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Non extensive statistical physics properties of the 2003 (Mw6.2), Lefkada, Ionian island Greece, aftershock sequence

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On 14 August 2003, Lefkada Island (Central Ionian) was affected by an Mw=6.2 earthquake. Due to a dense temporary seismic network that operating immediately after the main shock occurrence, hundreds of aftershocks were recorded and located with high precision whereas relocation of the main shock and early strong aftershocks became also feasible. Thus, the spatio–temporal distribution of aftershocks onto the main and the neighboring fault segments was investigated in detail enabling the recognition of four distinctive seismicity clusters separated by less active patches. The aftershock spatiotemporal properties studied here using the concept of Non-Extensive Statistical Physics (NESP). The cumulative distribution functions of the inter-event times and the inter-event distances are estimated for the data set in each seismicity cluster and the analysis results to a value of the statistical thermodynamic qT and qD parameters for each cluster, where qT varies from 1.15 to 1.47 and qD from 0.5 to 0.77 for the interevent times and distances distributions respectively. These values confirm the complexity and non-additivity of the spatiotemporal evolution of seismicity and the usefulness of NESP in investigating such phenomena. The temporal structure is also discussed using the complementary to NESP approach of superstatistics, which is based on a superposition of ordinary local equilibrium statistical mechanics. The result indicates that the temporal evolution of the Lefkada aftershock sequence in clusters A, B and C governed by very low number of degrees of freedom while D is less organized seismicity structure with a much higher number of degrees of freedom.

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