

CURRICULUM VITÆ ET STUDIORUM

Updated to July 10, 2010

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Education

- **Degree in Physics** at the University of Padova in 1996 with a thesis on the applications of General Relativity to space astrometry entitled “*Astrometria relativistica. Applicazioni al progetto GAIA*” (in italian). Thesis advisors: Prof. Fernando de Felice, Prof. Pierluigi Bernacca, Dr. Mario G. Lattanzi.
- **PhD in Space Science and Technology** at the University of Padova in 2001 with a thesis on relativistic astrometry entitled “*General Relativistic Astrometry from Space. Theoretical Modeling and Software Implementation for Data Reduction*”. Thesis advisors: Prof. Fernando de Felice, Dr. Mario G. Lattanzi. Coordinator: Prof. Pierluigi Bernacca.

Schools and courses

1. 8th Summer School of Parallel Programming, July 12–24 1999, CINECA, Casalecchio di Reno (BO), Italy.
2. International School of Space Science: 1999 course on High Precision Interferometry from Space, August 31–September 10 1999, L’Aquila. Italy.
3. PhD courses on Space Science (CISAS "G.Colombo"), June 12–14 2000, Bressanone (BZ), Italy.
4. Summer School “GAIA, A European Space Project.” May 14–18, 2001, Les Houches, France.
5. Course-Workshop “*Ottimizzazione di traiettorie nel volo spaziale.*” (“*Trajectories optimization in space flight*”). May 7–8 2002, CNUCE-CNR Pisa Research Area, Pisa, Italy.

6. “*Corso Avanzato di Calcolo Parallelo e Grid Computing*” (“*Advanced Course on Parallel Computing and Grid Computing*”). September 25–29 2006, Catania Astrophysical Observatory, Catania, Italy.
7. “*Introduzione alla programmazione Message Passing su Sistemi Paralleli*” (“*Introduction to Message Passing Programming on Parallel Systems*”). April 2–4 2007, Department of Mathematics, University of Torino, Torino, Italy
8. Java module of course “*Tecnologie Object Oriented*” (“*Object Oriented Technologies*”). November–March 2008. University of Torino/EURIX.

Teaching experience

October 1998–April 1999 Courses of Physics and Chemistry at E.I.O.M. (European Institute of Osteopathic Medicine).

Academic years 2001/2002 and 2002/2003 Teaching assistant at the University of Padova for the first year physics courses for engineering students.

Theses

1. Luca Bianchi, 2008. “Software N-body per la simulazione di sistemi planetari extrasolari.” Graduation thesis (“Laurea di primo livello”) in Physics. University of Torino, Italy.
2. Paolo Donati, 2010. “Test astrometrici di Relatività Generale col progetto GAME.” Graduation thesis (“Laurea specialistica”) in Physics. University of Torino, Italy.
3. Luca Bianchi, 2010. “Rappresentazione e ricostruzione relativistiche dell’assetto di satelliti applicate alla missione Gaia.” (“Relativistic satellite attitude representation and reconstruction applied to the Gaia mission.”) Graduation Thesis (“Laurea specialistica”) in Physics. University of Torino, Italy.

Scientific interests and activity

Relativistic models for astrometric observations, global astrometry and data reduction of astrometric data, high-precision tests of gravity theories, $f(R)$ gravity theories, Theory of Measure. N-body dynamics applied to planetary systems and stellar clusters. High-performance and parallel computing.

February 1–October 30, 2001 Research associate (“Contratto d’Affidamento d’incarico”) at CISAS (Center of Studies and Activities for Space) “G. Colombo” of the University of Padova, to study and implement relativistic models for astrometric data reduction.

January 1–December 31, 2002 Research associate (“Contratto di Collaborazione Coordinata e Continuativa”) at CISAS (Center of Studies and Activities for Space) “G. Colombo” of the University of Padova, to study and implement relativistic models for astrometric data reduction.

May 1, 2001–April 30, 2003 Post-doc fellowship (“Borsa post-dottorato”) at the Physics Department of the University of Padova with a program on the development of relativistic models of global astrometry from the space.

