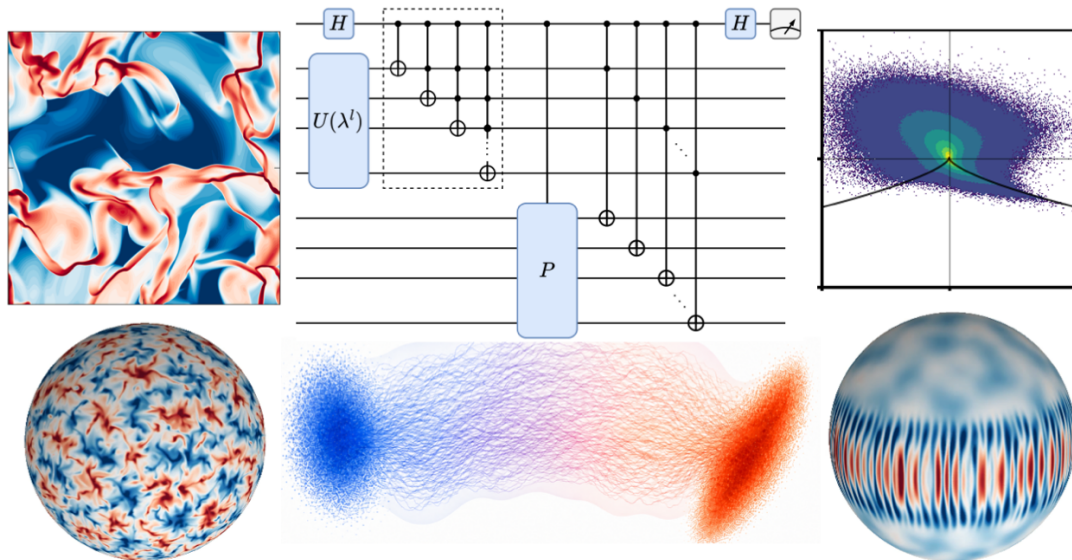


Discussion Meeting

Future connections between turbulence, quantum computing and generative machine learning

Leonardo Hotel, Weimar, 10-12 June 2026

Organized by M. Chertkov, K.R. Sreenivasan and J. Schumacher



Topics of the discussion meeting

Turbulence

Focus is on compressible turbulence, mesoscale Boussinesq and non-Boussinesq turbulent convection.

- Small-scale statistics and modeling of intermittency and non-Gaussianity
- Highly stratified convective motion in plane layers
- Extreme events (shock fronts, dust devils, coherent vortices and shear layers)
- Hierarchical organization of convection in nature, e.g. plume clustering and mesoscale eddies
- Lagrangian and Eulerian modeling of turbulent diffusion/dispersion and efficient models of turbulent mixing, Instantons and Lagrangian multi-particle dynamics in complex flows

Machine Learning in Turbulence

Focus is on generative machine learning of subgrid-scale parametrizations for turbulent flows, but also other methods.

- Generative AI for Lagrangian turbulence by (score-based) diffusion models, flow matching and stochastic interpolants
- Equivariant neural and recurrent networks as surrogate models for fluid flows
- Neural operators for modeling of fluid flow equations
- Reinforcement learning algorithms as subgrid-scale models
- Anomaly detection algorithms of extreme event detection

Quantum computing and quantum machine learning applications to Fluid Mechanics/Turbulence

Focus is on quantum algorithms for nonlinear fluid flow problems.

- Variational quantum algorithms, homotopy methods and Quantum Lattice Boltzmann methods to simulate nonlinear fluid equations
- Quantum reservoir computing and quantum Koopman as surrogate models for turbulence
- Quantum sampling, quantum-enhanced Markov chain Monte Carlo for Lagrangian turbulence
- Quantum-inspired turbulence simulations by tensor networks

Coupling of Turbulence simulations/experiments with ML and QC/QML algorithms in high-performance computing infrastructure

- Efficient work flows for hybrid HPC-ML and/or HPC-QC algorithms

List of invited speakers

Luca Biferale (University of Rome Tor Vergata)
Misha Chertkov (University of Arizona)
Christian Cierpka (TU Ilmenau)
Peyman Givi (University of Pittsburgh)
Christoph Gerbig (MPI Biogeochemistry Jena)
Toshiyuki Gotoh (Nagoya Institute of Technology)
Pedram Hassanzadeh (University of Chicago)
Dieter Jaksch (University of Hamburg)
Juan Pedro Mellado (University of Hamburg)
Juan José Mendoza Arenas (University of Pittsburgh)
Olivier Pauluis (New York University)
Sebastian Peitz (TU Dortmund)
Jörg Schumacher (TU Ilmenau)
Katepalli R. Sreenivasan (New York University).
Nils Thuerey (TU München)
Michael Wilczek (University of Bayreuth)
Yue Yang (Peking University)

Further Guests

Sal Rodriguez (Applied Surface Engineering)
Fluid Mechanics Group (PhDs & Postdocs, TU Ilmenau)

Travel and Accommodation

- Closest international airports in Berlin (BER), München (MUC) and Frankfurt (FRA); all are at about the same distance from Weimar
- From these airports, ICE train connections run to Erfurt Hbf, then a local train (15 min) from Erfurt to either Leipzig, Jena, or Gera is taken, exit at **Weimar Hbf**; these trains run at least each 30 minutes
- By car: Autobahn A4 passes Weimar, take **Exit 49 Weimar**
- The hotel is the **Leonardo Hotel Weimar**, Belvederer Alle 25, 99425 Weimar (picture in the middle)
- Rooms are booked for you from June 9th (arrival) to June 12th (departure) including breakfast and lunch as well as dinner on June 10th

