Here, we show the feasibility for the real-time estimation of coseismic displacements, within a few centimeters in accuracy level, using a stand-alone dual-frequency GPS receiver through a variometric approach.

This approach, named VADASE (Variometric Approach for Displacements Analysis Stand-alone Engine), is based on the time single-differences of carrier phase observations collected at a high-rate (1Hz or more) using a stand-alone receiver and on standard GPS broadcast products (orbits, clocks). First, the time series of epoch-by-epoch displacements are estimated. Then, provided that the collected observations are continuous, they can be added over the interval (limited to a few minutes) during which an earthquake occurs.

Since the proposed approach does not require either additional technological complexity or a centralized data analysis, in principle it can be embedded into the receiver’s firmware, thereby providing a significant contribution to tsunami warning systems.

The effectiveness of VADASE was proven using simulated and real data. In this last respect we analyzed 1Hz data recorded by the IGS station BREW during Denali Fault, Alaska earthquake (Mw 7.9, November 3, 2002), as well as the 5 Hz data collected by some of the stations of the UNAVCO-PBO network during Baja, Mexico earthquake (Mw 7.2, April 04, 2010).

VADASE results were compared with those obtained with other known real-time and post processing strategies; agreements within a few centimeters were achieved.

VADASE was awarded at the European Satellite Navigation Competition 2010 (http://www.galileo-masters.eu/) with DLR Special Topic Prize and with the First ESNC Audience Award.