Predictive signs of high-magnitude mainshocks based on the analysis of time behaviour of fractal parameters

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The predictability of three high-magnitude mainshocks at Southern California (Landers, 1992, M_W 7.3; Northridge, 1994, M_W 6.7; Hector Mine, 1999, M_W 7.1) is investigated by analysing the time evolution of several fractal parameters. The database is obtained from the SCSN (Southern California Seismic Network) catalogue for the 1981-2007 recording period and spatially restricted to the three aftershock areas. The analysed time series are interevent times, τ, and interevent distances, Δ, between consecutive events, equalling to or exceeding M_W 2.0. Time series include then background seismicity and aftershock activity. The purpose is attempting to find out predictive signs for these mainshocks by searching for peaks in the time evolution of two fractal parameters: lacunarity and Hurst exponent. The first goal would be to detect a peak before the mainshock. The second goal would be assessing the significance of this peak by comparing fractal parameters deduced for real time series with those derived for simulated seismic background activity. Although far, the results are not absolutely conclusive up to now, the combined use of lacunarity and Hurst exponent sometimes permits detecting warnings of a future mainshock. As an example, the lacunarity time evolution for Δ gives a warning of Landers mainshock approximately two months before. Another example is an early warning of Northridge mainshock when analysing τ series.