

Curriculum Vitae

Riccardo Brunino

Personal data

Name: Riccardo Brunino

Date of Birth: July 1st, 1978

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Education and Current position

Since August 2008 I am working in the High Performance Computing group at CINECA on a 3 years long “contract on a project” co-funded by CINECA and INAF.

At the same time, I am a fourth year PhD student in Computational Cosmology at the Institute for Astronomy and Particle Theory, School of Physics and Astronomy, University of Nottingham.

Laurea in Astronomy, University of Padova (Academic year 2003/4).

Title of my Laurea dissertation: “*The radial structure of simulated galaxy clusters*”; supervisor prof. G.Tormen.

Courses, Schools and Conferences

- *Scuola Avanzata di Calcolo Parallelo*
One week long school held at CINECA, october 2008.
- *Scuola Estiva di Calcolo Parallelo*,
Two weeks long school held at CINECA, september 2008.
- *National Astronomical Meeting of the Royal Astronomical Society*,
Queens University Belfast, April, 1st-4th, 2008.
Poster presented: *Quantitative comparison of hydrodynamical codes in astrophysics*
Soon to appear in the conference proceedings, available for download at the following url:
www.nottingham.ac.uk/~ppxrb/NAM08/PosterNAM.ppt
- *Advanced MPI*, one day course given by the Manchester University’s national HPC facility on April, the 20th, 2007
- *Introduction to MPI*, one day course given by the Manchester University’s national HPC facility on April, the 19th, 2007
- *Virgo Consortium meeting* Leiden, the Netherlands, January 17th-21st, 2007.
Talk given: *Code-comparison project*
- *Summer School: Evolution of Galaxies and their Large-Scale environment* organized by the Priority Programme at University of Bonn (GERMANY). Physikzentrum in Bad Honnef, July, 2nd-7th, 2006

- *Summer School Novicosmo 2005: The dark and the luminous sides of the formation of structures*, organized by S.I.S.S.A., Novigrad/Cittanova, Istria (CRO) 5-17 September 2005.
- *Science and applications of advanced computing paradigms*, Padova (ITALY) 28-29 October 2004, workshop organized by the Centre of Excellence “Science and Applications of Advanced Computing Paradigms”, supported by MIUR (Ministry of Education, University and Research).
- *Application of parallel computing to science and engineering*, Padova (ITALY) 7-10 July 2003, workshop organized by the Centre of Excellence “Science and Applications of Advanced Computing Paradigms”, supported by MIUR.
- *FORTRAN90 for the intensive scientific calculus* at C.I.L.E.A. (Consorzio Interuniversitario Lombardo per l’Elaborazione Automatica), Milano (ITALY) 25-27 March 2003.

Teaching

During my three years at the University of Nottingham I have been assisting Dr. Pearce, Dr. Mao, Dr. Maddox in the Computational Physics Laboratory course, mandatory for third year undergraduate students in Physics.

I have recently been supporting the hands-on sessions of the Parallel Computing schools held at CINECA.

Programming skills

- Operating systems: IBM-AIX, Unix, Linux, Windows (98/2000/XP)
- Languages: FORTRAN77, FORTRAN90, ANSI-C, Bash, L^AT_EX
- Software: IDL, MATLAB, SM, GNU-emacs, Beamer, Microsoft (and Open) Office Suite
- Libraries: MPI, HDF5, OpenMP

Languages Proficiency

- Italian: mother tongue
- English: reading (fluent), writing (fluent), speaking (fluent). In order to start my PhD at The University of Nottingham, I have successfully passed the *TOEFL* language certification (Internet based) with a total score of 100/120 (January 2006).

More about my work

During the first period in Nottingham, as a PhD student, I have been working at the development of a “void finder” algorithm aimed at detecting the location, shape and size of large underdensities in matter distribution, as present in large cosmological simulated volumes such as the Millennium Simulation carried out by the VIRGO Consortium. This effort has led to a publication (See Brunino et al. 2007 in the Publication list) in which a relevant astrophysical application of the procedure developed is extensively described. As a further validation of our algorithm we also took part in a large “void-finders” comparison project (See Colberg et al. in Publication list).

I then moved on to a more ambitious and demanding project in which the performances of four of the most widely used numerical codes for astrophysics are compared with analytical solutions (and with each other) in order to quantitatively test the accuracy of different numerical algorithms (both hydrodynamic and gravity solvers) as is briefly outlined in the poster presented at the NAM conference 2008 (www.nottingham.ac.uk/~ppxrb/NAM08/PosterNAM.ppt). This work resulted in a publication (see Tasker, Brunino et al. 2008 in the publication list).

In the last 18 months, I have been working on a larger project which involves several high resolution gravity-only resimulations of regions picked-up out of a larger cosmological run (namely the Millennium Simulation) in order to be representative of different large-scale environments. This project is to be seen as a “spin-off” of the GIMIC project (Virgo Consortium). Up to this point I have completed the whole set of runs and the relative post-processing analysis. I am now generating the merger-trees and, scratching the surface, testing the reliability of the numerical approximations used. The scientific goal of this work, is the study of environmental dependencies of galaxy formation in a cosmological context.

At present, I am also collaborating with Italian researchers working in the field of Numerical Cosmology.

Laurea thesis: During the first period of my Thesis project, I have improved an already existing Tree-SPH code written by Carraro and Lia (*MNRAS*,**297**,1021C (1998); *MNRAS*,**312**,371B (2000)). This code was intended to simulate the formation and evolution of galaxies following also the chemical history of the baryonic medium. The aim of my work was to test the possibility of extending this code to the simulation of clusters of galaxies, provided suitable initial conditions. I was eventually forced to abandon this project because my supervisor left for a sabbatical abroad.

I then started another project with prof. G.Tormen. I have written a suite of IDL programs that analyze a set of high resolution simulations of galaxy clusters (Dolag et al. astro-ph/0507480) in order to make a statistical study of the radial profiles of several quantities of interest (density, velocity and thermal structure of dark matter and diffuse gas).

This project resulted in a dissertation available at the following URL:
<http://nottingham.ac.uk/~ppxrb/LAUREA/tesi.pdf>

Publication list

- Brunino R., Trujillo I., Pearce F., Thomas P. *MNRAS*, **375**, 184B (2007)
- Colberg J. et al. *MNRAS*, **387**, 933C (2008)
- Tasker E., Brunino R. et al. *MNRAS*, **390**, 1267T (2008)

Bologna, July 5, 2010

Riccardo Brunino