<u>General Comments</u>

I think this is a very valuable subject for study, and I think that the authors have done the subject justice in this comprehensive and thoughtful manuscript. The work is coherent and well-reasoned throughout, with consideration of the multiple stakeholders that use InSAR data and specific areas where the authors show they have considered how this data may be processed and communicated ethically. The abstract is clear and covers the aim, results, and most of the important implications of the study. The manuscript is well-structured and easy to read throughout; the authors write fluently. Figures are easily understandable and clearly illustrate the relevant points in the manuscript, while the tables give a good summary of the meaning behind and application of different InSAR products. Well done to the designers, and to all involved in this study!

I have a couple of suggestions to make that I hope will further improve the quality of the manuscript. First, the abstract highlights the current challenge in communicating uncertainties with these data. I think this is an important and interesting challenge, but in the manuscript this section was shorter than I'd expected. It appears in the Conclusions, which references Figure 8c that specifies users strongly desire uncertainties included in future products. Do you have more information as to what uncertainties these might include? Adding 1-2 sentences of greater detail on uncertainties would bolster these conclusions – and given you end the abstract with them, they do feature quite prominently to a reader.

The second suggestion I would make would be to include a short section on the limitations of this study. I was surprised to not find any mention of the limitations of using Twitter in the first place. As the authors note, Twitter is used extensively by academic and industry scientists, and scientists in this study express that they want to communicate these data with non-scientists (i.e., outreach). But how much is Twitter used by these non-scientists? Exploring what platforms are used by these stakeholders should **obviously** not be added to this manuscript – it's another study entirely. Given that at least some of your colleagues (e.g., in Ethiopia) consider general education about the potential of satellite radar in volcanology to be important, I think there's scope to mention how Twitter is used only by some stakeholders (for instance, civil protection in the place I work in often use Instagram and Facebook for communications). Including a section on study limitations could also include a brief consideration on misinformation related to communication of InSAR data. I am uncertain as to how big a problem it is, but certainly misinformation around other volcanic hazards shared on social media. If your results do not give any evidence to contribute to the discussion on misinformation around InSAR data, perhaps it would be worthwhile to signpost the possibility of misinformation so that it might be explored in a subsequent study.

My third suggestion is regarding Sections 2.4 (Data: COMET Volcano Deformation Portal) and 3.2.3 (Results: Engagement with the COMET Volcano Deformation Portal). These sections are fascinating and I think deserve more attention. However, I see a certain challenge in that the participants in each of these sections are relatively few (10 respondents in Section 2.4, and two responses in Section 3.2.3). Furthermore, they constitute a different kind of engagement to Twitter, in that responses and feedback are much more individual. I think the barriers to uptake of satellite data you present in Table 2 is very valuable, and I would like to see the engagement with this portal and future directions explored in more depth than what is

presented in Section 3.2.3. With all that said, I recognize that this paper is already long at 31 pages, and that adding more detail to Sections 2.4 and 3.2.3 would make it even longer. Do you have enough data to present these sections as part of a separate, shorter second paper? That would be my recommendation. I think it would have the dual benefit of honing the focus of this excellent paper and giving sufficient space and respect to the interesting but too-short results presented in these two sections.

<u>Specific Comments</u>

COMET Volcano Deformation Portal and LiCSAR portal – AMAZING that these tools are out there, and that they are being used to engage with countries with active volcanoes worldwide!

Lines 125 – 128: these are very important and interesting questions. I read these as questions you might be answering in your study, and so was a little put out that they didn't appear again. Could you perhaps add a sentence to clarify that these are not the research questions you will be answering in this study but will instead be answered in another paper?

Line 137: I think it's very interesting that you have distinguished in-reach from outreach, to see how much data moves outside the bubble. Great! Suggestion to add "… and the types of data that are communicated *in each case"* to emphasize that you will be studying the different data types for in-reach vs outreach.

