COMPARISON OF RADIATION MODELS ON TURBULENT NON-PREMIXED FLAME DLR-A

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ABSTRACT. In this work, numerical simulation of a Turbulent Non-premixed Flame (TNF) is carried out with and without consideration of radiation effects. An axi-symmetric TNF surrounded by air-coflow known as flame DLR-A [1] is considered. The models employed for the turbulence and combustion are standard $k - \varepsilon$ and the Eddy Dissipation Concept (EDC). The temperature along the centreline of the flame obtained from the simulation (without radiation) is compared to the experimental data [1]. This flame produces combustion gases, such as H_2O, CO_2, CO, CH, OH and others. The main participating gases for radiative heat transfer are CO_2 and H_2O. The radiative heat flux at the domain boundary will be calculated with the Spherical Harmonic Method (P$_1$) [2] and the Imaginary Plane Method (IPM). For the non-gray gas mixture, the weighted-sum-of-gray-gases (WSGG) model [3] and the k-distribution model [4] employed to calculate the properties of the gas. The figure 1 shows the variation of temperature along the central axis and found to be in good agreement with the experimental result.
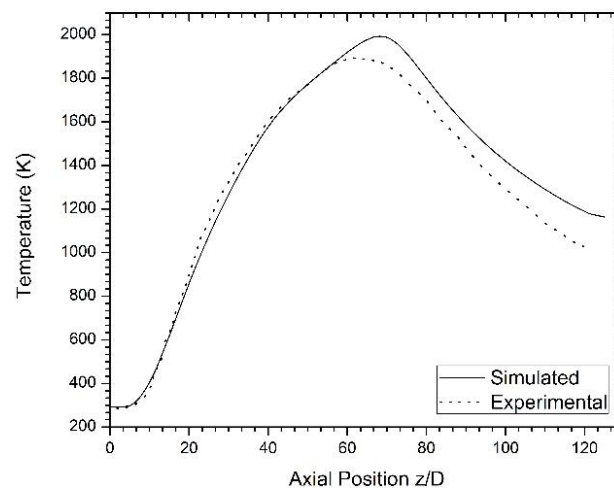
Figure 1. Temperature along the central axis

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