

Alfio Bonanno

Primo Ricercatore (Senior Researcher), INAF – Osservatorio Astrofisico di Catania

Associate, INFN – Sezione di Catania

Adjunct Professor, Department of Physics and Astronomy “Ettore Majorana”, University of Catania

Guest Scientist, Leibniz Institute for Astrophysics Potsdam (AIP), Germany

Email: alfio.bonanno@inaf.it · alfio.bonanno@ct.infn.it

Web: <https://webusers.oact.inaf.it/abo/>

ORCID: 0000-0003-3175-9776 · INSPIRE: A.Bonanno.1

Research profile

Three decades of work at the interface between quantum gravity and relativistic astrophysics. With M. Reuter he introduced the renormalization-group-improved black hole (2000), now a standard reference point for black-hole physics in asymptotically safe gravity. His work on black-hole interiors goes back to the analysis of the charged black-hole interior with W. Israel and collaborators (1995); more recently he showed that regular black holes can form dynamically in gravitational collapse when Newton’s coupling is antiscreened (2024), and that the mass-inflation instability of regular cores is generically softened (2021, 2025). He is a co-author of the community review *Towards a Non-singular Paradigm of Black Hole Physics* (JCAP 2025), and has shown that ultraviolet completeness alone excludes observable regions of the fifth-force parameter space (PRL 2026).

In parallel he has a long-standing research line in magnetohydrodynamics and dynamo theory—stability of toroidal magnetic fields and the Tayler instability in stellar radiation zones, solar and stellar dynamo models—and in stellar astrophysics and asteroseismology: PI of spectroscopic and photometric observing campaigns (SARG@TNG), member of the Kepler, TESS and PLATO asteroseismic consortia, Co-I of the NASA COFFIES project.

Publication summary (INSPIRE-HEP, October 2026): 138 peer-reviewed publications (177 citable papers); 6,866 citations; h-index 42.

Education and qualifications

2015	Italian National Habilitation as Full Professor in Theoretical Physics
1995	PhD in Physics, University of Catania
1992	Laurea in Physics, <i>magna cum laude</i> , University of Catania

Positions

2017 – present	Primo Ricercatore (Senior Researcher), INAF – Osservatorio Astrofisico di Catania
2006 – present	Adjunct Professor, University of Catania (teaching, see below)
2025 – 2027	Guest Scientist, Leibniz Institute for Astrophysics Potsdam (AIP), Germany
2024 – 2025	DFG Mercator Fellow, Leibniz Institute for Astrophysics Potsdam (AIP), Germany
1999 – 2017	Ricercatore Astronomo, INAF – Osservatorio Astrofisico di Catania
2006	Marie Curie Fellow, Astrophysikalisches Institut Potsdam, Germany
1996 – 1998	CNR Fellow (two national fellowships, ranked first)
1995 – 1996	Angelo Della Riccia Fellow, Université Louis Pasteur, Strasbourg, France
1993 – 1995	Research Assistant, University of Alberta, Canada

Teaching (University of Catania, Master's Degree in Physics)

- Magnetohydrodynamics and Plasma Physics (2024/25 – present)
- General Relativity and Cosmology, later General Relativity (2007/08 – 2023/24)
- High Energy Astrophysics (2021/22, 2023/24); Fluid Dynamics and MHD (2006/07)

Research group and supervision

- Current: scientific supervisor of two postdoctoral researchers (O. Melichev, G. Santagati) and supervisor of five PhD students (A. Panassiti, E. Glaviano, A. Spina, G. Giacometti, G. Ogialoro).
- Past: supervisor or co-supervisor of numerous PhD and Laurea theses at the University of Catania.

Grants, fellowships and recognition

- DFG Mercator Fellowship, AIP Potsdam (2024–2025).
- Principal Investigator (Responsabile Scientifico), INAF Theory Grant *Unveiling the magnetic side of the Stars* (2024–2026).
- President of IAU Commission E1 *Solar Radiation and Structure* (2024–2027).
- Corresponding Member (Socio Corrispondente) of the Accademia Gioenia.
- Local PI, PRIN-INAF grant (2006); coordinator of the Catania unit of the EU-FP7 IRSES project *ASK*.
- Marie Curie Fellowship (2006); Angelo Della Riccia Fellowship (1995); Accademia Gioenia award for the PhD thesis; two CNR national fellowships ranked first (1996–1998).

