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An improved robust detection of quiescences by RTL algorithm

Rita Di Giovambattista (1), Antonella Peresan (2), Stefania Gentili (2), Mohammad Tabei (3), and Mehdi Zare (3)

(1) Istituto Nazionale di Geofisica e Vulcanologia, (2) Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, (3) International Institute of earthquake engineering and seismology, IIEES, Tehran, Iran

The Region Time Length (RTL) algorithm is a method for intermediate term forecasts of large earthquakes, which analyzes declustered catalogs and is sensitive to quiescences that may precede major earthquakes. RTL has been progressively refined and has been applied in several regions of the World during the last decades. Recent versions of the algoritm permit to analyse the possible quiescence not only in the area surrounding the mainshock epicentre, but they allow drawing maps for the whole investigated region. The specific selection of the parameters affects the shape of the RTL and therefore the maps obtained, because of the different time and space window considered. In this study, we propose a new anhanced variant of RTL, which highlights only quiescences consistently detected for different choices of the free parameters, and hence is more stable.

Just as many other methods developed for the analysis of seismicity, RTL algorithm needs as input a declustered catalogue. For this purpose, we apply a new declustering tecnique based on the nearest-neigbour distances between events in the space-time-energy domain; this method in fact, while removing the identified aftershocks, allows preserving the background seismicity.

To exemplify the application of this variant of RTL algorithm we analyse seismicity preceding the Sarpol Zahab Mw 7.3 earthquake (12 November 2017), with the aim to understand whether the information from past events could provide some insights about the occurrence of this and other large earthquakes that occurred in the area. The retrospective application of RTL algorithm to Northwestern Iran, evidenced two broad quiescence regions, oriented NW-SE along the Zagros belt. One, located to the north, well corresponds to the Sarpol Zahab earthquake location and disappears immediately after the event. The second one, located in the southeastern part of the study region, persists up to the end of 2018.