EMSEV 2012
Gotemba Kogen Resort, Gotemba, Japan
October 1–4, 2012
Abstract 1-03p

Critical exponent for the interrelation between stress drop of earthquakes and lead time of seismic electric signals

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We treat pre-seismic electric signals, known as Seismic Electric Signals (SES), and associated earthquakes in view of "critical point" theories. We investigate a possible interconnection between the SES lead time, which is the time window between the detection of the SES signal and the occurrence of an impending earthquake, and the stress drop (which is the difference between two states of stress at a point on a fault before and after rupture) of the corresponding earthquake. Based on a large number of earthquakes (M_W>5.5) with available stress drop values that occurred in Greece during the last 3 decades and preceding SES signals (Dologlou, 2010) , we found a relation between the stress drop and lead time with fractal critical exponent of 0.33 (Fig.1). This value which falls in the range of the expected critical exponents for fracture, is very sensitive and has been tested for its credibility. It remains stable only for appropriate pairs of SES and earthquakes.

In addition, this exponent is very close to the reported one by Varotsos and Alexopoulos, (1984) which interconnects the amplitude E of the precursory seismic electric signals (SES) and the magnitude M of the forthcoming earthquake in the relation:

$$\log E = aM + b$$

where $E=\Delta V/l$, (with ΔV the potential difference measured between to points on the ground at a distance l), a $\approx$0.3- 0.4 and b is a constant depending on the geoelectrical structure around the measuring site. Usually, a-value is around 0.33 (Varotsos and Alexopoulos, 1984 see p.91).

Thus, the hypothesis that underlying dynamic processes evolving to criticality prevail in the pre focal area when the SES is emitted is significantly supported.

References

[1.] E. Dologlou, Power law relationship between parameters of earthquakes and precursory electrical phenomena revisited II, Nat. Hazards Earth Syst. Sci., 10, 1-7, 2010.

[2.] P. Varotsos, and K. Alexopoulos, Physical properties of the variations of the electric field of the earth preceding earthquakes, I, Tectonophysics, 110, 73- 98, 1984.

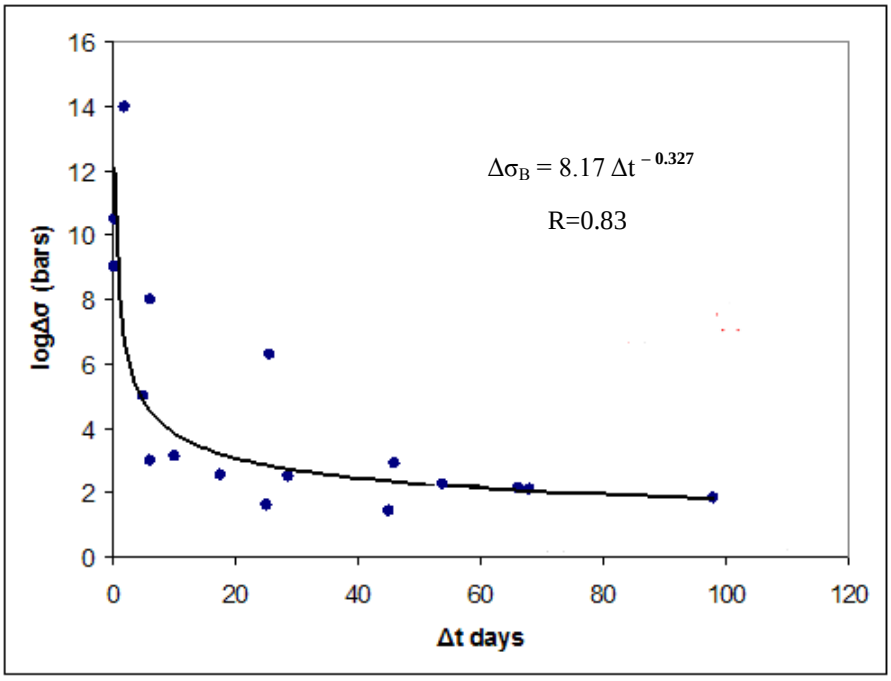

Fig.1 The plot of the relation between the stress drop and the lead time for the earthquakes considered by Dologlou 2010, along with the new data.