

Relative frequencies of seismic main shocks after strong shocks in Italy

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We analyzed a catalog of Italian earthquakes, covering 55 years of data from 1960 to 2014 with magnitudes homogeneously converted to M_w , to compute the time-dependent relative frequencies with which strong seismic shocks ($4.0 \leq M_w < 5.0$), widely felt by the population, have been followed by main shocks ($M_w \geq 5.0$) that threatened the goods and the health of the persons living in the epicentral area. Assuming the stationarity of the seismic release properties, such frequencies are estimates of the probabilities of potentially destructive shocks after the occurrence of future strong shocks. We compared them with the time-independent relative frequencies of random occurrence in terms of the frequency gain that is the ratio between the time-dependent and time-independent relative frequencies. The time-dependent relative frequencies vary from less than 1% to about 20% depending on the magnitudes of the shocks and the time windows considered (ranging from minutes to years). They remain almost constant for a few hours after the strong shock and then decrease with the time logarithmically. Strong earthquakes (with $M_w \geq 6.0$) mainly occurred between two or three months from the strong shock. The frequency gains vary from about 10000 for very short time intervals to less than 10 for a time interval of two years. Only about one third of main shocks were preceded by at least a strong shock in the previous day and about one half in the previous month.