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Online monitoring of alpine slope instabilities with L1 GPS Real Time Kinematic Positions

Zhenzhong Su (1), Alain Geiger (1), Philippe Limpach (1), Jan Beutel (2), Tonio Gsell (2), Bernhard Buchli (2), Stephan Gruber (3), Vanessa Wirz (3), and Felix Sutton (2)

(1) ETH Zurich, Institute of Geodesy and Photogrammetry, Switzerland (zsu@ethz.ch), (2) Computer Engineering and Networks Laboratory, ETH Zurich, Switzerland , (3) Department of Geography, University of Zurich, Switzerland

Real time (RT) monitoring the kinematic displacement of moving landforms is of great interest to geologists and geomorphologists. Differential GPS carrier phase processing is able to compute real time kinematic (RTK) positions with an accuracy of several centimeters. The accurate kinematic position means better temporal resolution compare to static daily solution. Cost-effective L1 GPS units make deployment of higher density network affordable, which means better spatial resolution. Moreover, the real time capability is critical in the context of early warning scenarios.
In this work, we present an online system for monitoring of alpine slope instabilities developed in the framework of the X-Sense project. First, a short introduction about the system will be given, from RT data transfer to RT GPS data processing and the online visualization of results. Second, we demonstrate the real time solutions and we show that GPS signal delay induced by None-Line-of-Sight (NLOS) propagation (like diffraction and reflection delays) is the major error source degrading the accuracy of computed RTK positions in short baseline process. For static stations, we model the error based on the solutions of previous days, and use the model to correct present and future solutions. For stations in motion, we propose to make use of carrier-to-noise ratio (C/N0) to appropriate dilute or correct NLOS error. By doing so, the standard deviation and especially the maximum deviation of computed RTK positions are significantly reduced.