May 2–December 31, 2003 Research associate (“Assegno di ricerca”) at the Astronomical Observatory of Torino.

January 1, 2004–December 31, 2005 INAF Post-doc fellowship (“Borsa post-dottorato INAF”) at the Astronomical Observatory of Torino.

January 1, 2006–April 15, 2007 Research associate (“Assegno di ricerca”) at the INAF - Astronomical Observatory of Torino.

From April 16, 2007 Scientist (“Funzionario Tecnico-Scientifico Categoria D1”) at the INAF - Astronomical Observatory of Torino.

Membership

1. Member of the INFN (Italian *National Institute of Nuclear Physics*) from October 1, 2001 to April 30 2003.
2. *Core member* of the Relativity and Reference System Working Group (RRFWG) and of the Simulation Working Group (SWG) of the Gaia mission (ESA) from 2001 to late 2005.
3. Member of the Coordination Unit 2 – Simulation and of the Coordination Unit 3 – Core processing of the Gaia Data Processing and Analysis Consortium (DPAC, Gaia mission) from late 2005 onward.

Scientific assignments

- Manager of the Work Package “Numerical comparison of RAMOD and GREM model” of the Coordination Unit 3 (DU “Relativistic Models and Tests”) of the Gaia Data Processing Consortium (DPAC).
- Manager of the Work Package “Design and maintenance of the Global Sphere Reconstruction system” of the Coordination Unit 3 (DU “Astrometric Verification”) of the Gaia DPAC.

Seminars and invited talks

1. “*Relativistic models for the Gaia observations*”, seminar held at the Astronomical Department of the University of Barcelona, Spain, on October 14, 2002.
2. “*Testing General Relativity by high precision astrometry*”, invited talk at the XXXVIIIth Rencontres de Moriond “Gravitational Waves and Experimental Gravity”, Les Arcs, France, March 22–29, 2003.
3. “*Gamma Astrometric Mission Experiment: science case*”, invited talk at the XVIII SIGRAV Conference, Cosenza, September 22-25, 2008.
4. “Mappare la Galassia. Come e Perché”, introductory conference for the Italian Astronomical Olympic Games, April 19, 2010.

Observing experience

Optical photometry with the astrometric reflector REOSC telescope of the Astronomical Observatory of Torino (45 nights from December 2004 to May 2005).

Know-how on computer science

Operating systems: Linux/Unix, Microsoft Windows, MacOS.

Scripting and programming languages: C, C++, FORTRAN 77/90, Java, Basic and VisualBasic, PHP, HTML, SQL, APL, Pascal, sed, awk.

DBMS: MySQL, Microsoft Access, PostgreSQL.

Applications: Mathematica, gnuplot, grace, IDL, IRAF, \LaTeX .

Languages

- Italian (mother tongue).
- English spoken and written (both good).
- Basic knowledge of Spanish and French.

Publications on refereed journals

1. de Felice, F., Lattanzi, M. G., Vecchiato, A., Bernacca, P. L., 1998. General relativistic satellite astrometry. I. A non-perturbative approach to data reduction. *Astron. Astrophys.*, **332**, 1133
2. de Felice, F., Bucciarelli, B., Lattanzi, M. G., Vecchiato A., 2001. General relativistic satellite astrometry. II. Modeling parallax and proper motion. *Astron. Astrophys.*, **373**, 336
3. Vecchiato, A., Lattanzi, M. G., Bucciarelli, B., Crosta, M., de Felice, F., Gai, M., 2003. Testing General Relativity by Micro-arcsecond Global Astrometry. *Astron. Astrophys.*, **399**, 337
4. Crosta M., Vecchiato A., de Felice F., Lattanzi M. G., Bucciarelli B., 2003. Some Aspects of Relativistic Astrometry from within the Solar System. *Cel. Mec. & Dyn. Astron.*, **87**, 209
5. de Felice F., Crosta M. T., Vecchiato A., Lattanzi M. G., Bucciarelli B., 2004. A General Relativistic Model of Light Propagation in the Gravitational Field of the Solar System: The Static Case. *Astrophys. J.*, **607**, 580
6. de Felice F., Vecchiato A., Crosta M. T., Bucciarelli B., Lattanzi M. G., 2006. A General Relativistic Model of Light Propagation in the Gravitational Field of the Solar System: The Dynamical Case. *Astrophys. J.*, **653**, 1552
7. Vecchiato A., Gai M., Lattanzi M. G., Crosta M. T., Sozzetti A., 2009. Gamma Astrometric Measurement Experiment. The science case. *Advances in Space Research*, **44**, 579-587.
8. Gai M., Vecchiato A., Lattanzi M. G., Liori S., Loreggia D., 2009. Gamma Astrometric Measurement Experiment. Implementation and performances. *Advances in Space Research*, **44**, 588-596.
9. Crosta M. T., Vecchiato A., 2010. Gaia relativistic astrometric models - I. Proper stellar direction and aberration. *Astron. Astrophys.*, **509**, A37.

