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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Tsunami arrival time detection system applicable to discontinuous time-series data with outliers" *by* J.-W. Lee et al.

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Tsunami arrival time detection system applicable to discontinuous time-series data with outliers, by Jun-Whan Lee, Sun-Cheon Park, Duk Kee Lee, and Jong Ho Lee, Nat. Hazards Earth Syst. Sci. Discuss., doi:10.5194/nhess-2016-153, 2016.

This paper describes a method for operational tsunami detection for the Korean tide-gauge of Ulleung-do. As pointed out by the authors, tsunami detection (and in general tide-gauge data processing) in real-time implies first to solve the problem of the management of data gaps and outliers. A method for outliers detection and gap-filling is implemented, together with three different algorithms for tsunami detection. The procedure is then tested on a month of data, which includes outliers, gaps and the signal of the 11 March 2011 tsunami.

The manuscript addresses an interesting and very important topic related to oper-

ational tsunami detection and warnings, obtaining interesting results. However, the manuscript has some weaknesses and it needs to be improved in several aspects, especially in the description of the algorithms. In my opinion, the manuscript needs to be revised in order to be published in nhess. To help the authors improve the manuscript, I am writing some comments and suggestions.

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Specific comments

The language is generally good, except some small mistakes. However, starting with paragraph 2.1, the explanations become very difficult. The outlier and the gap-filling algorithms are not clearly explained, several important information are missing (or postponed to the end) and therefore it is very difficult to read. The authors should make a further effort to better explain the algorithms in detail. The schemes provided are also too complex and do not help to make the explanation clearer (figures 4, 5 and 6). Some additional explanations come from the results and the discussion, however it would be better to anticipate them in order to understand what is being done. The acronyms and symbols are too much alike and it is difficult to distinguish them. It would be easier to give very different names to parameters according to the outlier, gap-filling or the three tsunami detection algorithms.

The explanations should also clarify the following issues and information:

Methods

* In the abstract, it is clearly stated that the authors would make use of the concept of the event period, which is however addressed only at the end, in the discussions, while the event time is already used in paragraph 2.2. Its explanation should be anticipated.

Outlier algorithm

* Is the short and long outlier detection algorithm the same? How is the difference in wave height between neighboring points computed? Is it the difference of wave height

of the time “now” with the previous datum? The 8-points window is used only to detect long-term outliers or also single outliers? * How does the outlier algorithm search for outliers? What does it mean that the algorithm is accelerated? Which is the stopping condition?

Gap filling algorithm

* The explanation of the algorithm lacks some important details, so that the algorithm method, especially LGFA, cannot be understood. * How long is n_LGFA? Please explicit it in the text. * What do you mean with target data? How are the target data first estimated? Or what are the target and search data? How are they used? Do you use the target data to look for data in the past that could fill the gap? It is not clear. * What is EPFM? What is the SWEP data? Some acronyms are not defined.

Tsunami detection algorithms

* The description of the SLOPE and TIDE algorithms are not very clear. In particular, the explanation and the reference to the algorithm TIDE is ambiguous, since it is a tool for harmonic analysis and tide prediction and not for tsunami detection. It should be explained more clearly how this algorithm is used to set up a tsunami detection. * How is it used the tsunami detection index? Why is it computed? It should be explained before the end of the results.

Results

* The results for outlier detection are here presented as a list of figure descriptions. It should be better to give a general explanation of the algorithm performance and use the figures as examples. * The outlier algorithm seems very strict: from the few data shown, I would not mark the data in figure 7(h) or 7(g) as outliers, or even the data in 7(d) or 7(e), especially if the same data patterns happen often in the time series, as it could seem in figure 7(f). To discriminate outliers, it would be better to inspect time series longer than a month, in order to safely tell if the data shown are outliers or not.

Where is the Ulleung-do tide-gauge located? Have you considered the possibility that some of the data shown are long period waves of about 5 cm height, which could be common in harbors or bays? * Regarding the gap filling algorithm, the explanation of how the performance tests were computed is missing (page 7, line 24-25). It would be interesting to see the performance of gaps shorter than 3 h.

Discussions

* Some explanations should be anticipated, some other information are repeated from the introduction. In particular the explanations on how the event time works should be anticipated. * I understand that so far only earthquake generated tsunamis could be detected, since the event time is triggered only by earthquake information and, without the activation of the event mode, there is no tsunami detection. Is this correct? This requires further discussions. * There is some confusion about travel times and travel time delays. The sentences at page 9 lines 27-28 is not correct (“tsunami travel time delay is found ... This delay is caused by ... Watada et al, 2014”). Did you mean to take into account the propagation time of tsunamis? * How is the alarm rate and the TDI rate defined in the sensitivity test?

Additional remarks

* Tsunamis can be generated by earthquakes. The term earhquakes should be preferred to seaquakes. Also terrestrial landslides is not correct: landslides that start over the land and fall in the water to generate tsunamis are usually called subaerial landslides. * Page 3, line 6: The descriptions of the literature algorithms need to be more rigorous, for example please check the description of the algorithm by Beltrami and Risio 2011. * Table 3 is never mentioned in the text. * Figure descriptions could be better explained. * In the introduction, a broader view of the situation of tsunami detection and automatic data-processing could be addressed, with the more recent developments. For example, new technologies have been introduced, and worldwide and European tsunami warning systems are being developed, together with automatic

data-processing algorithms.

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