

Curriculum Vitae

Michele Buzzicotti

Born July 21, 1987, in Terni (Italy)

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EDUCATION

Jan. 2017 **Ph.D. in Physics.** U. of Rome *Tor Vergata*. Title: Effects of Fourier mode reduction on small-scales turbulent fluctuations; Robustness and modelling.

May 2013 **Master's degree in Physics of the Atmosphere and Meteorology, cum laudem,** U. of Rome *Tor Vergata*. Title: Analysis and Diagnostic of the calibration techniques of water vapor measurements from two LIDAR Raman belonging to the international network NDACC.

CURRENT POSITION

Dec. 2018 - present Researcher. Dept. of Physics, **University of Rome Tor Vergata** (Italy)

Jun. 2023 - present Visiting Scientist at **University of Eindhoven TU/e** (Netherland)

OTHER POSITIONS

Oct. 2021 - Jan. 2022 Visiting Scholar at **University of Rochester** (New York, USA)

Jan. 2020 - Feb. 2020 Visiting Scholar at **University of Rochester** (New York, USA)

Mar. 2017 - Dec. 2018 Post-Doc. Dept. of Physics, **University of Rome Tor Vergata** (Italy)

PROJECTS/AWARDS

2021-2023 **Research Project U. Rome Tor Vergata**, Title: "Deep'n'Rec: Adversarial Deep Learning for Network Reconstruction". Duration: 24 months. Funds:10000 Euro.

2019-2021 **Research Project U. Rome Tor Vergata**, Title: "Machine Learning Techniques for Optimal Navigation in Complex flows". Duration: 18 months. Funds:16000 Euro.

2019 **PRACEdays19, Best Scientific Presentation Award.** Title: "*Energy cascade in rotating turbulent flows*".

2012 **Best Poster Presentation:** 12th Specialist Meeting on Microwave Radiometry and Remote Sensing of the Environment.

TEACHING EXPERIENCE

Dept. Physics U. Rome Tor Vergata (Bachelor Course): Statistical Mechanics.

Dept. Physics & Mec. Engineering U. Rome Tor Vergata (Master Course): Turbulence & Complex Fluids.

Dept. Physics U. Rome Tor Vergata (Master Course): Machine Learning Methods for Physics.

Dept. Physics U. Rome Tor Vergata (Ph.D. Course): Hands on Machine Learning.

Co-supervision: 2 Ph.D.: G. Goedert & L. Agasthya. **1 Under-graduate Students:** C. Calascibetta. **2**

Master Students: M. Scarpolini & A. De Santis. **Supervision: 2 Master Students:** F. Cianciotta & A.

Roscioli. **1 Under-graduate Student:** A. Sebastiani.

Short courses: (i) **First Ph.D. School of the Italian Society of Statistical Physics, IMT School for Advanced Studies Lucca in Italy:** Hydrodynamics and Turbulence (Tutoring, 2022). (ii) **STIMULATE Ph.D. School on Machine and Reinforcement Learning, Rare Events and Tensor Networks (ONLINE),** Deep Learning and RL applications (Short-course, 2020). (iii) **Big Data** computer lab for high-schools (PCTO, 2021 & 2023).

Key numbers (scientific impact, Google Scholar)

Number of published papers: 24 (1 NatureComm.; 2 PRL; 1 JAMES; 5 PRE/PRF; 6 EPJE; 2 JoT; 1 NJP; 1 Chaos; 1 PoP; 2 PoF; 1 AIxIA 2021; 1 EPL)

Number of papers under revision: 3 (1 Science Advances; 1 JAMES; 1 JFM)

Hirsch-index (H): 12

i10-index (# publications with more than 10 citations): 14

Citations (total): 446

TEAM MEMBER OF EUROPEAN PROJECTS

ERC AdG Smart-TURB. (PostDoc for 2-years)

ERC AdG NewTURB. (PostDoc for 1.5-years)

TEAM MEMBER OF HIGH-PERFORMANCE COMPUTING PROJECTS

PRACE Allocations: (i) *Turbulence under Rotation* (55MH, 2014) (ii) *Homogeneous and Anisotropic Turbulence* (27MH, 2015). (iii) *Instantons and Intermittency in Hydrodynamic Turbulence: A Lattice Monte Carlo Approach* (18MH, 2017). (iv) Inverse and direct cascades in rotating turbulent flows (60MH, 2018).

