Risk Assessment vs Wind Erosion Modelling –

Are the results for wind erosion predictions comparable?

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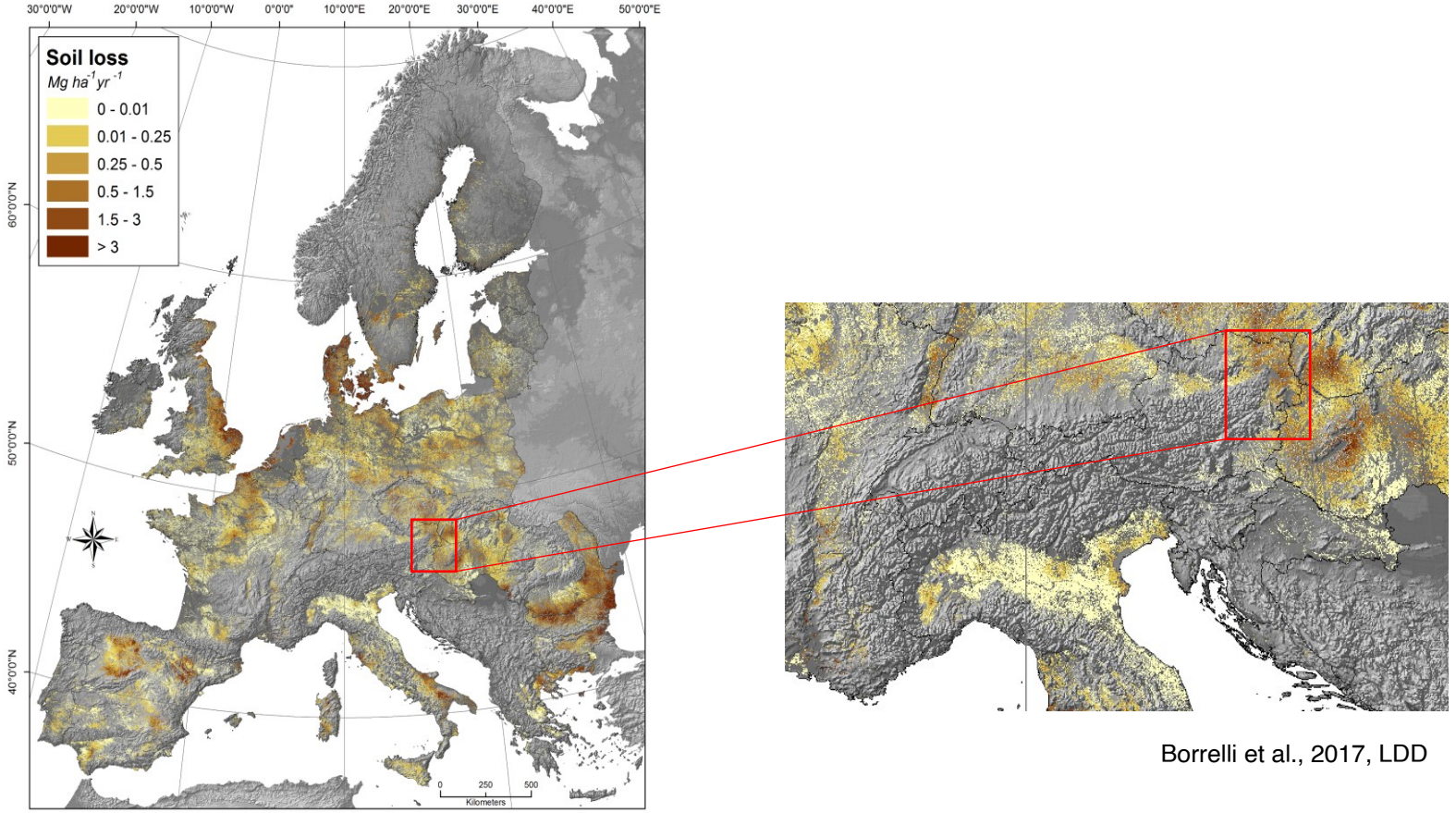
Introduction

