Abstract Submitted
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A Molecular Dynamics Simulation of the Turbulent Couette Minimal Flow Unit[1] EDWARD SMITH, Imperial College London — What happens to turbulent motions below the Kolmogorov length scale? In order to explore this question, a 300 million molecule Molecular Dynamics (MD) simulation is presented for the minimal Couette channel in which turbulence can be sustained. The regeneration cycle and turbulent statistics show excellent agreement to continuum based computational fluid dynamics (CFD) at Re=400. As MD requires only Newtons laws and a form of inter-molecular potential, it captures a much greater range of phenomena without requiring the assumptions of Newton's law of viscosity, thermodynamic equilibrium, fluid isotropy or the limitation of grid resolution. The fundamental nature of MD means it is uniquely placed to explore the nature of turbulent transport. A number of unique insights from MD are presented, including energy budgets, subgrid turbulent energy spectra, probability density functions, Lagrangian statistics and fluid wall interactions.

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