EuroHPC: 1 Project, EHPC-REG-2021R0049 (6MH, 2022).

Italian SuperComputing Resource Allocation – ISCRA: 4 Projects; LagrROT (2016), RotEuler (2016), MultiLES (2017), SupTURB (2018)

OPEN-SOURCE SOFTWARE & DATA INFRASTRUCTURE MANAGEMENT

Smart-Turb, Turbulence Database, Repository: <https://smart-turb.roma2.infn.it>

Complete, 3D Pseudo-Spectral Code, Repository: <https://git-smart-turb.roma2.infn.it>

FlowSieve, Code for Coarse-Graining of the Sphere: <https://github.com/husseinaluie/FlowSieve>

INVITED TALKS

- 2023 **Flow Seminar @KTH (Sweden).** Title: “*Physics-Informed Data-Driven Tools: From Ideal models to Geophysical systems*”.
- 2022 **Seminar @ICTP (Italy).** Title: “*Physics-Informed Data-Driven Tools: From Ideal models to Geophysical systems*”.
- 2021 **Young Seminars, Società Italiana di Fisica Statistica (Italy).** Title: “*AI Meets Turbulence: Lagrangian and Eulerian data-driven tools for optimal navigation and data-assimilation*”.
- 2020 **Indian Institute of Technology Hyderabad (India).** Title: “*Artificial Intelligence meets complex flows, from optimal navigation to reconstruction of turbulent data*”.
- 2020 **Laboratoire de Mécanique des Fluides de Lille (France).** Title: “*Artificial Intelligence meets complex flows, from optimal navigation to reconstruction of turbulent data*”.
- 2019 **Seminar at the CNR-ISAC Rome (Italy).** Title: “*Optimal navigation in complex flows*”.
- 2016 **COST Lagrangian transport: from complex flows to complex fluids; Lecce (Italy).** Title: “*Eulerian and Lagrangian turbulence on fractal Fourier set*”.

RESEARCH DISSEMINATION

- 2022 **Presentation during the activities of Moff’Art-Surgente:** Title “*Panta rhei (but how ?)*”
- 2020 **European Researchers’ Night:** Title “*The answer, my friend, is blowin' in the wind...*”

ORGANISING COMMITTEES

- 2022 **Workshop:** Challenges and Benchmarks for quantitative AI in Complex Fluids and Complex Flows, (Rome)
- 2020 **PhD Summer School:** School on Machine and Reinforcement Learning, Rare Events and Tensor Networks (Rome)

EDITORIAL AND REVIEWING ACTIVITIES

- 2022-present **Review Editor**, *Frontiers in Physics* (Interdisciplinary Physics)
- 2022-2023 **Guest Editor**, *European Physical Journal E*, **EPJ E Topical Issue: “Quantitative AI in Complex Fluids and Complex Flows: Challenges and Benchmarks”**

Referee for (only major): *Physical Review Letters (PRL)*, *Philosophical Transactions of the Royal Society A (PTRS A)*, *Physics of Fluids (PoF)*, *Physical Review Fluids (PRF)*, *Journal of Advances in Modeling Earth Systems (JAMES)*, *Journal of Turbulence (JoT)*, *Journal of Fluid Mechanics (JFM)*, *European Journal of Physics E (EPJ E)*, *Frontier in Physics (FronPhys)*, *Scientific reports (SciRep)*.

Evaluator for NWO: Dutch Science Council, main source of research grants in the Netherlands.

