# Dominant factors determining hydraulic conductivity of aquitards in the Netherlands
A random forest approach

Martijn D. van Leer[1], Willem Jan Zaadnoordijk [2,3], Alraune Zech[4],Jelle Buma[2], Ronald Harting[2], Marc F.P. Bierkens[1,5], Jasper Griffioen[2,6]

Introduction

Groundwater flow in clay and peat is more complex than through sand due to a more complex pore space and it is more sensitive to processes such as soil formation and compaction. How can we predict the hydraulic conductivity (K) of these sediments?
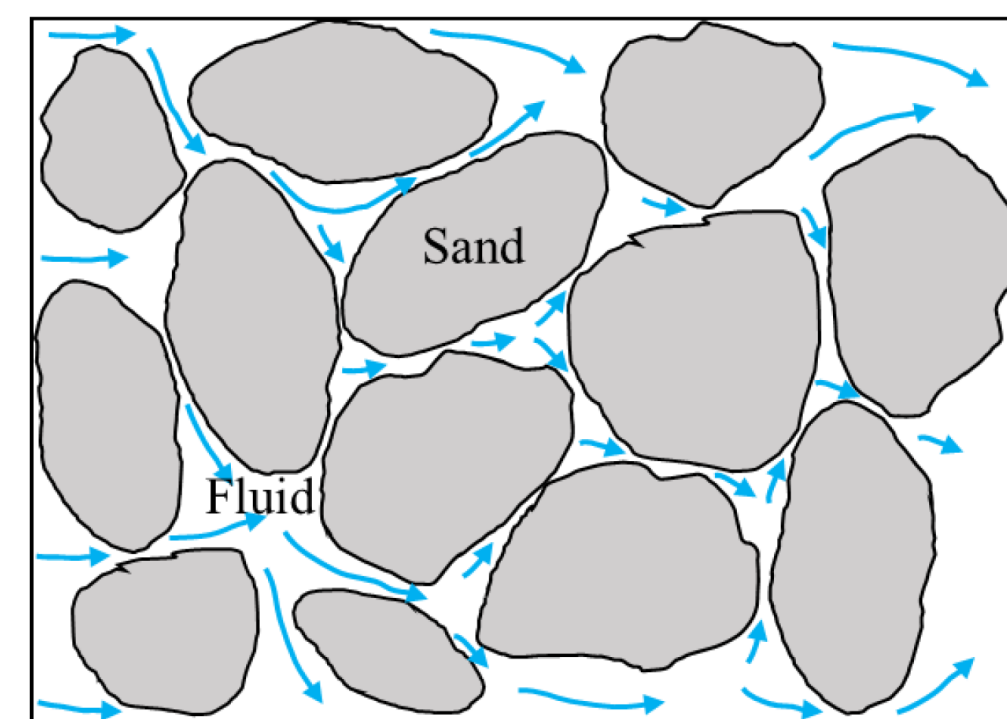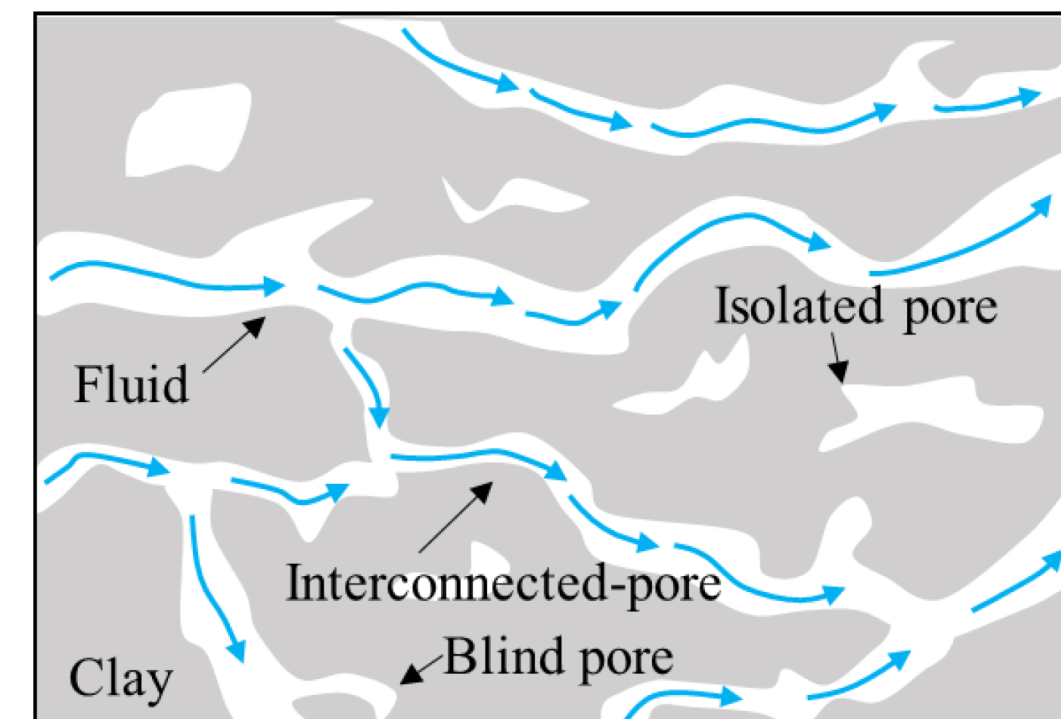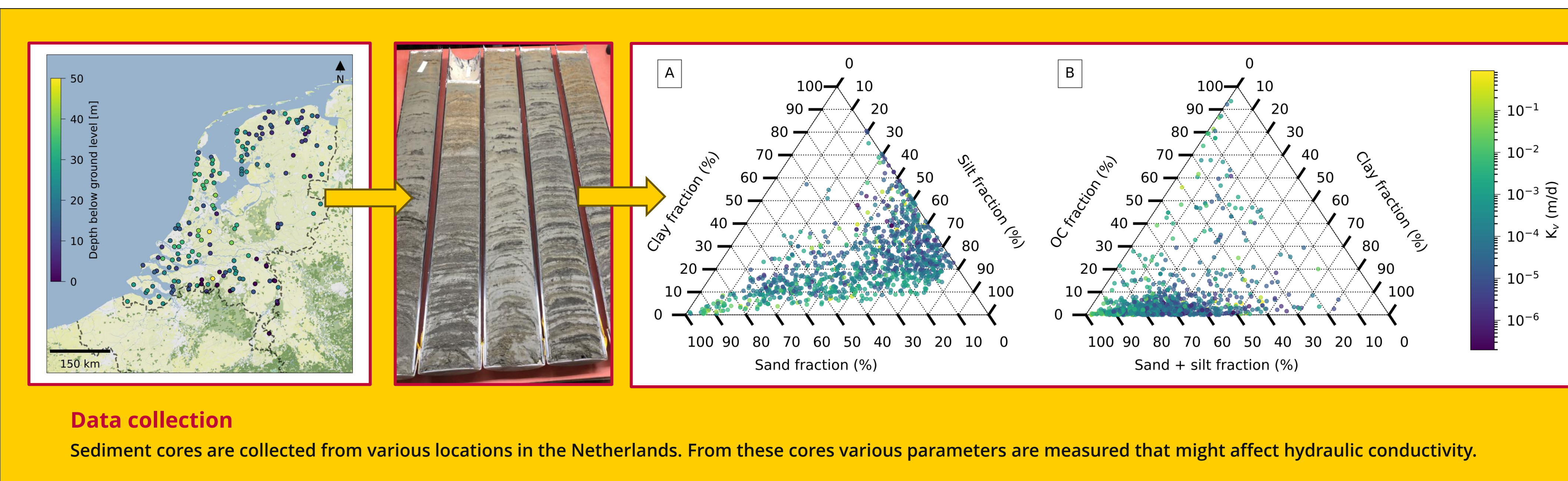

