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Evaluation of ambiguity resolution and multipath reduction in real time and post-processed kinematic relative positioning

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GNSS kinematic relative positioning has an essential importance to support several applications. For navigation, a real time positioning (RTK) is necessary. However, for other applications and for researches, a post-processed mode can be very useful and allows better results.

In order to obtain high accuracy, the involved errors, that are not removed in the double difference (DD) process, like multipath effect, have to be mitigated. The multipath effect prejudices the GNSS observables and the ambiguity resolution, mainly due to the movement dynamic, that causes abrupt variations of the survey geometry.

In the RTK, it is interesting to solve the ambiguity resolution as soon as possible. But for post-processed positioning, in a first step, it is better to perform the processing resolving the ambiguity only in the last epoch. In a second step, it is possible to re-process the data constraining the fixed ambiguity, when it can be solved, depending on the multipath error. In several applications, the ambiguity resolution can not be performed with reliability. But even the ambiguity being not resolved, its precision at the last processed epoch is much better than it was in the beginning. Thus, it will be discussed about the improvement obtained constraining this float ambiguity with better precision and reprocessing the data. In all presented processing modes, the multipath effect has to be mitigated. In this sense, this paper will present the possibilities of multipath reduction for the RTK and post-processed positioning using Multiresolution Analysis (MRA) by wavelet techniques. There are different strategies to perform

this method for each processing mode. The problems, advantages and disadvantages of all involved processes will be discussed in the paper.

Some experiments were carried out in the kinematic mode using a vehicle with known movement. Some objects were placed surrounding to cause multipath effect. The MRA were applied and the results were compared to evaluate the wavelet performance in correcting the multipath effect. The results showed improvements, mainly for the pseudorange observable.