E141-001 **Room: 304** **Time: May 17 10:45-11:05**

Seismic Electric Signals (VAN method)

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Seismic Electric Signals (SES) are low frequency (& #61603;1Hz) changes of the electric field of the earth that have been first observed in Greece[1, 2] to precede earthquakes, with a lead time from several hours to a couple of months. Their emission has been explained long ago[3] on the basis of the theory of critical phenomena and their physical properties & #8211;along with tentative explanations- have been reviewed recently[4]. Here, we summarize the recent advances on the SES observation and analysis, main points of which are the following:

At epicentral distances of the order of 100km, the SES electric field precedes markedly the time-derivative of the magnetic field[5]; this finds applications in the determination of the epicenter of the impending earthquake and in the distinction between true SES and noise emitted from artificial sources. A detectable difference in the time evolutions of the electric field components of SES exists[5], which can be also used for the determination of the epicenter of the impending earthquake.

In addition, the analysis of SES is significantly advanced by employing a new time-domain, termed natural time domain[6, 7]. This domain enables the distinction of similar looking electric signals that are emitted from systems of different dynamics[8]. Hence, it can discriminate true SES activities (critical dynamics) from noise emitted from nearby artificial sources. By the same token, natural time has been found to have applications to diverse fields, for example in analyzing electrocardiograms and allowing the discrimination of sudden cardiac death individuals from truly healthy humans[9]. The latter discrimination makes use of the fluctuations of the entropy, at different scales, defined in natural time[8]. This entropy changes under time reversal[10].

A key advantage of natural time is that it allows a better estimation for the time window of an impending mainshock[6, 11], provided that an SES activity has been observed. The spectral content of the seismic activity that occurs after the SES activity is studied in natural time: it evolves consecutively in time upon the occurrence of every new event (small earthquake), and finally coincides to that of the SES activity a few hours to a few days before the mainshock. Hence, this enables the estimation of the occurrence time of the impending mainshock with an accuracy that was not hitherto available.

References

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