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Sediment budgets and monitoring of erosion processes in the Roubine experimental catchment - ORE Draix - using high resolution terrestrial laser scanner (LiDAR)

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A monitoring of topographic changes of the Roubine catchment has been performed since 2007 with terrestrial laser scanner (LiDAR) in order to quantify the volumes of eroded sediment at the scale of elementary gullies. The Roubine catchment (0.13 ha) is located in the experimental research station of Draix (South French Alps) in the black marls formation that is particularly prone to weathering processes. These badlands feature high sediment supplies and heavily loaded flash-floods. LiDAR data have been acquired alternatively with an Optech ILRIS-3D and a Leica ScanStation 2 ensuring an accuracy of less than 1 cm for both distance and position. Topographic changes over a period of 2 years are quantified at the centimeter scale by comparing the different series of point clouds data. The Roubine catchment is monitored since 1983 with different measuring devices (meteorologic station, water and sediment discharge, solid transport). Volumetric sequences of erosion rates can be compared with volumetric measurements performed on a sediment trap and a gauging station located at the outlet of the basin. They yield to information on bedload/suspension solid transport and catchment hydrogeomorphic response to low and high intensity rainfalls. The topographic analysis reflects the mechanical and structural features of the hillslope controlling sediment supplies and transport through the development of small gullies. The analysis of the series of high resolution point clouds enables to observe slope erosion processes at the scale of the elementary gully (seasonal channel network development and collapse, sediment supply through erosion, deposition, and shallow mass movement). This study completes a 25 years period of erosion process analysis in this catchment by combining long-term observation of this elementary hillslope with seasonal high resolution topographic data.