

CURRICULUM VITAE - STEFANO BERTI

Assistant Professor (Maître de Conférences)
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PERSONAL DATA	Name: Stefano Surname: Berti Date of birth: 16/6/1976 Nationality: Italian
LANGUAGES	Italian (native) English (excellent) French (excellent) Spanish (good)

RESEARCH INTERESTS Transport phenomena in fluid flows: inert and reactive systems.
Statistical properties of turbulence in Newtonian and non-Newtonian fluids.
Phenomenology of complex fluids.

Studies

- 2003 - 2006** PhD in Physics, Università di Torino and Université de Nice - Sophia Antipolis (co-tutoring program). Thesis: “Non-Newtonian turbulence: viscoelastic fluids and binary mixtures”.
- 2003** MSc in Physics at Università di Roma “Sapienza”. Master degree Thesis: “Reaction-diffusion in non asymptotic situations”. Final mark: 110/110.

Research experience

- september 2012 -** *Assistant Professor* at Unité de Mécanique de Lille (Laboratoire de Mécanique de Lille until december 2017), Université de Lille.
- 2018 - 2021** *Invited Researcher* at Laboratoire de Météorologie Dynamique, ENS, Paris. *Project:* Transport properties of upper-ocean turbulence (collaboration with G. Lapeyre).
- jan. - aug. 2012** *Postdoc researcher* at Laboratoire de Météorologie Dynamique, ENS, Paris, financed by CNES. *Project:* Three-dimensional oceanic submesoscale dynamics from satellite data using new theoretical tools.

- 2011** Postdoc *researcher* at Laboratoire de Météorologie Dynamique, ENS, Paris, financed by CNRS. *Project*: Turbulence and nonlinear dynamics of oceanic upper layers; Lagrangian reconstructions of tracer fields.
- 2008 - 2010** Postdoc *researcher* at Laboratoire Interdisciplinaire de Physique, UJF, Grenoble, financed by CNRS. *Project*: Mechanics of single objects and interaction with their environment - complex fluids: viscoelastic turbulence; statistical properties of microswimmers' motion.
- 2007** Postdoc *researcher* at Helsinki University, financed by TEKES (Finnish Academy for Applied Sciences). *Project*: Multiphase fluids and reaction-diffusion systems: individual-based modeling of reaction dynamics; simplified models and numerical simulations for combustion.
- march 2006** Visiting young *researcher* at IFISC (Institute for Cross-Disciplinary Physics and Complex Systems), Palma de Mallorca, within the MEC-MIUR program of collaboration between Italy and Spain. *Project*: Stochastic modeling of reaction-diffusion systems.
- april - may 2005** Visiting *student/researcher* at Institut Non Linéaire de Nice, within the PhD co-tutoring program between Italy and France.

Teaching experience

- 2012 - 2021** Lab work of *Informatics*; course, exercise classes and lab work of *Numerical methods for engineers*; exercise classes of *Mathematical tools for engineers*; course and exercise classes of *Lagrangian and Hamiltonian mechanics*; course and exercise classes of *Applied mechanics*; exercise classes of *Continuum mechanics (fluids)*; exercise classes of *Constitutive laws in fluid mechanics*; course of *Fluid mechanics (applied turbulence)*; course of *Turbulence*; course of *Complex fluids*; course and exercise classes of *Applied fluid mechanics*; course and exercise classes of *Thermodynamics*; course of *Heat and mass transfer*.
Assistant Professor at Ecole Polytechnique Universitaire (EPU) de Lille and Department of Mechanics, Université de Lille.
- 2012 - 2021** *Monitoring* of assistant mechanical engineer internships (EPU), mechanical engineering final-project internships (EPU), Master 2 and 3rd year internships in applied mechanics (Université de Lille); 2 internships of each type per year on average.
Assistant Professor at Ecole Polytechnique Universitaire de Lille and Department of Mechanics, Université de Lille.
- 2009** *Lecturer* charged of course and exercise classes of General Physics (electricity, magnetism, electrotechnics) at the Department of Electricity and Industrial Informatics of IUT (Institut Universitaire de Technologie), Grenoble.

Supervision of students

PhD students

- 2021 - 2024** Michael Maalouly, PhD in Engineering science - Fluid mechanics; *Project*: Lagrangian particle dynamics in ocean submesoscale turbulence and future satellite data; in collaboration with G. Mompean.

