Reviewer 1	Location	Answer
General Comments:		
The manuscript you have submitted for publication provides a good insight on the information that is provided by SAR coherence and NDVI for the detection of areas affected by a landslide. In general, your work is well structured but is missing significant information in some sections of your article. *The methodology section does not fully present the proposed methodology, and also the conclusions section does not summarise your findings and no future work/steps are provided to fill the gaps of your current work. Calibration/validation of your results and/or methodology is also not provided in the article. This is critical to confirm your findings.* *Moreover, references need to be added in many parts of your work. Some examplesare provided in the attached pdf. Additionally, the tense that your article is writtenshould be passive, i.e. "it was tested" rather than "we tested". Some minor spellingmistakes are also noted in your article. Your figures needs some changes and alsomake sure that they are cross-referenced in the text (e.g. Figure 1)Please see in the attachment a comprehensive list of changes comments within thetext of your manuscript.*		Thank you for your comments. We have expanded several sections significantly, with a particular focus on the discussion, including adding the suggested, and other, references. A particular focus was put on describing future research questions and challenges. We are not sure exactly what is expected in terms of calibration or validation, since we make no attempt at mapping the landslide in our work. We have elaborated on this in more detail below. With regards to the tense of the the writing, we consider the passive voice in academic writing appropriate only in select cases, and chose to keep the majority of this paper written in an active voice. This is in accordance with, for example, recommendations made by Nature (https://www.nature.com/nature-research/for-authors/write). We hope to have addressed all spelling mistakes and have updated several of the figures.
Specific comments		
Term early warning in title is not justified. Maybe detection or monitoring is more appropriate. Additionally, you should add "case study" to the title. Suggestion: Radar coherence and NDVI ratios as landslide detection indicators. The case study of Mud Creek landslide in California	Title	We have changed the focus of the study to focus more on the time-series analysis of these indicators, and have therefore adjusted the title to: *Time-series analysis of radar coherence and NDVI ratios to characterize landslide activity: a case study from the Mud Creek landslide, California*
Add references	Line 23	We have added a paragraph describing the challenges of InSAR (and will add additional references): *Radar, while able to image the ground surface during all lighting and weather conditions, can be rendered useless in areas of steep topography due to its oblique viewing geometry and the resulting layover (the compression of a large area into only few image pixels) and shadowing effects (Wasowski & Bovenga, 2014; Hansen 2001). The amount of measurable ground deformation is also dependent on the viewing geometry, since radar instruments only measure the component of motion in line of sight (Massonet & Feigl, 1998). Further difficulties include the relative nature of radar measurements, making it necessary to know or assume a stable location where there is no deformation (Wasowski & Bovenga, 2014), as well as the fact that radar measurements are 2 pi wrapped, limiting the unambiguously measurable displacement to one quarter of the radar wavelength. The wrapped nature of the data requires that radar measurements are unwrapped to derive the actual displacement in meters rather than radians (Massonnet & Feigl, 1998; Chen & Zebker, 2002). This process is computationally expensive and phase unwrapping errors can mask the full displacement (Wasowski & Bovenga, 2014). Additionally, in order to reliably measure ground displacements, the wave scattering properties of ground targets must remain stable between two radar measurements. This similarity is expressed with the coherence metric (Zebker & Villasenor, 1992).*
Add more references (Tzouvaras et al., 2020 https://doi.org/10.3390/rs12101560 ; Ohki et al., 2020 https://doi.org/10.1186/s40623-020-01191-5; Jung and Yun, 2020 https://doi.org/10.3390/rs12020265)	Line 36	Thank you for pointing us to these very timely publications. The Ohki et al., (2020) and the Jung and Jun (2020) references in particular are relevant to our work and we have included these references.
Add more references (Rocca et al., 2000 https://doi.org/10.1023/A:1006710731155)	Line 37	We have added this and other references.

Add more references (same as above)	Line 44	See comment above. We have also included information from Ohki et al., (2020) and the Jung and Jun (2020) in the text to better reflect the current state of reseach.
Add proper map with coordinate frame, north arrow, scale, loacation in world	Line 55ff	Thank you for noticing that we did not reference the first figure in the text. We believe that it shows all the necessary content (we've added a few additional notes to outline the size of the landslide and added a scale bar and north arrow).
us --> used	Line 79	Thanks for catching that, we corrected this typo accordingly.
change to radar coherence	Line 80	Thanks for noticing the editing mishap. The sentence now reads: *In this study we used SAR data from ESA's Sentinel-1A and 1B satellites to perform a traditional InSAR displacement analysis and to compute the radar coherence.*
Add references	Line 81 ff	We have added more citations
Add cross reference in text	Figure 1	Good catch, thank you. We have now referenced the figure in the description of the study site.
