Chiara Sorgentone

Curriculum Vitae

Education

14/01/2015	**Ph.D. in Applied Mathematics**, _"La Sapienza"_, Rome, Italy.
Title:	Energy, enstrophy and symmetry preserving schemes for the numerical integration of non-linear advective problems
Supervisor:	Prof. Bernardo Favini

28/03/2011	**Master's Degree in Applied Mathematics**, _"La Sapienza"_, Rome, Italy, (joint work with CNR Roma Tor Vergata).
Title:	Lagrangian Model for pollutant dispersion
Supervisors:	Prof. C. Mascia and Dott. R. Sozzi (ARPALAZIO)
Final grade:	110/110 cum laude

2008-2009	**Erasmus Experience**, _Queen Mary University of London, School of Mathematical Sciences_, UK.

29/10/2008	**Bachelor's degree in Mathematics**, _"La Sapienza"_, Rome, Italy, (joint work with Roma Tre University).
Title:	Cut Elimination Theorem
Supervisors:	Prof. C. Bernardi and Prof. L. Tortora De Falco
Final grade:	110/110

Experience

01/09/2021 - ongoing	**Researcher in numerical analysis (RTDa)**, _Department of Basic and Applied Sciences for Engineering_, La Sapienza, Rome. Italy
01/09/2020 - 31/08/2021	**SAPIExcellence Research Fellowship**, _Department of Basic and Applied Sciences for Engineering_, La Sapienza, Rome. Italy
01/02/2019 - 31/12/2019	**Researcher**, _Permanent position_, KTH Royal Institute of Technology, Stockholm. Sweden
01/03/2017 - 31/01/2019	**Dahlquist Research Fellowship**, _KTH Royal Institute of Technology_, Stockholm, Sweden. Fellowship financed by Comsol AB and KTH.

01/02/2015 - 28/02/2017	**Postdoc position**, *KTH Royal Institute of Technology*, Stockholm, Sweden. Postdoc position on a Research Project funded by the Knut and Alice Wallenberg Foundation in Applied and Computational Mathematics on 'An integral equation method for 3D surfactant-covered drops', Supervisor: Prof. Anna-Karin Tornberg
2011	**Scholarship at CNR ISAC Institute**, *Institute of Atmospheric Sciences and Climate*, Consiglio Nazionale delle Ricerche, Tor Vergata, Italy. Study of micrometeorology and pollutants dispersions in Civitavecchia harbor

Languages

Italian	Native
English	Proficient
French	Beginner
Swedish	Beginner

Interruptions

Parental Leave	01/08/2017 - 02/02/2018; 13/08/2018 - 24/08/2018; 01/07/2019 - 31/08/2020.
Sick Leave	16/04/2019 - 15/06/2019.

Awards

2020	**1st classified at SAPIExcellence 2020**, *SAPIExcellence is an initiative promoted by Sapienza University of Rome to attract the best and most promising researchers, encouraging them to participate in the Marie Skłodowska-Curie (MSCA) and ERC programmes.*.
2018	**Seal of Excellence**, *Certificate delivered by the European Commission, as the institution managing Horizon 2020, the EU Framework Programme for Research and Innovation 2014-2020.* The project proposal 841876, BOUNDARIES, submitted under the Horizon 2020's Marie Sklodowska-Curie actions call H2020-MSCA-IF-2018 of 12 September 2018 by Chiara Sorgentone and Università degli Studi di Roma La Sapienza, following evaluation by an international panel of independent experts was scored as a high-quality project proposal in a highly competitive evaluation process.
2017	**Dahlquist Research Fellowship**, *The fellowship is awarded every two years to a young promising numerical analyst to pursue her or his own research interests*.

Publications

○ **Quadrature error estimates for layer potentials evaluated near curved surfaces in three dimensions**
Ludvig af Klinteberg, Chiara Sorgentone, Anna-Karin Tornberg (https://arxiv.org/abs/2012.06870, 2020)

○ **Pairwise interactions of surfactant-covered drops in a uniform electric field**
Chiara Sorgentone, Petia Vlahovska, Physical Review Fluids 6, 053601 (2021)

○ **Numerical and asymptotic analysis of the three-dimensional electrohydrodynamic interactions of drop pairs**
Chiara Sorgentone, Jeremy I. Kach, Aditya S. Khair, Lynn M. Walker, Petia Vlahovska, Journal

of Fluid Mechanics, vol. 914, A24, Special JFM volume in celebration of the George K. Batchelor centenary (2021)

