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PARALLEL UNSTRUCTURED-GRID FINITE-VOLUME METHOD FOR TURBULENT NONPREMIXED FLAMES USING FLAMELET MODEL

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A parallel unstructured-grid finite-volume method has been developed to accurately and effectively handle the physically and geometrically complex turbulent reacting flows. The parallel algorithm has been implemented to improve the computational efficiency of the unstructured-grid flow solver. The strong density-pressure-velocity coupling at all speeds is handled by the multiple pressure-correction method. In dealing the turbulent nonpremixed flame fields, the turbulence-chemistry interaction is represented by the laminar flamelet model which could be the optimum choice between accuracy and economy. Numerical results indicate that the present approach reasonably well predicts the overall features of the three-dimensional turbulent nonpremixed flame. However there exists the noticeable deviations between prediction and measurement. Based on numerical results of turbulent reacting flows, the detailed discussions have been made for the prediction capabilities, and limitations or defects of the present numerical and physical models.