- 2020 - 2021** Alice Jaccod, PhD in Mechanics, Acoustics, Electronics and Robotics - Fluid mechanics (Sorbonne Université); *Project*: Plankton dynamics in turbulent flows; in collaboration with S. Chibbaro.
- 2018 - 2021** Vinicius Tergolina, PhD in Engineering science - Fluid mechanics; *Project*: Phytoplankton vertical dynamics in stirred fluid environments; in collaboration with G. Mompean.
- 2015 - 2019** Dario Canossi, PhD in Engineering science - Fluid mechanics; *Project*: Viscoelastic turbulence in wall-bounded flows; in collaboration with G. Mompean.
- 2015 - 2018** Himani Garg, PhD in Engineering science - Fluid mechanics; *Project*: Particle transport in elastic turbulence; in collaboration with E. Calzavarini and G. Mompean.

Master students

- 2021** Raj Jayeshkumar Gandhi, Master in Aerospace Engineering (Ecole Centrale Lyon); *Project*: Elastic turbulence in curvilinear geometries; in collaboration with F. Romanò, E. Calzavarini (6 months).
- 2021** Elisa Chardon Legrand, Master in Physics (SOAC, Univ. Lyon); *Project*: Lagrangian particle dynamics at oceanic submesoscales and future satellite data; in collaboration with G. Lapeyre (4 months).
- 2020** Yueting Jiang, Master in Physics (EPFL, Lausanne); *Project*: The vertical stratification of temperature and phytoplankton in the English Channel and in Lake Geneva; in collaboration with F. Schmitt and E. Calzavarini (6 months).
- 2020** Titouan Seguin, Emilien Rouchon, Mechanical engineering internship (EPU); *Project*: Design of a demonstrator of wave generation for environmental applications; in collaboration with E. Calzavarini.
- 2019** Antoine Gontier, Valentin Legrand, Mechanical engineering internship (EPU); *Project*: Design and realization of a demonstrator of collective phenomena in a population of micro-robots; in collaboration with E. Calzavarini.
- 2019** Guillaume Sageot, Pierre Vanhove, Mechanical engineering internship (EPU); *Project*: Design and realization of a demonstrator of clogging in granular materials; in collaboration with E. Calzavarini.
- 2019** Sajed Medlej, Master in Geophysical fluid dynamics (CLEAR, Polytechnique, Paris); *Project*: Lagrangian dispersion in stratified upper ocean turbulence (4 months).
- 2018** Marine Le Breton, Mechanical engineering internship (EPU); *Project*: Design and realization of a demonstrator of Coriolis force; in collaboration with E. Calzavarini and T. Dienne.
- 2017** Lucas Decelle, Kévin Nicolas, Mechanical engineering internship (EPU); *Project*: Design of an educational table wind tunnel; in collaboration with E. Calzavarini.
- 2014** Kaci Allaoua, Master in Mechanics; *Project*: Convection by contact and radiation heating; in collaboration with E. Calzavarini and S. Hirata (6 months).
- 2014** Dario Canossi, Mechanical engineering internship; *Project*: Numerical simulation of dilute polymer solutions in channel flow; in collaboration with G. Mompean (6 months).

Scientific popularization experience

- 2020** *Coordinator* (in collaboration with E. Calzavarini) of a stand on *Transport of plastics in the ocean* for the exhibition “Planète Nature” at “Fête de la science”, High school Cousteau, Wasquehal (Lille).
- 2019** *Coordinator* (in collaboration with E. Calzavarini) of a stand on *Flowing properties of granular materials and active matter* for the exhibition “À demain” at “Fête de la science”, Lille.
- 2018** *Coordinator* (in collaboration with E. Calzavarini) of a stand on *Basic mechanisms at the origin of tides* for the exhibition “L’erreur” at “Fête de la science”, Lille.
- 2018** Seminar for high-school students on *Turbulence*, Departments of Mathematics and of Mechanics, Université de Lille.
- 2017** *Coordinator* (in collaboration with E. Calzavarini) of a stand on *Fluid turbulence* for the exhibition “Voyage(s)” at “Fête de la science”, Lille.
- 2016 and 2017** Seminar for high-school students on *Chaos and complexity in fluid dynamics*, Departments of Mathematics and of Mechanics, Université de Lille.
- 2016** *Coordinator* (in collaboration with E. Calzavarini) of a CNRS stand on *Swimming microorganisms* for the exhibition “Cycle(s) de vie” at “Fête de la science”, Lille.
- 2015 - 2016** Research partner of a project on initiation to research (TIPE) for French high-school students. *Student*: Alexandre Ohier, *Project*: Numerical weather forecasting, Lycée Mariette in Boulogne sur Mer and Université de Lille.
- 2015** *Coordinator* (in collaboration with E. Calzavarini) of a CNRS stand on *Fluid mechanical aspects of the climatic system* for the exhibition “Climat(s)” at “Fête de la science”, Lille.
- 2011** Collaboration as a *scientific consultant* with “IF-TV production” for documentaries for television.
- 2008 and 2009** *Scientific animator* for the exhibition “Fluides complexes: liquides ou solides” at “Fête de la science”, Grenoble.
- 2006** *Scientific animator* for the exhibition “Semplice e Complesso” organized by INFM (Istituto Nazionale di Fisica della Materia), Torino.