Status quo

- European maps identify Eastern Austria as high susceptible to erosion by wind



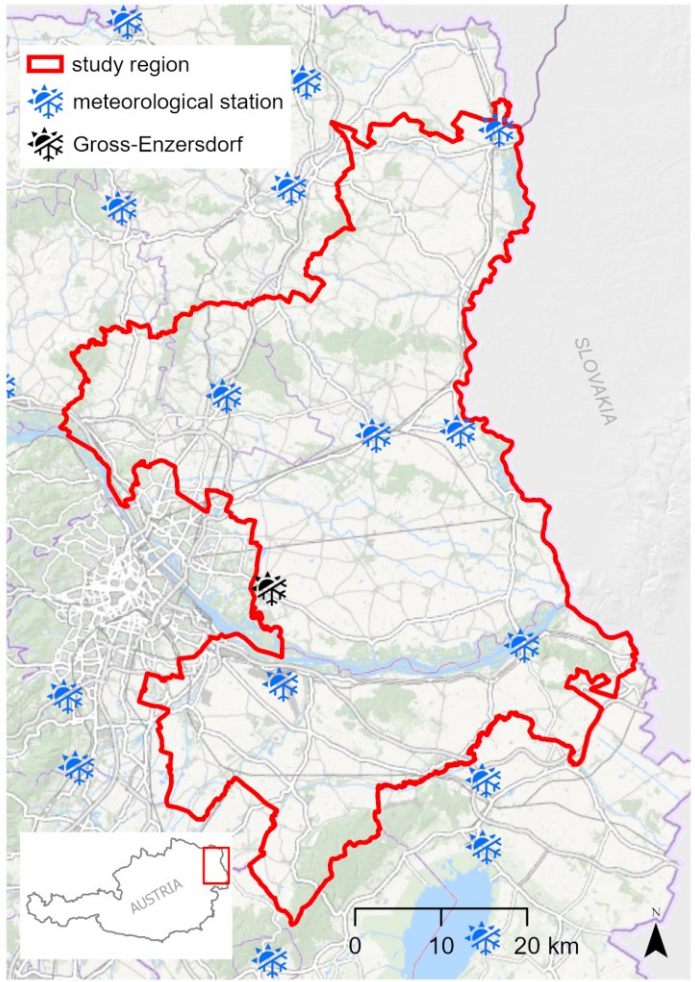
Borrelli et al., 2017, LDD

- wind erosion is recognized since 1770 in Eastern Austria → reforestation programs
- windbreaks are planted since 1950s

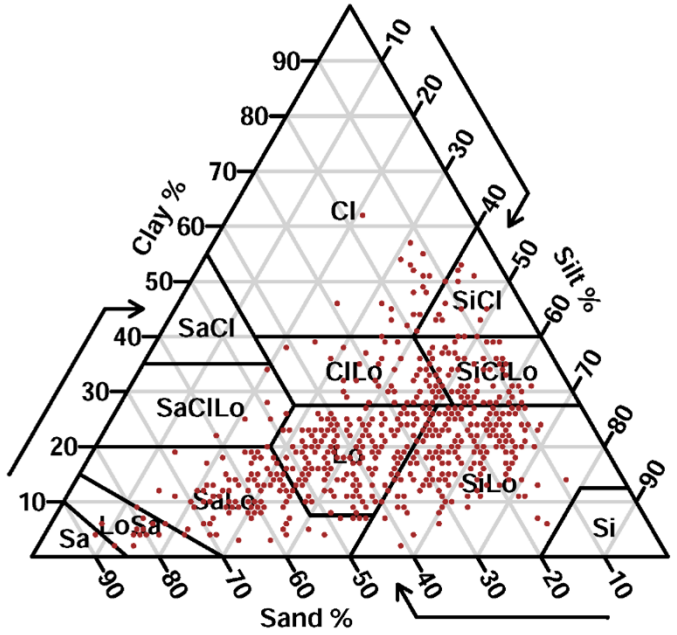
Study area

Characteristics

- favorable climatic and pedogenic characteristics for wind erosion with intensive agricultural land use:



- flat to gentle slopes (mean slope: **2.5°**)
- annual precipitation: **516 mm**
- mean wind speed: **3.4 ms^{-1}**
- dominant soil texture: **loam, loamy silt, loamy sand**
- **66% agricultural use**



Scheper et al., 2021, Land

Aims

However, so far…

- no field measurements on wind erosion
- only large-scale modelling studies
- no link to regional studies

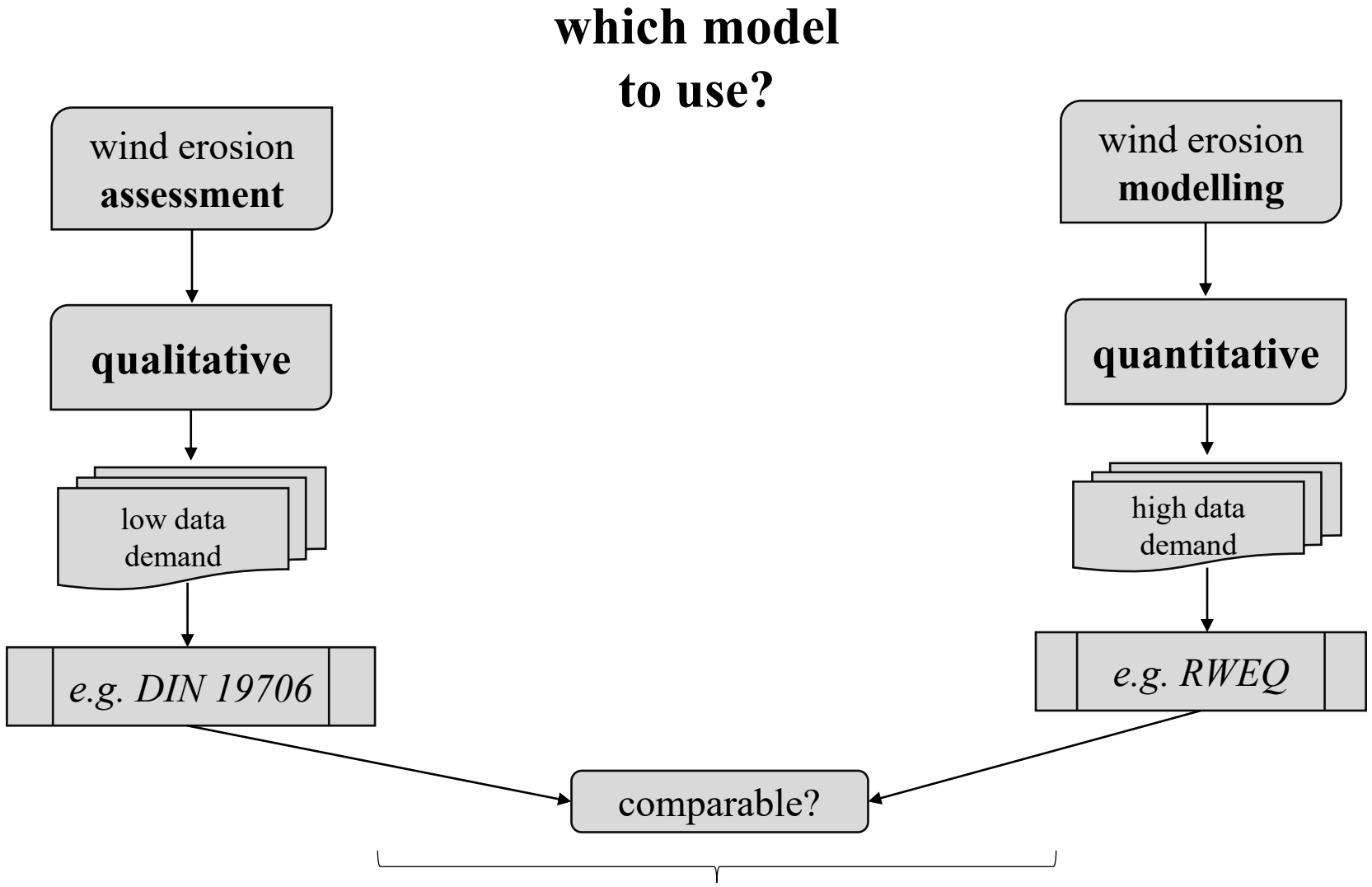
Aim:

