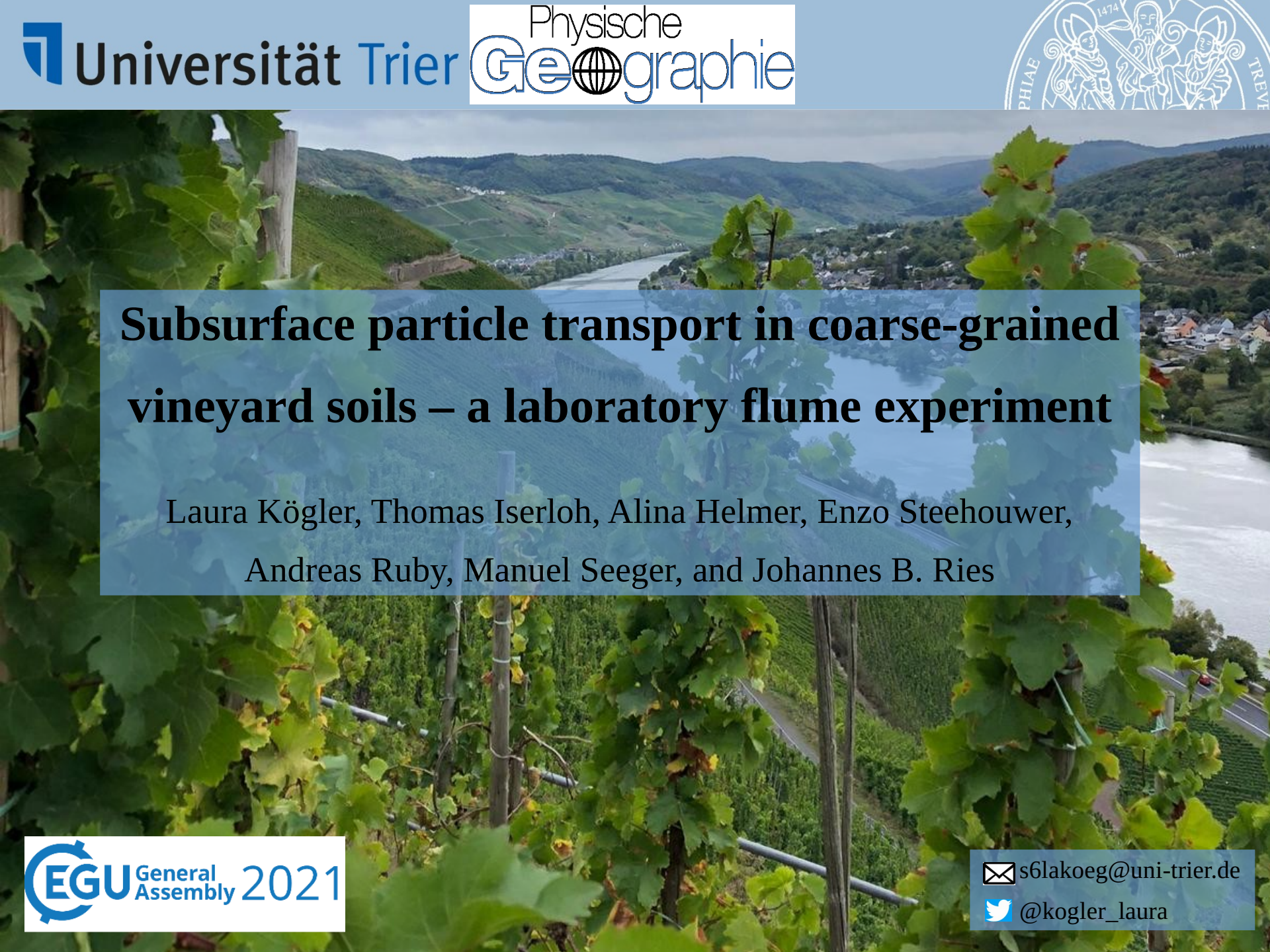

Subsurface particle transport in coarse-grained vineyard soils – a laboratory flume experiment

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Study Area

The study area is located in the Mosel wine region (Rhineland-Palatinate, Germany), the largest steep vineyard region in the world.

Scientific Background

Loose surface horizon over a compact one due to tillage or weathered parent material.

→This structure enables subsurface flows within the upper horizon, especially in periods of very high soil moisture.

→There is a knowledge gap concerning the identification and quantification of transported soil particles in this subsurface flow.

