

Chiara Sorgentone

Curriculum Vitae

Date of birth: [REDACTED]

Place of birth: [REDACTED]

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

Internal Prof. Maurizio Falcone
advisor:

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

01/09/2020 - **SAPIExcellence Research Fellowship**, Department of Basic and Applied Sciences for Engineering, La Sapienza, Rome, Italy.

01/02/2019 - **Researcher**, KTH Royal Institute of Technology, Stockholm, Sweden.
31/12/2019

01/03/2017 - **Dahlquist Research Fellowship**, KTH Royal Institute of Technology, Stockholm, Sweden.
31/01/2019

Fellowship financed by Comsol AB and KTH.

<https://www.kth.se/en/sci/the-dahlquist-resear/the-dahlquist-research-fellowship-1.856773>

- 01/02/2015 - **Postdoc position**, *KTH Royal Institute of Technology*, Stockholm, Sweden.
28/02/2017 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.
<https://www.youtube.com/watch?v=ciddKOcUZss&feature=youtu.be> (my project from 5.43)
<https://kaw.wallenberg.org/forskning/matematik-som-simulerar-mikrofloden>
- 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 and accreditations

- 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 Skłodowska-Curie actions call H2020-MSCA-IF-2018 of 12 September 2018 by Chiara Sargentone 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

- **Numerical and asymptotic analysis of the three-dimensional electrohydrodynamic interactions of drop pairs;**
Chiara Sargentone, Jeremy I. Kach, Aditya S. Khair, Lynn M. Walker, Petia Vlahovska Journal of Fluid Mechanics, accepted for publication for the Batchelor Special Issue (2020)
- **A 3D boundary integral method for the electrohydrodynamics of surfactant-covered drops**
Chiara Sargentone, 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)

PhD Thesis

- **Energy, enstrophy and symmetry preserving schemes for the numerical integration of non-linear advective problems**
Chiara Sorgentone, PhD Thesis (2015)
<http://www1.mat.uniroma1.it/ricerca/dottorato/TESI/ARCHIVIO/sorgentonechiara.pdf>

Preprints

- **Note on the pairwise interactions of surfactant-covered drops in a uniform electric field**
Chiara Sorgentone, Petia Vlahovska (<http://arxiv.org/abs/2011.00724>, 2020)

In preparation

- **Quadrature error estimates for layer potentials evaluated near curved surfaces in three dimensions**
Ludvig af Klinteberg, Chiara Sorgentone, Anna-Karin Tornberg (to be submitted, 2020)

Talks and Posters

- 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 Research, 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

○ Projects

- Feb 2015 - Involved in the Linné FLOW Centre (<http://www.flow.kth.se/>) activities within the focus area Micro and Complex flows; from March 2018 part of the Management Group.
- Mar 2018 - Part of the Management Group for the Linné FLOW Centre
- Dec 2019 (<https://www.flow.kth.se/about-flow/management-group-1.763365>).

Teaching

- AY 2018-2019 *Applied Numerical Methods*, Advanced course for Master and PhD students, KTH Royal Institute of Technology, Stockholm, Sweden
- AY 2012-2013 *Precorsi di Matematica*, Department of Mathematics, "La Sapienza" University of Rome, Italy
- AY 2011-2012 *Precorsi di Matematica*, Department of Physics, "La Sapienza" University of Rome, Italy

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 and Prof. Anna-Karin Tornberg (KTH Royal Institute of Technology, Stockholm) "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 ricerca 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

Certificates

- 2020 24 CFU - Italian teaching certification

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

Roma, 01/12/2020

