

# CURRICULUM VITAE - STEFANO BERTI

Assistant Professor (Maître de Conférences)  
Unité de Mécanique de Lille  
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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)

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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

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- 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

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- 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

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- 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 Département of Mechanics, Université de Lille.
- 2012 - 2021** *Monitoring* of assistant mechanical engineer internships (EPU), mechanical engineering final-project internships (EPU), Master 2 and 3<sup>rd</sup> 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 Département 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

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### PhD students

- 2020 - 2021** Alice Jaccod, PhD in Engineering science - 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

- 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

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- 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 INFN (Istituto Nazionale di Fisica della Materia), Torino.

### Collective responsibilities

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- 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

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- 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, 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

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

## Organization of scientific meetings

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

## Invited talks

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*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

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

*Relative dispersion in quasi-geostrophic models of upper-ocean turbulence*,  
7<sup>th</sup> 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*,  
8<sup>th</sup> Chaotic Modeling and Simulation International Conference, Institut H. Poincaré, Paris (France) 2015.

*Lagrangian reconstructions of surface ocean turbulence*,  
14<sup>th</sup> 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*,  
18<sup>th</sup> 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*,  
11<sup>th</sup> 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

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- S. Berti, G. Lapeyre *Lagrangian pair dispersion in upper-ocean turbulence in the presence of mixed-layer instabilities* Physics of Fluids, accepted (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 8<sup>th</sup> 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 11<sup>th</sup> 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).