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Opportunities provided by UAVs to monitor erosion processes in agricultural catchments: a case study from Northern France

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In erosion studies, accurate spatio-temporal data are required to fully understand the processes involved and their relationship with environmental controls. With cameras being mounted on Unmanned Aerial Vehicles (UAVs), the latter allow to collect low-altitude aerial photographs over small catchments in a cost-effective and rapid way. From large data sets of overlapping aerial photographs, Structure from Motion – Multi View Stereo workflows, integrated in various software such as PhotoScan used here, allow to produce detailed Digital Surface Models (DSMs) and ortho-mosaics. In this study we present the results from a survey carried out in a small agricultural catchment near Hallines, in Northern France. A DSM and ortho-mosaic was produced of the catchment using photographs taken from a low-cost radio-controlled microdrone (DroneFlyer Hexacopter). Photographs were taken with a Sony Nex 5 (16.1 M pixels) camera having a fixed normal lens of 50 mm. In the field, Ground Control Points were materialized by unambiguously determinable targets, measured with a 1” total station (Leica TS15i). Cross-sections of rills and ephemeral gullies were also quantified from total station measurements and from terrestrial image-based 3D modelling. These data allowed to define the accuracy of the DSM and the representation of the erosion features in it. The feasibility of UAVs photographic surveys to improve our understanding on water-erosion processes such as sheet, rill and gully erosion is discussed.

Keywords: Ephemeral gully, Erosion study, Image-based 3D modelling, Microdrone, Rill, UAVs.