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Prediction of the size distribution of soil fragments detached by interrill erosion

S. Leguédois (1), N. Kuhn (2) and F. Darboux (1)

(1) INRA, Soil Science Research Unit, BP 20 619 Ardon, 45 166 Olivet cedex, France, (sophie.leguedois@orleans.inra.fr) (2) University of Exeter, School of Geography, Archaeology and Earth Ressources, Amory Building, Rennes Drive, Exeter EX4 4RJ, United Kingdom

During rainfall, mechanical breakdown, swelling, dispersion and slaking detach soil fragments from crumbs formed by tillage or from crusted soil surfaces, providing sediment for interrill erosion. The destruction of the aggregates and subsequent erosion can change the size distribution of sediment significantly compared to the original soil. Knowing the size distribution of the detached soil fragments is essential for understanding the amount and temporal and spatial patterns of interrill erosion, as well as the potential off-site effects on the water quality of streams and lakes receiving the sediment.

Size distribution of sediment has been successfully included into several erosion models, for example WEPP or GUEST. However, obtaining size parameter values for a wide application of the models remains difficult, because there is no-easy-to-use tool to predict the size distribution of soil fragments detached by interrill processes. A preliminary work showed that, for a seedbed-like initial soil structure, aggregate stability tests can be used to determine the size distribution of soil particles available at the soil surface for interrill erosion. The objective of this study is to generalise these results to others soil surface conditions.

A set of laboratory experiments was carried out to measure the size distribution of soil fragments produced during rainfall on different soil types and soil surface conditions (i.e. fresh seedbed, coherent crusts, and depositional layers of loose aggregates). The different surface conditions were produced under controlled laboratory conditions.Then these soil samples were subjected to simulated rainfall in a custom-

designed fragment sampler and the size distribution of the collected fragments was measured. Aggregate stability of the different samples was determined by a standardised test. Fragment and aggregate size distribution were compared and showed good correlation, indicating the potential of aggregate stability tests for predicting the size distribution of interrill erosion sediment for a wide range of soil surface conditions.