



## Transition on the relationship between fractal dimension and Hurst exponent in the long-range connective sandpile models

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We calculated the Hurst exponent  $H$  and the power-law scaling exponent  $B$  for data of avalanche sizes in a new modification of sandpile models, i.e. the long-range connective sandpile (LRCS) models. The LRCS model is introduced by considering the random distant connection between two separated (instead of neighboring) cells. We explore the relationships between those two exponents  $H$  and  $B$ , and find the strong dependence upon the system size for such relationships. As the system size  $L$  of sandpile model decreases, the LRCS model can demonstrate a transition from the negative to positive correlations between the  $H$ - and  $B$ -values. While the negative and null correlations are associated with the fractional Gaussian noise and generalized Cauchy processes, respectively, the regime with the positive correlation between the Hurst and power-law scaling exponents may suggest an unknown, interesting class of the stationary Gaussian processes.