- **A 3D boundary integral method for the electrohydrodynamics of surfactant-covered drops**
  Chiara Sorgentone, Anna-Karin Tornberg, Petia Vlahovska, Journal of Computational Physics 389, p. 111-127 (2019)
- **Numerical simulation of 3D surfactant-covered drops in a strong electric field**
  Chiara Sorgentone, Anna-Karin Tornberg, Rend. Sem. Mat. Univ. Politec. Torino, NuMA 2018. Turin, September 19-21, 2018 Vol. 76, 2 (2018)
- **A highly accurate boundary integral equation method for surfactant-laden drops in 3D**
  Chiara Sorgentone, Anna-Karin Tornberg, Journal of Computational Physics 360, p. 167-191 (2018)
- **Adaptive time-stepping for surfactant-laden drops**
  Sara Palsson, Chiara Sorgentone, Anna-Karin Tornberg, D.J. Chappel (Ed.), on Boundary Integral Method (UKBIM11), Nottingham Trent University: Publications, Nottingham, pages 161 - 170, (2017)
- **A systematic method to construct mimetic finite-difference schemes for incompressible flows**
  Chiara Sorgentone, Bernardo Favini, International Journal of Numerical Analysis & Modeling (IJNAM) 14(3), p.419-436 (2017)
- **A New High Order Energy and Enstrophy Conserving Arakawa-like Jacobian Differential Operator**
  Chiara Sorgentone, Cristina La Cognata, Jan Nordström, Journal of Computational Physics 301, p.167-177 (2015)
- **Energy, enstrophy and symmetry preserving schemes for the numerical integration of non-linear advective problems**
  Chiara Sorgentone, PhD Thesis
  http://www1.mat.uniroma1.it/ricerca/dottorato/TESI/ARCHIVIO/sorgentonechiara.pdf

Talks and Posters

12th July 2021	Invited speaker, **Quadrature error estimates for layer potentials near curved surfaces**, ICOSAHOM, International Conference on Spectral and High Order Methods, 12th - 16th July 2021 Vienna, Austria (zoom)
20th November 2020	Invited speaker, **Electrohydrodynamic interactions of surfactant-covered drop pairs**, Fluid Dynamics Group Seminars (Zoom), Department of Mathematics, Imperial College London, London, UK
6th November 2020	Invited speaker, **Pairwise interaction of surfactant-covered drops: numerical simulations**, Talk for Ciclo di seminari per il Dipartimento di Scienze di Base e Applicate per l'Ingegneria, La Sapienza, Roma, Italy
16th June 2020	Invited speaker, **Simulation of 3D drops in uniform and quadrupole electric fields using a highly accurate boundary integral method**, Ciclo di seminari di modellistica differenziale numerica (Zoom), Dipartimento di Matematica, La Sapienza, Roma, Italy
28th February 2019	Invited speaker, **Numerical Simulations of 3D Surfactant-covered Drop Electrohydrodynamics**, SIAM Conference on Computational Science and Engineering, Spokane, USA
10th January 2019	Invited speaker, **Simulation of 3D drops in uniform and quadrupole electric fields using a highly accurate boundary integral method**, FLOW Annual Meeting 2019, Stockholm, Sweden

10th October 2018	Contributed talk, **Drop electrohydrodynamics**, Scientific Computing in Sweden, Lund, Sweden
19th September 2018	Contributed talk, **Simulation of 3D drop electrohydrodynamics using a highly accurate boundary integral method**, NUMA 2018, International Workshop on Numerical Mathematics and its Applications, Torino, Italy
10th July 2018	Invited speaker, **A Highly Accurate Boundary Integral Equation Method for Simulating Surfactant-Covered Drops in 3D**, ICOSAHOM International Conference on Spectral and High Order Methods, London, UK
4th July 2018	Invited speaker, **A Boundary Integral Equation Method for Surfactant-Covered Drop Electrohydrodynamics**, SIMAI 2018 Congress of the Italian Society of Applied and Industrial Mathematics, Rome, Italy
19th June 2017	Invited speaker, **Numerical simulation of 3D surfactant-covered drops based on integral equations**, X-DMS 2017 Extended Discretization Methods for partial differential equations on complex and evolving domains (ECCOMAS), Umea, Sweden
1st June 2017	Invited speaker,**A highly accurate boundary integral equation method for 3D surfactant-covered drops**, Numerical methods for PDEs and their application, Institut Mittag-Leffler, Stockholm, Sweden
27th February 2017	Invited speaker, **An integral equation method for 3D surfactant-covered drops**, SIAM Conference on Computational Science and Engineering, Atlanta, USA
19th October 2016	Contributed talk, **An integral equation method for simulating 3D drops with insoluble surfactant**, Scientific Computing in Sweden, Uppsala, Sweden
12th April 2016	Invited speaker, **A high order discretization method based on integral equations for simulating 3D deformable drops**, Department of Mathematics, "La Sapienza" University of Rome
14th September 2015	Contributed talk, **An integral equation method based on discretization of deformable drops by spherical harmonics**, ENUMATH 2015, Ankara, Turkey
18th March 2015	Contributed talk, **A New High Order Energy and Enstrophy Conserving Arakawa-like Jacobian Differential Operator**, European Conference on High Order Nonlinear Numerical Methods for Evolutionary PDEs: Theory and Applications (HONOM 2015), Trento, Italy
16th December 2014	Invited speaker, **Mimetic methods for non-linear advective problems**, "La Sapienza" University of Rome.
7th April 2014	Contributed talk, **Generalization of Arakawa's Jacobian**, Workshop on Partial Differential Equations on the Sphere (PDEs), NCAR (National Centre for Atmospheric Reasearch, Boulder (CO), USA)
24-28 March 2014	**Generalization of Arakawa's Jacobian**, Poster presented at ECMWF, Reading, England
28th May 2013	Invited speaker, **Numerical Simulation of quasi-geostrophic turbulence**, "La Sapienza" University of Rome.