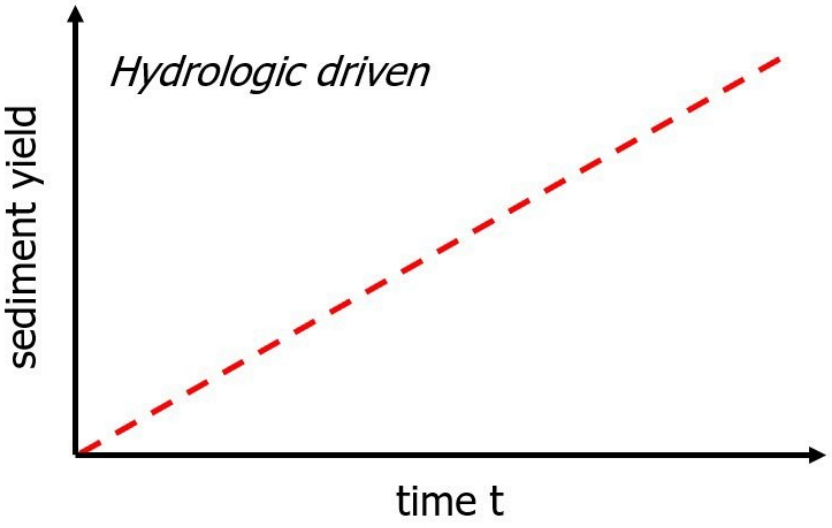
→If these soil particles reach relevant amounts, the soil degrades due to substantial loss of fine material.

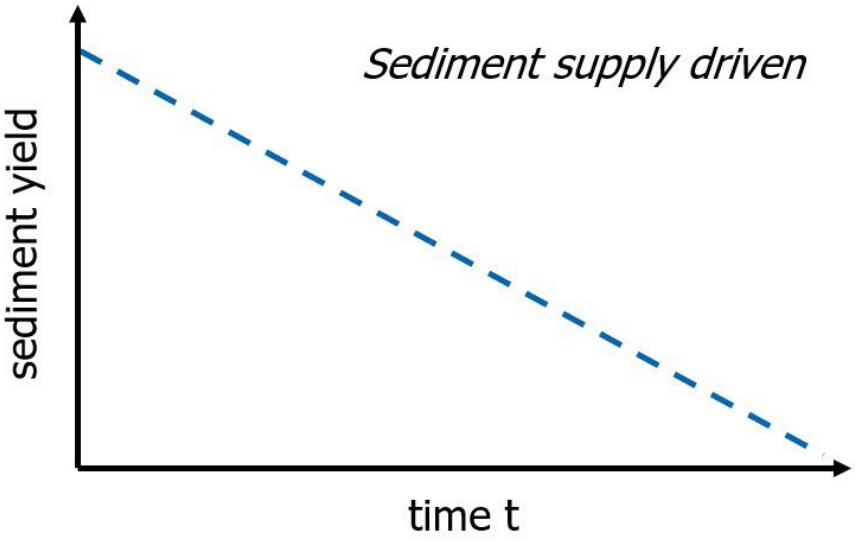
Research questions

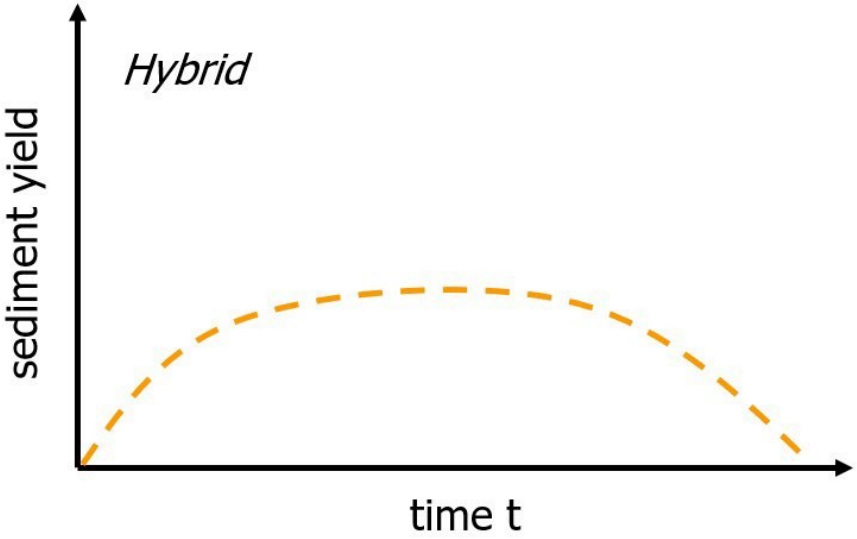
The study aims to..

- develop a sediment trap to determine the subsurface particle transport in coarse-grained vineyard soils of the Mosel wine region.
- detect how the relation of surface runoff, base runoff, and subsurface runoff in the system is.
- analyze the proportion of the subsurface runoff in the overall erosion process.

