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# Effect of segments of soil-water characteristic curves on the estimated permeability function using statistical methods

**Qian ZHAI*, Chengfeng Zhang, Guoliang Dai, Xueliang Zhao**

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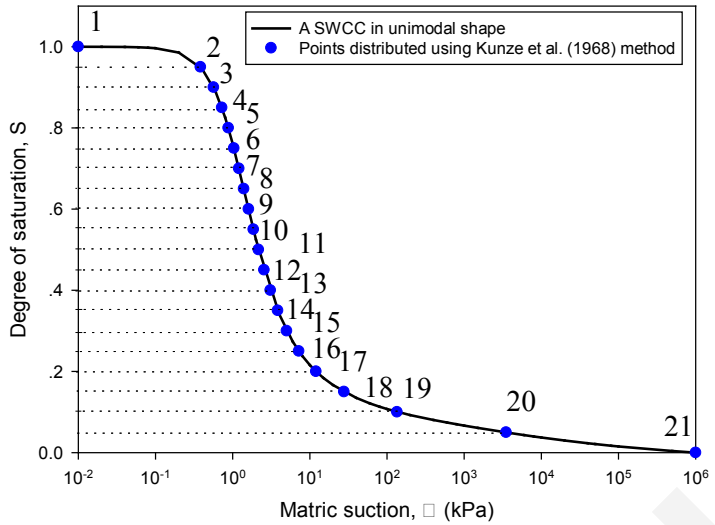
- *Corresponding Author, 101012332@seu.edu.cn
- ORCID: Qian ZHAI, https://orcid.org/0000-0003-4619-2821

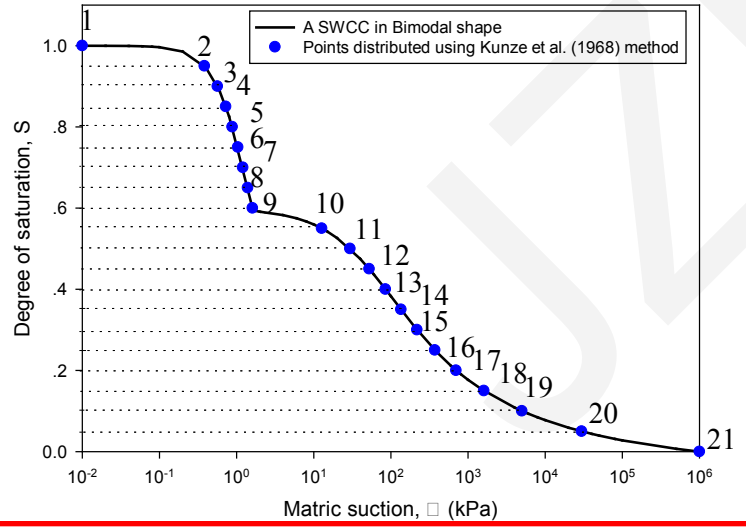
## Indirect method for the determination of coefficient of permeability

Coefficient of permeability of unsaturated soil is commonly obtained from indirect methods (such as estimation techniques) rather than direct methods (such as experimental measurement). Statistical method is believed to be most rigorous method for the estimation of the permeability of unsaturated soil. However, the accuracy of the estimated results using the statistical method are dependent on the segments of SWCC (i.e., procedure to divide the SWCC and the number of the SWCC segments.)

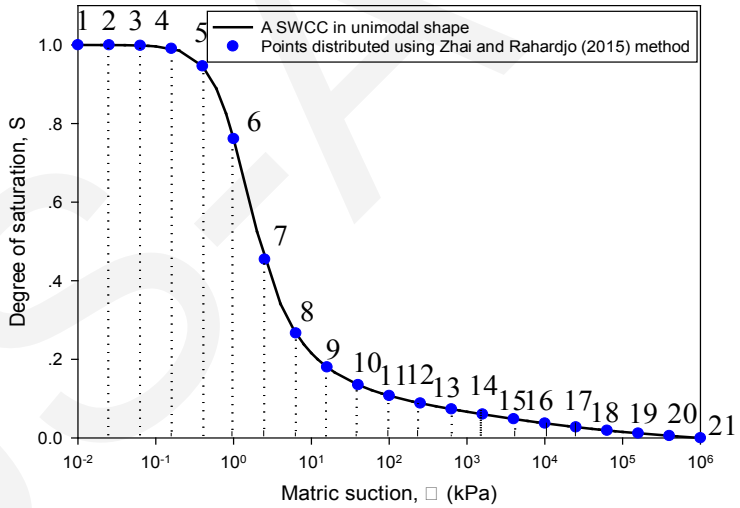
# Procedures for the division of the SWCC

