Record-breaking earthquake intervals in a global catalog and an aftershock sequence

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For the purposes of this study, an interval is the elapsed time between two earthquakes in a designated region; the minimum magnitude for the earthquakes is prescribed. A record-breaking interval is one that is longer (or shorter) than preceding intervals; a starting time must be specified. We consider global earthquakes with magnitudes greater than 5.5 and show that the record-breaking intervals are well approximated by a Poissonian (random) theory. We also consider the aftershocks of the 2004 Parkfield earthquake and show that the record-breaking intervals are approximated by very different statistics. In both cases, we calculate the number of record-breaking intervals n_{rb} and the record-breaking interval durations t_{rb} as a function of "natural time", the number of elapsed events. We also calculate the ratio of record-breaking long intervals to record-breaking short intervals as a function of time, r(t), which is suggested to be sensitive to trends in noisy time series data. Our data indicate a possible precursory signal to large earthquakes that is consistent with accelerated moment release (AMR) theory.