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Interactive comment on "Multi-temporal landslide activity investigation by spaceborne SAR interferometry: Polish Carpathians case study" *by* Kamila Pawluszek-Filipiak et al.

Anonymous Referee #2

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The authors have the data, but do not take a good advantage of them. In particular, they should show InSAR displacement time series to better demonstrate the state of activity of the studied landslides. What is new in the study with respect to many (tens or even hundreds) other similar studies that used InSAR for landslide assessment? Why is your study important? The authors closely follow some papers published several years ago, largely outdated. There is nothing new in that, unless the authors would like to focus on the problems and provide a critical assessment of these kind of simplistic approaches. However, this requires considerable landslide expertize and good knowledge of local slope processes, which, I'm afraid, the author may not have. So, I think, to bring out some novelty they need to re-focus on the application limitations and on some

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potentially interesting aspects of the study (see below).

InSAR results look OK. However, the assumptions regarding their use need to be better justified, limitations clearly acknowledged. The use of some rather arbitrary “thresholds” appears improper. Therefore, some of the interpretations and conclusions are questionable. The manuscript is poorly organized, includes repetitions (for example, between part 1 and 2). Sloppy, even the sections and subsections of the manuscript are incorrectly numbered. Citations thrown in a haphazard fashion, often not representative or useful. Poor English.

Detailed comments

Abstract – should improve. What are the relevant scientific questions you are trying to address??

1 Introduction This part includes some information about PSI technique that should be moved to part 2 Materials and Methods

At line 51-72 In recent decades, new methods for updating landslide inventory maps – too long, too many and outdated references.

At line 65 Commonly used methodology in the abovementioned papers is the PSI matrix approach with diverse SAR sensors, where specific thresholding of the landslide velocity, acquired from specific PSI processing, are performed. – OK, but this belongs to Materials and Methods

Objectives – I suggest to focus more on the limitations and some potentially most interesting aspects of the study, that is: âĂćEvaluating the effect of SAR geometry delivered from ascending and descending orbits from ALOS PALSAR and Sentinel 1 and the sensitivity to measure deformation over the study area; âĂć Evaluating the difference in landslide activity updated from three diverse data stacks, namely: L-band (ALOS), Cband with one satellite (Sentinel 1A, with a revisit interval of 12 days) and C-band with two satellites (Sentinel 1A and 1B with a revisit time of 6 days), respectively; âĂć

(New) Exploiting displacement time series for landslide activity/intensity assessment.

2 Materials and Methods This part mixes the description of the study area with the methods and includes unnecessary information like: This region is rural and, thanks to the breathtaking landscapes, the population has grown rapidly in recent decades. Moreover, it is also attractive to tourists.

At Line 106: landslide distribution within the study area as well their predefined activity states. – what do you mean by predefined?

2.1.1 Geological and hydrological settings of the study area No hydrological information is included, while different names of formations and units are thrown in and these are nowhere shown.

2.1.2 Landslide types and distribution (note that this section is repeated twice)

The landslide activity in the study area is mostly associated with hydro-geological conditions such as rock stratification and precipitation. These conditions created favorable conditions for landslide activation. – poorly written

Most of the landslide scarps within the study area lead down to valley floors – not clear

2.1 Radar data and PSI processing (page 6)

At line 177 Therefore, exploitation of C-band (Sentinel-1) and L- band (ALOS PALSAR) data can bring more advantages, especially in rural areas (Lu et al., 2018). – seems like an incorrect reference as the work is about land deformation in Changzhou city and uses InSAR data sets from 2006 to 2012, that is before Sentinel-1

2.2 PS post-processing phase (page 7)

After PSI processing, all results for the five diverse data sets have been post-processed in order to retrieve the most adequate displacement information – not clear what you mean by the most adequate, for what?

2.2.1 PS suitability analysis (page 7) – need to shorten as the information is already available in the literature

At line 204 Therefore, conversion of LOS deformation into the most probable direction (direction of maximum slope), by assuming a pure translational movement mechanism, is commonly used (Bianchini et al., 2012). – hopefully not so commonly, as, for example you also have rotational or combined rock-debris slides in your study area. This need to be explained.

2.2.2 PS velocity projection along the steepest slope (page 8)

At line 232 Despite the great advantage of the motion represented in the slope direction, this projection has some limitations. First, when β=90o, Vslope goes into infinity. Here we followed Herrera et al. (2013) and selected an absolute maximum value of β=72° - dangerous to talk about great advantage. Then, why should the approach by Herrera et al be good in your case?

2.2.3 Velocity thresholding for activity state estimation - PSI based matrix approach (page 8)

At line 247 For the LOS velocity, distribution is almost normal (Gaussian), while for SLOPE is second negatively skewed as a result of the PS reduction (Bianchini et al., 2013). Therefore, for activity state estimation, we applied 5 mm/yr as the Vslope threshold. – not very clear. Why 5mm/yr? What is your measurement precision?

At line 251 Four diverse activity states have been determined (Fig. 5): (1) reactivated = active after being inactive, (2) active continuous = currently moving, (3) dormant =inactive, but possible to be reactivated and (4) stabilised = not active anymore. – You have InSAR data and should show displacement time series to clearly demonstrate the state of activity of your landslides. For example, are they continuously moving?? I doubt. Don't some of them stop in a dry season or winter?

2.2.4 Landslide intensity estimation (page 9)

3. Results (page 9) 3.1 Landslide activity state and intensity map generation – part of this section belongs to the previous one (2 Methodology).

At line 271 However, the activity state has been presented only for landslides where sufficient PS points have been found. At least four PS points within a landslide body were set up as the threshold. – why just four PS? I know that some authors you cite have indicated and used (also their followers) this arbitrary threshold, but is it scientifically sound? You may not justify its use.

3.2. Possible hazard assessment (page 10) - part of this section belongs to the previous one (2 Methodology). However, why do you call it hazard assessment??? You are trying to assess possible damage. Moreover, please check the thresholds proposed by Mansour et al. (2011) really apply in your case and explain the limitations. At line 304 Landslide with velocity below 10mm we classified as landslide with minor expected damages. – questionable use of the threshold that can lead to dangerous interpretations. What if your landslide accelerates? And if t moves 9 mm/yr for 10 or more years?

3.3 Field validation (page 11) – again, part of this section belongs to the previous one (2 Methodology). However, what do you validate in the field? You make some inferences based only on some simple observations. Moreover, you when to the filed 10 years after the ALOS data were acquired, and 1-few years after the acquisition of Sentinel data. Need to explain.

Figures Fig 1 (and others) – lack of coordinates; incomplete caption

Fig 2 - > 60 geological units with no explanation, sending the reader to a supplementary material? You need to group them by similar lithology, with reference to the susceptibility to landsliding

Figs 4-6 Who needs to see these figures?

Fig 6 – Present or historical PSI data? Not clear what you mean.

Fig 7 – overlapping colors, hard to see what is going on.

Fig 8 – Landslide intensity scale or simply velocity scale?

Fig 11 – wrong choice of color for the landslide area, as some PS have the same or very similar color

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