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Measurement of wind erosion and dust emission triggered by different tillage tools

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Mechanized vineyard floor tillage aims at minimizing negative impact of weeds on water competition and spread of pests and diseases without herbicide application. It includes tillage between vines, in the vine row, and in headlands around vineyard blocks. While there is an increased awareness from vine growers and scientists concerning water erosion, wind erosion and dust emission are largely unnoticed processes that have not been investigated yet. The emission of soil particles seems to be strongly associated to the working of the soil surface by means of (tracked) tractor. This impact may be particularly important on surfaces considered erosion stable due to vegetation or stone cover preventing soil from direct detachment by wind.

The row-tillage only underneath the vines is an important management practice in modern and in organic viticulture because of the strongly reduced soil disturbance compared with clearing of the complete vineyard floor area. We investigated tillage as a trigger for wind erosion and dust production on particularly inclined vineyards in this study.

Three different tillage tools in three combinations were tested on two different steep-slope vineyards by means of modified Wilson and Cook Sampler (MWACS): rotary hoe, disc plow, and finger weeder.

We measured eroded material on both sites for different states of soil moisture and wind intensity. The results suggest a relationship between particular tillage tool combinations and airborne substrate particles that correspond to the general mechanical procedure.

These first results for measurement of tillage-induced wind erosion and dust emission indicate a considerable potential of vineyards to release dust that is related to specific management device needs to be investigated by means of qualitative analysis, flux measurements and monitoring.