

An improved drip infiltrometer measuring the near-saturated hydraulic conductivity: Pedotransfer development and macropore transport



Bo V. Iversen
Dept. of Agroecology
Aarhus University
Denmark

The near-saturated hydraulic conductivity is an important parameter in relation to the analysis of heterogeneous transport in the soil macropore system.

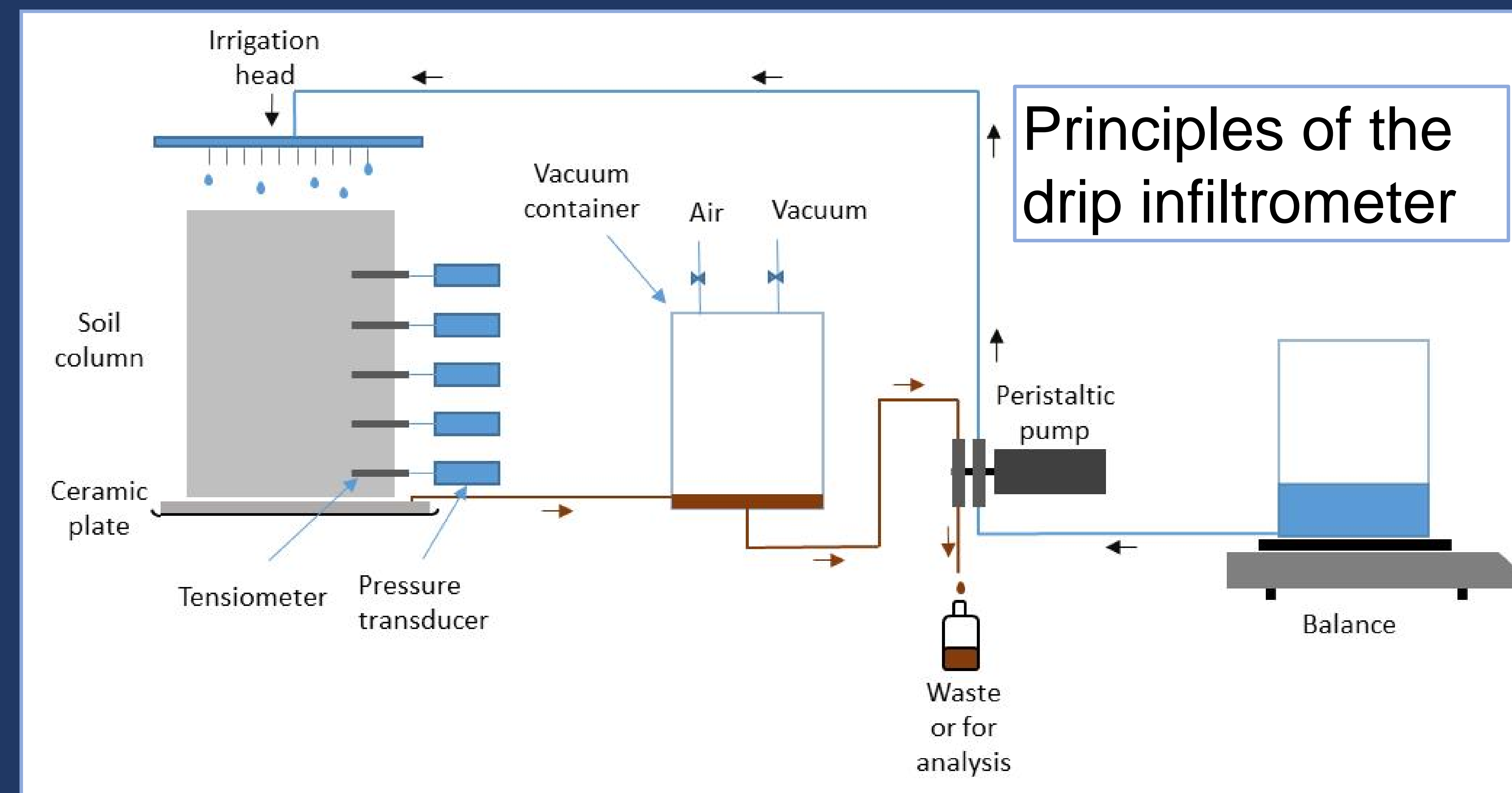
METHODS

- Our work was based on a large database containing information on soil hydraulic properties and basic soil properties
- 75 different sites have been visited
- Large (20 cm x 20 cm) undisturbed soil columns were sampled in the A-, B-, and C-horizon
- Saturated hydraulic conductivity, K_s , measured on ≈ 500 columns
 - Constant head method
- Near saturated hydraulic conductivity measured on ≈ 700 columns
 - Drip infiltrometer
- Pedotransfer (PTF) development
 - Predicting K_s and $k(-10)$ from basic properties (clay, sand, silt, OM, etc.)
 - Machine learning (Gaussian regression progress)
- HYDRUS 1D modelling (250 m resolution)
 - Matrix saturation
- Combined with k of macropores

