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Scaling of the two-point velocity difference along scalar gradient trajectories MARKUS GAMPERT, PHILIP SCHAEFER, JENS HENRIK GOEBBERT, NORBERT PETERS, Institute for Combustion Technology, RWTH Aachen — To analyze the geometrical properties of scalar turbulent fields, the concept of dissipation elements has been proposed by Peters and Wang (J. Fluid Mech. 2006, 2008). Starting from every grid point, trajectories can be traced in directions of ascending and descending gradient until a local extreme point is reached. Based on these trajectories, a dissipation element is defined as the region containing all grid points, whose trajectories share the same pair of extreme points. To parameterize dissipation elements, the linear length between and the scalar difference at the extreme points have been chosen. While the conditional scalar difference follows Kolmogorov scaling, Wang (Phys. Rev. E, 2009) showed that the velocity difference between maximum and minimum follows a linear scaling proportional to τ/λ, where τ is the integral time scale and λ the Taylor microscale. In this context, the intention of the present paper is the comparison and analysis of the scaling of the conditional velocity difference in the viscous and the inertial range. Therefore, Direct Numerical Simulations (DNS) of different turbulent flows at various Reynolds numbers $R_\lambda = 70 - 300$ are studied and discussed. It is concluded that the scaling is valid in all the above mentioned flows and thus posses a universal character.

Markus Gampert
Institute for Combustion Technology, RWTH Aachen

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