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Quantifying numerical dissipation rate for discontinuous Galerkin
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MUNZ, Uni Stuttgart — The numerical dissipation quite often can be large for typ-
ical Finite Volume and Finite Difference schemes. In LES applications it inhibits
the predictive capabilities if it is of the same order of magnitude or larger than the
physical subgrid-scale dissipation. Because of that there is an increasing interest in
CFD in using the discontinuous Galerkin (DG) methods because they are of high
order and have the ability to handle complex domains. We present comparison be-
tween numerical dissipation rates computed for the DG method and for standard FV
methods. The numerical dissipation is estimated following Schranner et al. (2015),
allowing to compute the numerical dissipation rate for arbitrary sub-domains in a
self-consistent way, using only information provided by the code in question. The
specific flow considered is a 3D Taylor-Green vortex flow which is simulated with
64^3 degrees of freedom and for different divisions of the computational domain into
elements with polynomial orders inside elements varying from 3 to 31. We find that
for low polynomial orders the numerical dissipation of the DG method is comparable
to what is observed for the FV codes at the same resolution but it decreases by an
order of magnitude for the polynomials of the highest order used.

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