Add a rectangle showing extents of area affected by landslide	Figure 1	We have zoomed in on the area and hope that this is even more useful than an outline.
Add references	Line 86ff	We have added more references.
More recent research is available on this topic. These references can also be used to explain the displacements results that are lower than expected. Wasowski and Bovenga, 2014 https://doi.org/10.1016/j.enggeo.2014.03.003 Manconi et al., 2018 https://doi.org/10.3390/rs10050672 Tzouvaras et al. 2020 https://doi.org/10.3390/geosciences10060236	Line 95	Thank you for noticing the incorrect description of the threshold for unambiguously measureable displacements. We have corrected this error and added addtitional references. We also have elaborated more on the question of unwrapping errors in the discussion.
Explain why you haven't used Sentinel-1A and Sentinel-1B to reduce revisit time to 6 days	Line 97	We did indeed use both Sentinel-1A and 1B, but this does not lead to a repeat time of 6 days in this part of the world. We have clarified the use of both in the text: *In this study we used SAR data from ESA's Sentinel-1A and 1B satellites to perform a traditional InSAR displacement analysis and to compute the radar coherence.*
Please specify the type of DEM you used	Line 105	We used the 1/3 arc second DEM provided by the USGS. This is the hightest resolution, seamless DEM available for the coterminous United States. Various data sources can go into this product: https://www.sciencebase.gov/catalog/item/4f70aa9fe4b058caae3f8de5. We have specified this in a bit more detail in the text as: ...the highest resolution seamless DEM available for the conterminous United States (downloaded from: \url{https://viewer.nationalmap.gov/basic/})
What is that threshold. You define it later on, specify here too and explain why this threshold is appropriate supporting it by references	Line 110	We have described this in more detail and justified why the different thresholds are necessary. There are no references for the threshold we use in the ratio analysis because, to our knowledge, there are no prior applications of this technique. We will add additional references to support the statement about the coherence threshold of 0.2 to 0.3 that is typically used in InSAR processing.
You need to explain the displacement calculation methodology further to justify your results	Line 112	We are not entirely sure what this comment refers to, but hope that in addressing the following points, we manage to address this request.

Why is that. Explain and add appropriate references	Line 114	A coherence threshold of 0.2 - 0.3 is typically used for InSAR analysis. If a large area is analyzed, pixels below that threshold can sometimes be masked. But coherence also provides important information the reliability of the information in an individual interferogram. The decision of whether or not to include any given interferogram in a time-series analysis is frequently based on visual inspection by the user, and poor quality interferograms are removed manually. In the spirit of reproducibility, we decided to define a threshold, rather than make a manual selection. We have clarified this approach in the methods section as follows and will add additional references as well: *Decisions about the quality of an interferogram and the reliability of the data for time series analyses are usually based on radar coherence. For individual interferograms, pixels with a coherence of less than 0.2 - 0.3 are often masked. Images with low overall coherence are usually omitted from InSAR time series analyses. This selection is often based on visual inspection and performed manually (e.g., Handwerger et al., 2019). To increase the reproducibility of our work, we experimented with a set coherence threshold to filter out poor quality interferograms. Because our area of interest is small relative to the size of the interferogram, mean image coherence over the entire interferogram is a poor indicator for the data quality in the landslide area. Instead, we calculated the mean coherence for each interferogram within just our area of interest and only retained images with a mean coherence above a defined threshold (0.35 for the displacement analysis and 0.5 for the coherence ratio analysis; see details below). We then computed time series of displacement, radar coherence ratio and amplitude ratio from all the retained images.*
Why do you chose this specific point? What are it's characteristics? You need to explain in detail in your methodology as the selection of a moving point can affect your results significantly.	Line 114/115	We chose a point that is well outside the landslide and in an area that experienced no apparent deformation. To clarify this, we have also plotted the mean displacement of a 9x9 cell area around the reference point (~30x30m) and explain in the text: *We selected a point west of the landslide as our stable reference region. This area is the same geologic unit, its vegetation cover is representative of the larger area, and it did not fail in the landslide. A preliminary displacement analysis also suggested it had not experienced any significant deformation.*
Add more specific NDVI threshold values for various types of soil.	Line 146	We are not entirely sure what this comment referes to, since NDVI reflects vegetation growth, not soil types. However, we have added additional details about typical NDVI values; *Typical values for dense, healthy vegetation are around 0.6, values for bare ground or minimal vegetation are typically below 0.2 (Carlson, 1998).*
No calibration/validation of your results is presented. This is critical as your findings are not confirmed by any means. See work from Burrows et al, 2019; Tzouvaras et al., 2020 https://doi.org/10.3390/rs12101560	Line 154	Thank you for this input. We are not sure what type of calibration or validation you are hoping to see. Both Burrows et al. (2019) and Tzouvaras (2020) use ROC analysis to assess how well co-event coherence loss can be used - in various ways - to map landslides (on in the Tzouvaras case, just one landslide). In our work we make no attempt at mapping the landslide. We realize that our original title was somewhat confusing in this regard, and hope that our refocusing on the time-series analysis alleviates this concern. Instead, we try to understand how **pre-event** coherence changes can be interpreted to understand landslide activity. Unlike all other authors, we do not use co-event image pairs. An additional analysis to use the pre-event time series of coherence ratio to map the landslide is beyond the scope of this work, but we have adressed this issue in the conclusions section.