Collective responsibilities

- 2019 -** Member of the laboratory council of UML (Unité de Mécanique de Lille), Lille.
- 2016 -** Organizer of seminars of UML, Lille.
- 2016 -** Co-coordinator of Master 2 internships (Department of Applied Mechanics) and last year internships in Mechanical engineering (EPU), Université de Lille.
- 2015** Member of the evaluation committee of PhD thesis, Laboratoire de Mécanique de Lille (LML), Lille.
- 2009** Organizer of the internal seminars of the DYFCOM (Dynamics of Complex Fluids and Morphogenesis) group, Laboratoire Interdisciplinaire de Physique, Grenoble.

Reviewer

Journals	Physica D, Physics of Fluids, Journal of Fluid Mechanics, Journal of Non-Newtonian Fluid Mechanics, European Physical Journal E, Europhysics Letters, Journal of the Royal Society Interface, Water, Journal of Atmospheric and Oceanic Technology, Journal of Geophysical Research: Oceans, Journal of Physical Oceanography, Nature Scientific Reports, Nature Communications.
Funding agencies	CNRS National Program LEFE (Fluid envelopes and environment) (France), Dutch Research Council NWO (Netherlands), Belgian Research Program ARC (Belgium).

Grants and participation to funded projects

2020 - 2023	Participation (as member of the Science Team) to CNES TOSCA project <i>Data and dynamical synergies for SWOT (DIEGO)</i> (coordinator: A. Ponte).
2016 - 2019	Participation to CNES TOSCA project <i>New dynamical tools for submesoscales characterization in SWOT data</i> (coordinator: G. Lapeyre).
2014 - 2018	Participation to the projet ANR (JCJC - SIMI 9) <i>SEAS: Sea-ice Evolution in Arctic Summer</i> (coordinator: E. Calzavarini).
2013	Project BQR (Bonus Qualité Recherche) - Emergence of Université de Lille <i>Transport and mixing in viscoelastic fluids</i> .

Organization of scientific meetings

2018	<i>Organizer</i> , in collaboration with E. Calzavarini and F. G. Schmitt, of the CNRS summer school <i>Active Transport in the Ocean: Turbulence, Chemistry and Biology</i> , Wimereux.
2016	Member of the local organizing committee of the <i>51st Congress of the French Society of Rheology</i> (in association with the Belgian Society of Rheology), Lille.
2015	Member of the local organizing committee of the <i>International Conference on Mechanics of Complex Solids and Fluids</i> , Lille.

Invited talks

Lagrangian dispersion in upper-ocean turbulent models including mixed-layer instabilities
Lille Turbulence Program - LMFL, Lille, June 2021.

Lagrangian dispersion in upper-ocean turbulent models including mixed-layer instabilities
Laboratoire de Météorologie Dynamique - ENS, Paris, November 2020.

Reaction-transport systems in heterogeneous environments and population dynamics
Namur Center for Complex Systems (naXys), Namur, May 2017.

Lagrangian reconstructions of temperature and velocity in a model of surface ocean turbulence
Workshop “Inversion of SWOT ocean observations”, CNES, Toulouse, June 2014.

Lagrangian transport: applications to ocean dynamics
Laboratoire d’Océanologie et de Géosciences, Université du Littoral, Wimereux, January 2014.

Lagrangian reconstructions of tracer fields in numerical simulations of upper ocean turbulence
Istituto di Scienze dell’Atmosfera e del Clima, CNR, Roma, April 2012.

Reaction-diffusion approach to combustion dynamics in a steady compressible flow
Institut Jean le Rond d’Alembert, Université Pierre et Marie Curie, Paris, March 2010.