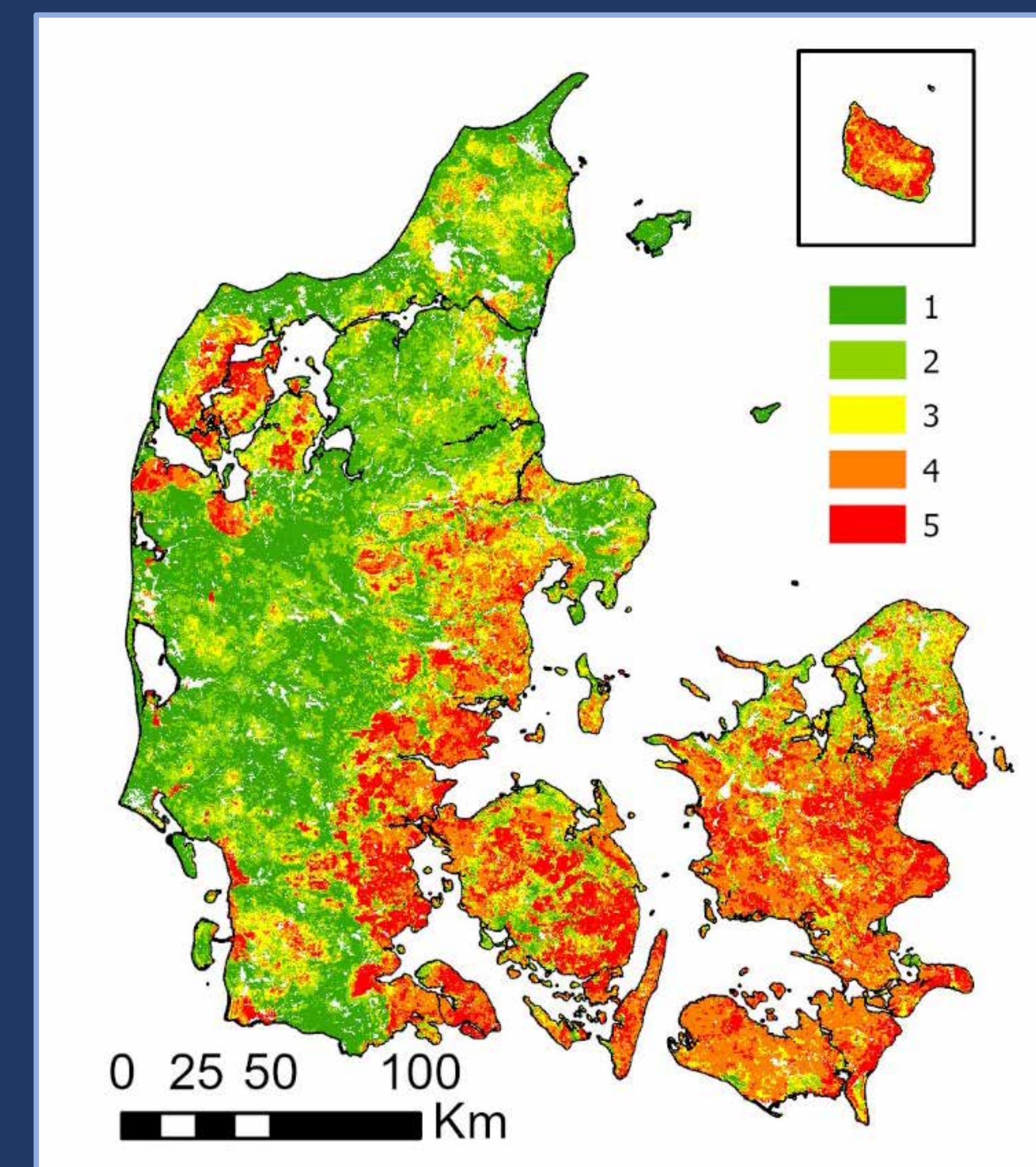