Discuss your results further. Why did InSAR failed to detect the deformation to its full extent? Did soil moisture due to rainfall affect the results? Is it due to the acceleration of displacement? See the references I provided in row 95	Line 155	We have added some extra information describing the unwrapping errors in the results section and now discuss these in detail in the discussion.
Add scale and north arrow. Change the color of the white line.	Figure 5	Excellent points. We have added a north arrow and length scale and made the white line black.
Why is that? Explain further. How do you remove the effect of rainfall/soil moisture to isolate the surface change due to the landslide? Additionally, from bibliography there is coherence drop with increasing temporal baseline between SAR acquisitions. Check and analyzse your findings better.	Line 169	Thank you for pointing out that we had not made it clear that the temporal baseline does not matter int his approach, because both the reference hillslope and the landslide experience the same drop in coherence, therefore the effects cancel out. We have highlighted this in several places in the manuscript. For instance, we have added the following statement to the methods section: *The advantage of the ratio calculations is that it cancels out any environmental factor that affects the hillslope and the landslideequally. Therefore, any deviation from a ratio of 1 indicates changes ongoing on either one or the other.* And, more specifically with regard to the radar processing: *This calculation is advantageous because it eliminates the effect of coherence loss due to increasing temporal and spatial baselines, regional-scale atmospheric disturbances, or vegetation cycles. Because these factors are expected to affect the larger region, any deviation from a ratio of 1 indicates varying behaviors between the landslide and the surrounding hillslope.*
Some text from the discussion should move to conclusions section which is rather poor. Future steps, ways to overcome problems you encountered etc.	Line 188	We have added additional information to the conclusion and discussion sections. See comment below.
You should add more references:Wasowski and Bovenga, 2014https://doi.org/10.1016/j.enggeo.2014.03.003Manconi et al., 2018https://doi.org/10.3390/rs10050672Tzouvaras et al. 2020https://doi.org/10.3390/geosciences10060236	Line 198	We have added additional references, including Handwerger et al., 2019; Manconi et al., 2018; Dai et al., in review.
This can also be justified on seasonal change of vegetation	Line 224	The change in NDVI actually cannot be explained by the seasonal vegetation cycle, since it is the *ratio* that is steadily declining, not the NDVI itself. This means that relative to its surroundings, the vegetation on the slide is declining. This is also shown in Fig. 8, where the NDVI in the slide area clearly deviates from that of the surrounding hillslope, indicating that it is no longer following the typical seasonal vegetation cycle. We have corrected titles of Fig. 6 and 7 to say "NDVI ratio", to ensure that this has not lead to the confusion around what the NDVI points are showing.
You should try to eliminate any interference of vegetation, soil moisture (reflectivity) from your final results. You should also add some future research in your conclusion section.	Line 229	We are not aware of any method that alows us, at this point, to definitively exclude any given factors. The goal of this work is to examine the information that can be gained from these different measures. If we eliminate the effects of soil moisture and vegetation dynamics, we exclude factors that are important for landsliding. However, we make an attempt at bringing our results and conclusions together in a more concise manner.

This section needs significant improvement as it doesn't summarize your work nor refers to any future work/research to improve findings further.	Line 250	Thank you for highlighting this. We have added the following information to the conclusions section: *In particular, the ratio calculation between the surrounding slope and the landslide eliminates interference due to temporal coherence loss, atmospheric disturbances, or vegetation cycles. Our analysis also indicates that this type of analysis can fill data gaps in places where data from only one orbit are suitable for deformation measurements. Nevertheless, questions around whether it is possible to fully disentangle the different factors leading to the pre-failure coherence loss and how common this kind of signal is for different kinds of landslides remain to be resolved. Similarly, it is worth investigating how the presence of more or less vegetation and use of different radar wavelengths influence the results. We also believe that it could be possible to automatically identify drastic drops in radar coherence ratios and NDVI ratio decreases, suggesting that this tool could be used to identify impending failures.* In addition, we have elaborated further on some of these points in the discussion.