

Marco Muccino

Position: PhD

Period covered: 2010/2014

Position: Post-Doc

Period covered: 2014/2015



I. Scientific Work

My research area includes:

- data reduction of GRBs, from Swift-BAT and XRT, Fermi-GBM and LAT and BATSE by using XSPEC, RMFIT, and the Swift-BAT and XRT pipelines to create spectra and light curves;
- analysis and classification of short GRBs and quest of related progenitor systems as neutron star–neutron star (NS–NS) or NS–white dwarf (WD) mergers in the context of the Fireshell model;
- analysis and classification of long GRBs and application of the "Induced gravitational collapse" (IGC) model, proposed to explain the GRBs-supernovae (SNe) connection;
- analysis of the X-ray afterglow of long and short GRBs;
- analysis of the high energy spectral component of short and long GRBs;
- cosmology with GRBs.

II. Conferences and educational activities

II a. Conferences:

- 1) IRAP Ph.D. Erasmus Mundus Workshop “Recent News from the MeV, GeV and TeV Gamma-Ray Domains”, March 21st – 26th, 2011 Pescara (Italy)
- 2) IRAP Ph.D. Erasmus Mundus school, May 25th – June 10th, 2011 Nice (France)
- 3) HEPRO (High Energy Phenomena in Relativistic Outflows) III, June 27th – July 1st, 2011, Barcelona (Spain)
- 4) 12th Italian-Korean Symposium on Relativistic Astrophysics, July 4th–8th, 2011 Pescara (Italy)
- 5) IRAP Ph Erasmus Mundus School, September 5th–16th, 2011 Nice (France)
- 6) IRAP Ph.D. Erasmus Mundus Workshop, “Gamma Ray Bursts, their progenitors and the role of thermal emission”, October 2nd–7th, 2011 Les Houches (France)
- 7) Third Galileo - Xu Guangqi meeting, “THE SUN, THE STARS, THE UNIVERSE and GENERAL RELATIVITY”, October 11th – 15th, 2011 Beijing (China)
- 8) 9th AGILE Science Workshop, Astrophysics with AGILE: Five Years of Surprises, April 16th –17th, 2012 ESA-ESRIN, Frascati (Italy)
- 9) Thirteenth Marcel Grossmann Meeting (MG 13), “On Recent Developments on Theoretical and Experimental General Relativity, Astrophysics and Relativistic Field Theories, July 1st– 7th, 2012

Stockholm (Sweden)

- 10) IRAP Ph.D. Erasmus Mundus School, September 3rd – 21st, 2012 Nice (France)
- 11) IRAP Ph.D. Erasmus Mundus School, May 16th – 31st, 2013 Nice (France).
- 12) 13th Italian-Korean Meeting on Relativistic Astrophysics, July 15th – 19th, 2013 Seoul (Korea).
- 13) IRAP Ph.D. Erasmus Mundus school, September 2nd – 20th, 2013 Nice (France).
- 14) XI International Conference on Gravitation, Astrophysics and Cosmology of Asia-Pacific Countries (ICGAC XI), October 1st – 5th, 2013 Almaty (Kazakhstan).
- 15) The 27th Texas Symposium on Relativistic Astrophysics, December 8th – 13th, 2013 Dallas (Texas, USA).
- 16) IRAP Ph.D. Erasmus Mundus School, February 23th – March 2nd, 2014 Nice (France).
- 17) Zeldovich-100 Meeting, “Subatomic particles, Nucleons, Atoms, Universe: Processes and Structure”, March 10th – 14th, 2014 Minsk (Belarus).
- 18) IRAP Ph.D. Erasmus Mundus Workshop, “Supernovae, Gamma-ray bursts and the induced gravitational collapse”, May 11th – 16th, 2014 Les Houches (France).
- 19) 1st Scientific ICRANet Meeting in Armenia, “Black Holes: the largest energy sources in the Universe”, June 30th – 4th July 2014 Yerevan (Armenia)
- 20) IRAP Ph.D. Erasmus Mundus school, September 8th – 19th, 2014 Nice (France).
- 21) The 2nd ICRANet Cesar Lattes Meeting, April 13th – 18th, 2015 Niteroi – Rio De Janeiro (Brazil).
- 22) Fourteenth Marcel Grossmann Meeting - MG14, July 12th – 18th, Rome (Italy).
- 23) 14th Italian-Korean Symposium on Relativistic Astrophysics", July 20th – 24th, Pescara (Italy)

II b. Work With Students:

Internal seminars and supervision of data analysis with PhD students.