Flow at pore scale

a. Flow in sand, with mostly structured spherical pores, where K is strongly dependent on grain size and porosity.

b. Flow in clay, with a more complex pore space, with isolated and blind pores, and an irregular pore structure.

(a)

(b) Chen et al., 2022

Data collection
Sediment cores are collected from various locations in the Netherlands. From these cores various parameters are measured that might affect hydraulic conductivity.

TOPINTEGRAAL dataset

- Hydraulic conductivity
- Grain size distribution
- Porosity
- Stratigraphic unit
- Lithofacies
- Depth
- X and Y coordinates
- Organic carbon content
- Carbonate content
- Chloride concentration (LHM fresh salt)

Random forest model
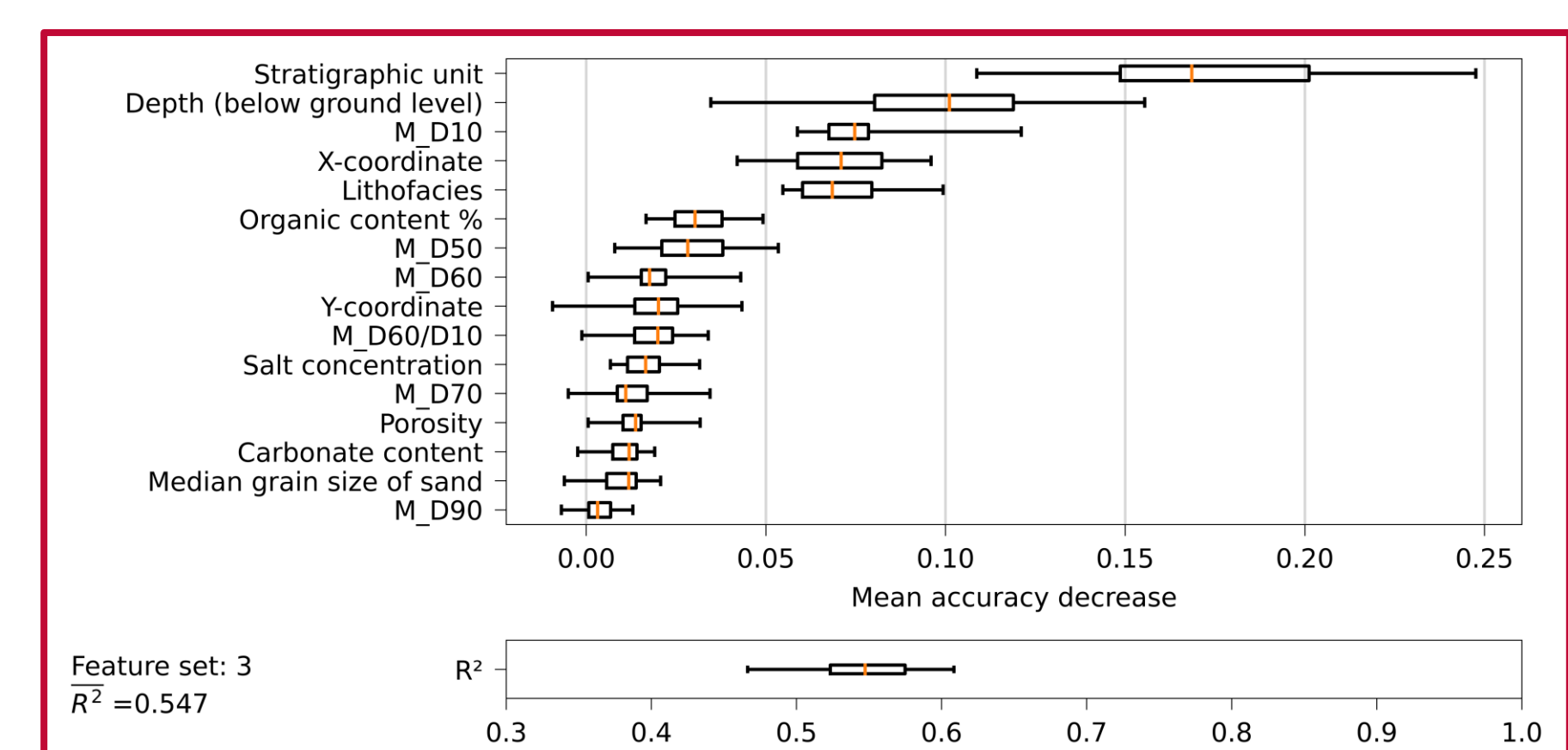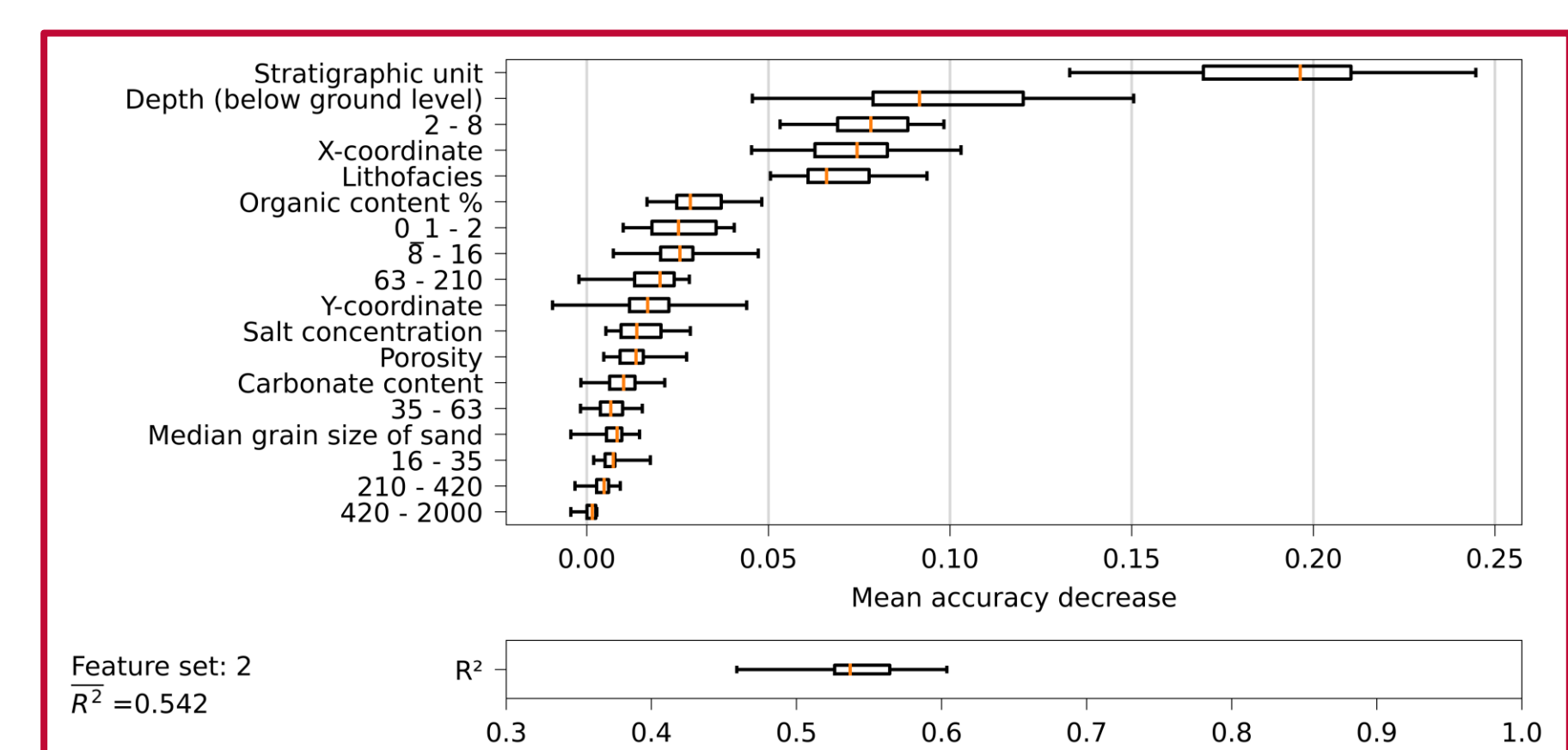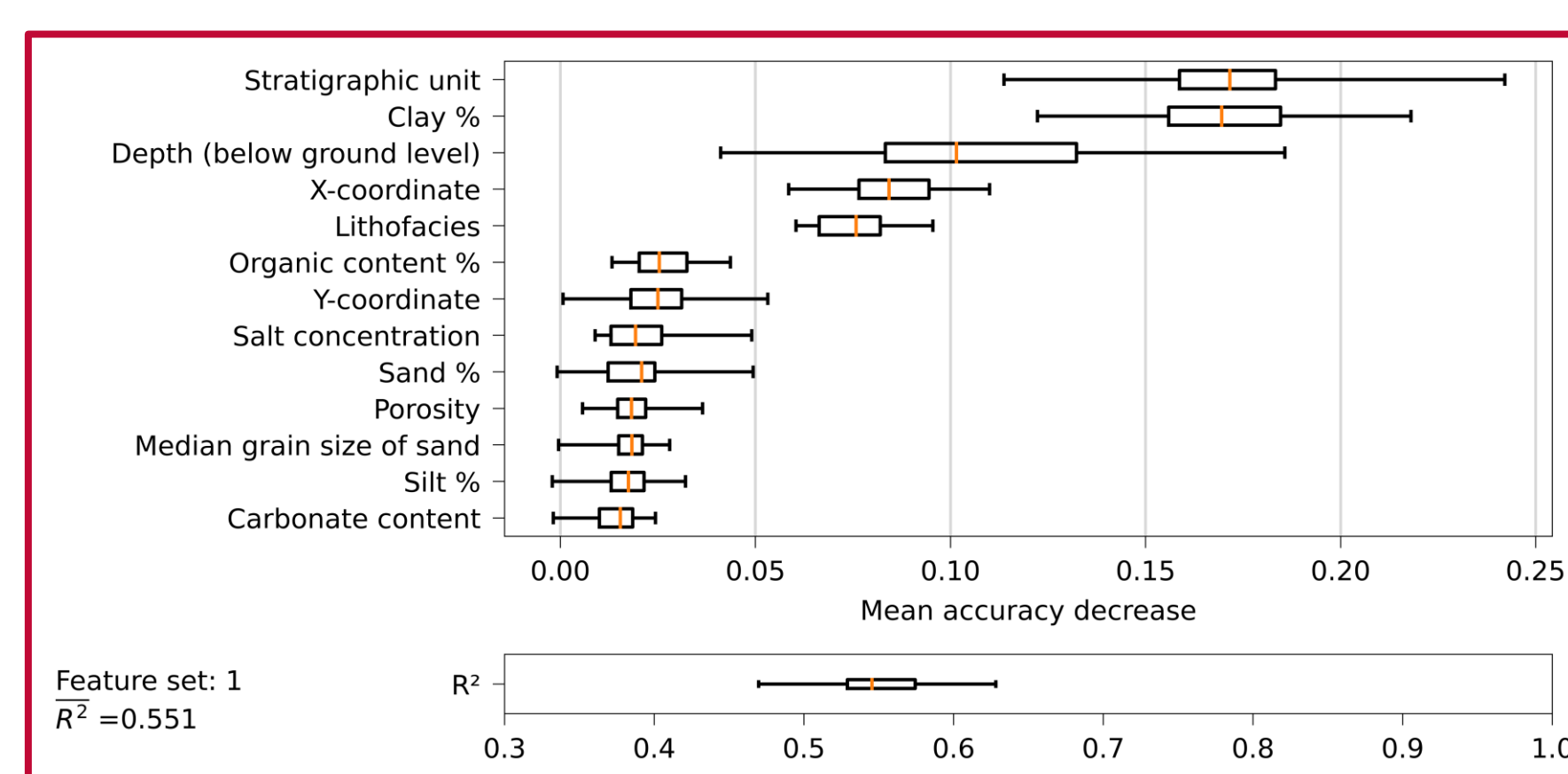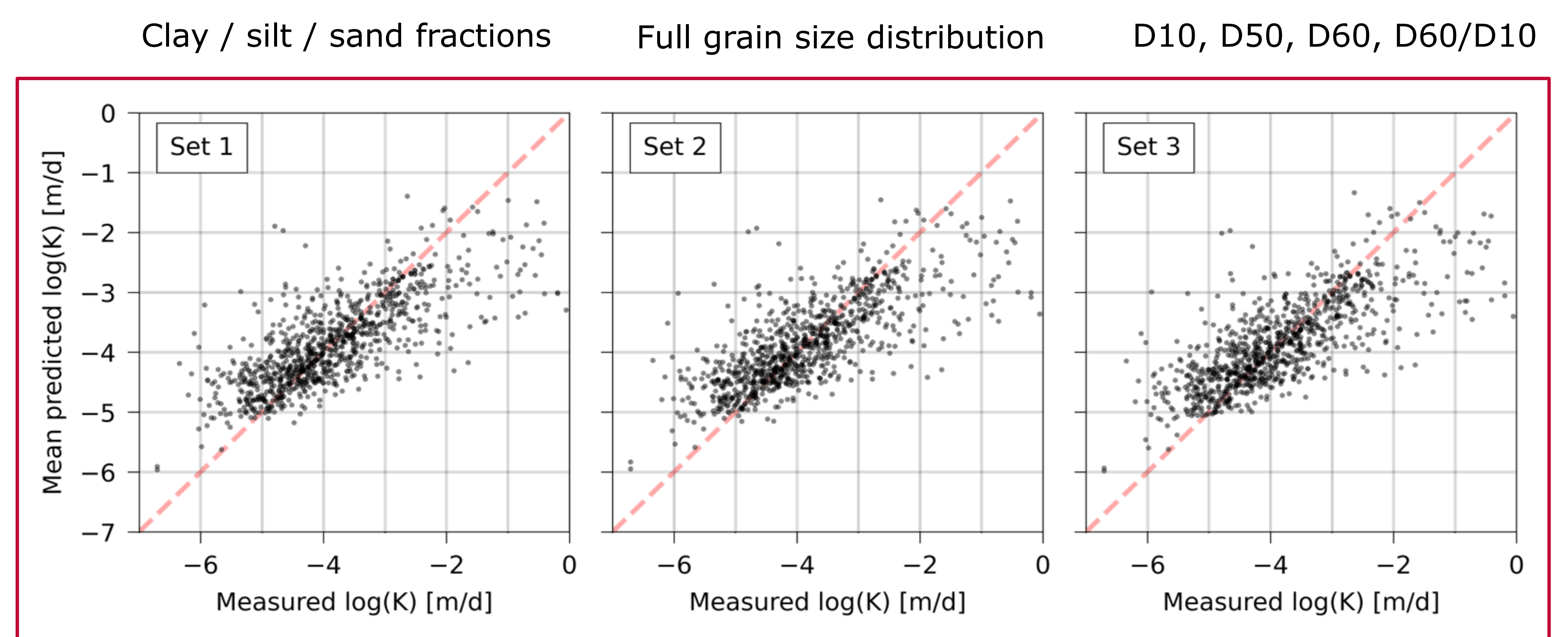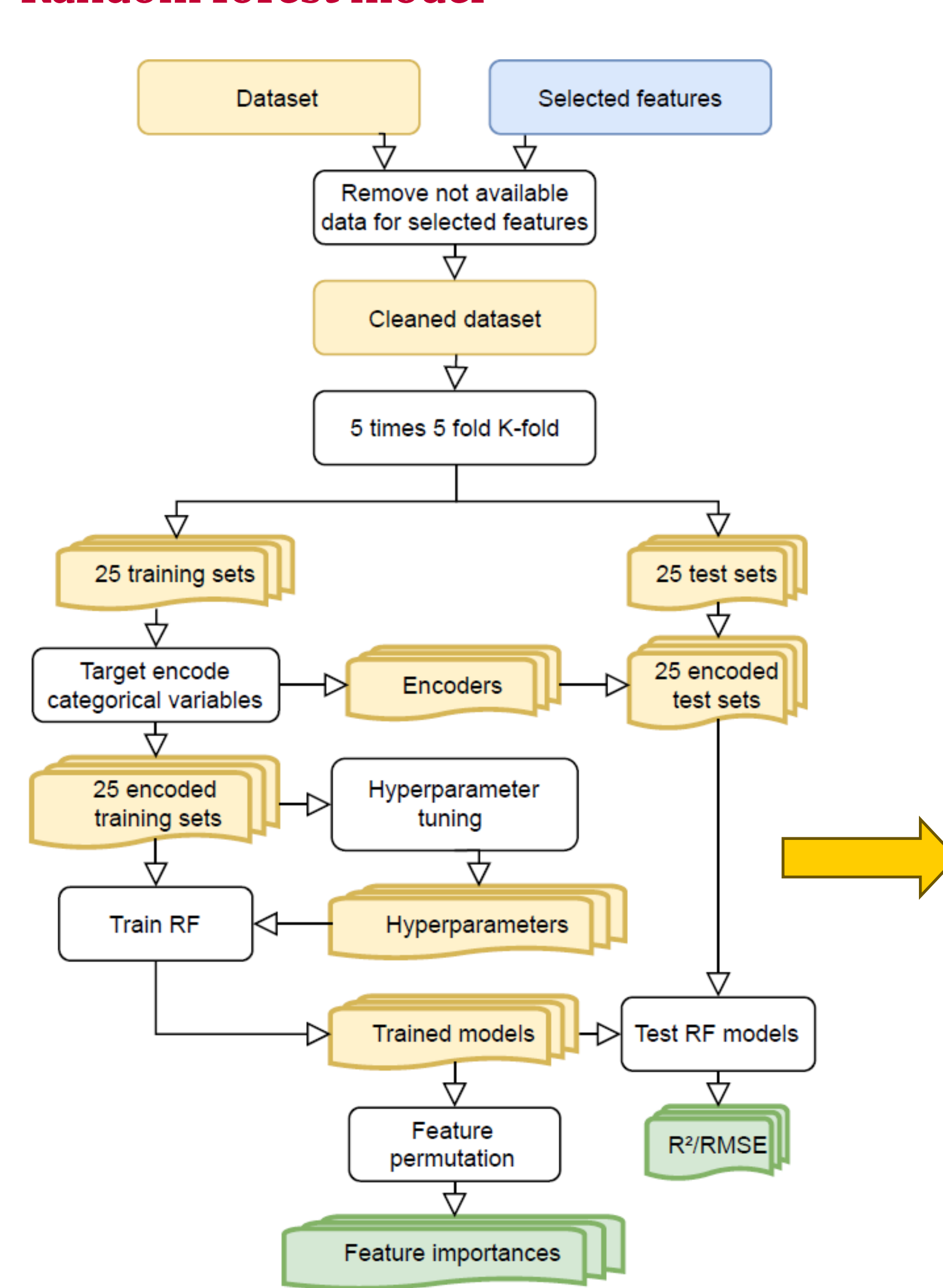
Results

