Reviewer #2

The paper illustrates the analysis strategy of GNSS data in the eastern portion of the Alpine arc, including a broad network of permanent stations. The procedures are well reported and the results are significant and valuable for tectonic studies and slow deforming processes investigations. All the outcomes are publicly available and well documented. I would strongly recommend the publication with only a few minor revisions and a general english editing to enhance readability.

We thank the Reviewer for the interest and for the constructive comments. We revise the manuscript accordingly, and we address the comments as follows.

Detailed comments:

Minor revisions:

Row 79-81: This sentence is rather generic and does not give details on your approach. I would suggest to either delete it or to better explain some terms, i.e. what kind of "slight bias" or "parameter" may compromise the quality (define which one). Or focus on your particular choices that should minimize the error sources.

We shall remove this redundant sentence and move the previous one at the beginning of the last paragraph of Section 1 “Introduction”.

Row 198-199: It is not clear if the data processing considers only GPS observations or if it includes other constellations. Please detail this here.

We shall specify that we process GPS data.

Row 215: What does “old receiver” mean? Are they single frequency receivers? Please add more details.

These stations are equipped with double frequency receivers. Initially we thought that the problem was due to the old receiver types but we verified that the problem persists also with the new receivers installed recently. Therefore, it seems an issue related to the way the network manager generates the RINEX. After many attempts, we managed to process the data coming from these stations using LC_HELP function of GAMIT/GLOBK. Anyway, we continue investigating how to solve this problem.
We shall modify the text accordingly.

Row 233 and 378: The Helmert transformation as proposed by the authors is rather peculiar, not alligned to EUREF standards in which only no-net-translations are imposed, please justify your choice.

To obtain position time series (Reviewer’ comment on row 233), we use both translation and rotation (instead of only translation), as done in recent studies from Herring et al. (2016) and

Serpelloni et al. (2022). We do not explicitly use scale to avoid potential absorption of height signals.
However, we made a further test using just translation, and results show negligible differences in the time series (see Figure below), with a standard deviation of the order of 0.1 mm in the horizontal components and of 1 mm as a maximum in the vertical component. Furthermore, the RMS of the time series also shows no significant variations when using or not the rotation in the reference frame realization. This further proves the robustness of our solution.

