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Hurst phenomenon and wildfires time series

A. Mangiavillano, Ph. Ellerkamp
University of Avignon, France. Départment of Géography. U.M.R. C.N.R.S. 6012 ESPACE

Wildfires are products of nonlinear interactions between physical, climatic and human parameters wich are articulate in scales of time and space. So, the predictability of the events is intrinsically limited. It seems that we also confront with a “wild randomness” according to the expression of B. Mandelbrot (1994, 1997). We measure the temporal instability of daily wildfires time series in the south of France during the period 1973-2006 by using Hurst exponent (H.E. Hurst, 1951). A time serie can be analysed by this exponent (H) wich represents the probability so that an event is followed by a similar event. This exponent occurs in several areas of applied mathematics, including fractals and chaos theory, long memory processes and spectral analysis. Hurst exponent estimation has been applied in areas ranging from biophysics to computer networking and was originally developed in hydrology. Hurst exponent range between 0 and 1. A value of 0.5 indicates a true random walk : there is no correlation between any element and a future element. If the Hurst exponent is $0.5 < H < 1.0$, the random walk will be a long memory process (a positive autocorrelation). If the Hurst exponent is $0 < H < 0.5$, data sets are unstable (negative autocorrelation) and this instability grows when H approaches 0. We show that data sets of daily burned area have an “anti-persistent behavior”. More the value of H is low plus the “black swan” (N.N. Taleb 2005, 2007) becomes probable (the fire or the series of fires which will bring back the value of the daily area burned towards its average value). This situation of instability evolve largely over the thirty studied years and are not identical according to the considered spaces. Furthermore, we open the question of the sensibility of this structural irregularity to the human action which radically changed in France since the Seventies.