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Statistical Analysis Of Seismicity Rate Changes As Precursors Of Strong Earthquakes

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Seismicity rate changes related to the occurrence of strong earthquakes usually provide valuable information on the temporal evolution of an earthquake sequence. Statistical analysis of the seismicity catalogues before and after the occurrence of strong earthquakes is based on the assumption of a nonhomogeneous Poisson process, which is a widely used model for a series of events (stochastic point process) with the rate or the intensity of occurrence of the earthquakes (i.e. the points of the process) varying with time. In the course of seismic excitation in particular, the application of statistical models has prevailed, in order to signify seismicity rate irregularities that may be considered as precursors of other strong earthquakes inside the seismic sequence. Therefore, based on adequate information going back in time before each seismic sequence, we try to estimate its future evolution by means of stochastic processes and the probabilistic theory. Interpretation of the results in association with the Coulomb stress changes can provide a tool in assessing the imminent seismic hazard. In the present work non-homogeneity is approached by power-law decay formulae that are adopted to describe the rate function of the aftershock sequences. Their parameters are estimated using the data provided by earthquake sequences that took place in the territory of Greece during the past decade. Several statistical methods are applied in order to investigate the temporal distribution of the earthquake sequence as well as the reference seismicity rate in each case. The robustness of the results was evidenced with the application of statistical tests, which accommodate every application.