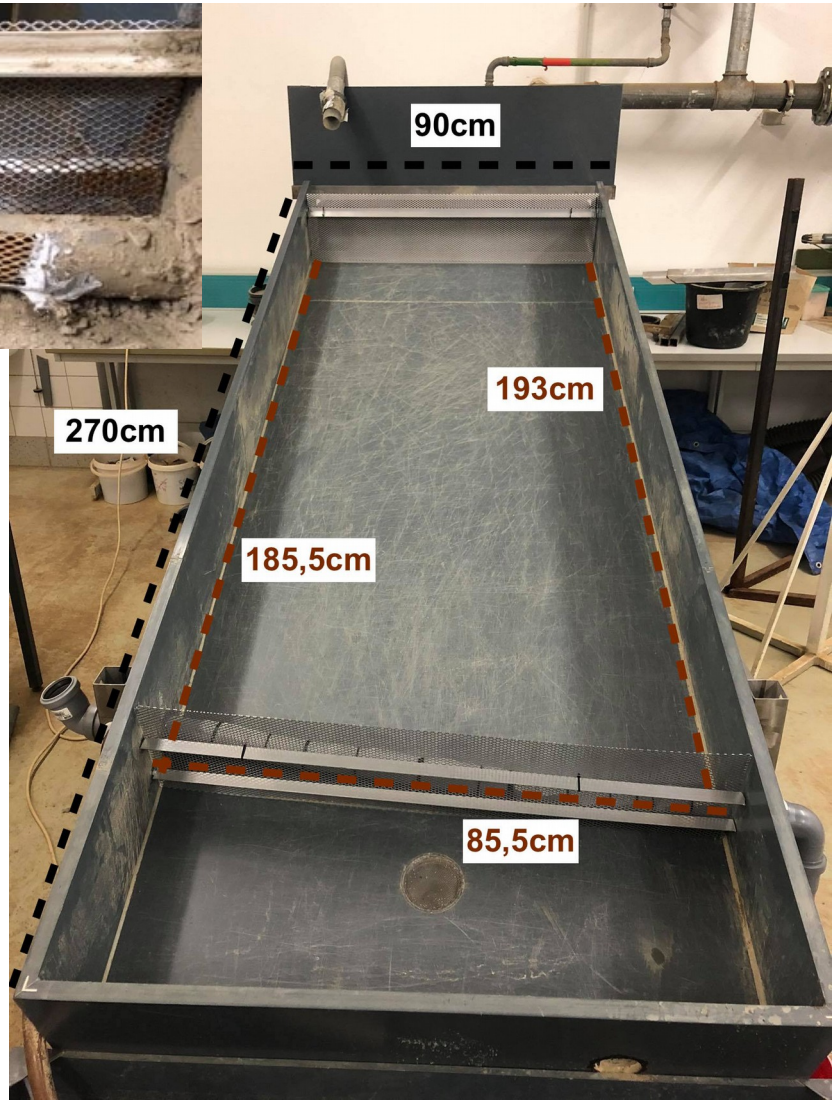
Hypotheses


Hydrologic driven
sediment yield
time t


Sediment supply driven
sediment yield
time t


Hybrid
sediment yield
time t

Experimental approach



The experimental approach consists of a sediment trap prototype, based on a drainage pipe, which is positioned into a test flume.

The sediment trap has a side-cut-out where a mesh (mesh aperture 3 mm x 6 mm) is installed.

The flume is filled with material from vineyard soil (Terric Anthrosols mainly with Devonian argillaceous schists and fluvial sediments).

