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Large scale Direct Numerical Simulation of premixed turbulent jet flames at high Reynolds number ANTONIO ATTILI, RWTH Aachen University, STEFANO LUCA, King Abdullah Univ of Sci Tech (KAUST), ERMANNO LO SCHIAVO, Sapienza University of Rome, FABRIZIO BISETTI, University of Texas at Austin, FRANCESCO CRETA, Sapienza University of Rome — A set of direct numerical simulations of turbulent premixed jet flames at different Reynolds and Karlovitz numbers is presented. The simulations feature finite rate chemistry with 16 species and 73 reactions and up to 22 Billion grid points. The jet consists of a methane/air mixture with equivalence ratio $\phi = 0.7$ and temperature varying between 500 and 800 K. The temperature and species concentrations in the coflow correspond to the equilibrium state of the burnt mixture. All the simulations are performed at 4 atm. The flame length, normalized by the jet width, decreases significantly as the Reynolds number increases. This is consistent with an increase of the turbulent flame speed due to the increased integral scale of turbulence. This behavior is typical of flames in the thin-reaction zone regime, which are affected by turbulent transport in the preheat layer. Fractal dimension and topology of the flame surface, statistics of temperature gradients, and flame structure are investigated and the dependence of these quantities on the Reynolds number is assessed.

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