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Estimation of the Peak Ground Acceleration with Artificial Neural Network (ANN) trained by Turkey strong-motion database

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Significant improvements have been observed in the size and quality of strong-motion databases in recent year in Turkey. Increasingly number of the strong ground motion earthquake recording stations have made an important contribution on data base. Also the peak ground acceleration (PGA) is significant parameter for earthquake hazard assessments. Therefore attenuation relationships have been developed for calculating PGA according to strong-motion databases. Generally this relation has been related to the earthquake magnitude and epicenter distance. Besides researchers have formulated different attenuation relationships according to other parameters (such as soil classification, seismic velocity, etc).
Artificial Neural Network (ANN), efficient and modern modelling method which has increased in literature with development of technology. Artificial Neural Networks are mathematical tools design to perform complex pattern recognition tasks. They have been estimated parameters in many field also geophysical applications. ANN is a flexible mathematical structure which is capable of identifying complex nonlinear relationships between input and output data sets. ANN models have been found useful and efficient, particularly in problems for which the characteristics of the processes are difficult to describe using physical equations. ANN is an information processing system that has certain performance characteristics in common with biological neural networks. It has been developed as generalizations of mathematical models of human cognition or neural biology. The basic processing elements of neural networks are called neurons. It consists of an input layer of neurons, one or more hidden layers of neurons, and a final layer of output neurons. In this way parameter estimates can be made with ANN trained by input and out data.
This study aim to estimate the PGA with ANN trained by strong-motion databases. The input data for training included the different interval magnitude of earthquakes ($5.0 < M < 8.0$) and various epicenter distances in Turkey recorded by Republic of Turkey Prime Ministry Disaster and Emergency Management Authority Presidential of Earthquake Department (AFAD) strong motions stations. The output data consist of the real recorded PGA. Also the estimated PGA by ANN have been compared with calculated PGA according to several attenuation relationships. The results have been shown that the ANN give more reliable and real-like PGA value than estimated from attenuation relationships.