Combustion dynamics in steady compressible flows
Rencontres Niçoises de Mécanique des Fluides,
Laboratoire J. A. Dieudonné, Université de Nice Sophia Antipolis, Nice, February 2009.

Turbulence in viscoelastic fluids
Laboratoire de Spectrométrie Physique, Université J. Fourier I, Grenoble, June 2007.

Phase separation in two-dimensional flows,
Helsinki University, May 2006.

Small scale statistics in viscoelastic turbulent flows,
IFISC, Palma de Mallorca, March 2006.

Oral presentations

Lagrangian pair dispersion in upper-ocean turbulent flows with mixed-layer instabilities,
vEGU General Assembly - Nonlinear Processes in Geophysics 2021.

Lagrangian pair dispersion in generalized two-dimensional turbulence,
17th European Turbulence Conference, Turin (Italy) 2019.

Relative dispersion in quasi-geostrophic models of upper-ocean turbulence,
7th Lagrangian Analysis and Prediction of Coastal and Ocean Dynamics meeting, Venice (Italy) 2019.

Relative dispersion in direct cascades of generalized two-dimensional turbulence,
Euromech/Ercoftac colloquium - Turbulent cascades II, Lyon (France) 2017.

Effects of discreteness on population persistence in an oasis,
Fluid active matter symposium, ICTAM 24, Montreal (Canada) 2016.

Lagrangian reconstructions of temperature and velocity in surface ocean turbulence,
IUGG General Assembly - Physical Oceanology (Sub-Mesoscale Eddies), Prague (Czech Republic) 2015.

Relative dispersion and turbulence in the Southwestern Atlantic Ocean from Lagrangian data,
8th Chaotic Modeling and Simulation International Conference, Institut H. Poincaré, Paris (France) 2015.

Lagrangian reconstructions of surface ocean turbulence,
14th European Turbulence Conference, ENS, Lyon (France) 2013.

Lagrangian reconstructions of tracer fields at ocean surface,
EGU General Assembly - Nonlinear Processes in Geophysics, Vienna (Austria) 2012.

Finite-scale dispersion in the southwestern Atlantic Ocean: analysis of Lagrangian drifters data,
18th Conference on Atmospheric and Oceanic Fluid Dynamics, Spokane, WA (USA) 2011.

Phenomenology of elastic turbulence in 2D polymer solutions,
Softflow 2009 summer school on “Complex and biofluids”, Cargese (France) 2009.

Combustion dynamics in steady compressible flows
PPF DYSCO “Dynamique des Systèmes Complexes”, Annecy (France) 2009.

- Phenomenology of elastic turbulence in two-dimensional polymer solutions*,
Rencontre sur la Microfluidique et Fluides Complexes, Marrakech (Morocco) 2008.
- Elastic turbulence in 2D viscoelastic flows*,
11th European Turbulence Conference, FEUP, Porto (Portugal) 2007.
- Small scale statistics in viscoelastic turbulent flows*,
EU Network “Fluid Mechanical Stirring and Mixing: the Lagrangian Approach”, Weizmann Institute of Science, Rehovot (Israel) 2006.
- Turbulent accelerations in viscoelastic fluids*,
EU Network “Fluid Mechanical Stirring and Mixing: the Lagrangian Approach”, ISI foundation Torino (Italy) 2005.
- Mixing and reaction efficiency in closed domains*,
International cross-disciplinary symposium on physics and biology, Oslo (Norway) 2005.
- Phase separation in a 2D turbulent flow*,
“Turbulence meeting”, Nice (France) 2004.
- Reactive transport in a non asymptotic situation: the case of a meandering-jet flow*,
Workshop “Lagrangian problems in turbulence”, Università di Roma “Sapienza” (Italy) 2003.

