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A compressible Lagrangian flow in an incompressible turbulent water jet THOMAS BASSET, Ecole Normale Superieure de Lyon, BIANCA VIGGIANO, Portland State University, THOMAS BAROIS, Universite de Bordeaux, MATHIEU GIBERT, NICOLAS MORDANT, Universite Grenoble Alpes, RAUL BAYOAN CAL, Portland State University, ROMAIN VOLK, MICKAEL BOURGOIN, Ecole Normale Superieure de Lyon — A large-scale Lagrangian study based on Particle Tracking Velocimetry has been completed on an incompressible turbulent round water jet spreading freely into water with a Taylor-based Reynolds number $Re_\lambda \simeq 260$. A particular tracer seeding only in the core of the jet is used. Based on tracer velocities, the mean velocity field is computed and compared with the self-similar velocity field known through Eulerian measurements. This measured field, still self-similar, is the same for the axial velocity but presents important discrepancies for the radial velocity. Actually, because we are using a particular core seeding, the entrained part of the flow, which is mainly radial, is not completely tagged. Therefore discrepancies for the radial velocity are observed between the jet flow and the Lagrangian tracer flow. By taking into account this particular inhomogeneous seeding, a new divergence-free model is proposed and successfully gives the tracer velocity field. Finally a diffusive model is also proposed to obtain quantitative relations between compressibility, entrainment and turbulent fluctuations.

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