Selected publications

Quantum gravity and black holes

1. A. Bonanno, M. Reuter, *Renormalization group improved black hole spacetimes*, Phys. Rev. D **62**, 043008 (2000).
2. A. Bonanno, D. Malafarina, A. Panassiti, *Dust collapse in asymptotic safety: a path to regular black holes*, Phys. Rev. Lett. **132**, 031401 (2024).
3. A. M. Bonanno, E. M. Glaviano, *Fifth-force constraints from UV-complete scalar-tensor gravity*, Phys. Rev. Lett. **136**, 201501 (2026).
4. A. Bonanno, A. Panassiti, F. Saueressig, *Cauchy horizon (in)stability of regular black holes*, arXiv:2507.03581 (2025).
5. A. Bonanno, R. A. Konoplya, G. Ogialoro, A. Spina, *Regular black holes from proper-time flow in quantum gravity and their quasinormal modes, shadow and Hawking radiation*, JCAP **12** (2025) 042.
6. R. Carballo-Rubio et al. (incl. A. Bonanno), *Towards a non-singular paradigm of black hole physics*, JCAP **05** (2025) 003.
7. A. Bonanno, T. Denz, J. M. Pawłowski, M. Reichert, *Reconstructing the graviton*, SciPost Phys. **12**, 001 (2022).

8. A. Bonanno, A.-P. Khosravi, F. Saueressig, *Regular black holes with stable cores*, Phys. Rev. D **103**, 124027 (2021).
9. A. Bonanno, R. Casadio, A. Platania, *Gravitational antiscreeing in stellar interiors*, JCAP **01** (2020) 022.

Magnetohydrodynamics, dynamo theory and stellar astrophysics

10. G. Guerrero, F. Del Sordo, A. Bonanno, P. K. Smolarkiewicz, *Global simulations of Tayler instability in stellar interiors: the stabilizing effect of gravity*, MNRAS **490**, 4281 (2019).
11. A. Bonanno, E. Corsaro, F. Del Sordo, P. L. Pallé, D. Stello, M. Hon, *Acoustic oscillations and dynamo action in the G8 sub-giant EK Eridani*, A&A **628**, A106 (2019).
12. A. Bonanno, *Stellar dynamo models with prominent surface toroidal fields*, ApJ **833**, L22 (2016).
13. A. Bonanno, A. Brandenburg, F. Del Sordo, D. Mitra, *Breakdown of chiral symmetry during saturation of the Tayler instability*, Phys. Rev. E **86**, 016313 (2012).
14. A. Bonanno, V. Urpin, *Stability of the toroidal magnetic field in stellar radiation zones*, ApJ **747**, 137 (2012).
15. R. Silvotti et al. (incl. A. Bonanno), *A giant planet orbiting the ‘extreme horizontal branch’ star V391 Pegasi*, Nature **449**, 189 (2007).

Service to the community

- Co-chair of IAU Symposium 274 *Advances in Plasma Astrophysics* (2010); SOC member of IAU Symposium 354 *Solar and Stellar Magnetic Fields* (Chile, 2019), *Stellar Magnetism: Challenges, Connections, and Prospects* (Potsdam, 2017), *Black Holes, Gravitational Waves and Spacetime Singularities* (Specola Vaticana, 2017).
- Editor of two international proceedings volumes (AIP Conf. Proc. 733; IAU Symposium 274, Cambridge University Press).
- Member of the Scientific Board of the International PhD School on Nuclear Physics and Astrophysics, University of Catania.
- Referee for Physical Review Letters, Physical Review D, MNRAS, A&A, Classical and Quantum Gravity, JCAP; grant evaluator for FWO (Belgium), NSERC (Canada), NCN (Poland), the Romanian National Research Council and the Italian MIUR.
- Invited and keynote talks include the Perimeter Institute (2009, 2014), the Karl Schwarzschild Meeting (keynote, Frankfurt 2013), SIGRAV national conferences (plenary, 2016, 2018), the Lorentz Center (Leiden), Nordita (Stockholm, 2011, 2013), and the XVII Brazilian School of Cosmology and Gravitation (lectures, 2018).