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Simulating 3D turbulence with Smoothed Particle Hydrodynamics XIANGYU HU, STEFAN ADAMI, NIKOLAUS ADAMS, Technical University of Munich — In 2002 Monaghan showed a Lagrangian averaged SPH (Smoothed Particle Hydrodynamics) turbulence model and simulated two-dimensional turbulence. Although achieving good results, this method was shown to be computationally very inefficient (Monaghan, 2002). In this work we present results of 3D turbulence simulated with our newly developed weakly compressible SPH method with modified transport-velocity formulation (Adami, et al., 2013). This fundamental modification was first proposed by Monaghan (Monaghan, 1989). Different from XSPH, we solve a modified momentum equation including a constant background pressure field that regularizes particle motion "physically" while strongly reducing artificial numerical dissipation. Numerical results show that the dissipation rate of the 3D Taylor-Green vortex agrees well with DNS results and compared to the standard Smagorinsky model the accuracy is improved (as shown in Figure 1.). To the best knowledge of the authors, this is the first time that a weakly-compress SPH method achieves better results on turbulent flow than the standard grid-based model.

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