Spatio-temporal effects of vegetated windbreaks on wind erosion and microclimate as basis for model development

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Field-scale soil wind erosion

Measurements

BEST Sediment traps – aero-cyclone system

Combination with micro-climate measurements

Results

Installation in Winter 2019/20

Frontal view of windbreak windbreaks were chosen which stand perpendicular to main wind direction

Model

One out of two field sites in the Pannonian region, eastern Austria

Semi-randomized design allows spatial analyses and quantifying the effect of windbreak

Weninger et al., EGU GA 2021
Field-scale soil wind erosion

Measurements

Reduction of wind speed leewards of windbreak in 2020
H = height of the windbreak
wind data filtered to wind direction within ± 45° deviation of perpendicular to windbreak

Results

Model

Weninger et al., EGU GA 2021
Field-scale soil wind erosion

Measurements

Results

Two example periods for sediment rates (sediment traps were emptied every three weeks)

Clear effect of distance (as expected)
Effect of soil moisture highly relevant (weather in March 2020 was dry in AT, July-August period was moist)

RU, GE ... site abbreviations

Weninger et al., EGU GA 2021
Horizontal sediment mass flux correlated to integrated wind energy above threshold (2 m/s)

Weninger et al., EGU GA 2021
Field-scale soil wind erosion

Measurements

Still to come:

Calibration of RWEQ and stochastic variation of input parameters (Fryrear et al., 2000)

Comparison with new failure rate model

Results

\[ Q = a (WF \cdot EF \cdot SCF \cdot K' \cdot COG) \]

Model

Weninger et al., EGU GA 2021
Care for trees!

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