CURRICULUM VITAE
GIUSEPPE STRACQUADANIO
Last update: June 04, 2015

Address: Department of Mathematics and Computer Sciences, University of Parma, Parco Area delle Scienze, 53/A - 43124, Parma, Italy.

Email: giuseppe.stracquadanio@nemo.unipr.it

Personal

Born on May 9, 1987,
Italian Citizen.

Present Position

PhD in Pure and Applied Mathematics:
I ended my PhD program in Mathematics at Department of Mathematics and Computer Sciences, University of Parma, on 31/12/2014. The thesis was discussed on 19/12/2015. Thesis title: High order semi-Lagrangian methods for BGK-type models in the kinetic theory of rarefied gases. Supervisors: Maria Groppi (University of Parma) and Giovanni Russo (University of Catania).

Education

- 10/2006 - 11/2009: Bachelor's degree in Applied Mathematics, thesis title: Equilibrio correlato di Aumann, University of Catania, advisor Prof. O. Naselli, Final grade 110/110 summa cum laude

- 10/2009 - 11/2011: Master's degree in Mathematics, thesis title: Well balanced finite volume schemes for the Saint-Venant model of the shallow water, University of Catania, advisor Prof. G. Russo, Final grade 110/110 summa cum laude

Brief description of the research interests

My research activity focuses on the study and implementation of high order accuracy numerical methods for the solution of BGK models in the frame of kinetic theory of rarefied gases. The BGK equation governs the evolution in the phase space of the distribution function of a monatomic gas, and it is a consistent approximation of the Boltzmann equation. The numerical method that I have developed is based on a semi-Lagrangian formulation, that allows us to use large time steps. The high order in time is obtained in two way, namely by using Runge-Kutta methods of high order DIRK type, or by using multi-step methods of BDF type. The latter one has the advantage of requiring less interpolation than the DIRK schemes. The high order in space is obtained by an interpolation technique of WENO (weighted essentially not oscillatory) type, preventing oscillations. I am currently studying some applications and extensions of these numerical schemes. I have implemented the one dimensional (in space and velocity) problem and the 3D (in velocity) problem [1]. The method has been also extended to two different BGK models for mixtures of inert gases [3,4]; reflective and diffusive boundary conditions have

been also included, with high order treatment of the boundary [2]. The next extension will cover the study of gas mixtures with chemical reactions, the extension to 2D problem, and the treatment of moving boundary. The activity is supervised by Prof. M. Groppi, University of Parma and Prof. G. Russo, University of Catania.

Publications:

1. M. Groppi, G.Russo, G.Stracquadanio, *High order semilagrangian methods for BGK models.* Preprint n.519, Department of Mathematics and Computer Science, University of Parma, 2014, accepted for publication in COMMUN MATH SCI, to appear.

2. M. Groppi, G.Russo, G.Stracquadanio, *Boundary conditions for semi-Lagrangian methods for BGK models.* Preprint n.522, Department of Mathematics and Computer Science, University of Parma, 2015, Special issue CAIM on Semi-Lagrangian Methods, submitted.

3. M. Groppi, G. Russo, G. Stracquadanio, *Semilagrangian methods for BGK models: inert and reactive gas mixtures.* In preparation.

4. G. Stracquadanio, *High order semi-Lagrangian methods for BGK-type models in the kinetic theory of rarefied gases*, Ph.D. thesis, University of Parma, Italy, Jan. 2015.

Conference Presentations - Speaker

- Semi-Lagrangian Day Workshop, February 6-7, 2013, MOX, Politecnico di Milano. Talk: *Semi-lagrangian schemes for the BGK model of the Boltzmann equation.* Joint work with M. Groppi and G. Russo.

- Workshop "Numerical aspects of hyperbolic balance laws and related problems", September 9-10, 2013, University of Milano. Talk: *Semi-lagrangian schemes for the BGK model of the Boltzmann equation.* Joint work with M. Groppi and G. Russo.

