Efficiency of the automatic seismic event location system in Brazil using SeisComP3

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The Brazilian seismographic network (RSBR) has been operating since 2009 by four nodes (USP, UnB, ON and UFRN) and currently comprises a set of 98 stations, all capable of online transmission. Automatic monitoring is performed by the SeisComP3 software with slight modifications to its default settings. Due to the triggering, nucleation and locating parameters, SeisComP3 default settings favor the detection and location of teleseismic events rather than local and regional Brazilian events. More recently, an effort was made to optimize triggering and picking parameters for part of the network, but not considering continuous records, as reported in a MSc. dissertation (Muñoz Lopez, 2021). In this work, we analyzed the RSBR catalog by studying the number of automatic and manual readings by magnitudes and maximum detection distances. Our analysis showed that only 6,5% of the Brazilian events from January 2014 to March 2021 in RSBR catalog were automatically located, mostly with magnitudes above M2.5. Additionally, we verified that Brazilian earthquakes with magnitudes below M2.5 were detected on seismographic stations as far as 1400 km, while the average minimum distance between RSBR stations is around 210 km. Those results may suggest that the current SeisComP3 settings are limiting automatic detection of Brazilian events with magnitudes below M2.5. We also compared Muñoz Lopez proposed parameters (ML) to the default SeisComP3 parameters (STD) on continuous waveforms recorded by some RSBR stations in March 2017. In this period, RSBR catalog indicates a total of 23 earthquakes with magnitudes M0.7 to M4.2. In our test, STD parameters generated 86 events (from 10,128 picks), mostly in and around the South American plate, while ML parameters generated 78 events (from 48,247 picks). Within the RSBR, STD generated only 12 events while ML generated 45. While reviewing the 12 STD generated events, we can confirm that all of them are teleseismic events falsely located inside the network. On the other hand, among the 45 ML events only 2 are Brazilian events also listed in the RSBR catalog, both with magnitudes M2.9. The other 43 are mostly noisy records nucleated as false events and a few teleseismic events falsely located inside the network. We conclude that while a step has been given on increasing the number of picks, it is still necessary to improve the parameters for nucleation and location of events for RSBR network to be able to give a real automatic contribution to the study of the Brazilian seismicity.