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Soil erosion modelling of single precipitation events using TLS and UAV in combination with Be-7 tracer, Andalusia (Spain)

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Soil erosion due to superficial run-off is determined by complex processes. Within this context, high resolution modelling of recent and sub-recent relief changes based on erosive single precipitation events constitutes a great challenge. For non-invasive field measurements, photogrammetric methods such as unmanned airborne vehicle (UAV) and terrestrial laser scanner (TLS) are especially suitable. So far, these methods were used for highly resolved erosion modelling mainly within laboratory environments. UAV are economic and flexible to generate aerial images and programmed flight pattern can be repeated almost arbitrarily. TLS has the advantage of high accuracy potential and automation level for digital terrain model generation. Both methods complement each other. To achieve a high accuracy of erosion rates for single precipitation events within the interill sector, the cosmogenic nuclide tracer Beryllium-7 (Be-7) is especially eligible due to the short radioactive half-life. High sorption at topmost soil particles and immobility at given pH-values enable fine-scaled erosion modelling (two millimetre increments).

For the presented project, the soil surface is measured before and shortly after strong precipitation events in the research area, located in the fragile marl landscape of Andalusia. Simultaneous investigations on a research section located in the Saxonian Loess Province (Eastern Germany) are performed. Hence, differing factors on soil erosion (e.g. precipitation intensity, slope characteristics, soil cover and soil type) are accounted for. For multi-temporal comparison of measured soil surface a stable local reference system, consisting of signalised points for photogrammetric data acquisition, is defined. Furthermore, undisturbed reference plots for Be-7 sampling are designed. First results and challenges are presented.