Line 146: on excluding retweets: I imagine this reduces the dataset to a manageable size, but do you then remove the possibility of exploring misinformation through images attributed to other events? I don't think you should add in data RTs, but I suggest that you could signpost the possibility of exploring retweets to identify a direction for future studies – that is, if misinformation is an issue for InSAR data communicating natural hazards (it certainly is for other types of data relating to volcanic hazards).

Line 155: "(2) the tweeters of the top ten most retweeted tweets." Congratulations on this excellent tongue-twister.

Lines 155 – 156: I find the wording of this pretty confusing. Can I clarify: *"top ten InSAR tweeters, (1) ranked by number of tweets, and (2) the tweeters of the top ten most retweeted tweets"* – I read this to mean that (1) are the ten accounts with the largest number of tweets in your study period, and (2) the accounts from which the ten tweets with most RTs come from during our study period. Is this correct? If not, I would suggest rewording to make this clearer.

Line 184: starting when in 2020 for Wordpress?

Line 185: can you suggest a reason why the two are not directly compatible?

Line 210: what language did you send the questionnaires in? Please specify in text.

Lines 214 – 215: the number of volcanoes … amazing! Was this Guatemala? I hear a different answer every time I ask.

Table 2: I think this is an excellent table. Thoughts:
- Is there any significance to the different colours of the table columns? White looks like scientific problems, grey like capacity or resources. Please explain the difference in your table caption.
- This is perhaps my ignorance, but "automated processing" to me reads as building capacity for automated processing within institutions themselves. Wouldn't this require more computing capacity and high-speed internet, which you state is outwith the capacity of these institutions? Would "ready-processed and analysed data" be a more precise way of describing what you mean? (I lifted this from your text, which I think describes the challenges neatly.

Lines 414 – 418: very, very interesting about the large difference between Ecuador and Ethiopia about the use of the portal – former in-reach (QC) and latter, outreach. I would love to read more about this, especially if and how you plan to continue seeking feedback from portal users and then implementing it. However, as I mention in my General Comments, this seems to be a different direction from the majority of the paper. Perhaps consider removing this section and sending to another one.

Lines 502 – 504: "*We consider regular communication of volcano portal updates to be a better strategy than automatic direct social media responses to eruptions or unrest, due to the potential for eclipsing or distracting from the official communications from local volcano observatories and civil protection*." – this is a very thoughtful and responsible stance for doing ethical science. Congrats!

Lines 514 – 527: "*Overall, InSAR Twitter was orientated towards natural hazards and specifically disaster or event response, rather than preparedness or disaster risk reduction, which reflects the current affairs nature of the Twitter platform (Petrovic et al., 2013; 515 Murthy, 2011; Acar and Muraki, 2011).*" – this is very interesting, and as I wrote in the General Comments, I think it's important to consider that people involved in preparedness or DRR do not use Twitter as their primary platform. I think your following sentence: "*It would therefore be useful to investigate the links between data dissemination, knowledge building over Twitter, and local event response to determine the specific applications and benefits to disaster 525 management (Figure 12)*" is very valuable. Have you ever seen a study that does this? If so, I would recommend referencing it here. If not, I think you could include this as a Recommendation. Perhaps after your recommendations for LiCSAR development and InSAR communications, you could include this as a separate Recommendation for integrated communication of natural hazards? It would be a highly valuable but complicated and intricate study.

Technical Corrections

- **Line 59:** "in addition *or* anthropogenic signals" – should be "to", perhaps?
- **Line 74:** "towards or *award* from the satellite" – should be "away", perhaps?

- **Line 126:** "consideration for teams that remote to the event" – add "are" before "remote"
- **Line 174:** "*though* acceptance of Twitter's user terms" – should be "through"
- **Line 175:** "Tweets" – lower-case
- **Lines 246 – 248:** you're missing a bracket to close the "(this …"
- **Line 359:** remove comma after "interferograms"
- **Line 440:** remove comma after "particularly"
- **Line 536:** "offer *one* mechanism" – this is ambiguous – what is that mechanism? Or do you mean the threads are the mechanism? In which case, I'd switch the "one" to "a".