

Interactive comment on “3D GPS velocity field and its implications on the present-day postorogenic deformation of the Western Alps and Pyrenees” by Hai Ninh Nguyen et al.

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Answers to reviewer #2:

R#2: “This paper investigates the usage of vertical GPS velocities for crustal deformation of the Western Alps using a large dataset of continuous sites in France and Spain. The paper presents a careful methodology for analyzing the time series derived from the GPS processing and the uncertainties treatment is well explained. The paper is well written and the illustrations support the manuscript. I have only one main comment related to discussion of the paper: The authors proposed (in the introduction) the question, whether slow tectonic motions below 1 mm/yr, can be resolved. However, in the discussion nor the conclusion of the paper there no clear answer to this question.

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I suggest a development of the discussion to what extent should we trust the vertical derived velocities from GPS? and how this extrapolates to other areas than the Alps. I think this can provide a good impact to the paper.”

A: To follow up on this question in the introduction, we have added an answer in the discussion and a suggestion to further improve our accuracy on the deformation patterns of the study region in the future: “The dispersion of the horizontal velocities (Figure 7) and vertical velocity versus altitude correlation (Figure 10) show that we can resolve sub-millimeter horizontal and vertical velocities in the Alps and the Pyrenees. Furthermore the independent result obtained with leveling in the Western Alps (Nocquet et al., 2016) shows that the uplift motion on the order of 1mm/yr is significant. Strain rate computation (Figure 8) suggests consistent patterns such as E-W extension in the Western Alps. However, these rates ($\sim 1 \times 10^{-9}$ yr⁻¹) are not significant and only denser networks with careful analysis of local coherent patterns will allow to tell whether this pattern is true or not. Combining the continuous and survey GNSS networks in a single homogeneous reprocessing could achieve this.”

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