Different grain size distribution metrics do not impact the prediction results. The most important parameters are stratigraphic unit, clay fraction (or the finest fraction in the other metrics) , depth, x-coordinate and lithofacies. Other parameters have limited impact on the hydraulic conductivity.

Learn more? Scan QR-code for full article and the dataset!

References

1. van Leer, M. D., Zaadnoordijk, W. J., Zech, A., Buma, J., Harting, R., Bierkens, M. F., & Griffioen, J. (2023). Dominant factors determining the hydraulic conductivity of sedimentary aquitards: A random forest approach. Journal of Hydrology, 627, 130468.
2. Chen, J., Tong, H., Yuan, J., Fang, Y., & Gu, R. (2022). Permeability prediction model modified on kozeny-carman for building foundation of clay soil. Buildings, 12(11), 1798.

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1 Department of Physical Geography, Utrecht University, Princetonlaan 8a, 3584 CB Utrecht, The Netherlands. Email: m.d.vanleer@uu.nl
2 TNO—Geological Survey of the Netherlands, P.O. Box 80015, 3508 TA, Utrecht, Netherlands
3 Water Resources Section, Faculty of Civil Engineering and Geosciences, Delft University of Technology, Delft, Netherlands
4 Department of Earth Sciences, Utrecht University, Princetonlaan 8a, 3584CB Utrecht, The Netherlands
5 Unit Subsurface and Groundwater Systems, Deltares, Daltonlaan 600, 3584 BK Utrecht, The Netherlands
6 Copernicus Institute of Sustainable Development, Utrecht University, Princetonlaan 8a 3584 CB Utrecht, The Netherlands