

# Reference Frame of GPS-PPP Solutions in Marmara Region-Turkey

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## SUMMARY

Monitored displacements/velocities consist of “rigid body displacement” and “deformation”. The rigid body part (rotation and translation) depends on the reference frame with which the coordinates are defined whereas the deformation part is independent from the frame definition. GPS Precise Point Positioning (PPP) has been important in positioning studies since it does not need simultaneously operating reference points on the field. It has been shown that the PPP is an alternative positioning technique in deformation analysis with respect to the relative positioning. To estimate the deformation parameters such as engineering strain and shear, it has been shown that the PPP technique gives similar results with the relative positioning. However, the rigid part of the monitored displacements/velocities from PPP is not clear since it is relative to a geocentric reference frame. In tectonic regions, the definition of a specific reference frame of the coordinates is important as much as monitoring the changes itself. In this study, we compared the GPS-PPP displacements with the Bernese v5.2 Eurasian-referenced displacements in 8 GNSS stations located at the central part of the Marmara Region belonging to the ISKI-CORS network in Turkey. For the period 2018-2021, four separate 7-day data sets were analyzed. The APPS online data processing service were used to perform the analysis. From the numerical results, we observed that the differences between both solutions were statistically insignificant in terms of north, east and up components. This result shows that the PPP can be performed directly to have Eurasian-referenced north, east and up displacement/velocity components as defined in nearly all tectonic studies of the region selected. However, it may not mean that this is valid for all parts of the Marmara Region. The reference frame of the PPP solution in this region will be fully examined in further studies having included long-term data of different points in different locations of the region.