10. Vecchiato A., Bernardi G., Gai M., 2010. Measurement of the PPN-Beta parameter in the GAME mission. *Advances in Space Research*, in preparation.

Publications on refereed proceedings

1. Gai M., Lattanzi M. G., Ligori S., Vecchiato A., 2008. GAME: Gamma Astrometric Measurement Experiment. Proc. SPIE **7010**, 701027.
2. Gai M., Lattanzi M. G., Ligori S., Loreggia D., Vecchiato A., 2008. Gamma Astrometric Measurement Experiment. Mem. S.A.It. Vol.75, 282.
3. Gai M., Vecchiato A., Ligori S., Fineschi S., Lattanzi M. G., 2009. The Gamma Astrometric Measurement Experiment (GAME). Proc. SPIE **7438**, in press.
4. Vecchiato A., Abbas U., Bucciarelli B., Lattanzi M. G., Morbidelli R., 2009. Global astrometric sphere reconstruction in Gaia: challenges and first results of the Verification Unit. In Klioner S. A., Seidelmann K. and Soffel M., eds., *Relativity in Fundamental Astronomy: Dynamics, Reference Frames, and Data Analysis*. Proceedings of the IAU Symposium 261, in press.
5. Vecchiato A., Gai M., Lattanzi M. G., Donati P., Morbidelli R., 2009. GAME. A small mission concept for high-precision astrometric test of General Relativity. Oral talk at the XXVII General Assembly of the IAU, JD9. Mem. S.A.It. Vol.80 n.4.

Publications on proceedings

1. de Felice F., Lattanzi M. G., Vecchiato A. and Bernacca P. L., 1997. A relativistic model for the GAIA observations. In Battrick B. editor, *Proceedings of the ESA symposium "Hipparcos - Venice '97", 13-16 May, Venice, Italy, ESA SP-402 (July 1997)*.
2. de Felice, F., Vecchiato, A., Bucciarelli, B., Lattanzi, M. G., Crosta, M. T., 2000. Relativistic models for a GAIA-like astrometry mission. In Johnston K. et al., editor, *Proceedings of IAU Colloquium 180, Washington "Towards Models and Constants for Sub-Microarcsecond Astrometry", Washington DC, USA, Mar 27-31, 2000*, pages 314–319.
3. Vecchiato A., Bucciarelli B., Lattanzi M. G., De Felice F., Crosta M. T., Smart R. L., Relativistic Astrometry: toward an Accurate Determination of γ , In Johnston K. J. editor, *XXIVth IAU General Assembly, JD 2, Models and Constants for Sub-microarcsecond Astrometry, Manchester (England, UK), Aug 7-18, 2000*, Highlights of Astronomy, **12**, 129.
4. Vecchiato A., Relativistic Satellite Astrometry. In V. G. Gurzadyan, R. T. Jantzen, and R. Ruffini, editors, The Ninth Marcel Grossmann Meeting, pages 1795–1796. World Scientific, 2002. Proceedings of the MGIX MM Meeting, The University of Rome 'La Sapienza' 2–8 July 2000.
5. Bucciarelli B., Crosta M. T., de Felice F., Lattanzi M. G., Vecchiato A., 2002. A Relativistic End-to-end Simulation for GAIA, 1st Gaia SWG Kick-off Meeting, Cambridge (UK), March 11–12, 2002.

