FY 2025 Annual Report

Unit Name

Complex Fluids and Flows Unit

Associate Professor Marco Edoardo Rosti

Collaborations

Daulet Izbassarov, Finnish Meteorological Institute, Finland, Viscoelastic duct flows

Parisa Mirbod, University of Illinois at Chicago, United Stes of America, Particle laden duct flows with porous walls

Stefano Musacchio, University of Torino, Italy, Turbulent particle suspensions

Guido Boffetta, University of Torino, Italy, Turbulent particle suspensions

Pinaki Chakraborty, OIST, Japan, Turbulent flows over rough walls

Marco Terenzio, OIST, Japan, Tracking of neurons

Amy Shen, OIST, Japan, Rheology of elastoviscoplastic fluids

Naoki Takeishi, Kyushu University, Japan, Red blood cells dynamics in confined geometries

Gustavo Gioia, OIST, Japan, Rayleigh-Taylor turbulence

Dhrubaditya Mitra, NORDITA, Sweden, Polymeric turbulence

Andrea Mazzino, University of Genova, Italy, Ocean waves

Giorgio Besagni, Politecnico di Milano, Italy, Bubble columns

Daulet Izbassarov, Finnish Meteorological Institute, Finland, Turbulent elastoviscoplastic flows

Marco Terenzio, OIST, Japan, Neuron growth statistics

Samriddhi Sankar Ray, International Center for Theoretical Sciences, India, Intermittency and dissipation anomaly

Stefano Olivieri, University of Genova, Italy, Filament break-up in turbulence

Andrea Mazzino, University of Genova, Italy, Filament break-up in turbulence

Dhrubaditya Mitra, NORDITA, Sweden, Elastic turbulence

Pinaki Chakraborty, OIST, Japan, Control of turbulent flows

Soledad Le Clainche, Universidad Politecnica de Madrid, Spain, Coherent vortex identification

Amy Shen, OIST, Japan, Canopy elastic turbulence

Cristian Marchioli, University of Udine, Italy, Flexible fibers in turbulence

Gautier Verhille, CNRS, France, Flexible fibers in turbulence

Alfredo Pinelli, City St. George University of London, United Kingdom, Control of canopy flows

Research Personnel

Piyush Garg, Postdoctoral Scholar

Ludovico Fossa, Postdoctoral Scholar

Lucas Menez, Postdoctoral Scholar

Ishita Jain, Postdoctoral Scholar

Aswathy Mukundan Sajila, Postdoctoral Scholar, Assistant Professor at Indian Institute of Space Science and Technology, India

Vishnu Ravindran, Postdoctoral Scholar, POC project at OIST

Rahul Kumar Singh, Postdoctoral Scholar

Morie Koseki, PhD Student

Simone Tandurella, PhD Student

Giulio Foggi Rota, PhD Student

Christian Amor Rodriguez, PhD Student

Michele Macaluso, Research Intern

Keetley James Rate, Research Intern

Aki Miyazawa, Research Intern

Estelle Marie Fons, Research Intern

Andrea Datri, Research Intern

Aditya Tekriwal, Research Intern

Aurelio Fioretto, Research Intern

Thibaut Thierry Dilosquet, Research Intern

Scholarly Contributions and Creative Productions (by Faculty)