- assess the spatial and temporal pattern of wind erosion risk for a selected study area in Eastern Austria

BUT:

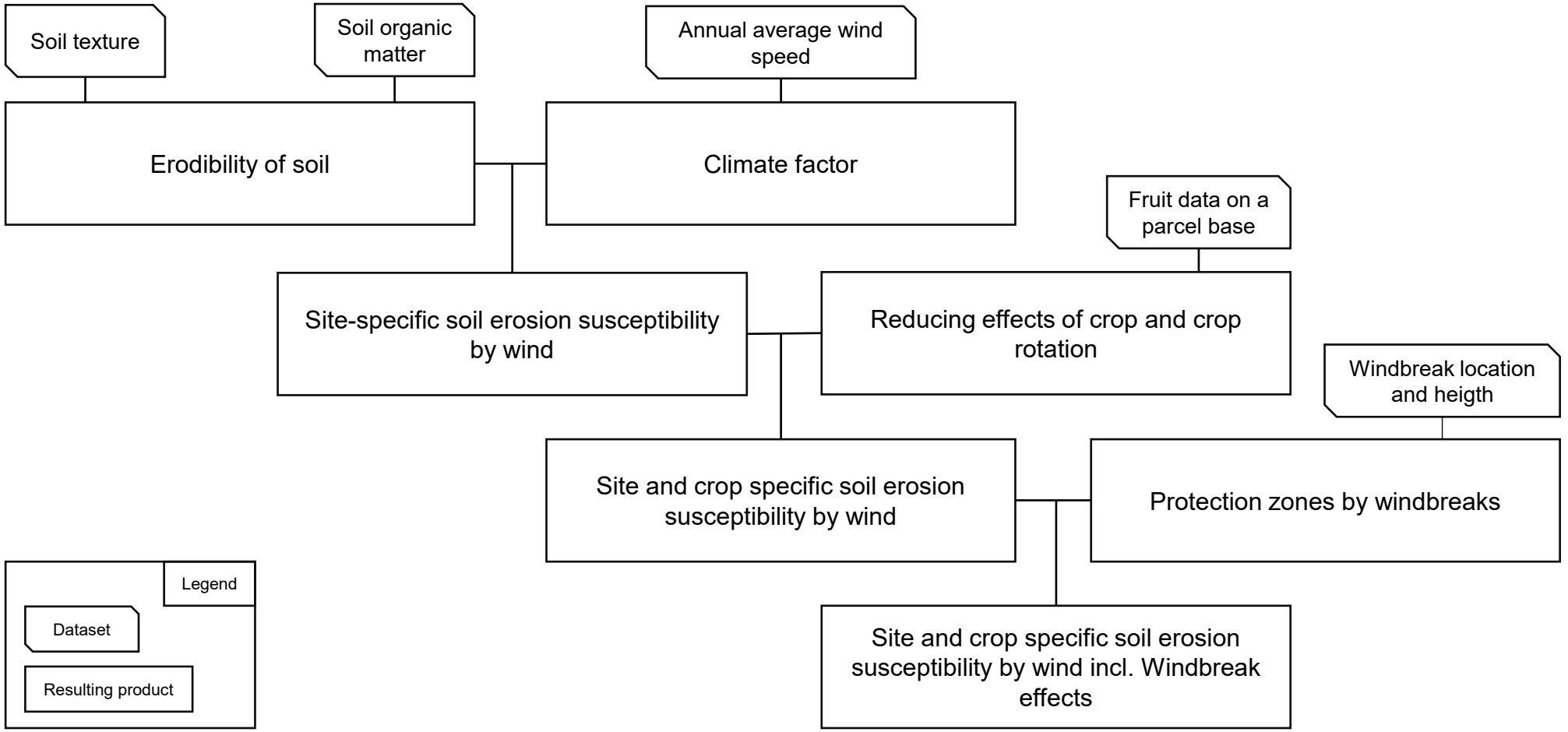
- ***which model to use?***

Risk assessment or wind erosion model?



