1st International High-Order CFD Workshop
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Summary of Test Case C1.5 Radial expansion wave (2D/3D)

Contributing groups:

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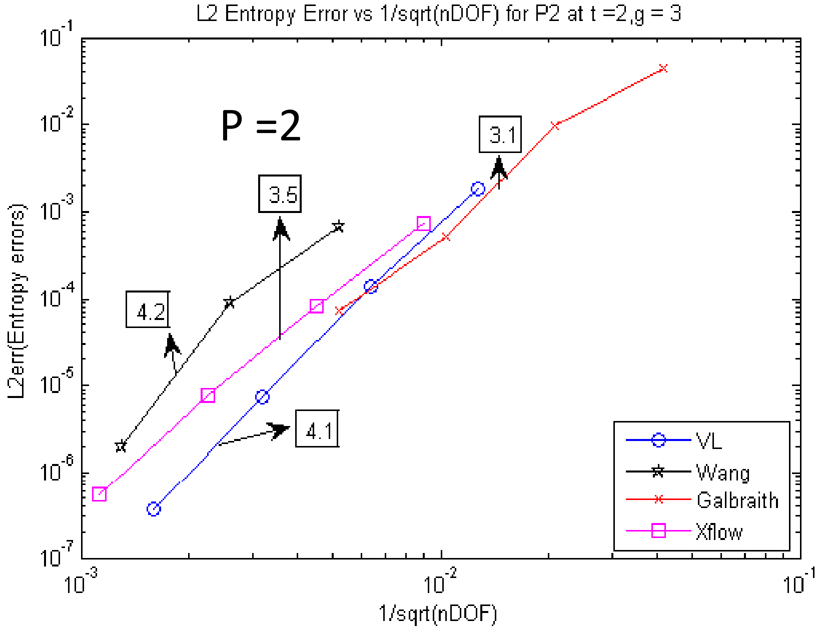
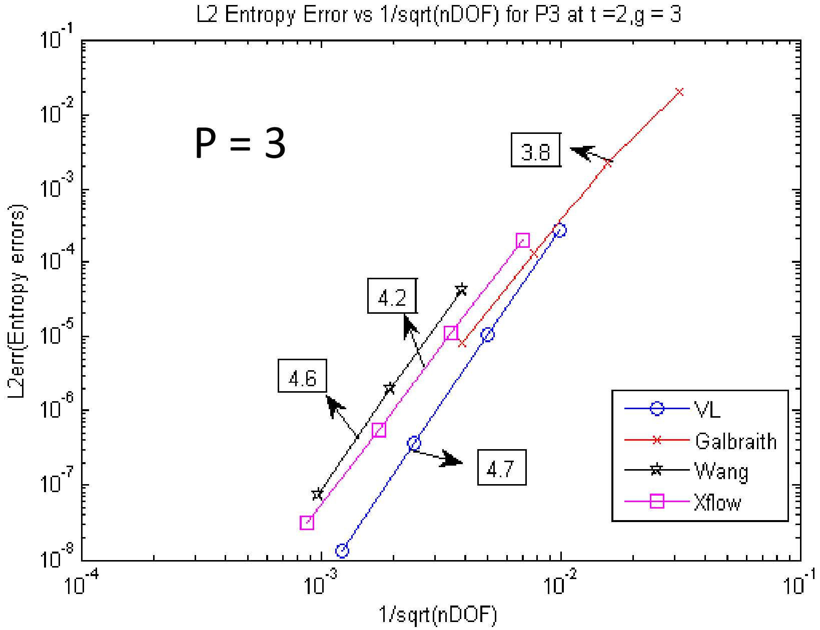
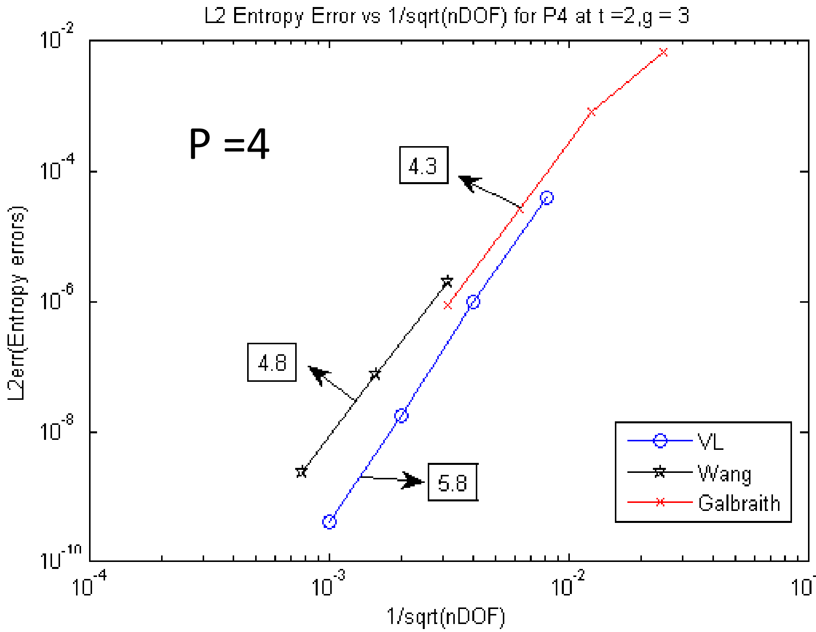
2D: Error vs. DOF

