Fractal rock slope dynamics anticipating a collapse

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Time series of dilatometric measurements of relative displacements on rock cracks on stable and unstable sandstone slopes were analysed. The inherent dynamics of rock slopes lack any significant nonlinearity. However, the residuals obtained by removing meteorological influences are fat-tailed non-Gaussian fluctuations, with short-range correlations in the case of stable slopes. The fluctuations of unstable slopes exhibit self-affine dynamics of fractional Brownian motions with power-law long-range correlations and are characterized by asymptotic power-law probability distribution with decay coefficient outside the range of stable Levy distributions.

Supported by the Czech Republic "Information Society" project No. T110190504.