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Mapping spatial variations of the frequency-magnitude distribution for Fogo-Congro region, São Miguel, Azores

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Any seismic catalogue is the result of signals recorded on a spatially and temporally heterogeneous network of seismometers. The seismic catalogue quality can be inferred through the determination of the magnitude of completeness (Mc), which is the lowest magnitude above which all seismic events in a space-time volume are detected (Wiemer & Wyss, 2000). Below Mc, some of the events are missed by the network due to several reasons, such as: the seismic events are too small to be recorded on enough stations; the network operators decided that events below a certain threshold are not of interest; or because they are too small to be detected within the coda of larger events, in the case of an aftershock sequence. In this work a Mc grid-mapping procedure developed by Wiemer & Wyss (2000) was applied on Fogo-Congro region (São Miguel, Azores) based on a statistical analysis of the frequency magnitude distribution of seismic events, for the period 2002-2006.

The seismic activity varies in space and time. The Gutenberg-Richter law, which describes the earthquake size distribution, through the b-value, is a very important "tool" for the seismicity characterisation. The spatial variation of the b-value can be related to differences in stress, pore pressure, and/or material heterogeneity. High b-values are usually associated with the presence of fluids on volcanic regions.

The seismic catalogue was evaluated statistically to identify areas of high b-values. The b-values were calculated for the Fogo-Congro region using the ZMAP algorithm (Wiemer & Wyss, 2000). The b-value found for the Fogo-Congro seismogenic region suggests the presence of magma and/or fluids (as suggested previously in other studies), since in the vicinity of magma bodies, high pressure, and high temperature gradients favour high b-values.