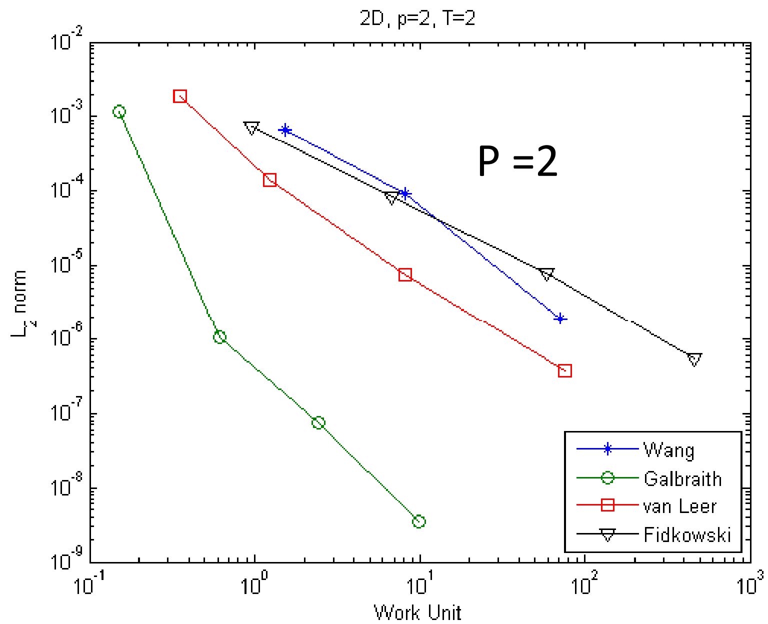


- Expected order: 2P+1 on rectangles, P+1 on triangles.
- Order short of 2P +1 on rectangles.
- Cause: unexpected lack of solution smoothness at larger times.
- All results for t=2, γ=3, for greatest smoothness.
- Van Leer has lowest error.