- NumHyp2013, September 23-27, 2013, Aachen. Poster: *Semi-lagrangian schemes for the BGK model of the Boltzmann equation.* Joint work with M. Groppi and G. Russo.

- SIMAI2014, July 7-10, 2014, Taormina. Talk: *High order Semi-Lagrangian schemes for the BGK model.* Joint work with M. Groppi and G. Russo.

- Workshop "Numerics for Nonlinear PDEs", January 29-30, 2015, University Roma Tre. Talk: *High order semi-Lagrangian methods avoiding interpolation for kinetic BGK-type equations.* Joint work with M. Groppi and G. Russo.

Conference Presentations - Coauthor

- 5th Workshop "Theory and Numerics of kinetic Equations", Saarland University, Saarbrücken, Germany, talk: *On semilagrangian methods for kinetic equations*, May 13–15, 2013, speaker: G. Russo.

- CSCAMM Seminar, University of Maryland, talk: *On semilagrangian methods for kinetic equations*, November 20, 2013, speaker: G. Russo.

- Conference "Problems on Kinetic Theory and PDE's", Novi Sad (Serbia), talk: *Kinetic relaxation models for reacting gas mixtures*, September 25–27, 2014, speaker: M.Groppi.

Invited talk

- Department of Mathematics, University of Firenze, *Semi-Lagrangian schemes for the BGK model of the Boltzmann equation,* February 26, 2014.

- Department of Mathematics, University of Wurzburg, Workshop: Evolutionary equations, June 29–July 4, 2015.

School

- 7th Edition Summer School on *Methods and Models of Kinetic Theory* (M&MKT 2014) June 8-14, 2014.

Attended PhD course

- *Numerical Methods for conservation laws*, hold by Prof. G. Naldi, University of Milano, 23/01/12–08/02/12, (exam with final score A);

- *Numerical methods for integral equations*, hold by Prof. A. Aimi, University of Parma, 01/03/2012–20/04/2012, (exam with final score A);

- *Kinetic theory*, hold by Prof. G. Spiga, University of Parma, 01/10/12–15/01/13, (exam with final score A);

- *Advanced Analysis*, hold by Prof. P. Celada, University of Parma, 01/10/12–15/01/13, (exam with final score B);

- *PhD course on Discontinuous Galerkin Finite Element Methods*, University of Pavia, 28/05/2012–01/06/2012;

- *Introduction to kinetic theory*, hold by Prof. A. Bobylev, University of Karlstad, 03/06/2013–13/06/2013;

- *Runge Kutta Discontinuous Galerkin Methods*, hold by Prof. A. Dedner, University of Warwick, 01/10/13–03/10/13.

Skills

- Programming language: Matlab, HTML, Maple, Cabri, Latex, Word, Excel, C (basic Knowledge)

- Foreign languages: English (level B2), German (level A1)

Partecipation to research projects

- 2013-2014 enrollment to INdAM-GNCS (National Group of Scientific Computing);

- 2014 GNCS research project, Semi-implicit and semi-Lagrangian numerical methods for hyperbolic systems of balance laws, coordinator L. Bonaventura;

- 2014 GNCS research project, High resolution methods for strongly non-linear evolutionary problems, coordinator R. Ferretti;

- 2013 GNCS research project, Multi-scale problems with hyperbolic dominance: numerical methods and applications, coordinator M. Semplice;

- Galileo Project 2014, Kinetic modelling and simulations of reactive gaseous mixtures and plasmas for nuclear fusion, coordinator F. Salvarani.

Teaching activities

- 2010/11: Teaching assistant for the undergraduate course in Geometry 1, 60 hours, University of Catania.

- 2012/13-2013/14-2014/15: Teaching assistant for the undergraduate course in Numerical Analysis, 60 hours, University of Parma.

Referee activities

Communications in Computational Physics (CiCP)