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**High-resolution direct numerical simulations (DNS) of turbulent collision of inertial particles**[1] BOGDAN ROSA, HOSSEIN PARISHANI, LIAN-PING WANG, U. Delaware, WOJCIECH GRABOWSKI, NCAR — In this talk we discuss an MPI implementation of turbulent collision and high-resolution DNS results using this MPI code. DNS is limited to relatively small flow Reynolds number or equivalently a small physical domain size at a given flow dissipation rate in a turbulent cloud. Here we are aimed at systematically extending the computational domain size by increasing the grid resolution. The MPI implementation requires parallelization of fluid velocity interpolation at the particle position, Lagrangian particle tracking, and collision detection in addition to the flow parallelization. Domain decomposition has been previously utilized for efficient MPI implementation of FFT in the pseudo-spectral simulation of fluid turbulence. Such a strategy is not naturally in line with the Lagrangian particle dynamics. Two general MPI issues for particle dynamics must be efficiently solved: the gathering of information in a finite region surrounding a particle and travelling of a particle through the boundaries of a subdomain. Our MPI results are carefully validated against a previous OpenMP implementation. Finally, turbulent collision statistics of inertial particles at grid resolution up to $512^3$ with $O(10^6)$ particles will be presented.

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