

Review of “ The new seismic catalog of the Gargano area (Southern Italy) after a decade of seismic monitoring by OTRIONS network” from Ferreri et al.

The authors present a new catalog obtained with seismic data from the OTRION network in the Gargano area (Italia) over the period 2013 - 2022. Previous catalogs in the region are from the national network, and from OTRION network over the period 2013-2018 (Filippucci et al. 2021) and 2013-2020 (Miccolis et al. 2021). These previous catalogues are from real time processes, suffering of incomplete dataset because of transmission problems. To be able to have a more complete catalog and try to improve the detection of small events, the authors reprocessed the whole period from continuous data with CASP automatic process, and analysed its performance, by comparing the obtained catalog to the manually reviewed version, and previous available catalogs.

General comments

The introduction need to be improved to better introduce the work and highlight the contribution of this new catalog. It would be more interesting to focus on processes to build high-quality seismic catalogs and what is already known on the studied area, rather than on a listing of existing networks in South Italia.

More details on CASP must be given, especially on triggering, detection, and picking to be able to appreciate the performance of the process, but also to understand the issues encountered by the authors in their automatic catalog.

The performance of CASP as parametrised in this study does not seem optimal given the significant part of fake events. Are the parametrisation use by the authors for CASP can be still improved ? If yes, the authors should discuss this point in the discussion part with some suggestions for improvement. A more general question about the methodology used in this study to build the catalog is : Why did the authors choose CASP which uses rather standard processes, and not more up to date methodologies including deep-learning for automatic picking, new associators, etc ?

Some suggestions are made below to improve English, but this is not exhaustive. Careful proofreading should be done to improve the English.

Specific comments and suggestions

- p1, line 7: ‘7 years’ instead of ‘7 year’ ;
- p.1, line 14-16 : the structure of the sentence is a bit weird, rephrase ;
- p. 2, line 30 : ‘earthquake’ appears twice in the sentence, I suggest ‘strong earthquake of November 23, 1999 (Ms=6.9)’ ;
- p. 3, line 60-61 : a parallel fault system is mentioned in the text, but not represented in Fig 1b. Add it ;
- p. 3, line 61-64 : the authors mentioned here the largest earthquakes in the region. It will be very useful in this introduction part to add a seismicity map. It will give an overview of the seismic activity in the area at least before OTRION network (or with the mentioned previous catalog from Filipucci et al. 2021) to better appreciate and highlight the contribution of this network and the catalog obtained in this study. It will also help to locate the mentioned earthquakes ;
- p. 4, line 75 : I am not sure to understand what the authors mean by ‘consistent in arrival times picking’. Consistent compare to what ?

- p. 5, line 108 - 109 : I suggest to modify the sentence as follows : ‘the network performance was evaluated by the percentage of operating days per year for each station between 2013 and 2022 (tab. A1). It is worth noting the clear improvement in network performance after 2019 compared to the preceding period.’ ;
- p. 5, line 113 : ‘after 2019’ instead of ‘after the 2019’ ;
- p. 6, section 2.2 should be shortened : lines 125-127 should be moved to the previous section describing the network, and lines 127 to 133 should be moved in the legend of Figure 3 ;
- p. 6, line 136 : ‘optimal’ is not the appropriate term regarding the quality of the stations in Figure 3 and A3 to A6, but I agree that half of the stations have overall good performances. Rephrase. Moreover, PPSDs is not sufficient to assess the overall quality of stations in particular for catalogue purpose, as some stations with low noise level (evaluated through PPSD) can lead to overpicking for some reasons and disturb picking process. Thus the number of detections per day (outside active seismic periods) can be a useful additional information ;
- p. 9, table 1 : it should be moved to the annexe part, no need to be in the main text ;
- p. 9, line 164 : CASP is mentioned as an *advanced* software for automatic detection/picking/event location, however looking in detail, it is quite standard procedures, nothing very new compared to nowadays workflow including deep-learning, new associators, etc. Rephrase ;
- p. 9, line 170 : why having choosing a band-pass filter between 10 and 25 Hz ? The lower bound seems to me a bit high. Is there a reason for that ?
- p. 10, lines 171-172 : give a bit more details on the parameters used for trigger, association and event detection, for instance minimum number of stations/picks, etc. It will help to better understand the performance of the automatic process described later in the paper (significant number of fake events, etc) ;
- p. 10, lines 175-186 : the authors must give a bit more information concerning the method used for picking. All these details would be useful to better understand the analysis of the automatic process performance ;
- p. 10, lines 193-194 : the authors mentioned the number of seismograms picked manually. It will be also interesting to add information concerning the number of additional picks provided by the manual revision (number of picks missed by the automatic process) ;
- p. 10, line 197 : an example of fake event seen at 3 stations is mentioned. Does it mean that event detection is made considering a minimum number of stations equal to 3 ? Detection with only 3 stations inevitably leads to false detections without other criteria to discard them, or/and to badly located events. If it is the case, this could explain some of the critical issues of the automatic process. Specify and comment ;
- p. 11, Figure 4 : add information about the filtering used for the plot. Use ‘recordings’ instead of ‘registrations’ (check other occurrences, and apply same correction). Some picks on the noisiest traces are quite puzzling, as no clear change in the signal is visible. Comment ;
- p. 11, lines 206-207 : among the 2012 events identified, what is the proportion of fake events and events outside the network badly located inside ?
- p. 12 line 229 : explain the choice of depth selection ;
- p. 13, line 238 : natural earthquakes should be represented in Fig 7a by blue dots, but there is no blue dot on the corresponding Figure. Add them ;
- p. 13, line 242 : why quarry blasts have depth ranging between 3 and 7 km ? Does it correspond to the manual or the automatic catalog ? Why not having relocate them with a fixed depth at the surface when identified as a quarry blast ?
- p. 14, Figure 7 : add transparency to histogram plots to be able to better see the differences of distribution between natural earthquakes and quarry blasts ;