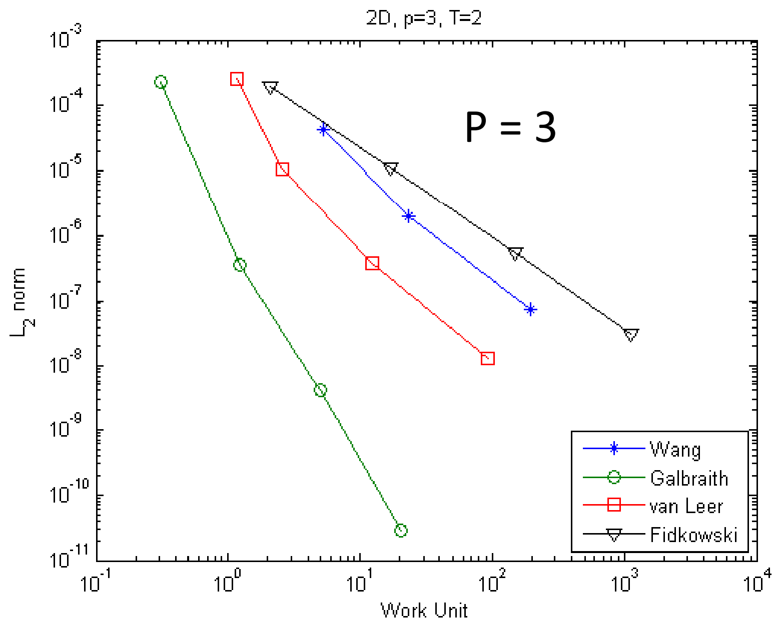


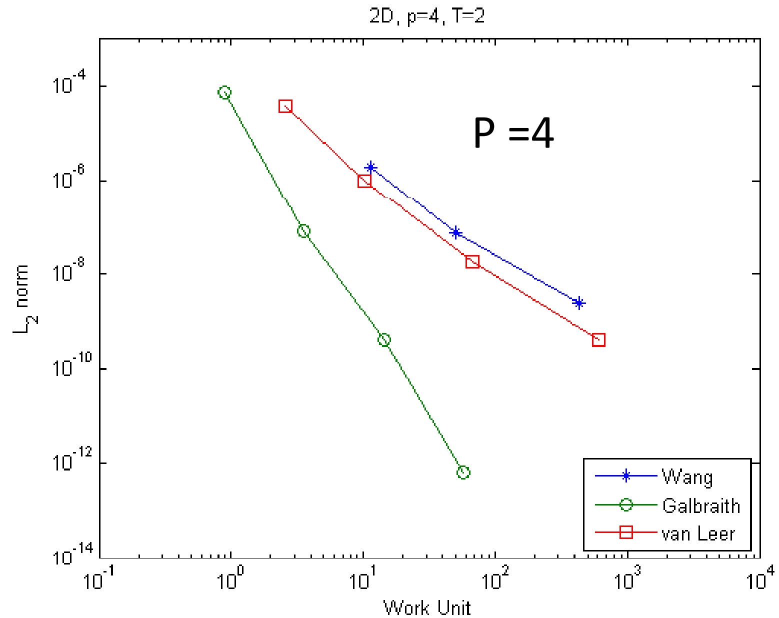


2D: Error vs. Work



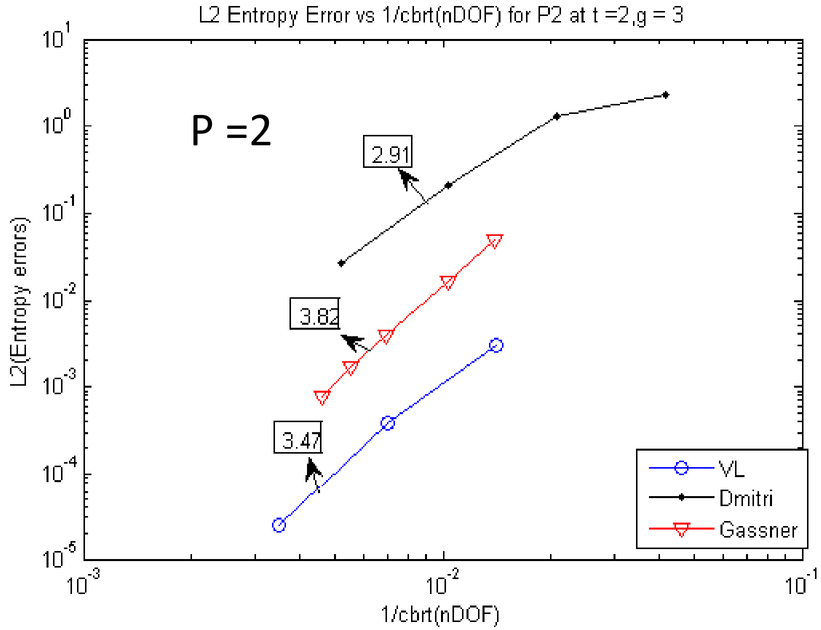
- Galbraith most efficient owing to use of analytical integration rather than Gaussian quadrature.
- Van Leer second best.

