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Portable laser topographic profiler for the evaluation of gully volumes

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Gullies are some of the most important sediment sources in the semi-arid environment, which cannot be documented sufficiently through measure conventional methods due to the high cost and effort for the continous evaluation of large areas. In this work, a laser device has been designed for measuring in short time intervals, numerous cross sectional areas of gullies.

It presents the following components: a laser distance sensor, a motor, a microcontroller with a compact-flash memory and a lithium battery which are connected to an only electrical circuit into a light metacrilate box of 19 x 7 x 8 cm. The data are unloaded to the PC through an USB connection. The measures are carried out through the movement of the laser sensor from the motor, at steps of 1.8 degrees until an angle of 180 degrees is completed. The 100 distance measures for each cross sectional area are stored in the memory while a PC interface allows to build the profile and to measure the section. The volume of gullies is determined after including the distances among the cross-sections (obtained from GPS surveys).

The cost of the device has been about 2000 euros. The accuracy of the distance checked in the laboratory has been equal to $\pm$ 5 cm, which has to be considered to evaluate the error in the calculation of the gully volumes.