

Fabio De Colle

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Research Positions

March 2009 - present: Postdoctoral position at the Astronomy Department of the University of California at Santa Cruz (USA).

January 2006 - December 2008: Marie Curie postdoctoral position at the Dublin Institute for Advanced Studies (Ireland).

Education

PhD in Astrophysics, Instituto de Astronomía, UNAM, México.
“Models of jets and disks around young stars”, October 2005, with honours.
Supervisor: Dr. Alejandro Raga (UNAM, Mexico).

M.S. in Astrophysics, Instituto de Astronomía, UNAM, México.
July 2003 (GPA 9.78/10).

B.S. in Physics, Università dell’Insubria, Como, Italy.
“Modeling and diagnostic of a plasma of SF₆ for industrial applications”.
December 1999, with honours (110/110 cum laude).
Supervisor: Dr. Claudia Riccardi (Università di Milano).

Research Interests

Numerical simulations and analytical models of astrophysical fluids: jets at different scales (Herbig-Haro, jet-driven core-collapse supernovae, GRBs), disks, supernova remnants, coronal mass ejections, wind-magnetosphere interaction, photoionised regions).

Development of **Numerical methods and codes** for the integration of hyperbolic and parabolic equations, including adaptive mesh refinement implementation and code parallelization.

Technical Skills

Languages: Italian mother tongue, fluent Spanish and English.

Programming techniques: Proficient in Fortran and MPI, basic knowledge of C, OpenMP, and Python.

Awards and Fellowships

HPC-Europe fellowship to visit CINECA (Italy), October-November 2007.

Marie-Curie fellowship, 2006-2008.

“Alfonso Caso” Medal as best PhD graduated in astrophysics of 2006 at UNAM.

Honours in the doctoral studies, 2005.

Two-month grant to visit the Institute for Advanced Study (Princeton, USA), 2005.

“Alfonso Caso” Medal (for Master studies) as best M.S. graduated in astrophysics of 2004 at UNAM.

Fellowship DGEP-UNAM for PhD studies, 2003-2005.

Fellowship DGEF-UNAM for Master studies, 2001-2003.

Honours in the undergraduate studies, 1999.

**Meeting
Organized**

“MHD code comparison workshop” at DIAS, Dublin, 13-14th December 2006 (organizer, ~ 20 participants).

“V JETSET school: High performance computing in astrophysics” at Galway, Ireland, 8-12th January 2008 (member of SOC and LOC, ~ 80 participants).

**Additional
Training**

1. JETSET Schools (5): Galway (Ireland), 8-12th January 2008; Azores Islands (Portugal), 25-29th July 2007; Sauze d’Oulx (Italy), 8-13th January 2007; Marciana Marina (Italy), 4-8th September 2006; Villard-de-Lans (France), 9-13th January 2006.
2. “Parallel Programming Course”, CSCS (Lugano, Switzerland), 23-25th of August 2006.
3. Course on “Introduction to developing Grid Applications on Grid-Ireland”, Trinity College (Ireland), 14-15th of February 2006.
4. Course on “Parallel programming techniques”, UNAM (Mexico), 5-6th October 2004.
5. “Graduate Summer School on General Relativistic Hydrodynamics”, Vancouver (Canada), 21-31st July 2003.
6. “Eighth Synthesis Imaging Summer School”, VLA, Socorro (USA), 18-25th June 2002.

**Funded
Projects**

HPC-Europe, to visit for 7 weeks CINECA (Italian Supercomputing centre, Bologna, Italy) to work on the parallelisation of my MHD code.

List of funded projects where I participated:

1. “Dynamics of astrophysical gases”, Principal Investigator (PI): J. Cantó, funded by CONACyT (Mexico), 2007;
2. “Vertical structure of passive disks”, PI: R. Rafikov, by NSF (USA), 2006;
3. “MHD models of astrophysical fluids”, PI: P. Velázquez, by DGAPA-UNAM (Mexico), 2006;
4. “Structure and dynamics of the astrophysical interfaces”, PI: J. Arthur, by DGAPA-UNAM (Mexico), 2006;
5. “Cometary flows in the Interstellar Medium”, PI: A. Raga, by CONACyT (Mexico), 2006.