Administration and scientific responsibilities

○ Organization of scientific events

28/02/2019	Organizer with Lukas Bystricky of the Minisymposium *Boundary Integral Methods for Particulate Flows* at SIAM CSE 2019
11/01/2019	Co-organizer of the one-day-workshop at KTH Royal Institute of Technology, meeting with the numerical analysis group of Bergen, talks and poster session
10-11/01/2019	Co-organizer of the FLOW Annual Meeting at Skogshem Wijk, Hustegavägen 1, Lidingo, Stockholm

○ Referee activity
- BIT Numerical Mathematics
- Journal of Computational Physics
- Mathematics and Computers in Simulation

○ Projects

Involved in the Linne FLOW Centre (http://www.flow.kth.se/) activities within the focus area Micro and Complex flows; from March 2018 part of the Managment Group.

Teaching

AY 2020-2021	*Analisi e Calcolo Numerico (Numerical Analysis)*, Department of Energy Engineering, "La Sapienza" University of Rome (TA)
AY 2018-2019	*Applied Numerical Methods*, Advanced course for Master and PhD students, KTH Royal Institute of Technology (TA)
AY 2012-2013	*Introductory Course in Mathematics*, Department of Mathematics, "La Sapienza" University of Rome (Reader)
AY 2011-2012	*Introductory Course in Mathematics*, Department of Physics, "La Sapienza" University of Rome (Reader)

Collaborations

2020 - ongoing	Joint project with Prof. Maria Rosaria Lancia (La Sapienza, University of Rome) "Boundary Integral Methods for Fractal Geometries". In the framework of heat propagation, a Venttsel' problem models the heat flow across highly conductive thin boundaries, which turns out to have several applications in physical and industrial processes (e.g. hydraulic fracturing, electrochemistry etc). We will reformulate this problem using a boundary integral approach for non-smooth surfaces and develop a suitable numerical method to study the problem numerically.
2018 - ongoing	Joint project with Prof. Petia Vlahovska (Northwestern University) "Drop Electrohydrodynamics". The idea is to bring together theoretical, numerical and experimental results to better understand the effect of electric fields on surfactant-covered drops.
2018 - ongoing	Joint project with Dr. Ludvig af Klinteberg (Simon Fraser University) "Error estimates for the evaluation of nearly singular integrals". The idea is to develop 3D error estimates for boundary integral methods where it is often necessary to evaluate layer potentials on or close to the boundary and where the underlying integral may be difficult to evaluate numerically and for which specialized quadrature techniques must be employed.

2014	During May and November 2014, I was a guest of Jan Nordström, Professor in Scientific Computing and Head of Division of Computational Mathematics in the Department of Mathematics at Linköping University, Sweden. The Professor, another PhD student, Cristina La Cognata and I worked together in the project "The Arakawa scheme reinvented using the splitting technique and SBP operators". We developed a finite difference discretization of the Jacobian operator in a mimetic way using SBP operator and compared this general formulation with the original formulation of Arakawa.
2011	During the year 2011 I worked at CNR ISAC Institute of Tor Vergata together with Michele Spada, Ilaria Pietroni, Andrea Bolignano, Igor Petenko, Matteo Morelli, Roberto Sozzi and Stefania Argentini on the project *The meteorological forecast operative at ARPA-Lazio: model results and comparison against measurements from the ARPA micrometeorological network* presented at *32 nd NATO/SPS International Technical Meeting on Air Pollution Modelling and its Application, ITM 2012, May 7 - 11, Utrecht, The Netherlands*.

Summer/Winter Schools and Trainings

15-26 August 2016	PDC Summer School: Introduction to High Performance Computing, KTH, Stockholm, Sweden
24-28 March 2014	Advanced numerical methods for Earth-System modelling Course, ECMWF (European Centre for Medium-Range Weather Forecasts), Reading, England
2013-2014	Training at ENEA, Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Centro ricerche Casaccia, Rome, Italy; *Study of the energy spectrum for a quasi-geostrophic model*
June 2012	Course on parallelization, CASPUR, Rome, Italy

IT skills

- UNIX and Windows
- LaTeX, Microsoft Office Programs
- FORTRAN 90, C++
- MATLAB

Other

2009-2010	On campus work placement at the Maths Library"La Sapienza" University of Rome
2007-2008	On campus work placement at Erasmus Office "La Sapienza" University of Rome