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Linking regional modelling with field measurements to evaluate effectiveness of living windbreaks as measures against wind erosion

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The degrading impact of wind on agricultural soils has been observed throughout centuries in the Pannonian region of central Europe. Nevertheless, soil loss was not yet quantified and the extent or relevance of the problem are unknown for this agriculturally important region. Especially dry soil surface is highly prone to erosion and as drought periods are expected to become more frequent and severe with changing climate, the risk of wind erosion will increase accordingly. Living windbreaks and similar agro-forestry systems are supposed to be highly effective measures against wind erosion. In an extensive research project, multiple approaches are integrated to obtain a broad view onto the relevance of soil degradation by wind on plot scale and its regional distribution.

More in detail, case studies are conducted where the soil loss by wind erosion is measured in sediment traps. Data about driving and stabilizing factors like wind speed, soil moisture, vegetation density etc. are measured in high spatial and temporal resolution. The measurements started in December 2019. Besides, wind erosion risk is modelled and mapped on regional scale applying state-of-the-art model procedures. The measurement results are used in an attempt to down-scale the model application and thus create a link to ground-truth data. Information about spatial and temporal variability of the driving factors is used for implementation of stochastic calculation procedures in a sensitivity study which determines the most relevant factors for wind erosion mitigation.

The used modelling approach also includes the effects of wind shelters what enables a partly evaluation of the existing network of such elements in the Pannonian region. There, the Authority of Land Reform has been supporting and documenting the installation of wind shelters for more than 60 years. Incorporating this data base, quantitative and qualitative statements will be developed about the state of the shelter belts and their relevance concerning erosion rates. Additionally, the potential and actual value of living windbreaks will be determined with special regards to physiological and ecological characteristics, stability under future climate conditions

and further ecosystem services in agricultural landscapes.