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#### [Volume XL-2](#)

Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XL-2, 173-177, 2014  
www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XL-2/173/2014/  
doi: 10.5194/isprsarchives-XL-2-173-2014

## Enhanced model for precise point positioning with single and dual frequency GPS/Galileo observables

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Keywords: GNSS, PPP, GPS, Galileo, Single frequency, Dual frequency

**Abstract.** This paper introduces a newly developed model for both single and dual-frequency precise point positioning (PPP), which combines GPS and Galileo observables. As is well known, a drawback of a single GNSS system is the availability of sufficient number of visible satellites in urban areas. Combining GPS and Galileo systems offers more visible satellites to users, which is expected to enhance the satellite geometry and the overall positioning solution. However, combining GPS and Galileo observables introduces additional biases which require rigorous modelling, including the GPS to Galileo time offset (GGTO) and the inter-system bias. This research introduces a new ionosphere-free linear combination model for GPS/Galileo PPP, which accounts for the additional errors and biases. An additional unknown is introduced in the least-squares estimation model to account for the additional biases of the GPS/Galileo PPP solution. It is shown that a sub-decimeter level positioning accuracy and 20% reduction in the solution convergence time can be achieved with the newly developed GPS/Galileo PPP model.

[Conference Paper](#) (PDF, 1042 KB)

Citation: Afifi, A. and El-Rabbany, A.: Enhanced model for precise point positioning with single and dual frequency GPS/Galileo observables, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XL-2, 173-177, doi:10.5194/isprsarchives-XL-2-173-2014, 2014.

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