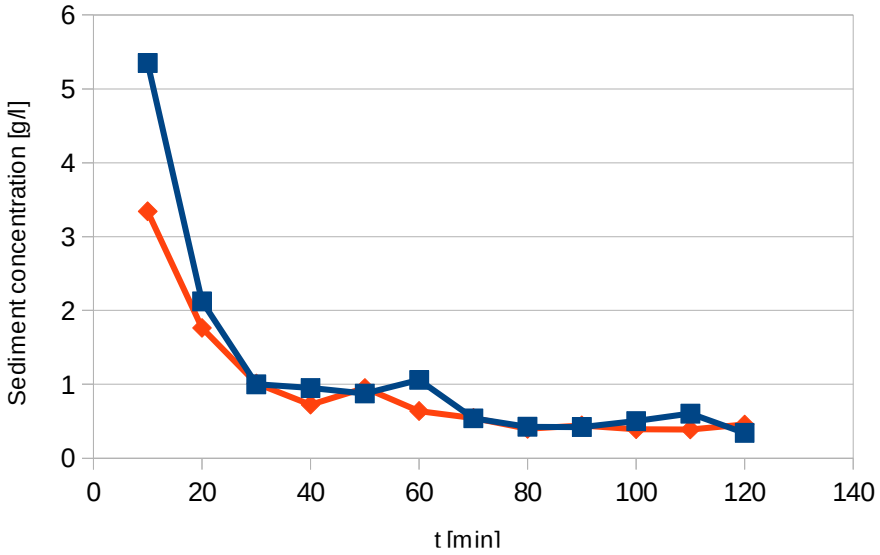
Experimental approach

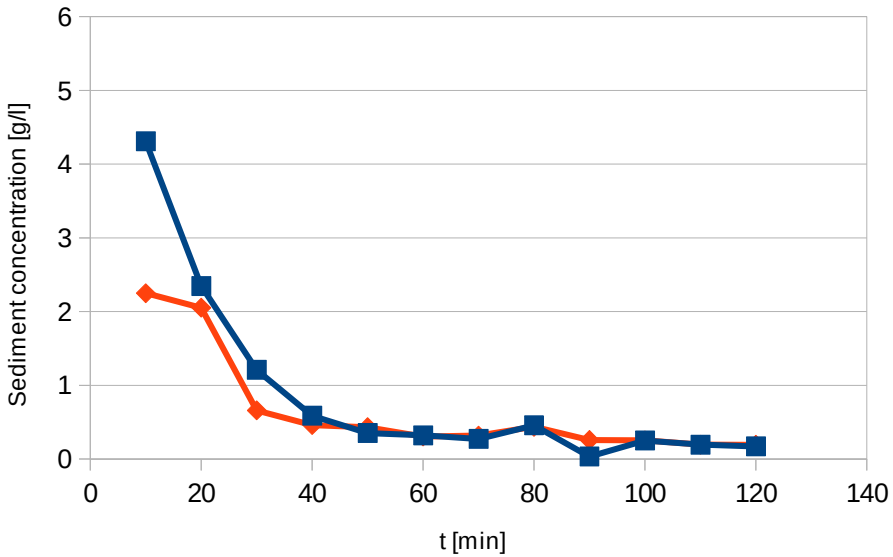
Water (5 l/min) enters the flume from the upper end with the help of an overflow and an irrigation system (120 mm/h).

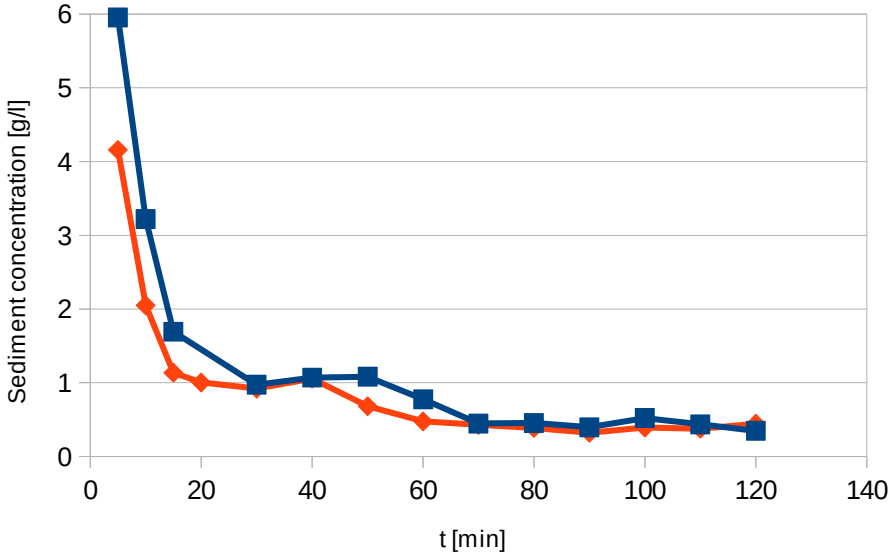
The trap and the lower end of the flume are connected to a separate drain where the water and eroded sediment are collected.

This collected material is then analyzed in the laboratory to quantify the amount and characteristics of the eroded material.

Preliminary results







Preliminary results

The preliminary results show a clear correlation between the measured total subsurface flow and sediment transport with the ones collected by the sediment trap prototype.

In conclusion, using this experimental set-up, it is possible to measure the process of fine soil material transport as well as the development of sediment traps for *in situ* measurements.

In the further course of the work, the sediment trap will be installed *in situ* in the vineyards to test its field applicability to determine valid subsurface erosion rates in vineyard soils.