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LZERO: GNSS cost-effective real-time positioning applied to landslide monitoring

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The Global Navigation Satellite Systems (GNSS) provide a globally extended dataset of primordial importance for a wide range of applications, such as crustal deformation, topographic measurements, or near surface processes studies. However, the high costs of GNSS receivers and the supporting software can represent a strong limitation for the applicability to landslide monitoring. Low-cost tools and techniques are strongly required to face the plausible risk of losing the equipment during a landslide event.

Centro di Ricerche Sismologiche (CRS) of Istituto Nazionale di Oceanografia e di Geofisica Sperimentale OGS in collaboration with SoluTOP, in the last years, has developed a cost-effective GNSS device, called LZERO, both for post-processing and real-time applications. The aim is to satisfy the needs of both scientific and professional communities which require low-cost equipment to increase and improve the measurements on structures at risk, such as landslides or buildings, without losing precision.

The landslide monitoring system implements single-frequency GNSS devices and open source software packages for GNSS positioning, dialoguing through Linux shell scripts. Furthermore a front-end web page has been developed to show real-time tracks. The system allows measuring real-time surface displacements with a centimetre precision and with a cost ten times minor than a standard RTK GPS operational system.

This monitoring system has been tested and now applied to two landslides in NE- Italy: one near Tolmezzo municipality and one near Brugnera village. Part of the device development has been included inside the project CLARA 'CLOUD platform and smart underground imaging for natural Risk Assessment' funded by the Italian Ministry of Education, University and Research (MIUR).