Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Resuspension of inertial particles in a swirling flow[1] BENJAMIN LAPLACE, JEREMY VESSAIRE, MICKAEL BOURGOIN, ROMAIN VOLK, Laboratoire de Physique, ENS de Lyon, Univ Lyon, CNRS, 69364 Lyon CEDEX 07, France. — We experimentally investigate the resuspension of particles much larger than the dissipative scale, moderately dense and moving in a turbulent Von Krmn flow of water generated by one disk with straight blades placed at the top of a small tank of square section 15 cm^2 and 22 cm high. A mean structure composed of an overall rotation and a vertical pumping is thus created. Lagrangian measurements have been performed, allowing for the reconstruction of the velocity and the acceleration fields of particles of different diameters and densities, as well as their positions distributions profiles. Surprisingly, in most cases, the particles are vertically distributed according a density profile close to an exponential-like shape as in the well-known experiment of brownian particles placed in a gravity field. This suggests an intriguing balance between gravity and the mean and fluctuating part of the flow. Nevertheless, two types of behaviors emerge depending on the particle size. Indeed, the largest particles tend to be trap close to the disk when the rotation frequency increases, meaning that their density profile is now reverse. An effect probably due to the interaction of the disk and the particles that produces an upward force force onto the particles.

[1]ANR-16-CE30-0028 and IDEXLYON (ANR-16-IDEX-0005)

Benjamin Laplace
Laboratoire de Physique, ENS de Lyon, Univ Lyon, CNRS, 69364 Lyon CEDEX 07, France.

Date submitted: 01 Aug 2019 Electronic form version 1.4