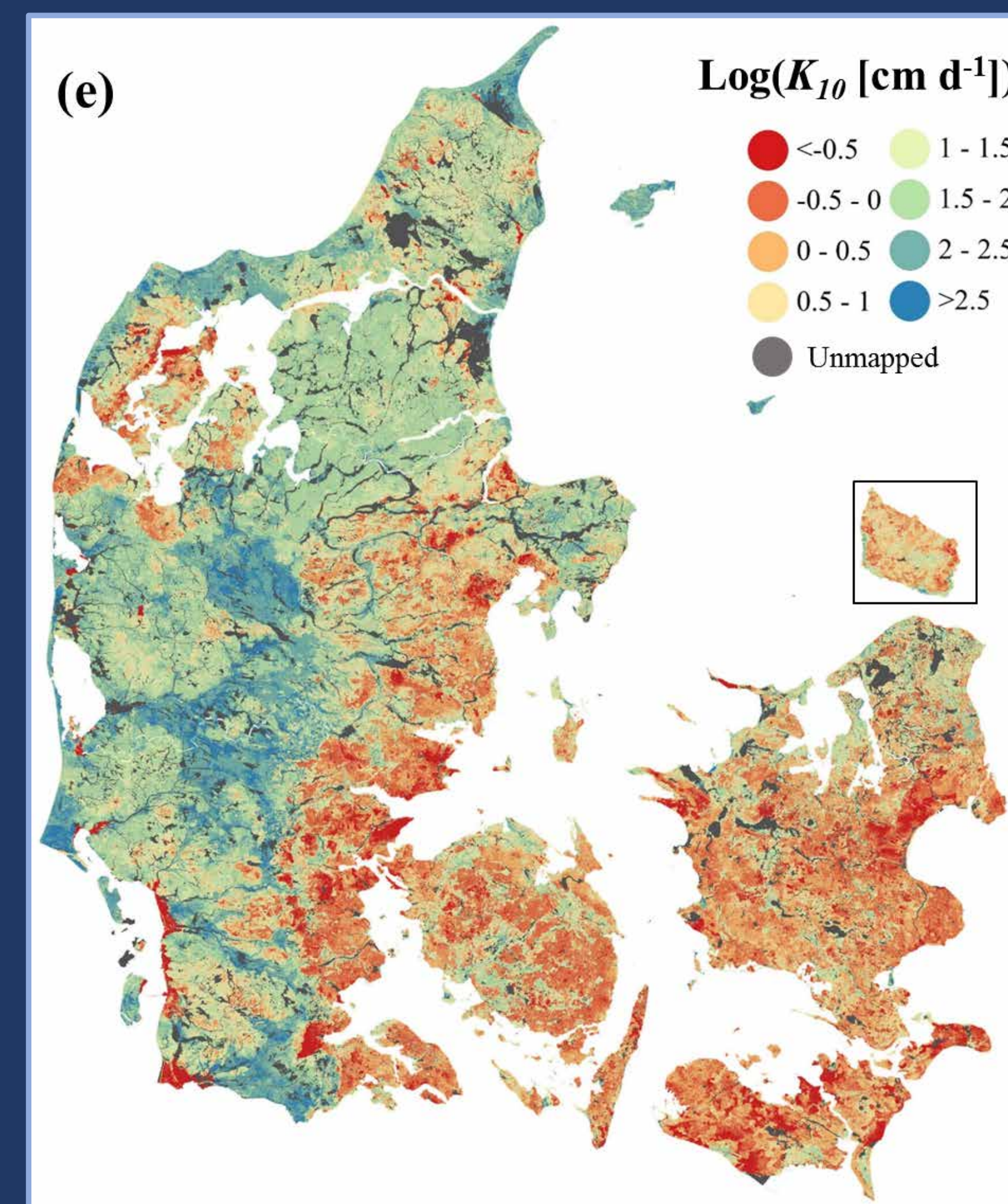
RESULTS, DISCUSSION, CONCLUSIONS