**Computational
Proposals**

ICHEC machines, Jet Simulations using a shared memory system, by F. De Colle, accepted.

HPC-Europe, Parallelisation of an MHD/AMR code, by F. De Colle, accepted.

Teaching Experience

Assistant to the professor during the Master course “Galactic Dynamics”, UNAM (2003).

Physics and Mathematics teacher at high school (2000).

Civil service (10 months) as teacher assistant for students with Down syndrome (1999).

Oral Presentations

1. “Mezcal: an MHD numerical code for simulations of astrophysical flows”, Northwestern University (USA), June 2010 - seminar.
2. “Bipolar Supernova Explosions: Nucleosynthesis and the Role of Magnetic Fields”, The Shocking UNiverse, Venice (Italy), September 2009 - contributed talk.
3. “Tomographic reconstruction of stellar jets”, UCSC (USA), May 2009 - seminar.
4. “On the origin of knots in stellar jets”, CRyA, UNAM (Mexico), February 2009 - seminar.
5. “On the origin of knots in stellar jets”, Instituto de Ciencias Nucleares, UNAM (Mexico), January 2009 - seminar.
6. “Inhomogeneous stellar jets: tomographic reconstruction”, Protostellar Jets in Context Conference, Rhodes (Greece), July 2008 - contributed talk.
7. “Tomographic reconstruction of stellar jets”, Instituto de Ciencias Nucleares, UNAM (Mexico), April 2008 - seminar.
8. “Diagnostics of inhomogeneous jets”, Comparison Workshop, Thuringer Landessternwarte Tautenburg, March 2008 - invited talk.
9. “Tomographic reconstruction of stellar jets”, V Jetset Meeting, Galway (Ireland), January 2008 - contributed talk.
10. “Simulations of a variable HH jet”, IV Jetset Meeting, Sauze d’Oulx (Italy), January 2007 - contributed talk.
11. “MHD numerical code(s) for astrophysical simulations”, MHD Code Comparison Workshop, DIAS, Dublin, December 2006 - invited talk.
12. “Which tests for the code comparison?”, MHD Code Comparison Workshop, DIAS, Dublin, December 2006 - invited talk.
13. “Numerical MHD code for astrophysical simulations”, Instituto de Ciencias Nucleares, UNAM (Mexico), October 2006 - seminar.
14. “MHD: numerical methods and applications to astrophysics”, Institute of Physics, Kyoto University (Japan), June 2005 - seminar.
15. “MHD vs. HD: numerical methods and simulations of astrophysical fluids”, Star formation workshop, CRyA, Morelia (Mexico), January 2005 - contributed talk.
16. “MHD: numerical methods and applications to astrophysics”, LAOG, University of Grenoble (France), August 2004 - seminar.
17. “Effects of magnetic fields on the $H\alpha$ emission from jets”, Virtual Astrophysical Jets 2003, Dogliani (Italy), October 2003 - contributed talk.

**Scientific
collaborations**

- A. Caratti o Garatti - Thuringer Landesstenwarte Tautenburg (Germany).
- A. Cerqueira - University of Santa Cruz (Brazil).
- C. del Burgo - Uninova (Portugal).
- W. Henney, J. Arthur - CRyA-UNAM (Mexico).
- D. Kasen - UCB (USA)
- P. Kajdic - IGF-UNAM (Mexico).
- J. Granot - U. Herfortshire (England)
- A. Raga, P. Velazquez, D. Lopez-Camara - ICN-UNAM (Mexico).
- E. Ramirez-Ruiz, S. Woosley, D. Lin, J. Guillochon, J. Naiman -UCSC (USA)