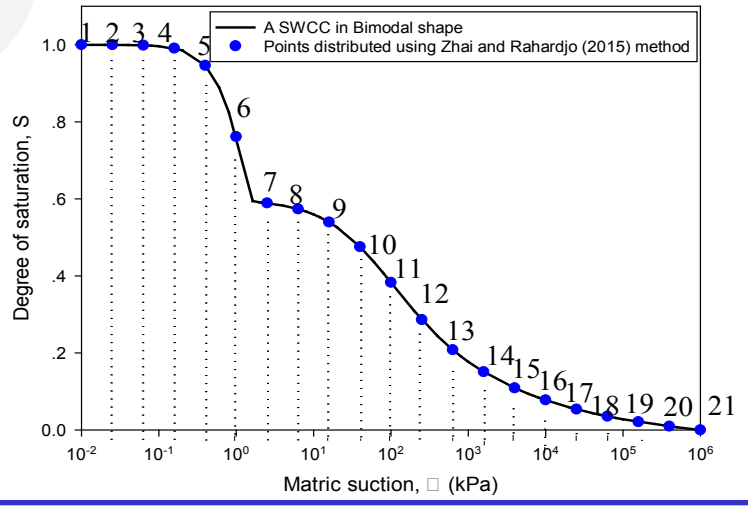
Conventional procedure for the division of SWCC



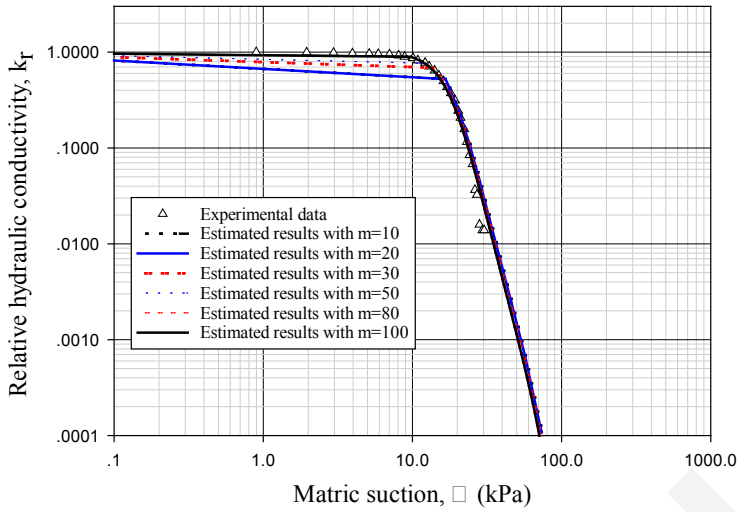

New procedure for the division of SWCC from Zhai and Rahardjo (2015)

