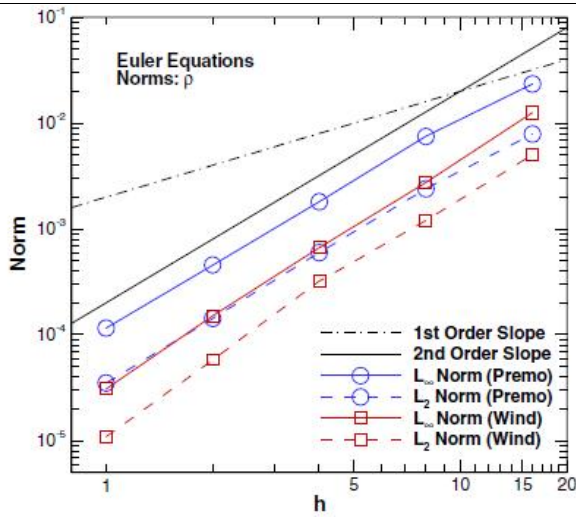


Support to Safety Analysis of Hydrogen and Fuel Cell Technologies

<b>Verification type</b>	Methodology
<b>Database reference</b>	MET-7
<b>Topic / Application</b>	Code verification Solution verification Manufactured Solution
<b>Physics</b>	General
<b>Summary</b>	This paper provides a comprehensive review of the processes that comprise verification of CFD codes.
<b>Description</b>	The method of manufactured solutions combined with order of accuracy verification is recommended for code verification, and this procedure is described in detail.  Solution verification is used to estimate the numerical errors that occur in every computational simulation. Both round-off and iterative convergence errors are discussed, and a posteriori methods for estimating the discretization error are examined
<b>Case Title</b>	Review of code and solution verification procedures for computational simulation
<b>Authors</b>	Christopher J. Roy
<b>Year</b>	2004
<b>Online reference</b>	Journal of Computational Physics 205 (2005) 131–156
<b>Case image</b>	 <p>The figure is a log-log plot titled 'Euler Equations Norms: ρ'. The x-axis is labeled 'h' and ranges from 1 to 20. The y-axis is labeled 'Norm' and ranges from 10<sup>-5</sup> to 10<sup>-1</sup>. The plot shows data points for L<sub>1</sub> Norm (Premo) (blue circles), L<sub>2</sub> Norm (Premo) (blue squares), L<sub>1</sub> Norm (Wind) (red circles), and L<sub>2</sub> Norm (Wind) (red squares). Two dashed lines represent the 1st Order Slope and 2nd Order Slope. The L<sub>1</sub> norms are consistently higher than the L<sub>2</sub> norms, and the Wind method shows slightly higher error than the Premo method for the same h.</p> <p>Global norms of the discretization error in mass density, from the verification via MMS</p>