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Turbulence-flame interaction in high Reynolds number premixed combustion ANTONIO ATTILI, RWTH Aachen University, Germany, STEFANO LUCA, King Abdullah University of Science and Technology, Saudi Arabia, DOMINIK DENKER, RWTH Aachen University, Germany, FABRIZIO BISETTI, The University of Texas at Austin, USA, HEINZ PITSCH, RWTH Aachen University, Germany — A set of four Direct Numerical Simulations of premixed flames is performed to investigate the effects of the Reynolds number on the interactions between the dynamics of the flame and turbulence. The Reynolds number based of the jet velocity and width ranges from 2800 to 22400, while the Karlovitz number is approximately 40 and is maintained constant for all the simulations. A 16 species skeletal mechanism for methane-air flames is employed and grids with up to 22 Billion grid points are used. Different aspects are investigated, including the flame structure and flame speed, the local statistics of scalar gradients, and the scaling of the fundamental turbulence properties with the Reynolds number. It is found that the structure of the flame, e.g., statistics of heat release rate conditioned on temperature, is very close to that observed in a one-dimensional flamelet and does not vary significantly with the Reynolds number. The analysis of the Reynolds number scaling of the Kolmogorov and integral scales reveals that the influence of combustion and heat release on the smallest scales of turbulence decreases as the Reynolds number increase.

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