Publications

- A. Jaccod, S. Berti, E. Calzavarini, S. Chibbaro *Three-dimensional turbulence effects on plankton dynamics behind an obstacle* European Physical Journal Plus **137**, 184 (2022).
- V. B. Tergolina, E. Calzavarini, G. Mompean, S. Berti *Effects of large-scale advection and small-scale turbulent diffusion on vertical phytoplankton dynamics* Physical Review E **104**, 065106 (2021).
- A. Jaccod, S. Berti, E. Calzavarini, S. Chibbaro *Predator-prey plankton dynamics in turbulent flow past an obstacle* Physical Review Fluids **6**, 103802 (2021).
- H. Garg, E. Calzavarini, S. Berti *Statistical properties of two-dimensional elastic turbulence* Physical Review E **104**, 035103 (2021).
- S. Berti, G. Lapeyre *Lagrangian pair dispersion in upper-ocean turbulence in the presence of mixed-layer instabilities* Physics of Fluids **33**, 036603 (2021).
- D. O. Canossi, G. Mompean, S. Berti *Elastic turbulence in two-dimensional cross-slot viscoelastic flows* Europhysics Letters **129**, 24002 (2020).
- A. Foussard, S. Berti, X. Perrot, G. Lapeyre *Relative dispersion in direct cascades of generalized two-dimensional turbulence* in *Turbulent cascades II*, Eds. M. Gorokhovski, F. S. Godeferd, Springer, p 217 (2019).
- D. Vergni, S. Berti, A. Vulpiani, M. Cencini *Reaction fronts in persistent random walks with demographic stochasticity* Physical Review E **99**, 012404 (2019).
- H. Garg, E. Calzavarini, G. Mompean, S. Berti *Particle-laden two-dimensional elastic turbulence* European Physical Journal E **41**, 115 (2018).
- B. Rabbanipour Esfahani, S. Hirata, S. Berti, E. Calzavarini *Basal melting driven by turbulent thermal convection* Physical Review Fluids **3**, 053501 (2018).
- A. Foussard, S. Berti, X. Perrot, G. Lapeyre *Relative dispersion in generalized two-dimensional turbulence* Journal of Fluid Mechanics **821**, 358 (2017).
- S. Berti, F. dos Santos *Relative dispersion and turbulence in the Southwestern Atlantic Ocean from drifters data*, Proceedings of the 8th Chaotic Modeling and Simulation International Conference, Chaotic Modeling

and Simulation (CMSIM) **1**, 9-20 (2016).

S. Berti, M. Cencini, D. Vergni, A. Vulpiani *Extinction dynamics of a discrete population in an oasis* Physical Review E **92**, 012722 (2015).

S. Berti, G. Lapeyre *Lagrangian reconstructions of temperature and velocity in a model of surface ocean turbulence* Ocean Modelling **76**, 59 (2014).

D. Vergni, S. Iannaccone, S. Berti, M. Cencini *Invasions in heterogeneous habitats in the presence of advection* Journal of Theoretical Biology **301**, 141 (2012).

S. Berti, F. Dos Santos, G. Lacorata, A. Vulpiani *Lagrangian drifter dispersion in the southwestern Atlantic Ocean* Journal of Physical Oceanography **41**, 1659 (2011).

M. Garcia, S. Berti, P. Peyla, S. Rafai *Random walk of a swimmer in a low-Reynolds-number medium* Physical Review E **83**, 035301(R) (2011).

S. Berti, G. Boffetta *Elastic waves and transition to elastic turbulence in a two-dimensional viscoelastic Kolmogorov flow* Physical Review E **82**, 036314 (2010).

S. Berti, D. Vergni, A. Vulpiani *Combustion dynamics in steady compressible flows* Europhysics Letters **83**, 54003 (2008).

S. Berti, A. Bistagnino, G. Boffetta, A. Celani, S. Musacchio *Two-dimensional elastic turbulence* Physical Review E **77**, 055306(R) (2008).

S. Berti, C. López, D. Vergni, A. Vulpiani *Discreteness effects in a reacting system of particles with finite interaction radius* Physical Review E **76**, 031139 (2007).

S. Berti, A. Bistagnino, G. Boffetta, A. Celani, S. Musacchio *Elastic turbulence in 2D viscoelastic flows* in *Advances in Turbulence XI*, Proceedings of the 11th European Turbulence Conference, edited by J. M. L. M. Palma, A. Silva Lopes, Springer (Porto, Portugal 2007).

S. Berti, A. Bistagnino, G. Boffetta, A. Celani, S. Musacchio *Small-scale statistics of viscoelastic turbulence* Europhysics Letters **76**, 63 (2006).

S. Berti, G. Boffetta, M. Cencini, A. Vulpiani *Turbulence and coarsening in active and passive binary mixtures* Physical Review Letters **95**, 224501 (2005).

S. Berti, D. Vergni, F. Visconti, A. Vulpiani *Mixing and reaction efficiency in closed domains* Physical Review E **72**, 036302 (2005).