

Reducing the effects of multipath in high-rate GPS analysis: evaluation and implementation of modified sidereal filtering

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In order to improve the accuracy of high-rate (1-Hz) displacements for geophysical applications, it is necessary to reduce systematic errors such as multipath. Modified sidereal filtering (MSF), where time series of high-rate GPS time series are shifted by the satellite orbital repeat time, has been shown to significantly reduce multipath errors. This study investigates the frequencies and repetition of multipath in high-rate GPS time series in order to maximize the effectiveness of MSF. Specifically, we examine the interplay of GPS satellite orbital repeat periods (theoretical, average, and true repeat values) and multipath frequencies on the most effective time shift for MSF. Implementation strategies are discussed and shown for a group of 1-Hz GPS receivers operating in southern California. This technique is flexible and significantly reduces positioning noise at both short and long periods (20-1000 sec).