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An accurate and efficient Lagrangian sub-grid model for multi-particle dispersion[1] FEDERICO TOSCHI, Eindhoven University of Technology, IRENE MAZZITELLI, University of Rome Tor Vergata, ALESSANDRA S. LANOTTE, CNR - ISAC — Many natural and industrial processes involve the dispersion of particle in turbulent flows. Despite recent theoretical progresses in the understanding of particle dynamics in simple turbulent flows, complex geometries often call for numerical approaches based on eulerian Large Eddy Simulation (LES). One important issue related to the Lagrangian integration of tracers in under-resolved velocity fields is connected to the lack of spatial correlations at unresolved scales. Here we propose a computationally efficient Lagrangian model for the sub-grid velocity of tracers dispersed in statistically homogeneous and isotropic turbulent flows. The model incorporates the multi-scale nature of turbulent temporal and spatial correlations that are essential to correctly reproduce the dynamics of multi-particle dispersion. The new model is able to describe the Lagrangian temporal and spatial correlations in clouds of particles. In particular we show that pairs and tetrads dispersion compare well with results from Direct Numerical Simulations of statistically isotropic and homogeneous 3d turbulence. This model may offer an accurate and efficient way to describe multi-particle dispersion in under resolved turbulent velocity fields such as the one employed in eulerian LES.

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