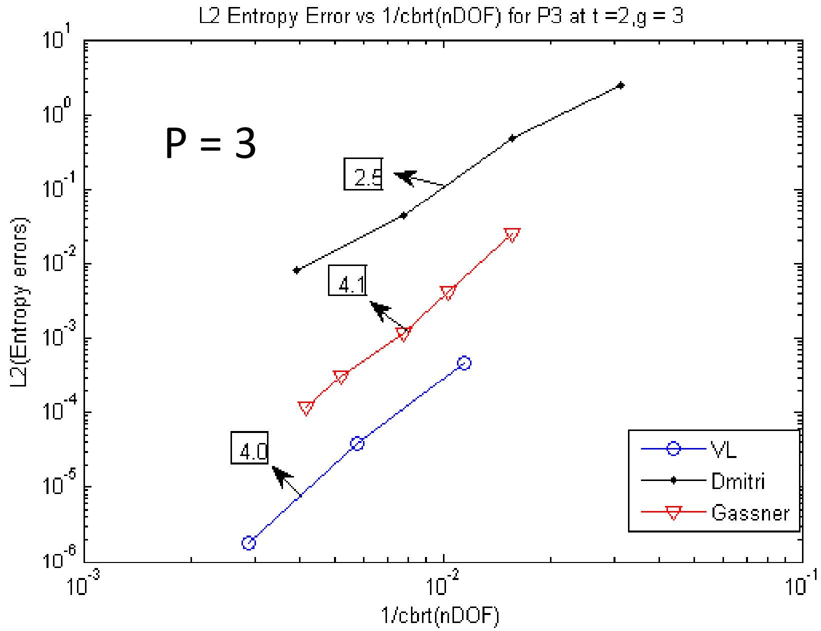


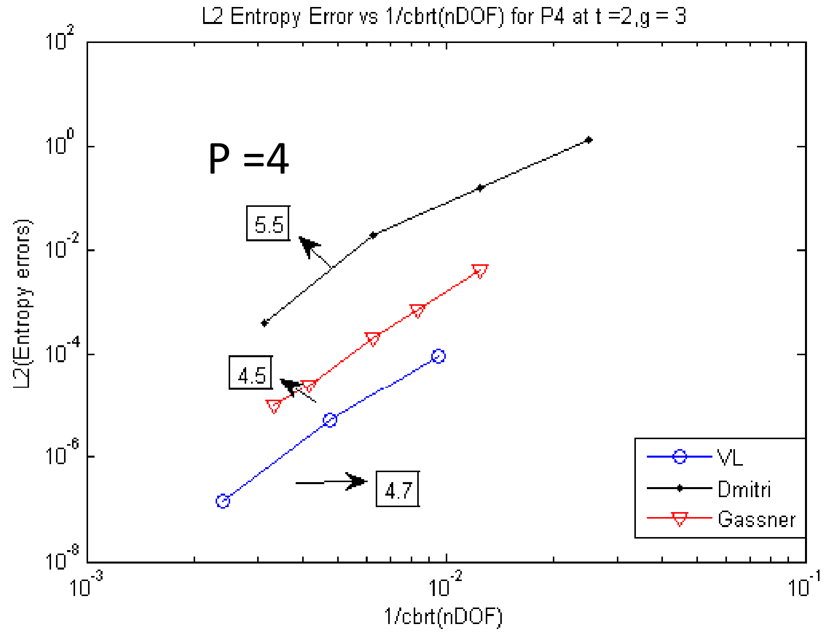


3D: Error vs. DOF

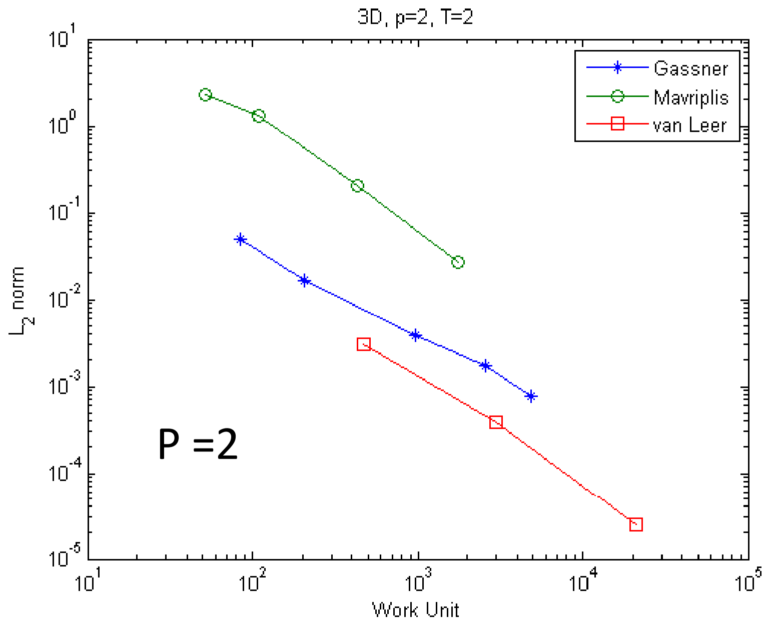
- Only regular hexahedral elements used.
- Results even further below expected order due to lack of solution smoothness.
- All results for t=2, γ=3.
- Van Leer has lowest error.



