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RECENT ADVANCES IN KINETIC-BASED MODELS FOR POLYDISPERSE MULTIPHASE FLOWS

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Abstract. Polydisperse multiphase flows arise in many industrial and environmental applications, and almost always involve a disperse phase with particles of different sizes and compositions. Moreover, the disperse-phase volume fraction covers a wide range, even in the same application. In this lecture, I will review recent advances in using kinetic-based moment methods to develop well-posed Eulerian-Eulerian models. This approach relies on formulating a kinetic equation for the disperse phase valid from close-packed to dilute conditions, coupled to a modified Navier-Stokes equation for the continuous phase. Through numerical examples, I will demonstrate that by including added mass and particle-fluid-particle stresses, this modeling approach is well posed for polydisperse flows with arbitrary material density ratios (i.e., bubbly, liquid-solid and gas-solid flows).

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