Journal Article

1. Foggi Rota, G.; Chiarini, A.; Rosti, M. E.
   Reconfiguration and Dynamics of Clamped Fibers under Finite-Amplitude Surface Gravity Waves. Physical Review Fluids 2025, 10, 014301.
2. Shahmardi, A.; Salimi, S. Z.; Tammisola, O.; Brandt, L.; Rosti, M. E.
   The Role of Wetting on the Flow of Two Immiscible Fluids in Porous Media. Physics of Fluids 2025, 37, 013112.
3. A. Chiarini, S. Tandurella, M. E. Rosti
   Kolmogorov-Size Particles in Homogeneous and Isotropic Turbulence. Journal of Fluid Mechanics 2025.
4. N. Takeishi, K. Ishimoto, N. Yokoyama, M. E. Rosti
   Inertial Focusing of Spherical Capsule in Pulsatile Channel Flows. Journal of Fluid Mechanics 2025.
5. A. Chiarini, R. K. Singh, M. E. Rosti
   Extending Kolmogorov Theory to Polymeric Turbulence. Physical Review Research 2025.
6. Rosti, M. E.
   The Effect of Shear-Thinning on the Scalings and Small-Scale Structures of Turbulence. Journal of Fluid Mechanics 2025.
7. G. Soligo, A. Chiarini, M. E. Rosti
   Reynolds Number Effect on the Flow Statistics and Turbulent–non-Turbulent Interface of a Planar Jet. Journal of Fluid Mechanics 2025.
8. P. Garg, Rosti, M. E.
   Elastic Turbulence Hides in the Small Scales of Inertial Polymeric Turbulence. Physical Review Letters 2025.
9. R. K. Singh, Rosti, M. E.

The Interplay of Inertia and Elasticity in Polymeric Flows. Journal of Fluid Mechanics 2025.

10. H. U. Naseer, D. Izbassarov, M. E. Rosti, M. Muradoglu
    Bubble-Induced Transition to Elasto-Inertial Turbulence. Journal of Fluid Mechanics 2025.
11. S. Nicholas, M. Omidyeganeh, A. Pinelli, A. Monti, G. Foggi Rota, M. E. Rosti
    Filament Inclination Effect on Turbulent Canopy Flows. Physical Review Fluids 2025.
12. A. Chiarini, R. K. Singh, M. E. Rosti
    Energy, enstrophy and helicity transfers in polymeric turbulence. Journal of Fluid Mechanics 2025.
13. M. Koseki, M. E. Rosti
    Understanding the effect of wall elasticity in turbulent channel flows. Journal of Fluid Mechanics 2025.
14. C. Marchioli, M. E. Rosti, G. Verhille
    Flexible Fibers in Turbulence. Annual Review of Fluid Mechanics 2026.
15. A. Chiarini, E. Gallorini, M. E. Rosti
    Dynamics of the velocity fluctuations in sedimenting suspensions of rigid fibres. Journal of Fluid Mechanics 2026.
16. G. Foggi Rota, A. Chiarini, M. E. Rosti
    Effect of submerged vegetation on water surface geometry and air-water momentum transfer. Geophysical Research Letters 2026.
17. G. Foggi Rota, R. K. Singh, A. Chiarini, C. Amor, G. Soligo, D. Mitra, M. E. Rosti
    The broken link between space and time in elastic turbulence. International Journal of Multiphase Flows 2026.

Presentation at Conference (invited)

1. Rosti, M. E.
   Hydrodynamics of Flexible Aquatic Plants*. EUROMECH Colloquium 652 - Non-spherical particles in turbulence 2025.*
2. Rosti, M. E.
   Polymeric and Elastic Turbulence*. ICMF 2025 2025.*
3. Rosti, M. E.
   Turbulence in a Fluid with Variable Viscosity*. Complex Flows and Complex Fluids - Satellite StatPhys29 2025.*
4. Rosti, M. E.
   Kolmogorov-Size Particles in Turbulence*. ICMF 2025 2025.*

Seminars

1. Rosti, M. E.
   The Multiscale Nature of Polymeric Turbulence*. 2025.*
2. Rosti, M. E.
   The Effect of Particles on Turbulence*. 2025.*
3. Rosti, M. E.
   The Multiscale Nature of Polymeric Turbulence*. 2025.*
4. Rosti, M. E.
   An Overview of Polymeric Turbulence*. 2025.*
5. Rosti, M. E.
   The Multiscale Nature of Elastic Turbulence*. 2025.*
6. Rosti, M. E.
   Polymeric and Elastic Turbulence*. 2025.*

Scholarly Contributions (by Unit Members)

