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Time-resolved tomographic PIV measurements in swirling jets ANDREA IANIRO, Dipartimento di Ingegneria Aerospaziale (DIAS), University of Naples Federico II, Naples 80125, Italy, DANIELE VIOLATO, Aerospace Engineering Department, Delft University of Technology, Delft, The Netherlands, GENNARO CARDONE, Dipartimento di Ingegneria Aerospaziale (DIAS), University of Naples Federico II, Naples 80125, Italy, FULVIO SCARANO, Aerospace Engineering Department, Delft University of Technology, Delft, The Netherlands — The vortex dynamics of swirling jets at a Reynolds number of 1,000 is investigated by time-resolved tomographic Particle Image Velocimetry. Experiments are conducted at several values of the swirl number S from 0 to 0.8, therefore spanning the transition between weak and strong swirl regimes. Time resolved measurements are performed with the intention to shed more insight into the relation between shear layer instability at the outer side of the jet and the unsteady behaviour of the core region characterized by tumbling/precession motion. The average flow topology is addressed first in order to highlight the topological differences between weak and strong swirl flows. The three-dimensional topology of vortex structures is then visualized with Q criterion. Finally, the measured velocity and vorticity field is employed to estimate the terms of the vorticity equation, which enable to discuss on a more quantitative basis the effect on vortex dynamics and on the overall phenomenology of swirling jets.

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