

Verification type	Analytical Solutions
Database reference	ANA-3
Topic / Application	Discretisation scale Length Scale
Physics	Laminar Premixed Hydrogen-Air Flames
Summary	The Paper identifies the spatial discretization required to capture all detailed continuum physics in the reaction zone for one-dimensional steady laminar premixed hydrogen-air flames.
Description	<p>The required spatial discretization to capture all detailed continuum physics in the reaction zone for one-dimensional steady laminar premixed hydrogen-air flames. The method reveals that the finest length scale is at the micron-level, which is an order of magnitude less than the scales employed in nearly all multi-dimensional and/or unsteady laminar premixed flame simulations in the literature.</p> <p>A verification calculation is performed to reproduce the temperature and species profiles of a stoichiometric, atmospheric pressure hydrogen-air flame found in Smooke et al.</p> <p>Smooke, M. D., Miller, J. A., and Kee, R. J., "Determination of Adiabatic Flame Speeds by Boundary Value Methods," Combustion Science and Technology, Vol. 34, Nos. 1-6, 1983, pp. 79-90</p>
Case Title	Verified Computations of Laminar Premixed Flames
Authors	Ashraf N. Al-Khateeb* , Joseph M. Powers† , and Samuel Paoucci
Year	2007
Online reference	45th AIAA Aerospace Science Meeting and Exhibit, 8-11 January 2007, Reno, Nevada

<p>Case image</p>	<p>species profiles vs. distance in a stoichiometric hydrogen-air flame for numerical verification, equivalent to predictions of Smooke et al., 4 To = 298 K, po = 1 atm</p>
<p>Governing equations</p>	
<p>Results</p>	