Review of egusphere-2023-2489

In the manuscript “A new tool for the estimation of Ground-Based InSAR acquisition characteristics before starting installation and monitoring survey”, Wolff et al. present a software tool to estimate different acquisition characteristics of GB-SAR installation sites based on a Digital Elevation Model of the study area. The motivation behind is to provide a tool to find the best installation location of the GB-SAR, in the case that several potential sites are available. The best installation site depends on the geometrical resolution, image distortions and backscatter intensity. They test the tool with a synthetic and two real study cases.

While I think that such a tool can be quite helpful to GB-SAR users, I think that the paper should not be published without major revisions. Below, I provide general and specific comments and suggestions for improving the manuscript that should be addressed prior to publication.

Major concerns:

- Various descriptions / visualizations / statements in the manuscript are incorrect:
    - In Figure 1, the authors visualize the emitted signal of satellite SAR systems as waveforms with uniform frequency. This is incorrect. Satellite SAR systems emit frequency modulated signals in order to achieve a fine slant range resolution after pulse compression.
    - P5, L94: “The duration of one sequence of frequency variation is also called pulse length τ and is linked to the BW by the following equation ..”. First, sweep duration or sweep length instead of pulse length is commonly used to describe the length of a frequency sweep of FMCW radars. Furthermore, the equation does not hold true! The inverse of the sweep duration equals the smallest measurable frequency shift for FMCW radars, and the time resolution corresponding to this frequency resolution is the inverse of the bandwidth. The latter is implicitly made use of in Equation 5.
      I guess you mixed this up with pulsed frequency modulated radars, for which the effective pulse length (after pulse compression) is the inverse of the chirp bandwidth.
    - P5, L101: “The range resolution is inversely proportional to the real antenna length L_real”. No, not the range resolution but the azimuth resolution is inversely proportional to the antenna length!
    - Figure 2: The incidence angle for the satellite case is not the sum but the difference of look and slope angles.
    - Figure 3: As I understand it, the yellow cells are supposed to visualize the distortion within the specific acquisitions. Furthermore, I am interpreting shrinked cell sizes in Y-direction as a result from foreshortening in the radar images. If this is correct, why is the cell size in Y-direction decreasing along the Y-axis in (d)? Actually the foreshortening would decrease with increasing look angle along the slope. Also i don’t understand what the following in the Figure caption means: "distance between two horizontal lines increased along Y due to an increase of the range resolution" Actually the range resolution is getting better (means smaller resolution) along Y, isn’t it? Lastly, It seems that the satellite SAR image is distorted in X-direction, showing as increased X cell sizes in the center of the image. Why is that?
      Maybe I’m misinterpreting the figure, however in that case the figure should maybe be reconsidered.
    - P8, L136: “The satellite InSAR image footprint is thus rectangular”. How is the shape of the satellite SAR footprint related to the azimuth resolution? Also on the contrary, you write on P4, L78 “The radar footprint on the ground is an ellipsoid”
    - Figure 7: how can omega_2 be smaller than omega_3? Also alpha_3 is larger than alpha_2.

- Conclusion: i think the usage of the proposed tool should be motivated and promoted better in the conclusion.. including that the tool is able to identify shadow areas and foreshortening etc for different radar positions, which is helpful to know beforehand.

  The advice given here regarding placement of the GB-SAR for large area monitoring is not a new finding of the paper, and determining the distance of the GB-SAR to the area of interest is not a difficult task, you don’t necessarily need your tool for that. I think the focus here should be much more on the real advantages of using your proposed tool.

- P9, L158: “A good balance between an acceptable resolution and backscattered enough signal must be found (Figure 6a, b)”.You describe that the maximum distance at which the GB-SAR can be deployed is 4-5 km, and that radar parameters have to be adjusted with regard to the distance. How do you choose these parameters in practice? Are you testing different parameters and comparing the results? Or are there specifications in the GB-SAR manual? Have you thought about including in your tool a rough estimate of the backscatter intensity of the point of interest with regard to the radar position, in order to find the appropriate radar parameters at a certain distance. Then the range resolution can be automatically updated with this information.

- The structure of the manuscript and also the formatting in certain cases make it difficult to read. Some examples:
  - P17, L307: The following paragraph is completely redundant, as the necessary input parameters and handling of the tool has already been described in Section 3.2.
  - P16, L292: Section 3.3.3 consists of only one sentence, which is not good practice.
  - P8, L137: Why is this sentence in bold letters and centered?

- I find the manuscript to suffer from poor usage of the English language. Proofreading by a native speaker would improve the reading of the manuscript considerably, I believe. Some examples:
  - P2, L48: "...consisting in a radar measuring head translating along a rail."
  - P4, L84: "...the amplitude of the signal sent must be important to reach the Earth surface and to be backscattered with enough intensity to be recorded by the radar receiver"
  - P9, L159: ".. backscattered enough signal.."
  - P10, L174: "A good monitoring is when the information related to this SoI is distributed in the maximum of pixels in range and not compressed only in a few ones"
  - P13, L226: "… middle of the area …"
  - P22, L371: " … the radar image is affected by an important foreshortening …"

Minor comments:

- P1, L24: "..it was dedicated". It is still, inter alia, dedicated to studying small movements phenomena. So usage of "has been dedicated" would fit better in my opinion.
- P4, L62: Section 2.1.1 I think it's confusing why range and azimuth directions are not introduced for GB-SAR here.
- P4, L69: "Those angles" In my opinion, it's not good practice to refer to the paragraph title like that.
- P5, L92: "signal emitted is of lower intensity". Compared to what?
- P5, L94: Figure 1e and 1g should be 1f and 1h, respectively.
- P10, L182: The table and its contents could be explained in much more detail, e.g. why the detected displacement is lower than the real displacement.. this can be, by the way, the case in every radar acquisition geometry.
- Table 3: Different font sizes used here
- P14, Equation (9): Formatting..
- P14, L251: " … should encompass the instable area to monitor." Shouldn't be some stable area also be included as reference?
- P15, Eq. 19, dLos in [Rmin,Rmax] .. does this definitively hold true in case of local topography? Or is the "mean plane" used here?
- P17, L296: What's the "mean plane"? Hasn't been introduced before.
- Table 5: dLos of synthetic test should be 200m, I guess. Furthermore, how can dlos in case 3 be outside of the range limits?
- Table 6: i did not get why is there a difference between the dLoS in Table 5 and Table 6?
- P26, L411: LoS is usually referred to as a vector or direction, not distance.
- Figure A: Colorbar labels of foreshortening and distance maps are mixed up
- Figures A/B/C: As I understand it, the foreshortening degree should be without unit? Instead of given in degrees..
- P35, L572: gradientm?
- P36, L623: Where was this published?