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Immersed Boundary Methods on Non-Uniform Grids for Simulation of a Fully Resolved Bed of Particles in a Near-Wall Turbulent Flow GEORGES AKIKI, S. BALACHANDAR, University of Florida — This study presents a dynamic distribution of the Lagrangian markers on a sphere when using the immersed boundary method with a non-uniform Eulerian mesh. The points are distributed in accordance with the surrounding Eulerian mesh to keep it optimized as the sphere moves in the channel. Also, a method is proposed to assign weights to the Lagrangian markers, both in the case of uniform and non-uniform distribution of the points. The newly proposed method of weight assignments uses vector spherical harmonics expansion of the weights. The error due to uneven distribution of the Lagrangian points is significantly reduced. These methods are then validated and applied in the simulation of a fully resolved bed of particles in a wall-bounded turbulent flow with periodic boundary conditions along the streamwise and spanwise directions. Results are analyzed for understanding of both effect of wall turbulence on particle motion and interaction, and the back effect of particles on the carrier-phase turbulence.

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