- p. 15, line 254 : the value for the standard deviation (2.586), is not consistent with results in Figure 8. Correct it.
- p. 15, line 256-257 : the performance of the picker does not seem to be as good as expected. Automatic picks seems to be systematically earlier than the manual ones, and some with significative differences. What is the methodology used for the picking process ? As mentioned, this could results in event closer to the network, but also in shallower events. Specify ;
- p. 16, line 271 : ‘assess’ instead of ‘asses’ ;
- p. 17, lines 286-287 : the authors mentioned the fact that rms refers to location quality in time domain, it is not quite exact, it represents the misfit between observed and theoretical traveltimes, it can be affected by the quality of the location in space, and the inconsistency of the true velocity structure compared to the velocity model used. Rephrase. They also mentioned the good values for rms parameters, but looking at table 3, we can noticed that the max value for rms is 23s which is quite high and surprising for a manually revised catalogue ! Comment and reprocess the corresponding event ;
- Section 5 : the first map of the seismicity appears only at the end of this section. It will be interesting to have a map of the seismicity relocated manually with the stations at the beginning of the section to better appreciate the discussions on the catalogue (quality, comparison NLL, hypo71, etc) ;
- p. 17, lines 300-304 : This part is very confusing and not really consistent with Figure 10 : delta_epi is not gaussian, values of standard deviations are very different to values after $\pm$ in delta_epi, delta_depth and delta_origin which are very high and not corresponding to figure 10. Correct and rephrase ;
- p. 17, line 308 : The authors claim that, for earthquake, manual revision is not necessary. But it is needed to remove fake events and quarry blast. Moreover this depends on the purpose, meaning on the use made of the catalog, especially in terms of pick quality. Rephrase
- p. 18, Figure 9 and p.19 line 320: histograms for hypo71 catalog are in red, not in orange. Correct.
- p. 19, line 310 : I do not understand the choice made by the authors concerning the initial depths used to refined the depth of locations done with hypo71 : depth range is from 10 to 100 km with a step of 10km. Figure 7c clearly shows that most of the events are located above 35km. Comment.
- p. 19, lines 324-326 : the difference in errh and errz between event locations done with hypo71 and NLL are surprising. Hypo71 and NLL have quite different uncertainty definitions, in hypo71 uncertainties correspond to one standard deviation, NLL provides a full probability density description of the errors. How errh and errz are computed from NLL output parameters ? Check the consistency of errh and errz for this 2 algorithms ;
- p. 19, line 327, p. 20, line 328-329 : the comments on depth $\pm$ errz for events close to the surface, is quite useless. Events close to the surface are always more difficult to locate, and in that sense, NLL often give a better uncertainty estimation, better catching this difficulties. Moreover, when station elevations and topography are included in NLL location, there are less events located at the surface ;
- p.20, line 339 : in the quality parameter computation (following Michele et al. 2019), why having considering a different weight for the gap ? Indeed, azimuthal gap has a great influence on the quality of the location, much more than the rms or the number of phases. Comment ;
- p. 20, lines 341-345 : as the quality parameter *qf* is not exactly the same for NLL and hypo71 as some parameters are not available for hypo71, thus I suspect that *qf* can be slightly different for equivalent quality of location. Thus, as classes are split based on the same value 0/0.25/0.5/0.75/1, the classes for NLL and hypo71 can therefore have slightly different

characteristic in terms of gap/rms/errh/errz/.... Thus the comparison of percentage of events in the different classes in table 4 may be not quite representative, and misleading. Comment ;

- p. 22, line 360 : a parenthesis is incorrectly positioned : by Woessner and Wiemer (2005) ;
- p. 23, lines 365-366 : how the authors can claim that the minimal magnitude detectable is lower for this catalog, given that the magnitudes are not exactly computed the same way, and that the difference mentioned is only 0.01 which is well below the typical uncertainties on magnitudes. Rephrase ;
- Figure 13 : labels of the different plot axes are too small. Enlarge them ;
- Figure 14 : histogram for hypo71 catalog is in red, not in orange ;
- p. 25, line 390 : the qf value given for NLL is probably incorrect : 6.3 ;
- p. 25, lines 394-401 : to better appreciate the contribution of this catalog in comparison to the ONT one, seismicity of ONT can be for example plot in the introduction part as already mentioned. A magnitude threshold of -1 is mentioned, this is not consistent with what is mentioned in previous section ;
- p. 25, line 400 : reference to figure is not correct : ??
- p. 25, line 411 : the authors mentioned the fact that the seismicity follows 2 alignments SW-NE. This can not clearly seen on the figure 13, seismicity is rather diffuse on both side of Mattinata fault ;
- p. 25, line 421-422 : the authors mentioned a seismic gap, but it sounds more as a region without seismicity. Is there historically seismicity in that region ?
- Figure A1 or A7 : one of these 2 figures should be put in the main text to better appreciate the discussion on seismicity features.