

## The Effect of Slope Aspect on Sediment Transport by Shallow Overland Flow under Wind-Driven Rain

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### Abstract

Wind-driven rain erosion and the combined effect of wind and rain on erosion processes have not been studied widely although wind has long been recognized as an important factor in water erosion. Since the wind comes with the rain, changes occur in raindrop velocity vector and raindrop frequency depending on the slope aspect. These changes can cause different erosion rates in different aspects. The aim of this study is to examine the effect of slope aspect both on the velocity, frequency and angle of raindrop and on sediment transport by shallow overland flow in wind-driven rains. The study was conducted in a wind tunnel rainfall simulator facility of Ghent University, Belgium. Two loess-derived agricultural soils, Kemmel sandy loam and Nukerke silt loam, were used after sieved into three aggregate fractions: 1.00-2.75, 2.75-4.80 and 4.80-8.00 mm, and weighing factors assigned to each fraction were 28, 32 and 40%, respectively. A 5kg soil sample was then packed into a 55 cm-long and 20 cm-wide pan after three fractions of aggregates were evenly mixed. Windless rains and the rains driven by velocities of 0, 6, 10, 12 m s<sup>-1</sup> were applied to soil pan placed at both windward and leeward slopes of 7, 15, and 20%. For each soil and slope aspect, there were two replicates with a total of 96 rainfall simulations. The results were statistically tested by a log-linear regression model through using rain and overland flow parameters. In wind-driven rains, different erosion rates were observed in different slope aspects not only due to the effects of wind on velocity, frequency, and angle of impacting raindrops but also due to the effects of wind on the shallow flow hydraulics.

*Key words:* wind-driven rain, slope aspect, shallow flow transport, flow hydraulics