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Effects of entry shapes on evolution and transition mechanisms of internal swirling flows XINGJIAN WANG, Florida Institute of Technology, YANXING WANG, New Mexico State University — Previous works have investigated the characteristics of the central recirculation zone and intrinsic instability waves of a swirling flow injected through a tangential slit entry. In practice, orifice entry is frequently used to generate the swirling motion in a cylindrical chamber, but is much less documented. In this study, we numerically explore flow evolution and transition mechanisms of internal swirling flow with orifice entry using Galerkin finite element method. A grid convergence study is conducted to ensure the appropriate grid resolution at the orifice entry and in regions with complex flow structures. The effects of Reynolds number and swirl level controlled by the orifice angle are examined in detail. The numerical results of tangential slit and orifice entries will be compared systematically in terms of flow topologies and underlying instability mechanisms. A unified theory connecting different flow states of swirling flow will be established.

Xingjian Wang
Florida Institute of Technology

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