- identification of similar risk zones?
- identical assignement of severity?

DIN19706



Scheper et al., 2021, Land

Revised Wind Erosion Equation (RWEQ)

$$Q_{max} = 109 * (WF * EF * SCF * K' * COG)$$

$WF = weather\ factor$

$EF = erodibility\ factor$

$SCF = soil\ crust\ factor$

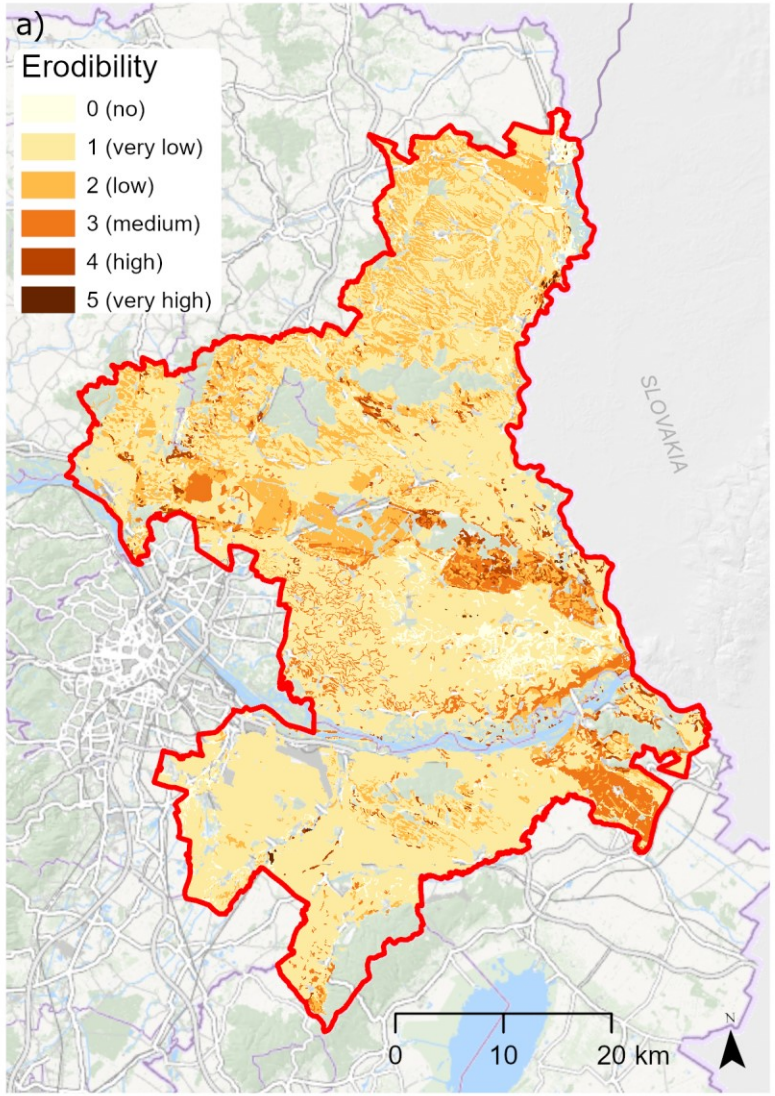
$K' = roughness\ factor$

$COG = combined\ crop\ factor$

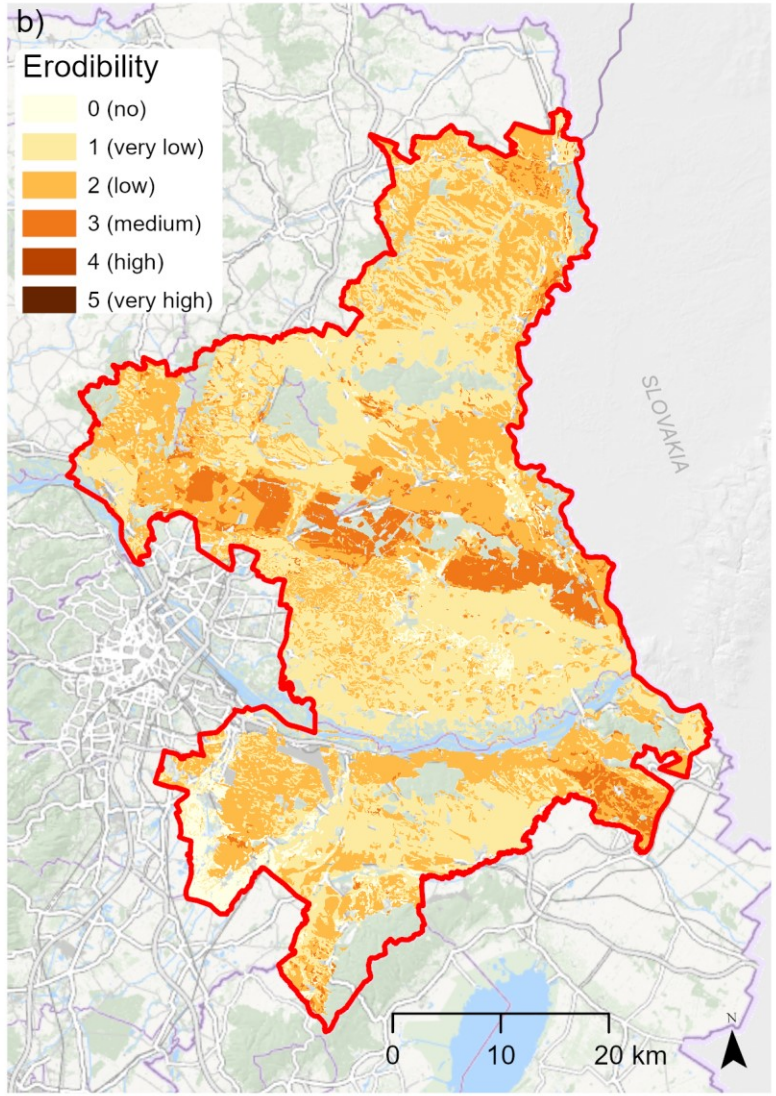
According to Fryrear et al., 1998, Tech. Bull.

