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Kinetic-Based Moment Methods for DNS and LES of particle-laden flows: the Anisotropic Gaussian Closure SABAT MACOLE, EM2C-Ecole Centrale Paris, AYMERIC VIÉ, Center For Turbulence Research, Stanford, ADAM LARAT, EM2C-Ecole Centrale Paris, FRANCOIS DOISNEAU, EM2C-Ecole Centrale Paris-ONERA, CHRISTOPHE CHALONS, Université de Versailles Saint-Quentin, MARC MASSOT, EM2C-Ecole Centrale Paris — The simulation of particle-laden flows is a challenging topic due to their multiscale character. Lagrangian particle tracking methods are classically used. However, for high performance computing, such approaches deteriorate with the disperse phase inhomogeneities. Moment methods bypass this issue through an Eulerian framework allowing to use the same parallelization paradigm as the gas phase. We present recent developments for DNS and LES based on a Kinetic-Based Moment Method. The moment system is closed by assuming a presumed shape for the NDF. The selected NDF is an Anisotropic Gaussian giving the following properties: 1/ hyperbolicity; 2/ realizability of the moments; 3/maximization of entropy; 4/ H-theorem. The method is evaluated on configurations of increasing complexity that exhibit its potential and drawbacks. This method extends towards LES by means of a full kinetic-based filtering technique instead of filtering the moment equations. Thus realizability conditions are easily derived, and the main properties of the DNS system are preserved. The subgrid terms are closed following the work of Zaichik et al. 2009. The resulting LES strategy is evaluated based on filtered DNS results.

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