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A novel particle SGS model based on differential filter for LES of particle-laden turbulent flows[1] GEORGE PARK, JAVIER URZAY, PARVIZ MOIN, Center for Turbulence Research, Stanford University — When performing LES of particle-turbulence interactions, proper modelling of the effect of subgrid-scale (SGS) fluid motions on the particle dynamics is critical for accurate prediction of particle dispersion. Existing particle SGS models recover the missing SGS fluid velocities required in the particle equation of motion by assuming stochastic evolution of SGS fluctuations seen by particles, or by deconvolving the LES solution with an approximate inverse of the filter. In this study, we investigate the use of the differential filter for deconvolution-based particle SGS modelling. Deconvolution with a differential filter is potentially an attractive alternative to the existing Pade-filter based approximate deconvolution techniques. Exact deconvolution can be done trivially with differential filter, because the filter is defined in the inverse-filter form, and the method can be easily extended to unstructured grids. LES of one-way coupled particle-turbulence interaction in isotropic turbulence is performed, and model performance is analysed in terms of particle dispersion statistics. A dynamic procedure for determining the coefficient related to the filter width is under development, and the resulting formulation will be compared to constant coefficient models.

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