

Interactive  
Comment

# ***Interactive comment on “Appraising the Early-est earthquake monitoring system for tsunami alerting at the Italian candidate Tsunami Service Provider” by F. Bernardi et al.***

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Received and published: 25 June 2015

General comments:

This is an interesting manuscript of high quality that describes the Early-est real-time earthquake monitoring system as implemented at the Tsunami Alert Center of INGV (CAT-INGV) and discusses its performance based on nearly 3 years of data (3/2012–12/2014). While the mission of CAT-INGV is limited to detecting and alerting on potentially tsunamogenic earthquakes in the NEAM region, in order to have a relevant dataset, the authors use ~5500 global events for their analysis. I regard this approach

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as valid, and would guess that with regard to the performance for the NEAM region, the assessment of this study provides can be viewed as realistic / conservative.

Overall the MS is well written, comprehensive, and clear, in parts the english can be improved. I provide some comments / corrections below and in the attached annotated pdf.

I suggest that this MS can be accepted subject to 'technical corrections' (very minor revisions).

Comments to the MS:

Abstract: The abstract could be improved by minor reworking overall: some parts are quite general where in others a lot of (too much) detail (method & values) are provided without a clear view of which are the most relevant conclusions.

p 2914

line 14

"... with reference manually revised / verified catalogs." reword to explain that you compare Early-est to established global catalogs of manually reviewed events.

line 17 and onward

you provide the differences in parameters as 'mean diff +/- std. dev'. This is useful, but initially irritating as it is not directly explained. A 'mean difference' of 20km in epicenter with a 20km std. dev does not seem to be better constrained than a 'mean diff' of 0 km in depth with a 30km std.dev.

line 20/21

"magnitude mb shows wide differences" - this is not clear (immediate question: systematic?); in particular as you then provide the values for the mb diff after correction, but one cannot judge how this compares to the initial. Overall there are too much details

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in this magnitude part of the abstract.

p2915

line 3

'rather quickly toward the final value': here some numbers would help.

1 Introduction

p2915

line 9

'... in sea areas...' - I would suggest to use 'ocean' instead of 'sea' throughout the text

p2916

line 3

'... are not in place.' Are there really none (at the moment) - or just no data available (to you) in rt? Can you comment on 'future planned deployments' (just in half a sentence)?

p2917

line 12

'... but also M8+...': wording doesn't make sense (option: ', including also M8+ ... that generated significant tsunamis.')

line 18/19

'>=M5.5 do not occur very frequently' - provide number of past M5.5+ (e.g. total over xx yrs / avg per yr / 10yrs...)

2 Early-est algorithm description

p2920

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line 5-19

the associater description is copy/paste from the appendix. With a reference to the appendix this can be shortened / generalized (or even left out)

3 Dataset

p2921

line 2

‘global regional and teleseismic events’ - unclear: I guess you mean ‘events from around the globe recorded at regional and global distances’?

line 13 ff

reference catalogs: please provide /cite ‘references’ for all the catalogs you use. Ask the catalog providers which are the most appropriate if in doubt.

line 19/20

‘... source parameters for different time windows’ - better write ‘... different time periods’

I would also suggest to combine this and the next sentence:

‘The above mentioned observatories and centers provide manually verified and/or revised earthquake source parameters for different time periods.’

4 Epicenter

p2922

suggest change title to ‘Epicenter location’

general comments to this section:

There seems to be evidence of ‘regional systematic’ mislocations in the GMT catalog

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when compared with INSAR images of the fault (~20 km average) (e.g. Weston et al 2011 JGR, 2012 Tectonophysics). Would this have any impact on your assessment? I would not call the difference between locations in the various catalogs 'uncertainty' (lines 9 and 11) but just 'difference' as you then do below (line 15 ff) - uncertainty implies that you are actually certain that the true location lies somewhere in the area described by this uncertainty, while in reality you compare two 'arbitrary' locations. Related to this, can you include information about the location uncertainty given in the various catalogs, and compare that to the differences between the catalogs? At the end of this paragraph a summary of your conclusions on this comparison would be helpful.

5 Hypocenter depth

general comments

Is there any systematic dependency of the depth difference with actual event depth? Also here perhaps add a brief summary conclusion at the end.

6 Magnitude

p2923

general comment: you do not discuss the uncertainty of the single magnitude estimations given by each catalog - I would guess that you mainly are playing around in the noise? line 20ff: 'Since the ICG/NEAMTWS guidelines...' - this sentence is not clear. suggest: Since the ICG/NEAMTWS guidelines prescribe that for earthquakes with depth  $Z > 100$  km a standard general warning should be delivered only for events with  $M \geq 5.5$ , and no action shall be taken for smaller magnitudes, we analyze in this section only the magnitude comparisons for events with  $Z < 100$  km.

p 2924

line 2: the comparison  $N_c - G_c$  is missing in fig. 4

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line 13/14: also here, is there a dependence of magnitude differences with event depth?

p2925 / Fig 5

I don't really agree that your 'correction functions' improve the magnitude estimate in any significant manner. The regression lines plotted in Fig 5 seem to have the wrong slope (should in both cases be  $>1$ )?

p2927

line 5ff: are these magnitude corrections really significant when assessing the tsunamogenic potential of an event (and given the overall uncertainty of magnitude estimation)?

7 Speed performances and tsunami warning alert time

p2927

line 21: I don't think convergence to the 'final' value is the issue, but to a 'stable and useable' value that is close enough to the final.

p2928

line 11-13: this text is repetitive to before (p2927 line 17ff) - leave out and slightly reword paragraph below.

line 24/25: 'we set a timeline' - not sure what you mean here. reword / explain?

line 27/28: where does the 'numbering' of the locations (2nd, 5th, 8th) come from?

p2929

line 5: if the seismologist has the warning within 15 minutes, how long does it take then that this warning reaches the authorities?

8 Discussion and final remarks

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p2929

line 14/15: reword: “Early-est provides locations with uncertainties comparable to those of other global catalogs.” (also line 16-18, reword similarly).

As mentioned before, you assess the ‘uncertainty’ in the reference catalogs by comparing them against each other, without looking at the error estimates of the single catalogs.

p2930

line 12/13: ‘From our analysis...’ : without further explanation / conclusion this statement seems irrelevant.

p2931

lines 14 to end: this statement would fit better at the start of the discussion, or in a separate ‘summary’. (or leave out)

Appendix: Oct tree ...

the first paragraph is exactly the same text as in the body of the MS - either expand here or shorten in body.

Table 1:

can you provide error estimates for the source parameters from the Early-est calculations?

Figure 1:

it is hard to tell but it seems you are also using station(s) from the Swiss network (code CH)? The network code ‘SS’ you list is a generic code for single stations and is not informative without further detail.

Figure 3:

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(also comment in text) Is there a depth-dependency that could be shown as figure?

Figure 4:

The text refers to a 'left' panel Nc-Cc which is missing in the figure

Figure 5 a/b:

from the point 'cloud' shown I have a hard time believing the slope of the regression lines.

References mentioned:

Weston et al, 2011, JGR: doi:10.1029/2010JB008131

Weston et al, 2012, Tectonophysics: doi:10.1016/j.tecto.2012.02.001

Please also note the supplement to this comment:

<http://www.nat-hazards-earth-syst-sci-discuss.net/3/C1130/2015/nhessd-3-C1130-2015-supplement.pdf>

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 3, 2913, 2015.

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