

## ***Interactive comment on “Present-day surface deformation of the Alpine Region inferred from geodetic techniques” by Laura Sánchez et al.***

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Manuscript: Sánchez et al., Present-day surface deformation of the Alpine Region inferred from geodetic techniques

The authors present a kinematic representation of the Alpine region obtained from a large, but not complete, network of GNSS stations. They process and analyze GPS and GLONASS data and estimate the constant (secular drift) velocity field of more than 300 points across the Alps. The data processing sounds fine and aligned to the highest geodetic standards. The results are well exposed and displayed. The time series cover the time span from 2004 to 2016, would expect that they were up to date. I understand that such analysis are time-consuming but it's a pity that new geodetic solutions

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turn up to be already "aged". Another point that I would raise is the completeness of the GNSS network, there are plenty of public stations on the Italian side of the Alps that are missing in this study: the SPIN, Piemonte-Lombardia network (28stations, [www.spingnss.it](http://www.spingnss.it)); the Veneto network (30stations, [retegnssveneto.cisas.unipd.it](http://retegnssveneto.cisas.unipd.it)); the TPOS, Trento network (11stations, [www.tpos.provincia.tn.it](http://www.tpos.provincia.tn.it)); the STPOS, Bolzano network (9 stations, [www.stpos.it](http://www.stpos.it)) and the RING, INGV ([ring.gm.ingv.it](http://ring.gm.ingv.it)) network. As a matter of fact, there are many dozens of more stations available in the Alpine region, this will certainly downgrade the value of the results. The manuscript is fluently written and the findings and scientific issues are clearly stated. I strongly suggest to add all available data to their analysis, at least for future releases.

Abstract: adequate, all findings are well detailed, a little lengthy.

Introduction: relevant, good references and complete.

Geologic and tectonic framework: excellent scheme focused on the Alpine and surrounding regions

Distribution of the CO-GNSS stations: The authors collect a huge number of GNSS stations in the region but I do not find any RING station of the INGV permanent network in Italy (<http://ring.gm.ingv.it>). Their GPS data are publicly available since 2015, the network covers the Italian peninsula and extends in the Po plain and alpine region, where about 20 stations are located in the region of interest. Nor other existing public GNSS data are considered (see complete list above) I'm wondering why those data are neglected in the current work, they should be included in such a review analysis.

Analysis of GNSS data and determination...: Figure 4 (caption): BOLG time series, it is stated that the blue vertical lines represent seismic events, please indicate location and magnitude of those events. Which events did occur in 2005 and 2009 near Bologna? Are these really seismic events occurring nearby?

4.3 Velocity solution: (line 9 page 10) to me the stated shortening (0.5-1 mm/a) is

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underestimated, probably 1-2 mm/a is more appropriate looking at the velocity map, could the author strengthening their estimates with plots showing velocity projections along the given directions? After reading line 20 on page 14, I'm persuaded that the numbers should be somehow supported by supplementary velocity profiles.

(line 11 page 11): it is stated that the orogenic gravitational movement is slower than GIA, but in the following lines the authors concluded that the GIA effects are negligible. So what is then uplifting the Alps? I would suggest to re-state the sentence (line 11) in order to not contradict the final conclusion.

5.1 Least-squares collocation (LSC) approach: (line27, page 13) I would suggest to compare the eurasian euler pole with the original ITRF2008 pole, given in: Altamimi, Z., L. Métivier, and X. Collilieux (2012), ITRF2008 plate motion model, *J. Geophys. Res.*, 117, B07402, doi:10.1029/2011JB008930.

5.2 Horizontal deformation model: The authors should compare their results also vs. Devoti et al., 2017 that publish a recent velocity solution for the entire Mediterranean region, the reference is: Devoti et al. (2017), A Combined Velocity Field of the Mediterranean Region. *Annals of Geophysics*, 60 (2), doi:10.4401/ag-7059.

(line 3 page 14): please label the Periadriatic line in the map (at least in figure 1).

(line 17and19, page 14) the 6-16 longitude span seems too wide (entire region), probably the authors would like to indicate a narrower zone, please check the longitude limits. Figure 12: I appreciate a lot the uncertainty map in this figure, it well supplement the associated estimates.

Typos line 8, page 8: plus/minus character is lacking on the horizontal and vertical thresholds

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