Name of Unit Member	Type	Title	Publisher
Ludovico Fossa	Poster Presentation at Conference	Heavy Kolmogorov-size spherical particles in homogeneous isotropic turbulence	OISTxJST [Complex Flow] workshop, Japan
Morie Koseki	Poster Presentation at Conference	The effects of wall flexibility in turbulent channel flow over a deformable wall	OISTxJST [Complex Flow] workshop, Japan
Giulio Foggi Rota	Poster Presentation at Conference	Elastic turbulence in channel flows	OISTxJST [Complex Flow] workshop, Japan
Rahul Kumar Singh	Poster Presentation at Conference	Two invariant measures in polymeric turbulence	Complex Flows and Complex Fluids - Satellite StatPhys29, Italy
Morie Koseki	Presentation at Conference	The effects of wall flexibility in turbulent channel flows over viscous hyperelastic wall	OIST-Keio Showcase Talk, Japan
Giulio Foggi Rota	Presentation at Conference	Lagrangian drifters in a decaying gravity wave	Annual Meeting of the Japanese Society of Fluid Mechanics, Japan
Piyush Garg	Presentation at Conference	The small scales of polymeric turbulence	Annual Meeting of the Japanese Society of Fluid Mechanics, Japan
Ludovico Fossa	Presentation at Conference	Kolmogorov-size particles in homogeneous isotropic turbulence	Annual Meeting of the Japanese Society of Fluid Mechanics, Japan
Morie Koseki	Presentation at Conference	The effects of compliant walls on turbulent heat transfer	International Symposium on Turbulence, Heat and Mass Transfer, Japan
Piyush Garg	Presentation at Conference	The limiting behavior of elastic turbulence	EUROMECH Colloquium 652 - Non-spherical particles in turbulence, Italy
Giulio Foggi Rota	Presentation at Conference	Interface dynamics of a turbulent water layer	Complex Flows and Complex Fluids - Satellite StatPhys29, Italy
Piyush Garg	Presentation at Conference	Examining the dissipation range of polymeric turbulence	Complex Flows and Complex Fluids - Satellite StatPhys29, Italy
Christian Amor Rodriguez	Presentation at Conference	Sparse representation of elastic turbulence in planar jets	ICMF 2025, France
Giulio Foggi Rota	Presentation at Conference	Turbulence and interface dynamics above smooth and vegetated beds	ICMF 2025, France
Morie Koseki	Presentation at Conference	The effects of compliant walls on turbulent heat transfer	Annual Meeting of the Japanese Society of Fluid Mechanics, Japan
Giulio Foggi Rota	Seminars	The broken link between space and time in elastic turbulence	University of Manchester, UK
Christian Amor Rodriguez	Seminars	Physics-aware hybrid reduced order models of viscoelastic turbulent flows	Universidad Politécnica de Madrid, Spain
Morie Koseki	Seminars	The effects of the wall elasticity in turbulent channel flows over viscous hyperelastic walls	JK-FLOW (Japan-Korea Fluid Mechanics Online Workshop), online

Honors, Awards & Fellowships

Term 1 2025 - Term 1 2025	Andrea Prosperetti award, Andrea Prosperetti award, 2025, International Conference of Multiphase Flows [Fiscal Year: 2025-12-01]
Term 2 2025 - Term 2 2025	2025 François Frenkiel Award for Fluid Mechanics, 2025 François Frenkiel Award for Fluid Mechanics, 2025, American Physical Society [Fiscal Year: 2025-12-01]

Term 2 2025 - Term 2 2025	Reviewer Excellence Award, Reviewer Excellence Award, 2025, American Physical Society [Fiscal Year: 2025-12-01]

Honors, Awards & Fellowships [By Unit Members Only]