- The new drip infiltrometer proved to be effective measuring the near-saturated hydraulic conductivity
- Robust PTFs was developed and evaluated through bootstrapping
- Development of Danish national maps of soil hydraulic properties
- The spatial distribution of hydraulic properties was used in the modelling making us able to point out areas where macropore flow can contribute to significant transport of nutrients of pesticides.

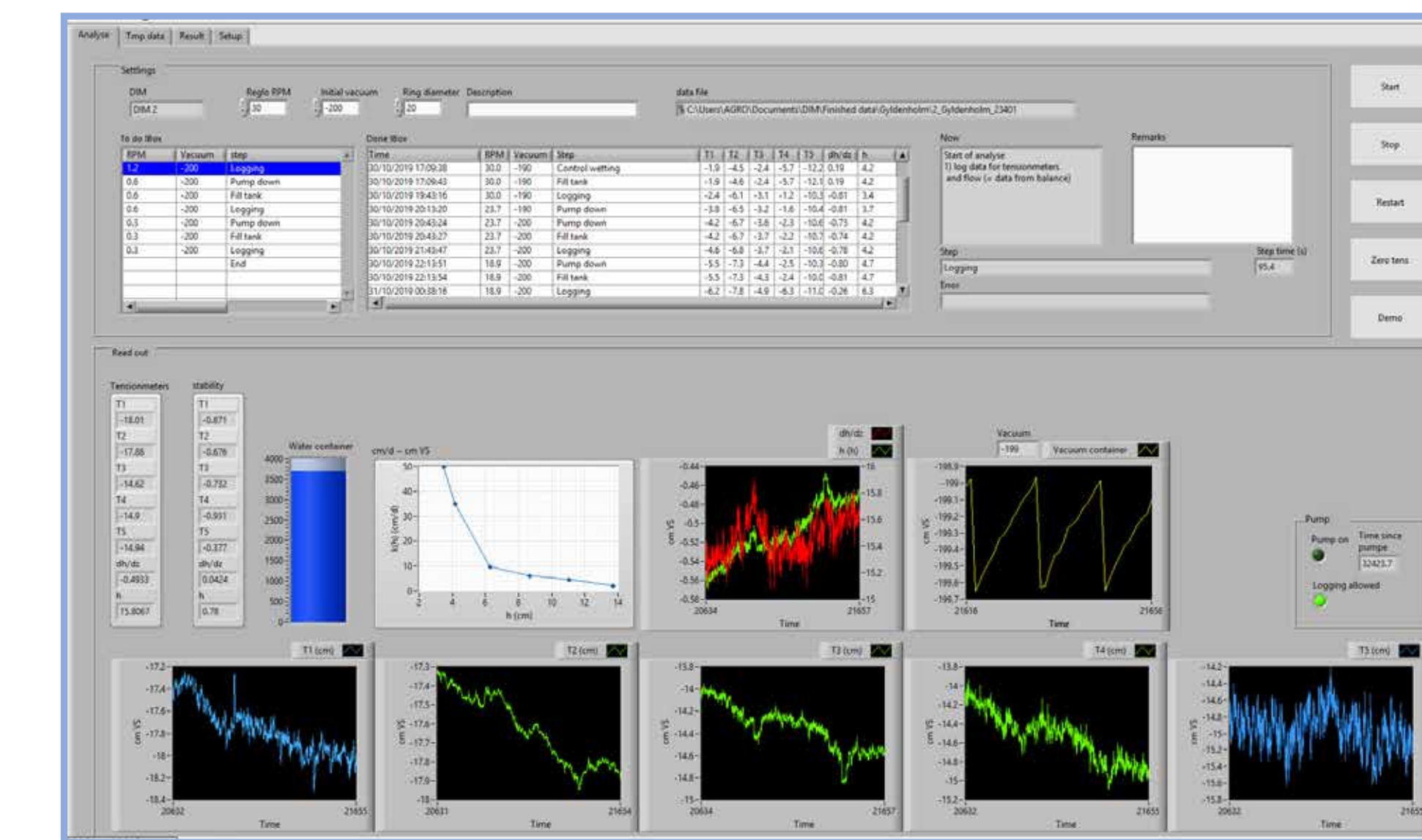
Based on measured near-saturated hydraulic conductivity we were able to predict areas in Denmark with a high risk of macropore flow



