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Interpolation error in DNS simulations of turbulence: consequences for particle tracking MICHEL VAN HINSBERG, JAN TEN THIJE BOONKKAMP, FEDERICO TOSCHI, HERMAN CLERCX, Eindhoven University of Technology, The Netherlands — An important aspect in numerical simulations of particle-laden turbulent flows is the interpolation of the flow field. Interpolations are needed in many applications, for example, simulations of turbulent aerosol transport, transport of bed load sediments and marine species. For the interpolation different approaches are used. Where some studies use low-order linear interpolation, others use high-order spline methods. This study focuses on estimating the interpolation error and compares it with the discretisation error of the flow field. In this way one can balance the errors in order to achieve an optimal result. Algorithms have been developed for the approximation of the interpolation error. As a spin-off of the theoretical analysis a practical method is proposed which enables direct estimation of the interpolation error from the energy spectrum of the flow. Furthermore it is shown how this energy spectrum is affected by the interpolation. Our results suggest that a coherent choice of the interpolation method and the value of $k_{max}\eta$ should be made in order to balance the errors. Our approach may provide a quantitative indicator for this purpose.

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