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Assessment of two progress variable implementation procedures for supersonic combustion WENHAI LI, TTC Technologies, Inc., FOLUSO LADEINDE, Stony Brook University — In the traditional non-premixed flamelet model, the reactive scalars are expressed in terms of the mixture fraction Z and its scalar dissipation rate χ . However, the parameter set (Z, χ) cannot behave as a unique identifier to parameterize all flame thermochemical states on the S-shaped curve. Therefore, the progress variable C has been introduced to replace χ so that unique flamelet solutions can be determined by the values of (Z, C) . However, χ can be identified as one of the most important parameters in non-premixed combustion since its mean value represents the rate of molecular scalar mixing and its fluctuation can directly influence the variance of Z . Therefore, χ should be kept as a control parameter in the flamelet table in order to correctly account for the compressive strain effects in high speed combustion. In this study, an interpolation-based progress variable implementation procedure is introduced so that (Z, χ) can still be used to obtain multiple flamelet solutions on each branch of the S-curve. This way, unique flamelet solutions can be obtained by an interpolation procedure based on C .

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