Reviewer for ISCRA and LISA: Call for proposals on the Italian SuperComputing system.

MEMBERSHIPS OF SCIENTIFIC SOCIETIES (only those still active)

INFN (Nat. Inst. of Nucl. Phys.); EUROMECH (Europ. Mech. Soc.); APS (Americ. Phys. Soc.).

MAIN COLLABORATIONS & TEAM MEMBERS: I am proud and honoured that I had the opportunity to learn from world class scientists such as R. Benzi, U. Frisch, L. Biferale, C. Meneveau. With some of them I still collaborate. More recently, my main collaborators have been A. Alexakis (ENS, Paris), A. Celani (ICTP, Trieste), and F. Toschi (TUE, Eindhoven). I have an open collaboration with Prof. Hussein Aluie (University of Rochester, NY) on geophysical observation and numerical models' data analysis. More recently I have started another collaboration with Prof. Ricardo Vinuesa (KTH, Stockholm) on Machine Learning subjects.

The 12 most relevant papers (not the most cited).

Authors	Title	Journal	Year
Buzzicotti M.	Data reconstruction for complex flows using AI: Recent progress, obstacles, and perspectives / (Invited paper)	EPL, 142 (2), art. no. 23001	2023
Buzzicotti M., Storer B.A., Khatri H., Griffies S.M., Aluie H.	Spatio-temporal coarse-graining decomposition of the global ocean geostrophic kinetic energy	JAMES - Earth Systems Journal - AGU Open Access Journal	2023
Storer B.A., Buzzicotti M., Khatri H., Griffies S.M., Aluie H.	Global energy spectrum of the general oceanic circulation	Nature Communications, 13 (1), art. no. 5314	2022
Buzzicotti M., Bonaccorso F., C. Di Leoni P., Biferale L.	Reconstruction of turbulent data with deep generative models for semantic inpainting from TURB-Rot database / (Invited paper)	Physical Review Fluids, 6 (5), art. no. 050503	2021
Buzzicotti M., C. Di Leoni P.	Synchronizing subgrid scale models of turbulence to data	Physics of Fluids, 32 (12), art. no. 0031835	2020
Buzzicotti M., Biferale L., Toschi F.	Statistical Properties of Turbulence in the Presence of a Smart Small-Scale Control	Physical Review Letters, 124 (8), art. no. 084504	2020
Biferale L., Bonaccorso F., Buzzicotti M., C. Di Leoni P. Gustavsson K.	Zermelo's problem: Optimal point-to-point navigation in 2D turbulent flows using reinforcement learning	Chaos, 29 (10), art. no. 103138	2019
Biferale L., Bonaccorso F., Buzzicotti M., Iyer K.P.	Self-Similar Subgrid-Scale Models for Inertial Range Turbulence and Accurate Measurements of Intermittency	Physical Review Letters, 123 (1), art. no. 014503	2019
Buzzicotti M., Aluie H., Biferale L., Linkmann M.	Energy transfer in turbulence under rotation	Physical Review Fluids, 3 (3), art. no. 034802	2018
Buzzicotti M., Linkmann M., Aluie H., Biferale L., Brasseur J., Meneveau C.	Effect of filter type on the statistics of energy transfer between resolved and subfilter scales from a-priori analysis of direct numerical simulations of isotropic turbulence	Journal of Turbulence, 19 (2), pp. 167-197	2018
Biferale L., Buzzicotti M., Linkmann M.	From two-dimensional to three-dimensional turbulence through two-dimensional three-component flows	Physics of Fluids, 29 (11), art. no. 111101	2017
Buzzicotti M., Bhatnagar A., Biferale L., Lanotte A.S., Ray S.S.	Lagrangian statistics for Navier-Stokes turbulence under Fourier-mode reduction: Fractal and homogeneous decimations	New Journal of Physics, 18 (11), art. no. 113047	2016