Term 1 2025 - Term 1 2025	Giulio Foggi Rota, Scholarships to attend Complex Flows and Complex Fluids - Satellite StatPhys29, Scholarships to attend Complex Flows and Complex Fluids - Satellite StatPhys29, 2025, Satellite StatPhys29 [Fiscal Year: 2025-12-01]
Term 1 2025 - Term 1 2025	Rahul Kumar Singh, Scholarships to attend Complex Flows and Complex Fluids - Satellite StatPhys29, Scholarships to attend Complex Flows and Complex Fluids - Satellite StatPhys29, 2025, Satellite StatPhys29 [Fiscal Year: 2025-12-01]
Term 2 2025 - Term 2 2025	Morie Koseki, Young Researchers' Award for Excellent Presentations , Young Researchers' Award for Excellent Presentations , 2025, Japanese Society of Fluid Mechanics [Fiscal Year: 2025-12-01]
Term 2 2025 - Term 2 2025	Giulio Foggi Rota, Running-up for 2024 JFM Emerging Scholar Best Paper Prize, Running-up for 2024 JFM Emerging Scholar Best Paper Prize, 2025, Journal of Fluid Mechanics [Fiscal Year: 2025-12-01]
Term 2 2025 - Ongoing	Christian Amor, Scholarship to attend the International HPC Summer School 2024, Scholarship to attend the International HPC Summer School 2024, 2024, RIKEN [Fiscal Year: 2024-07-01]

External Service

Term 1 2022 - Ongoing	Associate Editor, European Journal of Mechanics - B/Fluids [Fiscal Year: 2022-01-01]

Other Institutional Service

Term 1 2025 - Term 1 2025	OIST SEED Programs, (University) [Fiscal Year: 2025-12-01]

Outreach Activities [For Unit Members Only]

Term 1 2025	Morie Koseki & Giulio Foggi Rota, Meet students from Naha Nikkei Business College - vocational school [Fiscal Year: 2025-12-01]
Term 2 2025	Ludovico Fossa, Help at Unna Festival [Fiscal Year: 2025-12-01]
Term 2 2025	Ludovico Fossa, Help at Unna Matsuri at Onna-son Community Centre [Fiscal Year: 2025-12-01]

Workshops and Seminars [Organized and Hosted by Faculty/Units]

Speaker Name(s)	Title	Location	Date
Jeff Morris	Rheology of dense suspensions: from mud to statistical mechanics	OIST	2026-01-26
Stefanie Rauchenzauner	Multi-scale modeling of large-scale gas-particle flows	OIST	2025-11-19
Daulet Izbassarov	How air moves and affects us: simulations of urban, indoor, and human air quality	OIST	2025-11-18
Alfredo Soldati	Angular velocity of Kolmogorov-scale fibers as proxy for turbulent dissipation	OIST	2025-11-04
Kohei Ohie	Rheology of bubble-bearing fluids and its application to flow prediction	OIST	2025-10-24

Speaker Name(s)	Title	Location	Date
Takashi Arima	A hyperbolic nonlinear viscoelastic model (1D) in the framework of rational extended thermodynamics	OIST	2025-09-26
Susumu Goto	A new measure of intermittency	OIST	2025-09-26
Takeshi Sato	Discovering constitutive equations from nonlinear rheological data using a sparse identification technique	OIST	2025-09-26
Yoshiyuki Tagawa	Short-term dynamics of liquid and soft matter: focused jets and cavitation	OIST	2025-09-26
Hiromitsu Takeuchi	Crossover between quantum and classical fluid mechanics	OIST	2025-09-26
Hongna Zhang	Numerical simulation of high-Wi viscoelastic drag-reducing turbulence	OIST	2025-09-09
Giorgio Cavallazzi	Multi-agent deep reinforcement learning for distributed control of wall-bounded turbulent flows	OIST	2025-06-24
Giorgio Besagni	Bubble column fluid dynamics: a multi-scale perspective	OIST	2025-06-03
Samriddhi Sankar Ray / International Center for Theoretical Sciences - Tata Institute of Fundamental Research, India	How Universal is Turbulence?	OIST	2025-03-11