Fabio De Colle - Publications

PEER REVIEWED
JOURNALS

Published

1. **F. De Colle**, C. del Burgo, & A.C. Raga, “*Tomographic reconstruction of the three-dimensional structure of the HH30 jet*”, ApJ, accepted (2010)
2. E.M. Schneider, P. F. Velázquez, E. M. Reynoso & **F. De Colle**, “*An MHD study of SN 1006 and determination of the ambient magnetic field direction*”, MNRAS, in press (2010), preprint: astro-ph/1006.1150
3. W. J. Henney, S. J. Arthur, **F. De Colle** & G. Mellema, “*Radiation - magnetohydrodynamic simulations of the photoionization of magnetised globules*”, MNRAS, vol. 398, pp. 157-175 (2009)
4. J. C. Toledo-Roy, P. F. Velázquez, **F. De Colle**, R. F. González, E. M. Reynoso, S. Kurtz & J. Reyes-Iturbide, “*Numerical model for the SNR DEM L316: simulated X-ray emission*”, MNRAS, vol. 395, pp. 351-357 (2009)
5. **F. De Colle**, J. Gracia & G. Murphy, “*The Effect of a Stellar Magnetic Variation on the Jet Velocity*”, ApJ, vol. 688, pp. 1137-1141 (2008)
6. **F. De Colle**, A.C. Raga & A. Esquivel “*The Dynamics of Internal Working Surfaces in MHD Jets*”, ApJ, vol. 689, pp. 302-307 (2008)
7. **F. De Colle**, C. del Burgo, & A.C. Raga, “*Diagnostics of inhomogeneous stellar jets: Convolution effects and data reconstruction*”, A&A, vol. 485, pp. 765-772 (2008)
8. A.C. Raga, J. Cantó, **F. De Colle**, A. Esquivel, P. Kajdic, A. Rodríguez-González, & P.F. Velázquez, “*A Latitude-dependent Wind Model for Mira’s Cometary Head*”, ApJL, vol. 680, pp. 45-48 (2008)
9. A. Esquivel, A.C. Raga & **F. De Colle**, “*A 3-mode variable ejection velocity, precessing jet model for HH 30*”, A&A, vol. 468, pp.613-616 (2007)
10. A.C. Raga, **F. De Colle**, P. Kajdic, A. Esquivel & J. Cantó “*High resolution simulations of a variable HH jet*”, A&A vol. 465, pp.879-885 (2007)
11. R. Rafikov & **F. De Colle**, “*Structure of Passive Circumstellar Disks: Beyond the Two-Temperature Approximation*”, ApJ, vol. 646, pp.275-287 (2006)
12. **F. De Colle** & A.C. Raga, “*MHD simulations of radiative jets from young stellar objects: H α emission*”, A&A, vol. 449, pp.1061-1066 (2006)
13. A.H. Cerqueira, P.F. Velázquez, A.C. Raga, M.J. Vasconcelos & **F. De Colle** “*Emission lines from rotating proto-stellar jets with variable velocity profiles: I. Three-dimensional numerical simulation of the non-magnetic case*”, A&A, vol. 448, pp.231-241 (2006)
14. **F. De Colle**, & A.C. Raga, “*Interaction of HH objects with molecular cloud and generation of Alfvén waves*”, MNRAS, vol. 359, pp.164-170 (2005)
15. C. Riccardi, R. Barni, **F. De Colle**, & M. Fontanesi, “*Modeling and Diagnostic of a SF₆ RF plasma at low pressure*”, IEEE Trans. on Plasma Science, vol. 28, pp.278-287 (2000)

In preparation

16. **F. De Colle** & A. Caratti o Garatti, “*Simulations of Interacting Herbig-Haro objects and comparison with observations*”, MNRAS in preparation (2010)
17. **F. De Colle**, D. Lopez-Camara, E. Ramirez-Ruiz, & J. Granot, “*Development of a new SRMHD code and application to the study of GRB afterglow*”, ApJ in preparation (2010)
18. **F. De Colle**, E. Ramirez-Ruiz, & S. Woosley, “*Conditions for detonation in jet-driven core collapse supernovae*”, ApJ in preparation (2010)

EDITED BOOKS

J. Gracia, **F. De Colle**, & T. Downes, “*Jets from young stars IV: High performing computing in astrophysics*”, Lecture Notes in Physics (Berlin, Springer), Vol. 791 (2009)

