

The Athens, Greece, Earthquake (Ms = 5.9) of 7 September 1999: An Event Triggered by the Izmit, Turkey, 17 August 1999 Earthquake ?

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ABSTRACT

The Athens, Greece, earthquake (Mw 5.9) of 7 September 1999 occurred in a region of low seismicity at a distance of ~ 600 km from the epicenter of , and only 21 days after, the large (Mw 7.5) Izmit , Marmara Sea, earthquake of 17 August 1999. The possibility that the Izmit event triggered the Athens one is examined on the basis of a three-step procedure. The first step is a stochastic test showing that the probability for a strong shock to occur randomly in a 21-days time interval (i) in the region of Athens (radius ~ 30 km) and (ii) within a distance of ~ 70 km from Athens , is on the order of only 5.75×10^{-5} and 2.3×10^{-3} , respectively. Second, a short review on the current ideas about earthquake triggering by other earthquake concluded with that the Athens shock generated within the critical space and time ranges described for other likely triggered events occurring not only in the tectonic regime where the Izmit and Athens earthquakes took place but also in other seismogenic areas of the Earth. A model that considers earthquake triggered by earthquake as an instability to transient slip, was used to calculate the distant shear stress increase at the Athens earthquake fault as a result of the superimposed unrelaxed (coseismic) and relaxed stress change caused by the Izmit earthquake due to deep aseismic viscous slip. The total stress accumulation within about one month from the Izmit earthquake occurrence was found on the order of 4.2×10^{-3} bars , which is rather significant in that it doubles the yearly mean rate of tectonic stress accumulation in the region. Finally, from a time-to-failure analysis it was found that although the process of small ($4.0 \geq M_L \geq 2.0$) earthquake generation, at a distance of about one source dimension (~ 30 km) from the Athens earthquake epicenter ,started to accelerate very slowly from the beginning of 1994, only immediately after the Izmit earthquake culminated with foreshock activity. The above independent results favour the conclusion that the Athens earthquake was likely advanced in time possibly because of dynamic stress change due to the Izmit large earthquake .