Nat. Hazards Earth Syst. Sci. Discuss., 1, C1076–C1081, 2013
www.nat-hazards-earth-syst-sci-discuss.net/1/C1076/2013/

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Calibration of a real-time tsunami detection algorithm for sites with no instrumental tsunami records: application to stations in Eastern Sicily, Italy" *by* L. Bressan et al.

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Received and published: 4 September 2013

The authors are indebted to the reviewer Begoña Pérez Gómez for the important comments that will allow us to improve our paper. For each point, we answer her comments here below.

- Some mention to the effect of tide gauge malfunction in the algorithm performance in real time. This is perhaps something difficult to avoid and could generate false alerts. It should be mentioned however and, if possible, with some proposal of how minimizing this problem.

Tide-gauge malfunctioning is indeed something difficult to avoid, and a mention is going to be added in the revised text.
As for the algorithm development, we addressed already only the case of missing data, i.e. the case where the recording of the 5 s datum fails so that the datum isn't recorded. In this case, the algorithm waits till the next data is recorded and behaves differently accordingly to the amount of missing data: if the number of missing data is less than a pre-defined quantity, TEDA linearly interpolates the missing data, computes the TEDA functions and checks the alert conditions from the time of the first missing datum till the actual moment. In case the gap is too long, and the amount of missing data is above a pre-defined quantity, TEDA resets and starts computing TEDA functions as if in the beginning of a new series. In this case TEDA is fully operational after an initial time used to load TEDA functions.
The other malfunctioning that can happen is the recording of erroneous data, which TEDA cannot actually manage at this time of development and that are outside the scope of the present paper. We will mention this problem in the revised text.

- Sudden seiches may appear with the same magnitude or larger than small tsunamis, some mention to the response of the algorithm to these events should appear.

  In the revised text, a mention of the behavior of TEDA to seiches will be introduced.

- Pages 3 and 4: not very clear, step 1 in the second procedure: "creation of the background database by selection homogeneous records of sufficient length to cover most of the sea-level conditions from very calm to large perturbations", should be in fact common in both cases (with or without tsunami records), as this is independent of tsunami occurrences. It is not clear from the text why this is not also the first step in the first case. Expanding the database to include

the background signal especially in the temporal vicinity of the tsunami arrival (page 3, lines 60-61) seems obviously needed, but not enough for background characterization. I would re-write this step with the following text: “creation of the background database by selection of at least one year of homogeneous records with adequate tsunami sampling interval to cover most of the sea-level conditions from very calm to large perturbations”.

Yes, this passage is going to be better explained in the revised text. In particular, for Catania and Tremestieri, a two year time series has been used to test TEDA as a “background test”, and then four different background conditions have been selected for the test with the synthetic tsunami signals.

- Page 5, line 139: what is understood by real time here, when the alert is triggered? one second, five seconds, 1 minute?

  The station is not in operational stage now. Data are transmitted only upon request to the acquisition center, which occurs once or twice per day. This feature will not change in operational mode. However, it is foreseen that in operational mode TEDA algorithm will be run locally at the station level and only after alerts detection, alert messages and data will be transmitted real-time to the identified control center. The protocol for operation is not yet defined, but it is foreseen that alerts messages will be transmitted with no delay, while data can be packed and transmitted every 30 sec or every minute. These details will not be reported in the text, since we believe it is premature and can be released only after the final decision has been made.

- Page 5, lines 147-150: important aspect mentioned here of the effect of harbour works after the storm, could an example of the change of the signal be shown (the two spectra before and after, for example?)

  Yes, we can show the comparison of the two different spectra in the revised manuscript.

- Page 6: I find the description of the algorithm a bit difficult to read and follow: many acronyms and so on..One recommendation: a list of acronyms and a simple figure with the scheme illustrating how the algorihtm works, the window of data affected and so on.. It would help a lot.

  We will try to improve the explanation of the algorithm TEDA by adding a list of acronyms. We will introduce an easier scheme of TEDA in the revised text.

- Two methods are described to be run in parallel: the tsunami-detection and the secure-detection method. Are the alerts triggered when both of them detect the tsunami or may be that the alert is triggered with just one of them?

  The alert is triggered whenever at least one of the two methods triggers an alert. The text will be modified to make this point clearer.

- Page 11: lines 385-390: I don’t understand if the tsunami signals are synthetic and obtained with a tsunami propagation model how the co-seismic displacement of the land is reproduced.. Perhaps in this scenario you modify the bathymetry of the model? Could you please explain better this?

  Yes, the tsunami signals are synthetic and computed with the tsunami propagation and inundation model UBO-TSUFD. The model updates the bathymetry with the co-seismic deformation, and computes the tsunami propagation and inundation with the updated bathymetry (see Tinti and Tonini, 2013), so that a coastal area that subsides below the mean sea level remains inundated after the tsunami. In this case, the computed synthetic marigram (referred to mean sea level) would go from a sea-level of about -80 cm at time 0, because of the instantaneous co-seismic subsidence, to 0 cm at the end of the tsunami. Given that an hypothetical tide-gauge would be anchored to the subsiding coast, the marigram has been corrected to an amount equal to the co-seismic subsidence, i.e. from 0 to about 80 cm.
  This part is going to be better explained in the revised version.

Technical and typing corrections:

- pg.3, line 58: “a long record”instead of “a long records”.

  We will modify the paper as suggested.

- pg.5, line 143: “January 22nd, 2008”instead of “22 January 2008”. This affects to all the dates in the document pg.7.

  I followed the date and time conventions of nhess, http://www.natural-hazards-and-earth-system-sciences.net/submission/manuscript_preparation.html

- line 212: “t_{IS}=6,8,10,12,4”(I assume is 14 instead of 4?).

  No, it is 4 min. The case t_{IS} = 4 min was considered only after the others when we discovered that the best solution was found for t_{IS} = 6 min. We will change the case names in the text in order to provide t_{IS} values in ascending order.

- pg.11, line 365: “parent faults”instead of “parents faults”.

  We will correct it in the paper.

- pg.12, line 415: do you mean wind waves here?

  Yes, and we will introduce it explicitly in the text too.

- pg. 27, figure 8: window1,window2...not clear in this plot. Also I don’t understand the position of the letters C, R, C+b and S+b in the third plot...what does this mean? Better explanation of this plot in general..

  The figure is going to be better explained in the paper. The letters and the windows refer both to the different background conditions over which a tsunami signal has been superimposed.

- Table 1: specify what TDI is (not only in the text).

The explanation and the definition of TDI is going to be better explained in the text and in table 1.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 2455, 2013.