6. de Felice F., Crosta M. T., Vecchiato A., Bucciarelli B., Lattanzi M. G., 2003. Methods of relativistic astrometry in space: the static case, in *Proceedings of the Monte Rosa Conference "GAIA Spectroscopy, Science and Technology"*, Gressoney St. Jean (Aosta), Sep 9–12, 2002, Munari U. ed., ASP Conf. Ser. 298.
7. Vecchiato A., Lattanzi M. G., Bucciarelli B., Crosta M. T., de Felice F., Gai M., 2004. Testing General Relativity by High Precision Global Astrometry from Space. In J. Dumarchez and J. Trần Thanh Vân, editors, *Gravitational Waves and Experimental Gravity*, proceedings of the XXXVIIIth Rencontres de Moriond, Les Arcs, March 22–29 2003, World Pub., Hanoi, pages 347–354.
8. Bini D., Bucciarelli B., Crosta M. T., de Felice F., Lattanzi M. G., Vecchiato A., 2004. Relativistic satellite attitude: joining local and global reference frames for the realization of space-borne astrometric catalogues. In Gaume R., McCarthy D. and Souchay J., editors, *The International Celestial Reference System: Maintenance and Future Realization*, proceedings of the XXVth IAU General Assembly, JD 16, Sidney (Australia), July 22, 2003, in press
9. Bucciarelli B., Crosta M. T., de Felice F., Lattanzi M. G., Vecchiato A., 2005. Relativistic Astrometry: the RAMOD Project. In C. Turon, K. S. O’Flaherty and M. A. C. Perryman, editors, proceedings of the Symposium *The Three Dimensional Universe with Gaia*, Oct 4–7, 2004, Paris (France), ESA SP-576, pages 259–262.
10. Bernardi G., Bucciarelli B., Ferreri W., Lattanzi M. G., Morbidelli R., Pannunzio R., Smart R. L., Vecchiato A., 2005. In viaggio fra le stelle. The making of GSC II. In I. Robson, and L. L. Christensen, editors, *Communicating astronomy with the public*, proceedings of the joint ESO/ESA/IAU conference *Communicating astronomy with the public 2005 (CAP2005)*, Garching (Germany), June 14–17, 2005, ESA/Hubble, pages 292–294.
11. Smart R. L., Bernardi G., Vecchiato A., 2006. A Divulgative CD-Rom Based On The Making of GSCII. In Pasachoff J., Ros R. M. and Pasachoff N., editors, *Innovation in Teaching/Learning Astronomy Methods*, proceedings of the XXVIth IAU General Assembly, Special Session 2, Prague, in press.
12. Vecchiato A., Gai M., Lattanzi M. G., Morbidelli R., 2008. Measurement of the PPN- γ parameter with a space-born Dyson-Eddington-like experiment. In “The eleventh Marcel Grossmann meeting”, proceedings of the MG11 Meeting on General Relativity. Berlin, Germany 23 - 29 July 2006, pages 2585-2587.
13. Bucciarelli B., Crosta M. T., Lattanzi M. G., Vecchiato A., Preti G., de Felice F., 2008. Relativistic astrometry with Gaia, advances in the RAMOD project. In “The eleventh Marcel Grossmann meeting”, proceedings of the MG11 Meeting on General Relativity. Berlin, Germany 23 - 29 July 2006, pages 2543-2545.
14. Crosta M. T., Bucciarelli B., de Felice F., Lattanzi M. G., Vecchiato A., 2008. Astrometric observable and relativistic catalogues. In EAS Publications Series, Volume 30, pages 345-348.
15. Loreggia D., Gai M., Vecchiato A., Gardiol D., Ligori S., Lattanzi M. G., 2008. Design of a compact astrometric instrument for the GAME mission. In *A giant Step: from Milli- Micro-arcsecond Astrometry*. Proceedings of the IAU Symposium 248, pages 274-275.
16. Vecchiato A., Lattanzi M. G., Gai M., Morbidelli R., 2008. Gamma Astrometric Measurement Experiment. Testing General Relativity with a small mission. In

A giant Step: from Milli- Micro-arcsecond Astrometry. Proceedings of the IAU Symposium 248, pages 290-291.