CONFERENCE PROCEEDINGS

1. **F. De Colle**, C. del Burgo, & A.C. Raga, “*Application of Tomographic Techniques to Stellar Jets*”, Protostellar Jets in Context, by K. Tsinganos, T. Ray, M. Stute eds., AP&SS Proceedings Series, Berlin, Springer, pp.305-310 (2009)
2. A. Esquivel, A.C. Raga & **F. De Colle**, “*Numerical simulations of Herbig Haro objects: a low excitation HH object*”, Protostellar Jets in Context, by K. Tsinganos, T. Ray, M. Stute eds., AP&SS Proceedings Series, Berlin, Springer, pp.535-537 (2009)
3. **F. De Colle** & A. Caratti o Garatti, “*Interacting knots in jets: Simulations vs. Observations*”, Protostellar Jets in Context, by K. Tsinganos, T. Ray, M. Stute eds., AP&SS Proceedings Series, Berlin, Springer, pp.527-529 (2009)
4. A.C. Raga, J. Cantó, **F. De Colle**, A. Esquivel, P. Kajdic, A. Rodríguez-González, & P.F. Velázquez, “*Radiative jets from variable sources*”, Protostellar Jets in Context, by K. Tsinganos, T. Ray, M. Stute eds, Astrophysics and Space Science Proceedings Series, Berlin, Springer, pp.285-294 (2009)
5. A.C. Raga, J. Cantó, **F. De Colle**, A. Esquivel, P. Kajdic, A. Rodríguez-González, & P.F. Velázquez, “*Radiative jets from variable sources*”, RevMexAA(SC), vol. 36, pp. 186-192 (2009)
6. S. Cabrit, M. Bocchi, M. Camenzind, A. Ciardi, **F. De Colle**, et al. (15 authors), “*Dynamics of magnetized YSO jets: Examples of results from the JETSET network*”, RevMexAA(SC), vol. 36, pp. 171-178 (2009)
7. **F. De Colle**, “*Parallelisation of an AMR code for simulations of astrophysical fluids*”, Science and supercomputing in Europe, HPC-Europe report 2007, 15-20 (2007)
8. A.C. Raga, P.F. Velázquez, **F. De Colle**, et al. (11 authors), “*Adaptive grid simulations of ionized flows*”, AIP Conf. Proc., vol. 875, pp. 320-325 (2006).
9. A.H. Cerqueira, P.F. Velázquez, A.C. Raga, M.J. Vasconcelos, & **F. De Colle**, “*Radial velocity asymmetries from jets with variable velocity profiles*”, AIP Conf. Proc., vol. 875, pp. 285-288 (2006).
10. **F. De Colle**, & A.C. Raga, “*Generation of turbulence in molecular cloud by HH objects*”, AIP Conf. Proc., vol. 784, pp. 730-735 (2005).
11. **F. De Colle**, & A.C. Raga, “*Effects of the magnetic field on the H α emission from jets*”, Ap&SS, vol.293, pp.173-180 (2004) - (REFEREED CONFERENCE PROCEEDINGS)

12. C. Riccardi, **F. De Colle**, R. Trasarti-Battistoni, & M. Fontanesi, “*Generation of Reynolds stress in laboratory plasmas*”, Physics Scripta, vol. 63 (2), pp.154-156 (2001) - (REFEREED CONFERENCE PROCEEDINGS)
13. C. Riccardi, **F.De Colle**, M. Fontanesi, C.C. Petty, R.I. Pinsker, & C. Hidalgo, “*Reynolds stress generation and sheared $E \times B$ flows via IBW in Thorello*”, AIP Conf.Proc., vol. 595 (1), pp.83-89 (2001)
14. C. Riccardi, R. Barni, **F. De Colle**, & M. Fontanesi, “Characterization of electronegative plasmas”, Czech Journal of Physics, vol. 50 S3, pp.441-444 (2000)
15. C. Riccardi, R. Barni, **F. De Colle**, & M. Fontanesi, “*Analysis of the Diffusion with Negative Ions in a SF6 Plasma*”, Journal of Technical Physics, vol. 15(1), pp.221-224 (1999)