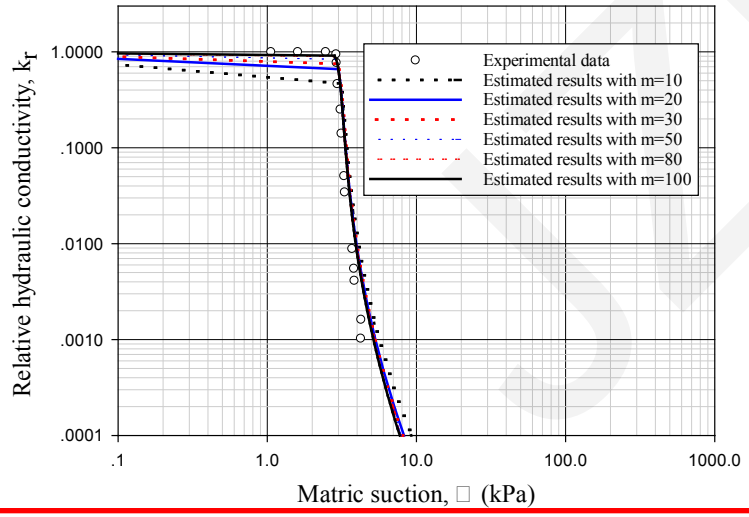


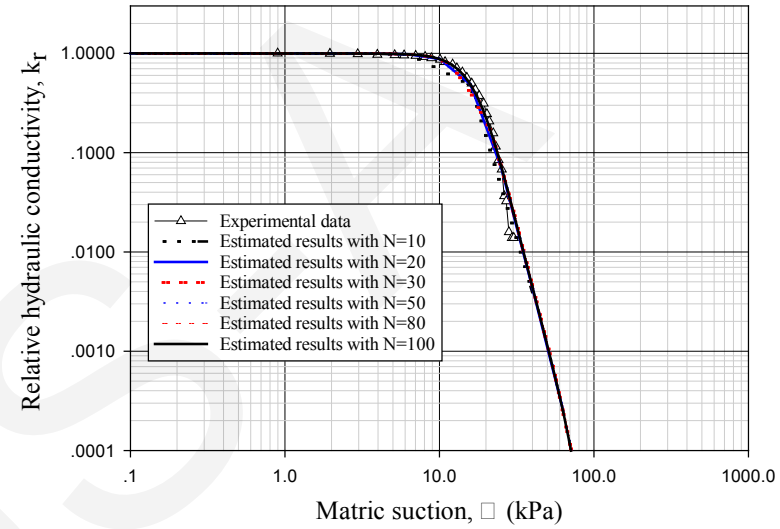
# Comparison between the estimated results for unimodal SWCCs

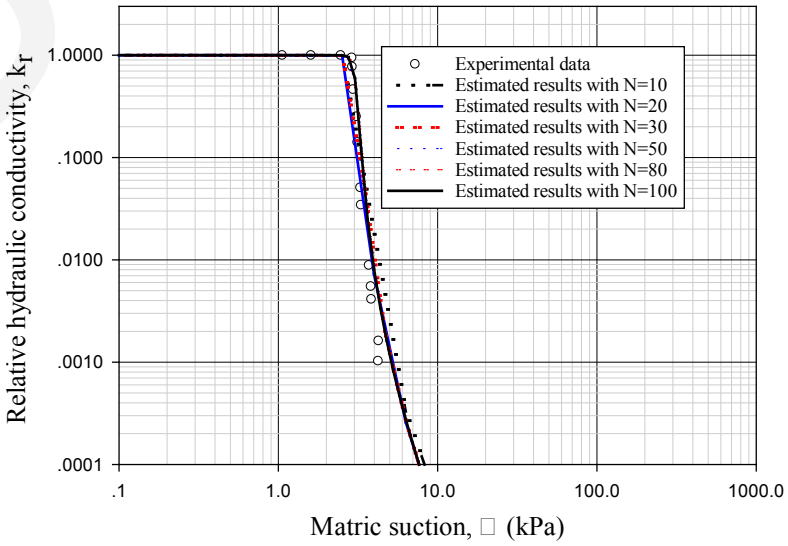
Estimated results for Glass beads and Fine sand from Conventional method



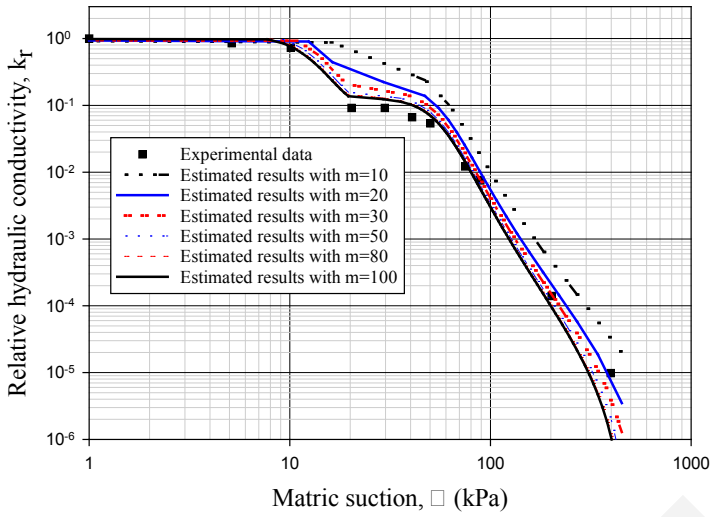



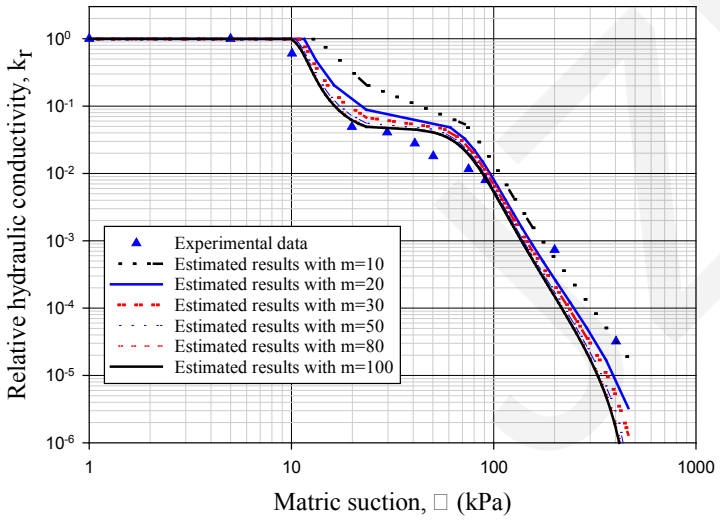

Estimated results for Glass beads and Fine sand from Zhai and Rahardjo (2015)'s method