Comparison of **erodibility**

DIN19706



RWEQ



Scheper et al., 2021, Land

Comparison of **climate/weather factor**

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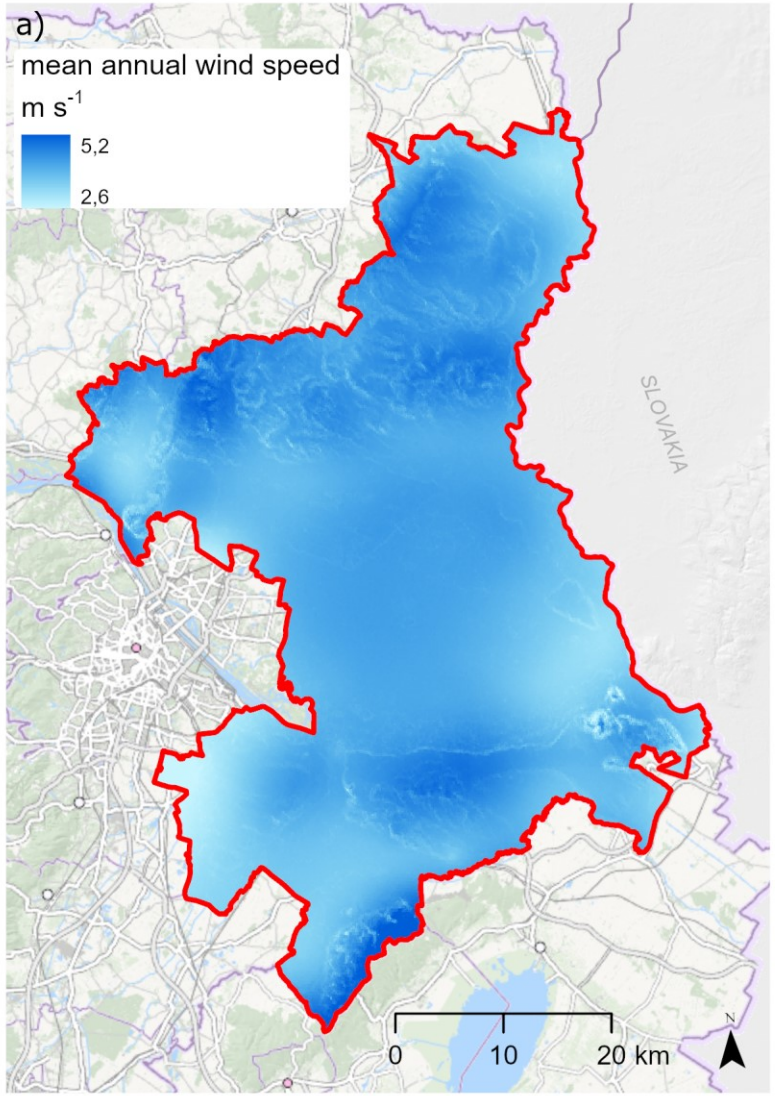
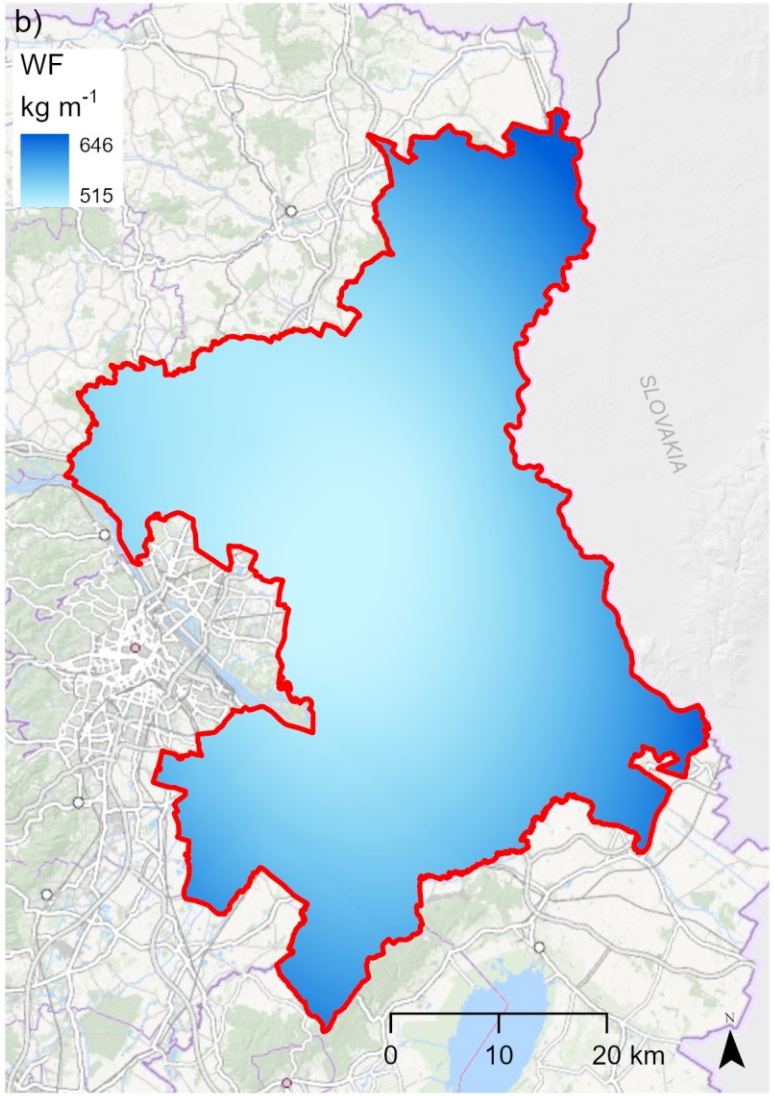