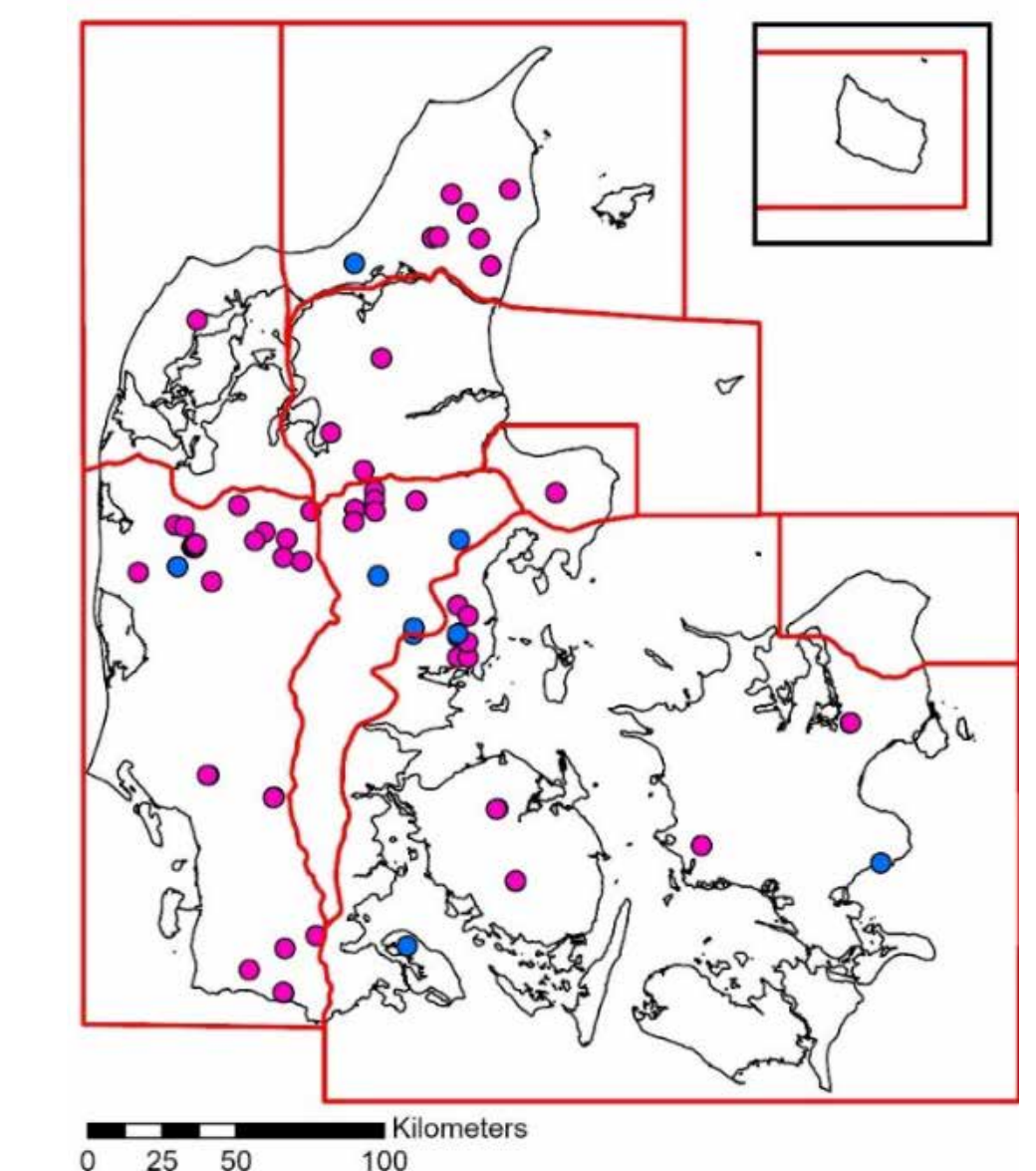
Predicted values of $k(-10)$



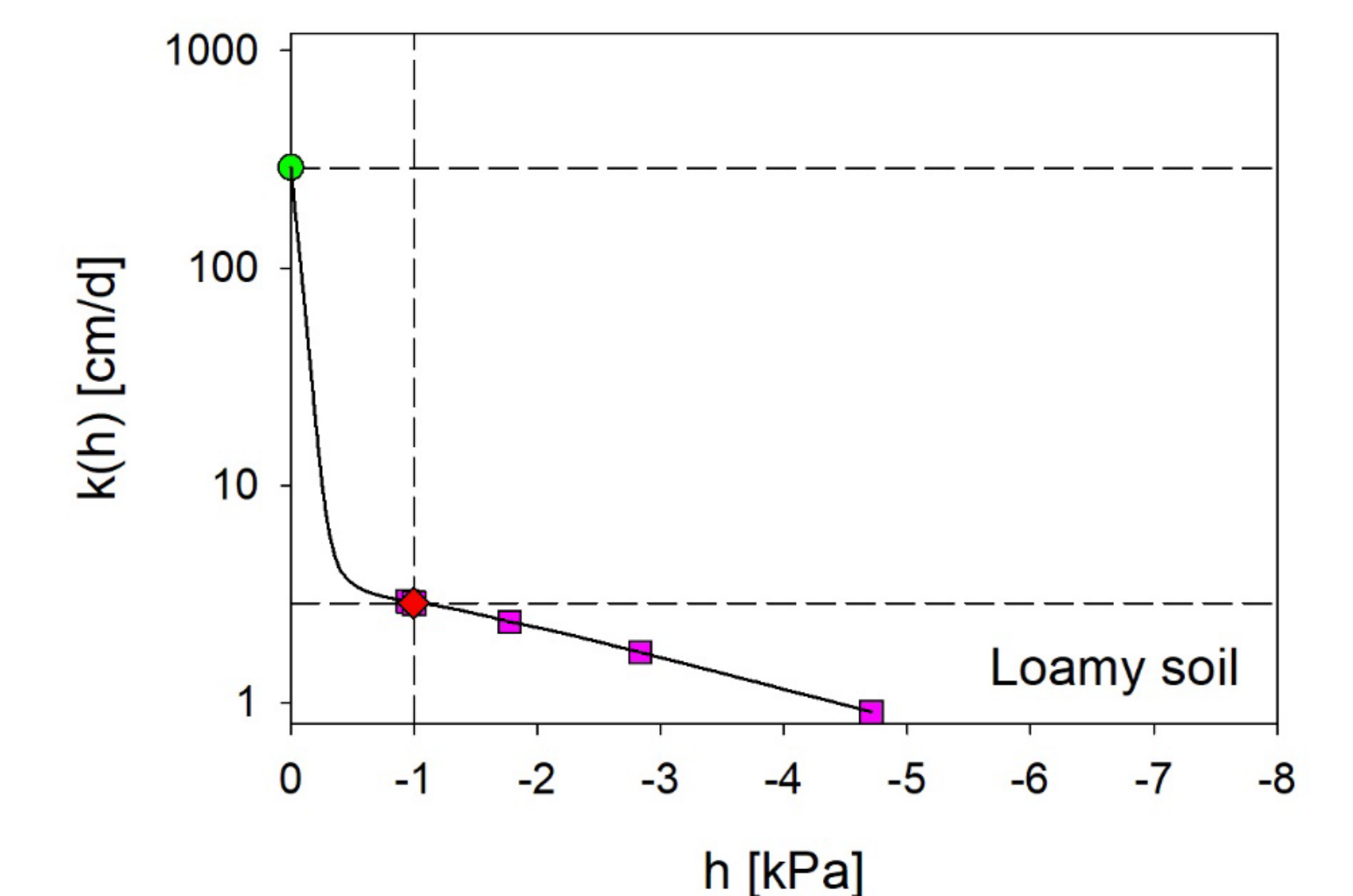
Risk map of macropore flow



