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The effect of modernized GPS and Galileo in the theoretical limits of the precise point positioning

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The modernization of the Global Positioning System (GPS) and the advent of the European Project Galileo will lead to a multifrequency Global Navigation Systwm (GNSS). Single GNSS receiver observations could be used to estimate smoothed pseudoranges which, in turn, can be exploited to better estimate the absolute position of the receiver and its clock correction. In fact, if we consider the satellite ephemerides and satellite clock corrections as perfect quantities (i. e. not affected by errors), the adjustment of GNSS positions is broken down into single receiver adjustment. In addition, the least squares (LS) theory leads to a feasible adjustment in two steps, where covariance matrices can be explicitly written, studied and propagated from one step to the other, so that a rigorous solution is finally obtained. In this work, the presence of a third GNSS frequency in the precise positioning is analyzed. In particular, this work deals with the analytic representation of the above mentioned LS procedure and provides theoretical limits for the achievable accuracies in different scenarios.