RWEQ



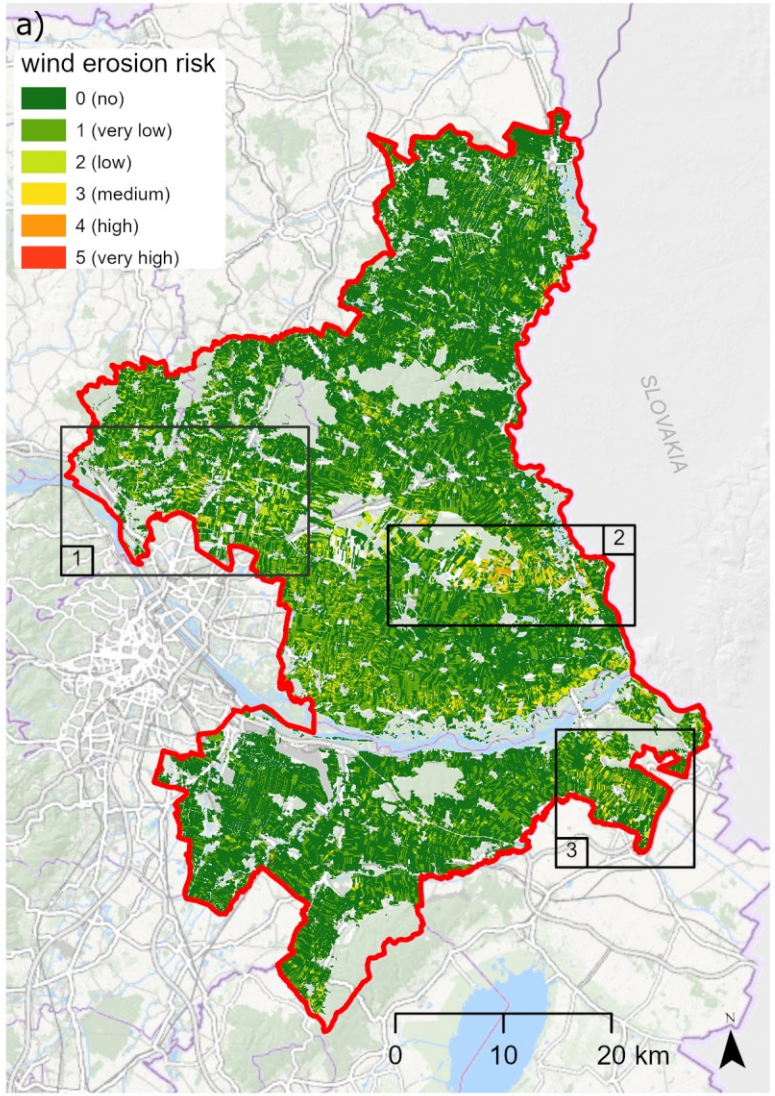
Scheper et al., 2021, Land

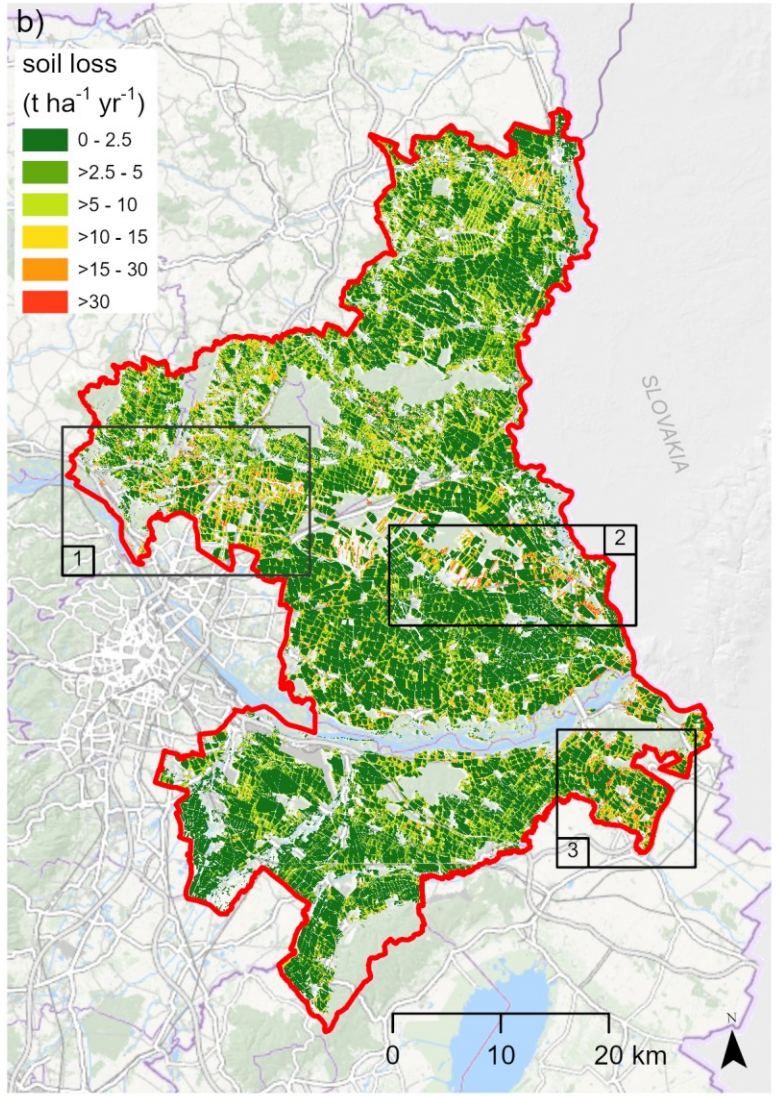
Comparison of **wind erosion risk**

DIN19706

RWEQ

Mean wind erosion risk (DIN19706): **0 (no)**



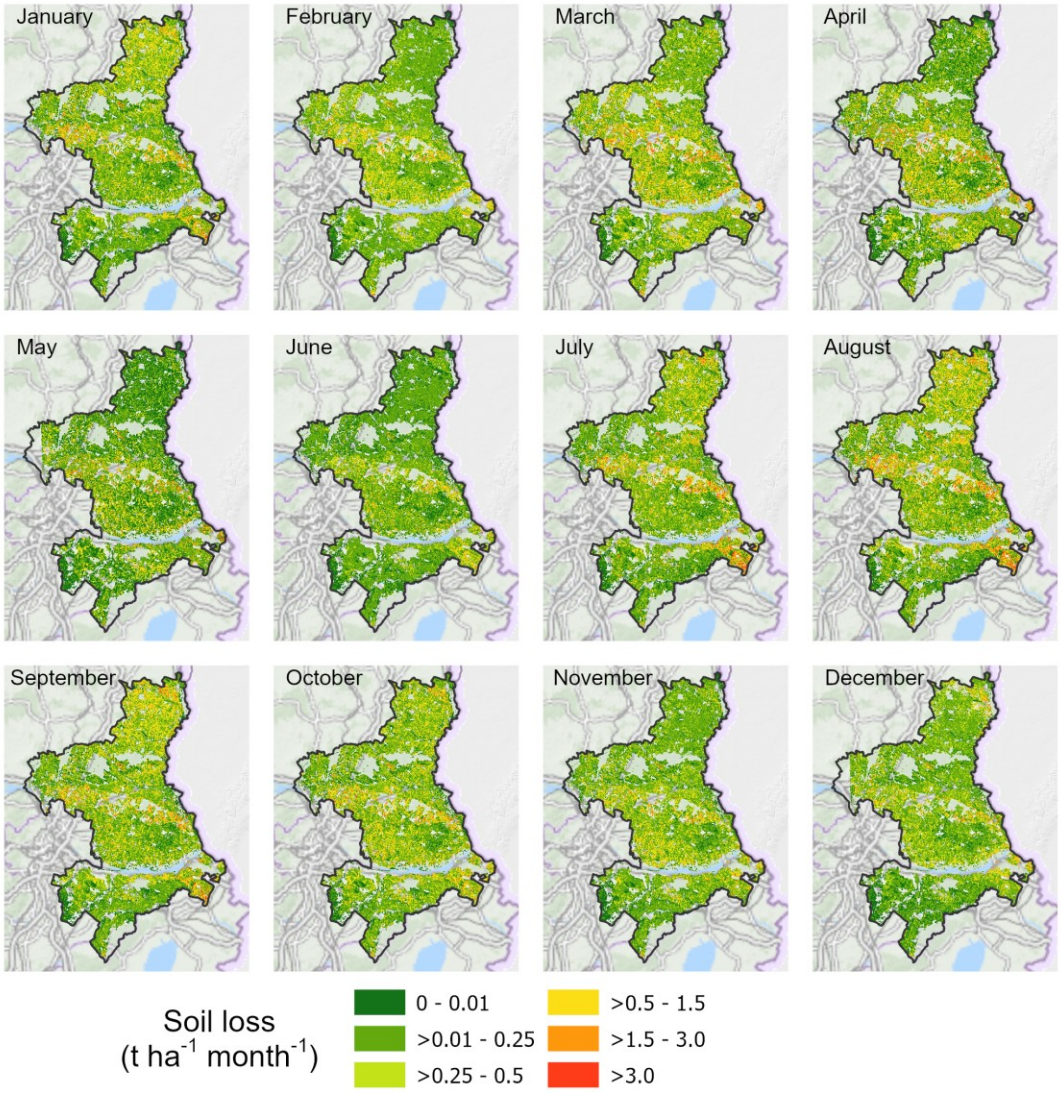


Mean annual soil loss (RWEQ): **3.7 t ha^{-1} yr^{-1}**

Scheper et al., 2021, Land

Monthly wind erosion risk

Month	Modeled Soil Loss in t ha^{-1} month^{-1}			
	Mean	Standard Deviation	Median	90th Percentile
January	0.35	0.64	0.14	0.88
February	0.27	0.4	0.14	0.62
March	0.40	0.66	0.17	1.00
April	0.35	0.67	0.09	0.95
May	0.26	0.56	0.04	0.74
June	0.18	0.4	0.05	0.46
