Verification type	Manufactured Solutions
Database reference	MAN-2
Topic / Application	Order of convergence
Physics	Discontinuities Shocks Turbulent flow
Summary	This review study explains the state of the art for verification, focussing on MMS techniques. Recent advances in MMS applied to flows with discontinuities are explained.
Description	This is a keynote lecture where the author, a recognised expert in code verification, covers a number of topics on the state of the art. The author highlights problems using MMS for turbulent flows, given the use of source terms and locally switched max/min limiters (these preventing generation of a reference solution). In particular he focusses on recent work exploring use of MMS applied to multicomponent flows and to flows with discontinuities. These would have relevance to hydrogen safety applications for deflagration and detonation. J. W. Banks, T. Aslam, and W. J. Rider, "On sub-linear convergence for linearly degenerate waves in capturing schemes," Journal of Computational Physics, Vol. 227, 2008, pp. 6985-7002. B. Grier, E. Alyanak, M. White, J. Camberos, and R. Figliola, "Numerical integration techniques for discontinuous manufactured solutions," Journal of Computational Physics, Vol. 278, 2014, pp. 193-203. B. Grier, R. Figliola, E. Alyanak, J. Camberos, "Discontinuous Solutions Using the Method of Manufactured Solutions on Finite Volume Solvers," AIAA Journal, pp. 1-10, DOI: 10.2514/1.J053725 The document contains references to a number of other useful references for MMV
Case Title	Code Verification: Past, Present, and Future
Authors	Chris Roy
Year	2015

Online reference	Keynote Lecture, ASME V&V Symposium