

# LSM-Seminar

Time: WED October 19, 2022 16:00 pm OHSA/B17

## Recent advances in the modelling of incompressible turbulent two and three-dimensional flows

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### Abstract:

This talk is split into two parts. First, I present a novel hybrid Eulerian-Lagrangian approach to simulate two-dimensional turbulent flows where the Lagrangian fluid parcels are represented by elliptical parcels. Major benefits of our model include the natural mixing based on parcel splitting and merging as well as the ability to resolve small-scale structures. This new Elliptical Parcel-In-Cell (EPIC) method is compared with a pseudo-spectral method for several standard test cases with application to atmospheric flows. Second, a pseudo-spectral method is presented to model inviscid three-dimensional Beltrami flows, i.e. steady flows where vorticity is parallel to velocity. The flow studied here is inside a horizontally doubly periodic domain vertically confined between parallel free-slip impermeable surfaces. Since the flow we consider does not satisfy the stress-free condition, a standard pseudo-spectral method with three-dimensional hyperviscosity and filtering cannot be applied. Although the flow is steady in theory, an instability due to numerical noise causes the flow to break down into anisotropic turbulence.