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Dear Referee,

Thank you for the positive review. We modified the manuscript accordingly to yours comments and answered your questions below.

Yours sincerely,

O. Cavalié, F. Cappa, and B. Pinel-Puysségur

**1.** *About the structure of the manuscript. The authors follow a structure of InSAR method – InSAR measurements – uncertainty – creep modeling, with methods, results, and discussion together. If possible, I suggest reorganizing them into Methods, Results, and Discussion*

It seems important to us to separate the observations from the modelling. Actually, InSAR measurement are facts and show clearly the ongoing subsidence of the airport platform at least since 1992 (date of the first ERS SAR images) and probably since the late 1970s when the platform was built. The noise analysis allows also to understand the accuracy of the measurements. The modelling part is thus fed by the robust InSAR measurements and it seems logical to introduce InSAR and Modelling one by one.

Understanding the deformation is more complex because it requires a detailed knowledge of the platform underground. Such work has been done in few papers cited in the article, but it can't give the full picture. Moreover, models are always a simplified view of reality, although modelling is the only way to have an idea about how the airport deformation will develop. Thus, it was important to add a modelling section (that we didn't do in Cavalié et al. (2015)). But, we think it's important to keep separate from the observations.

Finally, our discussion/conclusion brings face to face observations and modelling to elaborate some recommendations about how to handle this particular situation where a critical infrastructure might be at risk.

To summarize, I would not group InSAR and modelling methods under one section.

**2.** *The authors used the Heaviside step functions for reconstructing the time series. Why this function was chosen? Are there some other functions that can also be applied in this situation? Some information/discussion can be added.*

InSAR measurements have been computed from three independant datasets (corresponding to 3 different satellites generations : ERS, Envisat and Sentinel-1) with no overlapping periods. So direct measurements cannot give the offsets from one time series to the following one (red dots on the figure 3d of the paper). To simulate the 2 "artificial" offsets (between ERS and Envisat, and between Envisat and Sentinel-1), the Heaviside step is the most natural way (and standard way) to do. But it is only to simulate the offset due to the lack of overlap between time series. Otherwise, we assume a logarithmic evolution of the subsidence.

**3.** *Similar to the above comment, why viscoelastic Burger's model was used? Are there some other models appropriate to this study area? Some information/discussion can be added.*

See the response to a similar question of the reviewer 1:

Soils and rocks can exhibit creep behavior, which is the development of time-dependent strains at a state of constant effective stress (Bland, 1960; Findley et al., 1976; Jaeger and Cook, 1979). Creep behavior influences the long-term stability of grounds and movement of slopes. This time-dependent material behavior exhibits viscoelastic or viscoplastic characteristics that can be reproduced with different creep models of increasing complexity depending on the type of material and loading conditions (Jaeger and Cook, 1979). Several constitutive laws have been introduced in the past to study creep and this still is an active field of research in the rock physics labs and geophysical field studies.

Creep is the tendency of solid material to deform permanently under certain load that depend on time and temperature. Typical creep process has three phases which are primary creep (creep rate decreasing over time), secondary creep (constant creep rate) and tertiary creep (increasing creep rate until failure) as shown in Fig. 5a.

In this work, tertiary creep is not modelled. We used the Burgers model, composed of a Kelvin model and a Maxwell model (Jiand and Wang, 2022), which is well adapted to accurately describe the characteristics of the primary and secondary creep stages (Jaeger and Cook, 1979), a behavior representative of the surface displacement measured by InSAR on the airport platform. A number of research works have previously demonstrated that this creep model was successfully used to model deformation of soils and surface displacement of landslides (You et al., 2013; Liao et al., 2022)

**3.** We also modified the manuscript according to your comments.

- L2: done
- L5: ok
- L7 : ok
- L12 : we changed the sentence.
- L18 : done

- L23: done
- L34: done
- L49: we replaced "Indeed" by "And"
- L56: done
- L57-58: we agree that it sounds strange and we removed this sentence
- Line 76: Yes you did understand it properly. The mass was dropped from the top of a crane. I doubled check the reference and it turns out that it is 23 m and not 22 m... I corrected the number in the manuscript.
- L84: We changed "Since" for "Since then"
- Caption Figure 2: we change the sentence by adding "image pairs processed into"
- L108-109: Resolution in raw SAR images are different for range and azimuth axis and also depend on the satellite. For ERS and Envisat, SAR images have a better resolution in azimuth (by a factor 5) compared to range. On the contrary, Sentinel SAR images have a better resolution in range (by a factor 4) compared to azimuth. So, if we want a ∼square ground pixel, we need to add extra multilooking in the better resolved direction.
- L119: ok
- L145: Spatially, pixels can be affected by different sources of noise. One type is due to the distribution of scatterers inside a resolution cell (or pixel) and of their temporal evolutions. In this case, the noise is really pixel dependent. For example, if vegetation grows between the 2 SAR acquisitions or if the ground get eroded, the pixel coherence will decrease and the measurement will be more noisy. On the contrary, pixels on urbanized areas usually show a low noise level as the scatterers (roads, buildings) inside a pixel do not change between the acquisitions. Therefore, it would not make sense to study the noise level of the interferograms in the hills nearby the airport as vegetation and erosion are two factors that will increase the noise content of those pixels compared to the pixels located on the airport platform. Moreover, wave delays in the atmosphere are also heterogeneous and thus impact pixels differently. Studying the noise of the area of interest is thus better if it is possible.
- L160-161: we agree and completed the paragraph
- L190: This is the uncertainty we estimated previously (Figure 4).

## References

Cavalié, O., Sladen, A., and Kelner, M.: Detailed quantification of delta subsidence, compaction and interaction with man-made structures : the case of the NCA airport, France, Nat. Hazards Earth Syst. Sci., 15, 1–12, https://doi.org/10.5194/nhess- 15-1-2015, 2015.