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Quantifying numerical dissipation rate for discontinuous Galerkin methods JULIAN DOMARADZKI, GIACOMO CASTIGLIONI, USC, FELIX SCHRANNER, TU Munich, NICO KRAIS, ANDREA BECK, CLAUS-DIETER MUNZ, Uni Stuttgart — The numerical dissipation quite often can be large for typical 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 between 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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