

EGU2020-9938

<https://doi.org/10.5194/egusphere-egu2020-9938>

EGU General Assembly 2020

© Author(s) 2020. This work is distributed under the Creative Commons Attribution 4.0 License.



## Quantifying evolution of aftershocks sequences by Delta/Sigma method: a parametric analysis

**Domenico Caccamo**<sup>1</sup>, Vincenza Pirrone<sup>2</sup>, Antonella Peresan<sup>3</sup>, and Roberto Lotronto<sup>2</sup>

<sup>1</sup>University of Messina, Dipartimento di Scienze Matematiche e Informatiche, Scienze Fisiche e Scienze della Terra,, none, Italy (caccamod@unime.it)

<sup>2</sup>External Collaborator, Messina, Italy

<sup>3</sup>National Institute of Oceanography and Experimental Geophysics. CRS-OGS, Udine. Italy

The Delta/Sigma method is applied in this study to investigate the seismic sequences following major earthquakes, with the aim to understand whether they fit the classical laws of aftershocks occurrence, such as the classical Omori Law and its recent variants, and to explore whether observed deviations from these laws may provide some statistically significant information about the possible occurrence of further large aftershocks. Specifically, the Delta/Sigma method is based on the observation of possible anomalies in the temporal decay of an aftershock sequence. In fact, given the number of events actually observed within a time window  $U$  (e.g. 1 day), its difference (Delta) with respect to theoretical number of events, and its standard deviation (Sigma), it was found that, before the occurrence of large aftershocks, the Delta/Sigma ratio may reach rather high values (e.g. above 2-2.5), which can be possibly followed within few days by some relevant aftershocks. The investigation area (referred as "Box") is defined as a rectangular sector, with dimensions proportional to the magnitude  $M$  of the mainshock, and with barycenter computed based on aftershocks occurred during the first  $T_b$  days from the mainshock.

To investigate the performances of the Delta/Sigma method various earthquake sequences are selected from different regions worldwide, including those associated with recent destructive earthquakes in Italy and Iran. The input data necessary for this study are extracted from global datasets (ANSS-USGS and ISC catalogs) and regional catalogs (e.g. ISIDE bulletins for the Italian territory). A wide set of parametrics tests is carried out in order to verify if this method could forecast the moderate and large aftershocks, which occurred in the region surrounding the mainshocks epicenter. Different input parameters are considered, in order to check the stability and statistical significance of the obtained results.

The preliminary results suggest that the application of Delta/Sigma method could highlight the possible occurrence of several significant aftershocks. Careful assessment of forecasting capability is essential, in order to provide relevant information for mitigation of risks associated with large aftershocks occurrence.