Non-linear time series and seismic behaviour analysis of Aegean region (Turkey) earthquakes

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Earthquake hazard potential of the Aegean Region (Turkey) was analysed by using Hurst algorithm (Hurst, 1951). An analysis method for a time series representing the evolution of a physical system was developed in an original way by Hurst who had a very complete collection of data set. Hurst exponent (H) is characterized by its degree, and it indicates the intrinsic memory. The Range (R) analysis introduced by Hurst (1957) has been applied to earthquake sequences within a region (Lomnitz, 1994; Goltz, 1997; Cisternas et al., 2002; Polat et al., 2002, 2005; Abik et al, 2005; Pérez-López et al., 2006). It provides a powerful technique to study the non-linearity of a time series, and it gives a way to understand the predictability of earthquakes into a seismic region.

In this research, we described the Hurst component and showed its application to the non-linear seismic time series in around Aegean Region of Turkey. We used both historical and instrumental seismicity of KOERI (Kandilli Observatory and Earthquake Research Institute) and USGS PDE, and combined them to obtain a homogeneaous single data set.

Hurst coefficient was obtained H=0.74, namely a high persistence (H>0.5) of the system memory, by using selected earthquakes (M>2.0) for a time series of 100 years. Than we interested more particularly in Izmir Region (3rd biggest metropolitan city of Turkey with its more than 3 million inhabitants) Hurst component was found H=0.57 in around this city. Results indicates an independent (H=0.5) system memory over there. The Range (R) estimation and cumulative seismic moment reveal that expected

earthquake in Izmir area could not reach to a magnitude greater or equal to Mw=6.6 . Similar consequences and Hurst (H) coefficients also observed by using most recent data set from 1975 to 2005. These results indicate that the seismicity of Izmir and its environment are dominated by swarm type activity developed under the different tectonic systems according to the analysis of non-linear time series.

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