17. Crosta M. T., Bucciarelli B., de Felice F., Lattanzi M. G., Vecchiato A., 2008. The RAMOD astrometric observable and the relativistic astrometric catalogues. In *A giant Step: from Milli- Micro-arcsecond Astrometry.* Proceedings of the IAU Symposium 248, pages 397-398.
18. Vecchiato A., Abbas U., Bucciarelli B., Lattanzi M. G., Morbidelli R., 2009. Global Astrometric Sphere Reconstruction in Gaia. Challenges and First Results of the Verification Unit. Poster presented at the XXVII General Assembly of the IAU, JD5.

Technical notes

1. Vecchiato A., Crosta M. T., de Felice F., Lattanzi M. G., 2003. The OATo-PD PPN relativistic model for GDAAS2 - I. Model overview. Gaia livelink, ref. code RRFWG-TOPD-001.
2. Crosta M. T., de Felice F., Bucciarelli B., Lattanzi M. G., Vecchiato A., 2004. Proper frames and Time Scan for Gaia-like satellites. Gaia livelink, ref. code not assigned, date December 20, 2004.
3. Vecchiato A., Morbidelli R., Lattanzi M. G., Bucciarelli B., Roge C., Morosini M., 2007. Experimenting GSR for AVU. Gaia livelink, ref. code GAIA-C3-TN-INAF-AVE-001-01.
4. Lattanzi M. G., Vecchiato A., Drimmel R., 2007. AVU-GSR Software Requirements Specifications. Gaia livelink, ref. code GAIA-C3-SP-INAF-ML-002-02.
5. Vecchiato A., 2008. The astrometric model of GSR1. Gaia livelink, ref. code GAIA-C3-TN-INAF-AVE-002-01.
6. Vecchiato A., 2008. A more efficient algorithm for the derivation of the constants of motion in GSR1. Gaia livelink, ref. code GAIA-C3-TN-INAF-AVE-003-01.
7. Vecchiato A., Messineo R., Abbas U., Bucciarelli B., Lattanzi M. G., 2009. Global Sphere Reconstruction Software Design Document. Gaia livelink, ref. code GAIA-C3-TN-INAF-AVE-004-01.
8. Vecchiato A., Abbas U., Bucciarelli B., Lattanzi M. G., 2009. Global Sphere Reconstruction Software Test Specification. Gaia livelink, ref. code GAIA-C3-TN-INAF-AVE-005-01.
9. Vecchiato A., Abbas U., Messineo R., 2009. GSR Software Test Report for Cycle 7. Gaia Livelink, ref. code GAIA-C3-TR-INAF-AVE-006-01.
10. Vecchiato A., Abbas U., 2009. GSR Software Release Note for Cycle 7. Gaia Livelink, ref. code GAIA-C3-TR-INAF-AVE-007-01.

Publications in popular science magazines

1. Vecchiato A., 2002, GAIA: una rivoluzione nell'astrofisica. *Nuovo Orione* n.126, November 2002

2. Vecchiato A., 2004, Una supernova scappata dalla culla. *Nuovo Orione* n.149, October 2004
3. Vecchiato A., 2004, Più veloci della luce? *Nuovo Orione* n.151, December 2004
4. Vecchiato A., 2005, L'occhio infrarosso di Spitzer. *Nuovo Orione* n.157, June 2005
5. Vecchiato A., 2006, L'effetto Lense-Thirring, o la lunga storia del principio d'inerzia. *L'Astronomia* n.274, May 2006

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