July	0.39	0.82	0.12	0.97
August	0.49	0.93	0.17	1.26
September	0.42	0.74	0.17	1.04
October	0.39	0.65	0.18	0.97
November	0.27	0.44	0.12	0.67
December	0.24	0.4	0.11	0.58

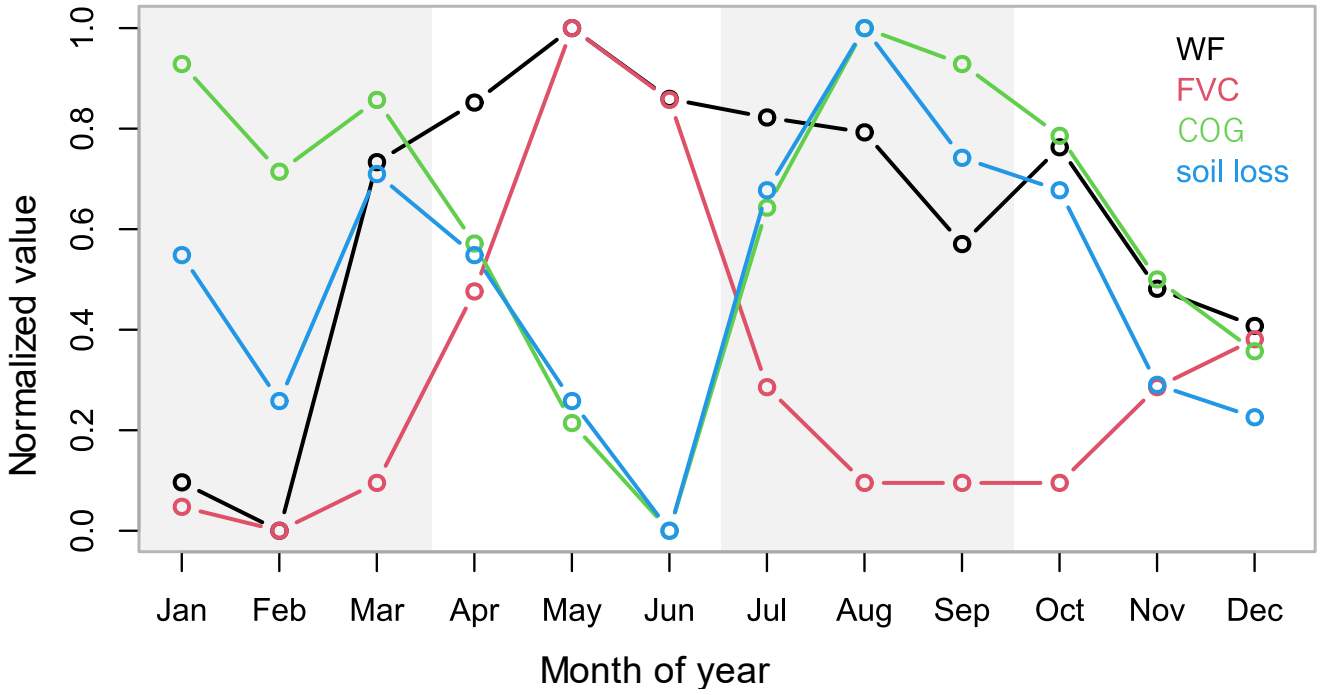


Scheper et al., 2021, Land

Monthly wind erosion risk

Monthly variations according to min-max-normalisation

- $Normalisation = \frac{value - min}{\max - min}$



- Vegetation cover (FVC, COG) has the highest impact on soil loss
- Weather factor (WF) itself has lower impact as far as vegetation cover is high

Scheper et al., 2021, Land

Conclusions

General:

- risk assessment and wind erosion modelling identify similar risk areas
- severity classes/ranking of soil erosion classes differ

RWEQ-specific for the study region:

- erosion risk in the study area is not neglectable (mean annual soil loss of 3.7 t ha^{-1} yr^{-1})
- vegetation cover is the most important factor to control wind erosion

For more information:

- **Scheper**, S., Weninger, T., Kitzler, B., Lackóová, L., Cornelis, W., Strauss, P., and Michel, K. (2021): Comparison of the Spatial Wind Erosion Patterns of Erosion Risk Mapping and Quantitative Modeling in Eastern Austria. Land, 10, 974, doi: 10.3390/land10090974

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