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Experimental measurements of particle transport modification in dense particle-laden turbulent flows[1] ROUMAISSA HASSAINI, University of Minnesota, FILIPPO COLETTI, ETH Zurich, COLETTI'S TEAM — Inertial particles at high volume fractions can modify the turbulence which in return affects the particle transport. For such flows the fluid and the particles behavior become challenging to measure and understand. We tackle this problem by studying experimentally particle-turbulence interaction in a homogeneous turbulence chamber with negligible mean flow. Time resolved Particle Image Velocimetry (PIV) and Particle Tracking Velocimetry (PTV) measurements are carried out simultaneously to capture the fluid velocity and the particles position from the Kolmogorov to the integral scale. Two sets of parameters were used to vary the Stokes number by one order of magnitude while keeping the gravitational settling similar. The particle concentration was increased up to 5e5. We focus on the solid phase. A drastic change on the settling velocity has been observed due to preferential sweeping with a stronger modification for heavier clustered particles. Clustering has been reported to increase with the volume fraction associated with a different cluster size evolution for the different Stokes numbers. Independently of inertia an increase of the dissipation rate due to the drag effect can be linked to the enhancement of the turbulent kinetic energy.

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