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Non-extensivity in seismicity. The case of L'Aquila area (central Italy), struck by the April 6th 2009 earthquake (ML5.8)

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The Tsallis-based non-extensive statistics has been becoming a fruitful method to analyze complexity in time series. A magnitude distribution law, different from the Gutenberg-Richter relationship, was developed by Sotolongo-Costa and Posadas (2004), and later refined by Silva et al. (2006), by means of applying the non-extensivity concept. Using this law, the analysis of the magnitude distribution of the 2005-2009 seismicity of L'Aquila area (Central Italy), struck by a strong earthquake (ML=5.8) on April 6th 2009 (1:32 UTC), was performed. This was the strongest event of the sequence. The analysis of the frequency magnitude distribution of three time intervals - (1) from April 16, 2005 to March 30, 2009, (2) from March 30, 2009 to April 6, 2009, and (3) from April 6, 2009 to July 1, 2009- reveals that the nonextensivity parameter q increases in the seismic interval (2), before the occurrence of the strongest L'Aquila event, indicating an increase of the degree of out-of-equilibrium state before the occurrence of the strongest event.