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Comparison of full multicomponent transport and mixture-averaged approximation in a forced, time-dependent, methane-air coflow diffusion flame

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The CFD solver `laminarSMOKE++` [1], designed for laminar reacting flows with detailed kinetic mechanisms, is used to compare two different approaches for modelling multicomponent diffusion including Soret effects in a forced, time-dependent laminar lifted CH_4/N_2 flame in air. On the one hand, the mixture-averaged approximation is used, and on the other hand full multicomponent transport derived from the Kinetic Theory of Gases is considered using the efficient 1+M formulation [2, 3] recently implemented in `laminarSMOKE++` [4]. The time-dependent oscillating flame considered, corresponding to the experiment reported in [5], allows to compare the lift-off heights and time responses in the different calculations depending on the diffusion flux treatment.

References

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