III. Service activities

III a. Within ICRANet

- 1) Lecture: IRAP Ph.D. Erasmus Mundus School, September 5th - 16th, 2011 Nice (France)
“High Energy emission in GRBs: the case of GRB 090902B”
- 2) Lecture: IRAP Ph.D. Erasmus Mundus School, September 3rd - 21st, 2012 Nice (France)
“GRB090227B: the missing link between genuine short and long GRBs”
- 3) Lecture: IRAP Ph.D. Erasmus Mundus School, May 16th-31st, 2013 Nice (France) “GRB

090510: A Disguised Short Gamma-Ray Burst with the Highest Lorentz Factor and Circumburst Medium”

4) Lecture: IRAP Ph.D. Erasmus Mundus School, September 2nd–20th, 2013 Nice (France) “Data analysis of GRBs in the Fermi era”

5) Lecture: IRAP Ph.D. Erasmus Mundus Winter School, February 23th–March 2nd, 2014 Nice (France) “On the Binary Driven Hypernovae and their nested X-ray afterglows”

6) Lectures: IRAP Ph.D. Erasmus Mundus school, September 8th–19th, 2014 Nice (France)

a) “Generalities of GRBs and short GRBs in the fireshell model”,

b) “The binary-driven hypernovae”

III b. Outside ICRANet

December 2014. Set of lectures in Almaty (Kazakhstan) on GRBs for graduated and under-graduated students

IV. List of Publications, 2014 – 2015

1) “Evidence for a proto-black hole and a double astrophysical component in GRB 101023”, *A&A*, 538, A58 (2012). A.V. Penacchioni, R. Ruffini, L. Izzo, M. Muccino, C.L. Bianco, L. Caito, B. Patricelli, L. Amati.

2) “GRB 090227B: the missing link between the genuine short and disguised short GRBs”, *ApJ*, 763, 125 (2013); M. Muccino; R. Ruffini; C.L. Bianco; L. Izzo; A.V. Penacchioni.

3) “GRB 110709B in the induced gravitational collapse (IGC) paradigm”, *A&A*, 551, A133 (2013); A.V. Penacchioni, R. Ruffini, C.L. Bianco, L. Izzo, M. Muccino, G.B. Pisani, J. A. Rueda.

4) “On a novel distance indicator for Gamma-Ray Bursts associated with Supernovae”, *A&A*, 52L, 5 (2013); G.B. Pisani, L. Izzo, R. Ruffini, C.L. Bianco, M. Muccino, A.V. Penacchioni, J. A. Rueda, Y. Wang.

5) “GRB 090510: A Disguised Short Gamma-Ray Burst with the Highest Lorentz Factor and Circumburst Medium”, *ApJ*, 772, 62 (2013); M. Muccino, R. Ruffini, C.L. Bianco, L. Izzo, A.V. Penacchioni, G.B. Pisani.

6) “On binary-driven hypernovae and their nested late X-ray emission”, *A&A*, 565, L10 (2014); R. Ruffini, M. Muccino, C. L. Bianco, M. Enderli, L. Izzo, M. Kovacevic, A. V. Penacchioni, G. B. Pisani, J. A. Rueda, Y. Wang.

7) “Induced gravitational collapse at extreme cosmological distances: the case of GRB 090423”, *A&A*, 569, A39, (2014); R. Ruffini, L. Izzo, M. Muccino, G. B. Pisani, J. A. Rueda, Y. Wang, C. Barbarino, C. L.

Bianco, M. Enderli, M. Kovacevic.

- 8) "A search for Fermi bursts associated with supernovae and their frequency of occurrence", *A&A*, 569, A108 (2014); M. Kovacevic, L. Izzo, Y. Wang, M. Muccino, M. Della Valle, L. Amati, C. Barbarino, M. Enderli, G. B. Pisani, L. Li.
- 9) "GRB 130427A and SN 2013cq: A Multi-wavelength Analysis of An Induced Gravitational Collapse Event", *ApJ*, 798, 10 (2015); R. Ruffini, Y. Wang, M. Kovacevic, C. L. Bianco, M. Enderli, M. Muccino, A. V. Penacchioni, G. B. Pisani, J. A. Rueda.
- 10) "Extracting multipole moments of neutron stars from quasi-periodic oscillations in low mass X-ray binaries", *Astronomy Reports*, 59, 441 (2015); K. Boshkayev, J.A. Rueda, M. Muccino.
- 11) "On binary driven hypernovae and their nested late X-ray emission", *Astronomy Reports*, 59, 581 (2015); M. Muccino, R. Ruffini, C. L. Bianco, M. Enderli, M. Kovacevic, L. Izzo, A. V. Penacchioni, G. B. Pisani, J. A. Rueda, Y. Wang.
- 12) "Induced gravitational collapse in the BATSE era: The case of GRB 970828", *Astronomy Reports*, 59, 626 (2015); R. Ruffini, L. Izzo, C. L. Bianco, J. A. Rueda, C. Barbarino, H. Dereli, M. Enderli, M. Muccino, A. V. Penacchioni, G. B. Pisani, Y. Wang.
- 13) "Predicting supernova associated to gamma-ray burst 130427a", *Astronomy Reports*, 59, 667 (2015); Y. Wang, R. Ruffini, K. Kovacevic, C. L. Bianco, M. Enderli, M. Muccino, A. V. Penacchioni, G. B. Pisani, J. A. Rueda.
- 14) "GRB 140619B: a short GRB from a binary neutron star merger leading to black hole formation", *ApJ*, 808, 190 (2015); R. Ruffini, M. Muccino, M. Kovacevic, F. G. Oliveira, J. A. Rueda, C. L. Bianco, M. Enderli, A. V. Penacchioni, G. B. Pisani, Y. Wang, E. Zaninoni.
- 15) "New measurements of Ω_m from gamma-ray bursts", *A&A*, 582, A115 (2015); L. Izzo, M. Muccino, E. Zaninoni, L. Amati, M. Della Valle.