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Characterization of 4 years MagnetoTelluric monitoring data by studying the temporal behaviour of Alpha Stable Distribution Parameters

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Analyzing a 4 years of a single site MT continuous monitoring data, a systematic variation of the MT transfer function estimates was observed in the [20–100 s] period range that was shown to be connected to the global geomagnetic activity, Ap index (Romano et al., 2014). The monitored period, from 2007 to 2011, includes the global minimum of solar activity which occurred in 2009 (low MT source amplitude). It was shown that the impedance robust estimations tend to stabilize when the Ap index exceed a value of 10. In order to exclude a possible dependence of the observed fluctuation on the presence of a local cultural noise source, for a shorter period ($\sim$2 months) the monitoring data were also processed by using a remote site.
Recently Chave (2012) demonstrated that MT data can be described by alpha stable distribution family that is characterized by four-parameters that must be empirically determined. The Gaussian distribution belongs to this family as a special case when one of the four parameter, α the tail thickness, is equal to 2. Following Chave (2016), MT data are typically stably distributed with the empirical observation that $0.8 \leq \alpha \leq 1.8$.
In order to better understand the observed dependence of the MT continuous monitoring on the global geomagnetic activity, here we present the results a re-analysis of the MT monitoring data with a two steps processing. In the first step, we characterize the time series of the Alpha Stable Distribution Parameters (ASDP) as obtained from the whole processing of the dataset with the aim of checking for possible connections between these last and the Ap index. In the second step, we estimate the ASDP by using only the samples which satisfy the mathematical range of existence of the normalized WAL (Weaver et al.,2000) considering these last as a diagnostic tool to detect which segments of the time series in the frequency domain are strongly contaminated by noise (WAL selection criterion).
The comparison between the results of the two above mentioned steps, allow us to understand how the WAL based selection criterion performs.