Nat. Hazards Earth Syst. Sci. Discuss., 1, C151–C154, 2013
www.nat-hazards-earth-syst-sci-discuss.net/1/C151/2013/

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Automated classification of Persistent Scatterers Interferometry time-series" *by* M. Berti et al.

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Received and published: 26 April 2013

Thanks to the Anonymous reviewer for the constructive comments. Here is our reply.

Reviewer: The proposed method is novel and seems useful, but the reviewer fails to find any accuracy assessment of the proposed methodology. The reviewer is curious to see, for example, the commission and omission error for each category regarding the classification result. It seems that, for instance, type 0 and 1, along with type 2 and 3, can be very possibly misclassified. In consequence, the reviewer strongly asks for adding the accuracy assessment in the "result" section.

Reply: The paper is probably not sufficiently clear about this point. We performed a careful quantitative analysis to assess the accuracy of the proposed methodology. This

work is described in the last paragraph of section 2.2 ("Calibration of thresholds in statistical tests") and in section 3.2 ("Calibration of statistical thresholds"). The point is that in our application the "calibration analysis" directly provides an "accuracy assessment". In fact, the classification of PS time series is obtained by applying a sequence of conventional statistical tests whose reliability is well documented in the scientific literature, and do not require any additional validation. What is needed instead is a proper calibration of the statistical thresholds. For instance, let's assume that the ANOVA test for the significance of the linear regression is applied at a given time series, providing a probability value =0.02: if we use a statistical threshold =0.05 (level of significance=5%) the time series will be classified as uncorrelated (type 0), while using =0.01 (level of significance=1%) the time series will be classified as linear (type 1). There is no "right" or "wrong" outcome in the statistical analysis, everything depends on selected level of significance. Therefore, as discussed in section 2.2, the statistical thresholds must be adjusted to the specific needs since they depend on many factors (quality of the dataset, number of temporal scenes, purpose of the analysis). For this reason we performed an accurate calibration of the thresholds used in our dataset. We compared the result of the automatic and manual classification of 1000 PS time series using the Receiving Operational Curve method, in order to find the values that provide the best correlation with the expert judgment. In the revised manuscript we will explain this issue in more detail, to make clear that the method is correct but that the reliability (accuracy) of the results heavily depends on a proper choice of the statistical thresholds.

Reviewer: Page 218, line 11: Currently the toolboxes cannot be downloaded from the provided link. The reviewer asks for a trial of the toolbox (may be the test version, can be provided with the temporary link in "the response to reviewers") so as to test its functionality.

Reply: The download link is now active.

Reviewer: Page 222, section "Spatial clustering": The reviewer suggests to consider the following article regarding the spatial clustering of PS for landslide detection, so

as for the section of “introduction”: LU P., CASAGLI N., CATANI F., TOFANI V., 2012. Persistent Scatterers Interferometry Hotspot and Cluster Analysis (PSI-HCA) for slow moving landslides detection. International Journal of. Remote Sensing. 33(2).

Reply: Thanks for the reference, we missed this paper. In the revised manuscript we will refer to this interesting work both in the Introduction and in the “Spatial clustering” section.

Reviewer: Page 226, line 7: Why it is necessary to adjust the frequency peak to zero? What if the whole area is actually in the movement? The reviewer suggests considering the stability of the reference point.

Reply: We adjust the frequency peak to zero to remove the bias in the dataset. Of course this must not be done if the whole are is actually moving and PS velocities are unbiased. However, the example presented in the paper (and shown in Fig. 14) refers to a large area located in the Northern Apennines of Italy (about 2000 km2) where an overall movement +1.15 mm/year that affect slopes, valley floors, and plain areas is not realistic. The data supplier guarantees the stability of the reference point, but this is not the point. Regardless of the reason for the bias (stability of the reference point, residual error from the atmospheric correction..) the example in section 4.2 is given to point out the importance of removing systematic errors from the dataset, since even a small bias in the data may provide misleading classification of the time series. This point will be better explained clearly in the revised manuscript.

Reviewer: Page 232, Fig. 1: Some trends are not so “typical” as described, for example, why type 0 is uncorrected but not classified as linear? Similarly, why type 1 is linear but not uncorrelated? Such confusion can be also found with type 2 and 3. As a result, corresponding statistics needs to be provided here to justify each type of trend.

Reply: The same comments reported in the first reply can be applied here. However, in the revised paper we will add the results of the statistical tests (probability values and related statistical thresholds) within each plots shown in Fig. 1. This should help

the reader to understand that time series classification directly depend on the selected statistical thresholds.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 207, 2013.