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Analysis of Cliff-Ramp Structures in Homogeneous Scalar Turbulence by the Method of Line Segments MICHAEL GAUDING, TU Bergakademie Freiberg, JENS HENRIK GOEBBERT, Juelich Aachen Research Alliance, NORBERT PETERS, RWTH Aachen University, CHRISTIAN HASSE, TU Bergakademie Freiberg — The local structure of a turbulent scalar field in homogeneous isotropic turbulence is analyzed by direct numerical simulations (DNS). A novel signal decomposition approach is introduced where the signal of the scalar along a straight line is partitioned into segments based on the local extremal points of the scalar field. These segments are then parameterized by the distance between adjacent extremal points and a segment-based gradient. Joint statistics of the length and the segment-based gradient provide novel understanding about the local structure of the turbulent field and particularly about cliff-ramp-like structures. Ramp-like structures are unveiled by the asymmetry of joint distribution functions. Cliff-like structures are further analyzed by conditional statistics and it is shown from DNS that the width of cliffs scales with the Kolmogorov length scale.

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