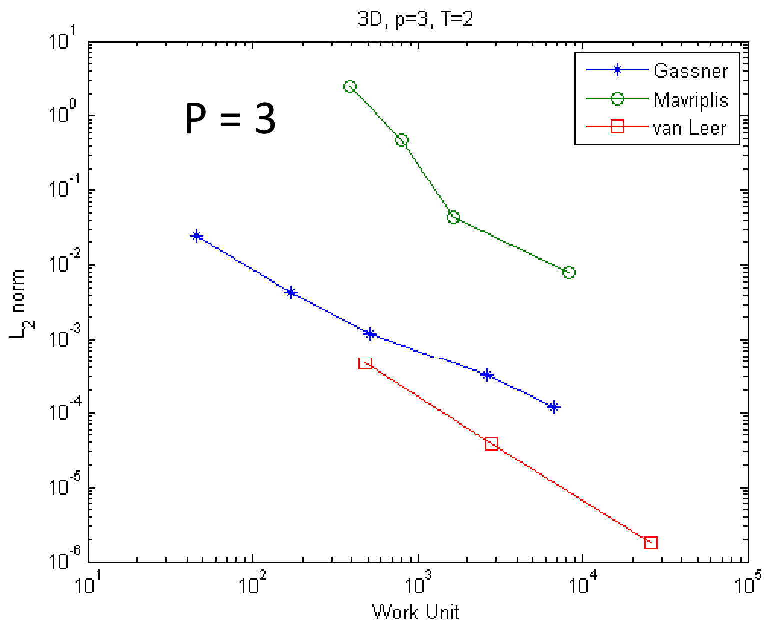


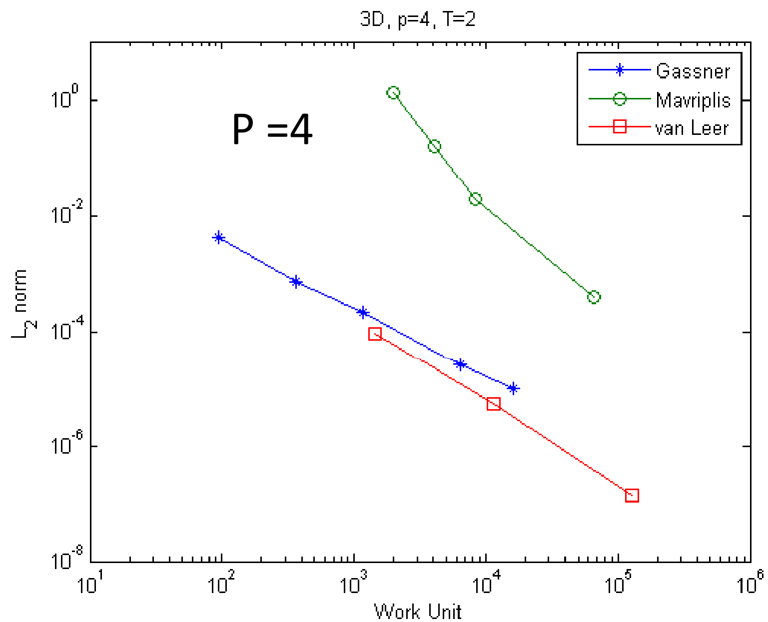


3D: Error vs. Work



- Only regular hexahedral elements used
- Van Leer most efficient.





C1.5 Radial expansion wave

Conclusions

- Before order of accuracy 2P+1 can be reached with any DG method, the problem of the non-smoothness of the solution must be fixed, possibly by adding a manufactured source term.

- The consistently low errors of Van Leer et al. may be owing to high-order Gaussian quadrature used in anticipation of order of accuracy 2P+1.