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Particle shape and size data from natural granular wear material support non self-similar cataclasis in carbonate fault rocks

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Cataclastic rocks exert a primary control on the frictional strength, stability, seismic velocity, and permeability properties of fault zones. A fundamental yet still unresolved puzzle provided by cataclasis is whether particle size reduction can be regarded as a dominantly self-similar process or not. Available field, laboratory and numerical modelling results on the evolution of cataclastic rocks are still controversial. Furthermore, recent data interpretation questions the fractal behaviour of particle size distributions in fault cores and enhance the dominant role of earthquake-induced, dynamic rock pulverization to determine cataclastic fabrics. Here we report data on particle shape and size from natural cataclastic rocks in poorly layered carbonates in the Apulian foreland of the Southern Apennines of Italy. Particle shape analyses show that particle angularity decreases with increasing size and, for a given size class, it decreases with increasing fractal dimension of the particle size distribution. These results offer robust support to the temporally and spatially variable nature of rock comminution i.e. non self-similar cataclasis.