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Non-Gaussian statistics and spatially-organized extreme events on experimental fracture surfaces LAURENT PONSON, CNRS, INSTITUT JEAN LE ROND D'ALEMBERT TEAM — The measurement of an abnormally high roughness exponent $\zeta \simeq 0.80$ on fracture surfaces of a large range of materials has been a long standing open question. Here, we revisit the roughness of cracks in metallic alloys and mortar where this value were reported, and show that this behavior is intimately connected with a non-Guaussian statistics of the height fluctuations of the fracture surfaces. The fat tails observed on the roughness distribution are shown to result from spatially organized domains where the local slope is abnormally large. This network of extreme events is characterized by long-range spatial correlations and power law statistics, and their scale of observations suggest that they are signature of microcracking in the material. Our findings support that damage is the central mechanism at the origin of the universal scaling behavior with $\zeta \simeq 0.80$ and open new perspectives in the quantitative investigation of microscopic failure processes from the analysis of fracture surfaces.

Laurent Ponson
CNRS

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