2020), *General relativistic magnetohydrodynamic dynamo in thick accretion discs: fully non-linear simulations*, MNRAS, 491(2), 2346-2359

[11] O. Porth, K. Chatterjee, R. Narayan, C. Gammie, Y. Mizuno, P. Anninos, J. G. Baker, **M. Bugli** et al. (2019), *The Event Horizon General Relativistic Magnetohydrodynamic Code Comparison Project*, ApJSS, 243(2), 26

[12] Q. Qian, C. Fendt, S. Noble and **M. Bugli** (2017), *rHARM: Accretion and Ejection in Resistive GR-MHD*, ApJ, 834(1), 29

[13] L. Del Zanna, E. Papini, S. Landi, **M. Bugli** and N. Bucciantini (2016), *Fast reconnection in relativistic plasmas: the magnetohydrodynamics tearing instability revisited*, MNRAS, 460(4), 3753-3765

Other publications in peer-reviewed conference proceedings

[1] M. Bendahman, A. Buellet, **M. Bugli** et al. (2023), *Exploiting synergies between neutrino telescopes for the next galactic core-collapse supernova*, RICAP-22, 8th Roma International Conference on Astroparticle Physics

[2] **M. Bugli**, J. Guilet and M. Obergaulinger (2023), *Magnetorotational core-collapse supernovae: the impact of the magnetic field's structure*, IAU Symposium n. 363

[3] **M. Bugli**, J. Guilet, T. Foglizzo and M. Obergaulinger (2022), *Probing the central engine of core-collapse supernovae with their multi-messenger emission*, SF2A-2022

[4] **M. Bugli** (2022), *Multi-messenger emission from magnetized core-collapse supernovae*, 31st Texas Symposium on Relativistic Astrophysics

[5] M. Bendahman, **M. Bugli** et al. (2021), *Exploring the Potential of Multi-Detector Analyses for Core-Collapse Supernova Neutrino Detection*, 37th International Cosmic Ray Conference

[6] A. Reboul-Salze, J. Guilet, R. Raynaud and **M. Bugli** (2021), *A global model of the magnetorotational instability in proto-neutron stars*, SF2A-2019, 515-519

[7] L. Del Zanna, N. Tomei, **M. Bugli** and N. Bucciantini (2020), *Creation and dissipation of magnetic fields in non-ideal GRMHD simulations*, J. Phys.: Conf. Ser., 1623, 012004

[8] N. Tomei, L. Del Zanna, **M. Bugli** and N. Bucciantini (2020), *Amplification of magnetic fields in accretion discs by GRMHD dynamo*, Memorie della Societa Astronomica Italiana, 91, 307

[9] **M. Bugli** (2018), *ECHO-3DHPC: Relativistic Accretion Disks onto Black Holes*, 26th Euromicro International Conference on Parallel, Distributed and Network-based Processing (PDP), 674–681

[10] L. Del Zanna, **M. Bugli** and N. Bucciantini (2014), *High-order Schemes for Non-ideal 3+1 GRMHD: A Study of the Kinematic Dynamo Process in Accretion Tori*, ATRONUM 2013 ASP Conference Series, 488, 217

[11] **M. Bugli**, L. Del Zanna, N. Bucciantini (2014), *Mean Field Dynamo in Thick Disks around Kerr Black Holes: High Order Axisymmetric Simulations*, International Journal of Modern Physics: Conference Series, 28, 1460203

[12] N. Bucciantini, **M. Bugli**, L. Del Zanna (2014), *Dynamo action in thick discs around Kerr black holes: high-order resistive GRMHD simulations*, 40th COSPAR, E1.5-52-14

Doctoral Thesis

M. Bugli (2017), *Non-axisymmetric modes in three-dimensional magnetized tori accreting onto black holes*