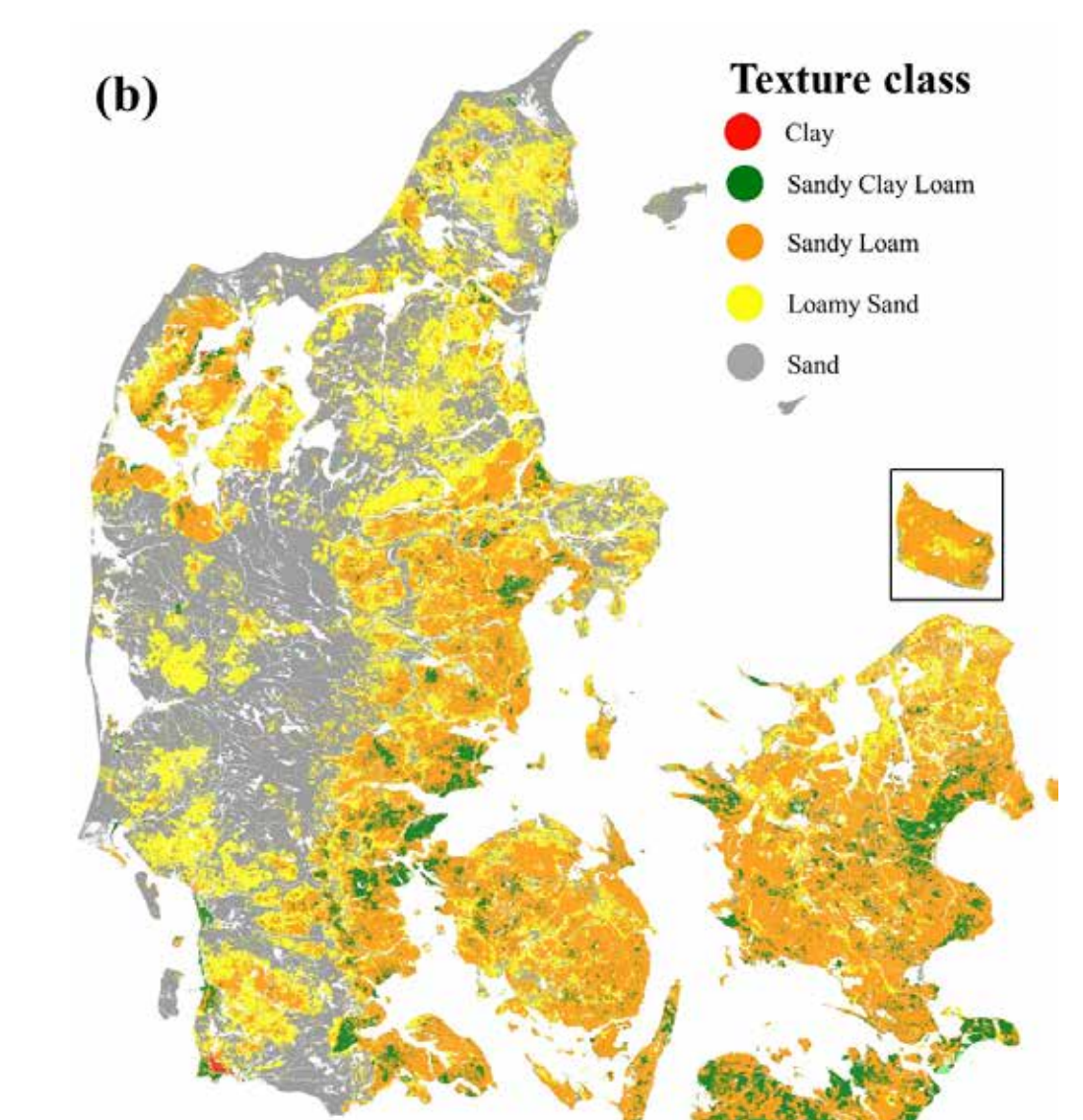
Graphical user interface controlling the drip infiltrometer setup



Visited sampling sites in Denmark



Predicting K_s and $k(-10)$



Soil texture classes (Adhikari et al. 2013)

Bo V. Iversen, Ali Mehmandoost Kotlar, Michael Koppelgaard