The blackout of September 2019 on the island of Tenerife: an opportunity to estimate the level of contamination of electromagnetic noise using the magnetotelluric method

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The magnetotelluric method (MT) is a geophysical technique that provides high resolution information of the electrical resistivity of the subsurface geological structures by measuring the natural variations of the electromagnetic field recorded on the surface. Among the numerous applications, it can be used to map the presence of fluid reservoirs and localize significant structural contrasts that could be related to the presence of a geothermal or volcanic system. However, the interference of the anthropogenic noise during the MT measurements could affect significantly the correct interpretation of the collected data.

For this reason, in order to evaluate the effect of data contamination by anthropogenic sources, we analyzed the data registered by a continuous recording magnetotelluric station located inside the caldera of Las Cañadas (Tenerife, Spain). The instrumentation consisted of an ADU-08e, equipped with EPF-06 electrodes and MFS-06 magnetic coils. Two electric (Ex, Ey) and three magnetic (Hx, Hy, Hz) components have been recorded. This geophysical station was installed by the Instituto Volcánologico de Canarias (INVolCAN), with purposes of volcano monitoring, on June 2019 and since then it has been recording data daily in the frequency range of 0.001 – 1000s.

On September 29 (2019) a significant electric blackout took place in the entire island of Tenerife in which, during approximately 6 hours the electricity supply was completely shut down. This situation represented a clear opportunity to obtain raw data almost free of anthropogenic contamination and it could help to quantify the effect of the anthropogenic noise in the MT measurements performed in a densely urbanized area as Tenerife. The first results show the clear change at 13:11:39 local time (GMT) in which both the electrical and magnetic components evidenced a pronounced change in their temporal pattern. Moreover, the comparison of the impedance tensor components between the previous hours and during the blackout reveals a noticeable difference for periods higher than 1 s.