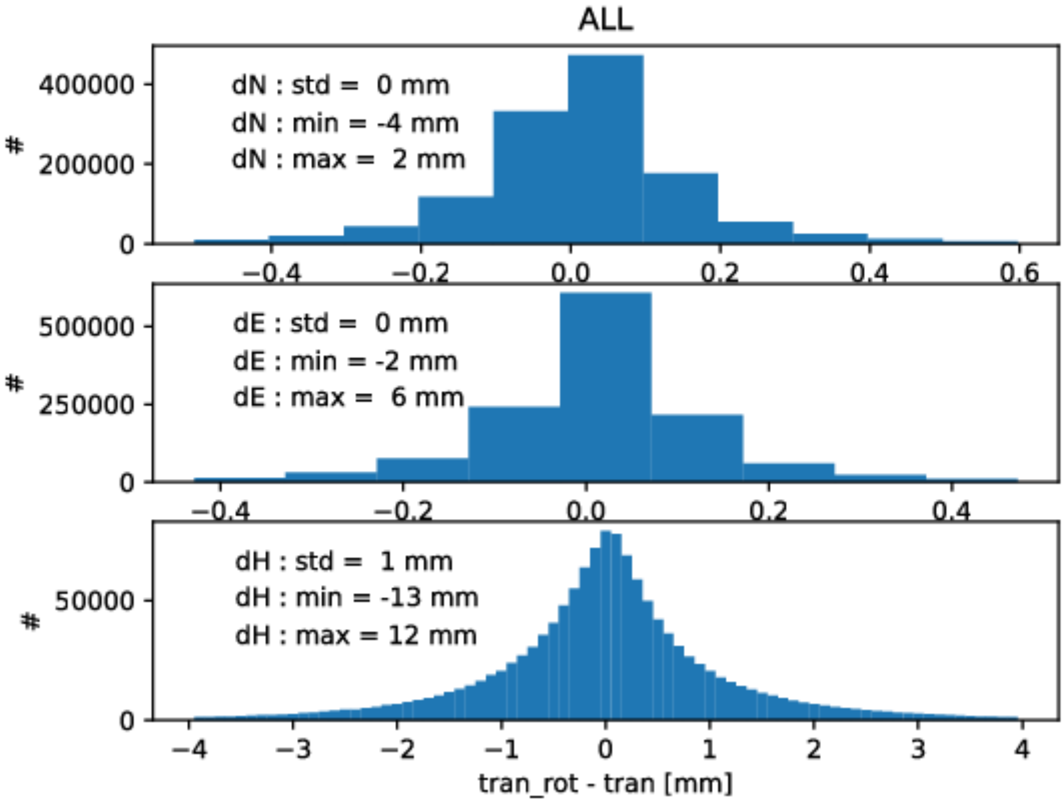

Figure: histogram of the differences between the daily position of all sites computed with translation and rotation and the daily position computed only with translation. The differences are shown for each of the components: from above to the bottom: N, E, and Up.

Regarding the velocities computation, as reported in the EUREF documentation (available at the link https://epncb.oma.be/_productsservices/coordinates/#methodology) "*The EUREF reference frame solution is a multi-year position and velocity solution computed with the CATREF software (Altamimi et al., 2007). The positions and velocities are aligned to the IGb14 reference solution under minimal constraints using 14 transformations parameters (translations, rotations, scale and their rates) on a selection of IGb14 reference stations*.". We do follow the same approach, except for the scale parameter: we consider translation and rotation and their rates. We do not explicitly use scale to avoid potential absorption of height signals, following Herring et al. (2016).

We shall rewrite the paragraphs cited by the Reviewer to make them clearer.

Row 244-250: This paragraph should be revised, try to better clarify what steps you did to get velocities. e.g.

1) it seems that you combine (in time domain?) daily solutions to get velocities: this is not clear enough.

2) you state the need to estimate both rotations and rotation-rates independently of EOP. It is not clear what data do you use as input in the estimation process.

3) Is the velocity/position estimated using least squares or kalman filtering?

Row 249: what solutions? velocities? positions? not clear.

Row 250: time series and velocities? are you really recomputing time series? not clear

We shall rewrite the paragraph cited by the Reviewer to make it clearer and answer the Reviewer's comments on row 244-250. We shall modify the paragraph as follows:

"To compute the velocity field, we use the forward-running Kalman filter implemented in the GLOBK module, in which the state vector includes the positions and velocities for each station (Herring et al., 2016). The input data are the daily loosely constrained solutions, as they may be freely rotated and translated, thus eliminating the need to include EOP in the state vector, and their full variance-covariance matrices. Following Herring et al. (2016), from the analysis of the previously generated time series, we retrieve the list of outliers to be excluded from the computation and the site specific parameters to model the stochastic noise on the station positions. At each epoch, the Kalman filter updates positions and velocities. With the aim of reducing the computation time, we divide the stations into sub-networks using netsel. We use a nominal number of 90 stations for each sub-network and the noise model obtained from the time series analysis. First, we estimated the velocities and positions of the stations included in each sub-network. Then, we combine the solutions obtained for each sub-network in a single solution. At the end of the forward Kalman filter run, we align positions and velocities to the IGb14 reference frame using twelve parameters Helmert transformation (rotation, translation and their rates). Velocities of stations within 1 km distance (including differently named stations at the same location) are equated in this reference frame realisation. Finally, we recalculate the time series and velocities using the values obtained in the previous iteration as a priori coordinates and expand the list of reference stations to include all the stations with random walk values lower than 0.5 mm2/yr. As reported by Herring et al. (2018), the time series that best represent the final velocity solution are those computed considering all stations in the solution as reference sites. We also express our solutions relative to the Eurasia plate as defined by Altamimi et al. (2017) plate motion model (ETRF14 reference frame) using the same procedure adopted for IGb14."

Figure 10: A few velocity vectors don't show the arrowhead, why? Please explain in the caption, at least.

The Reviewer is right. It is a problem with GMT options. We shall modify the figure to draw all the vectors' arrowheads.

I also uploaded the manuscript pdf file with a number of text editing corrections.

Thank you for your kind help. We shall modify the text accordingly.