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ASSESSMENT OF ENGINEERING GAS RADIATIVE PROPERTY MODELS IN HIGH PRESSURE TURBULENT JET DIFFUSION FLAMES

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ABSTRACT. This article is a part of a more general study which aims to determine the most relevant engineering gas radiative property models to be applied in the simulations of combustion problems. Two versions of the full-spectrum CK (FSCK) model, the Rank-Correlated full-spectrum *k*-distribution/ Spectral-Line-Weighted-sum-of-gray-gases (RC FSK/SLW) and a new version of the Weighted-Sum-of-Grey-Gases (WSGG) model are compared with the Narrow-Band CK (NBCK) model in four turbulent axisymmetric jet diffusion flames fueled either by hydrogen or methane at atmospheric and higher pressures. As a first step, these comparisons are performed in decoupled radiative heat transfer calculations with the thermal fields being prescribed. The databases and coefficients associated to these different models are determined from a unique Line-By-Line database in order to allow a relevant comparison. Model results suggest that the SLW/FSK methods coupled to the Cai's scheme (JQSRT 141 (2014) 65-92) or the Rank-Correlated spectrum (JQSRT 214 (2018) 120-32) and databases generated from accurate LBL database are the most mature gas radiative property models to be implemented in CFD code dealing with combustion problems involving complex geometry and gas-soot mixtures.