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A Voronoi Analysis of Preferential Concentration of Heavy Particles in Active Grid Generated Turbulence MARTIN OBLIGADO, ALAIN CARTELLIER, MICKAEL BOURGOIN, Laboratoire des Ecoulements Geophysiques et Industriels, CNRS/UJF/G-INP UMR 5519, BP53, 38041, Grenoble, France — Particle laden flows are of relevant interest in many industrial and natural systems. When the carrier flow is turbulent, a striking feature is the phenomenon called preferential concentration: particles denser than the fluid have the tendency to inhomogeneously distribute in space, forming clusters and depleted regions. We present a study on the preferential concentration and clustering in homogeneous and isotropic turbulence based on Voronoi diagrams. We have formerly quantified preferential concentration as a function of the Stokes number (defined as the ratio of the particle viscous relaxation time to dissipation timescale of the flow) in moderate turbulence conditions, up to Reynolds number based on Taylor microscale of the order of $R_\lambda \sim 120$. Using an active grid recently implemented in our windtunnel, we investigate in the present study the effect of Reynolds number on particles clustering in the range $R_\lambda \sim 200 - 400$. Clustering level is found to be significantly higher than previous measurements at lower Reynolds number. We also present an analysis of the geometry of clusters and voids and investigate the possible connection with stick-sweep mechanisms using direct numerical simulation data of homogeneous isotropic turbulence.

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