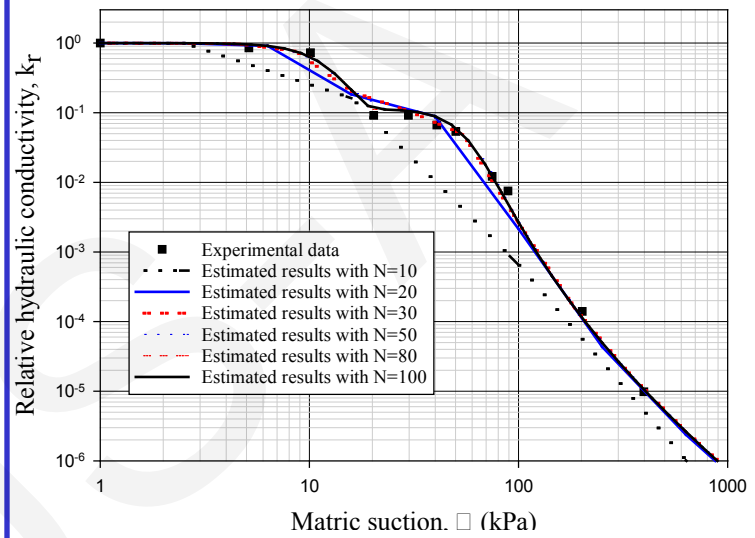



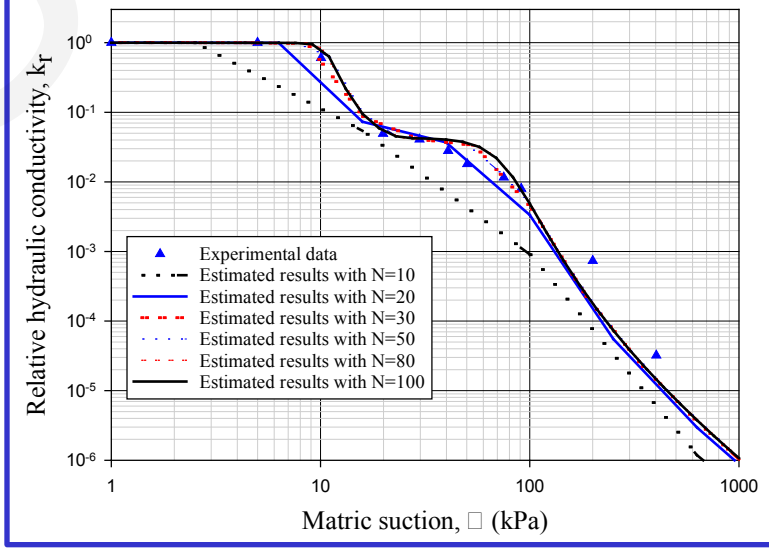
# Comparison between the estimated results for bimodal SWCCs




Estimated results for K50S50 and K50S50 with 9% mica from Conventional method

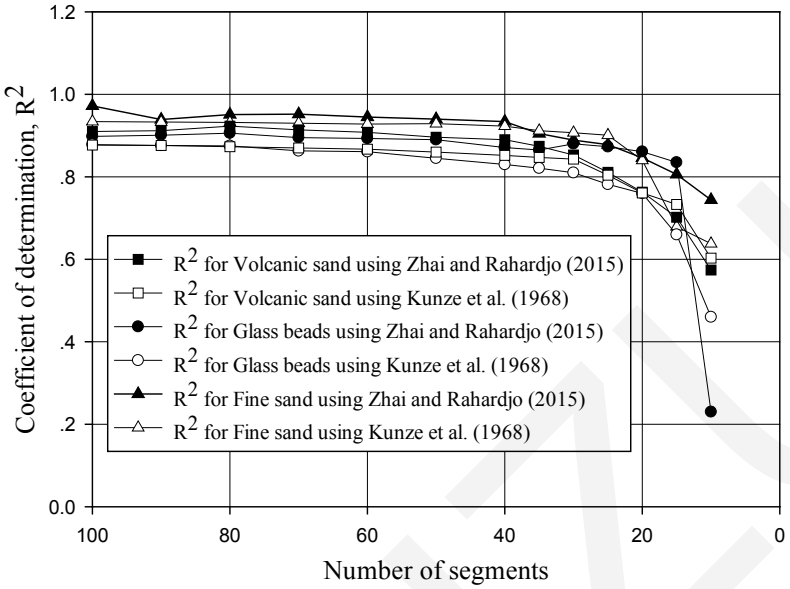


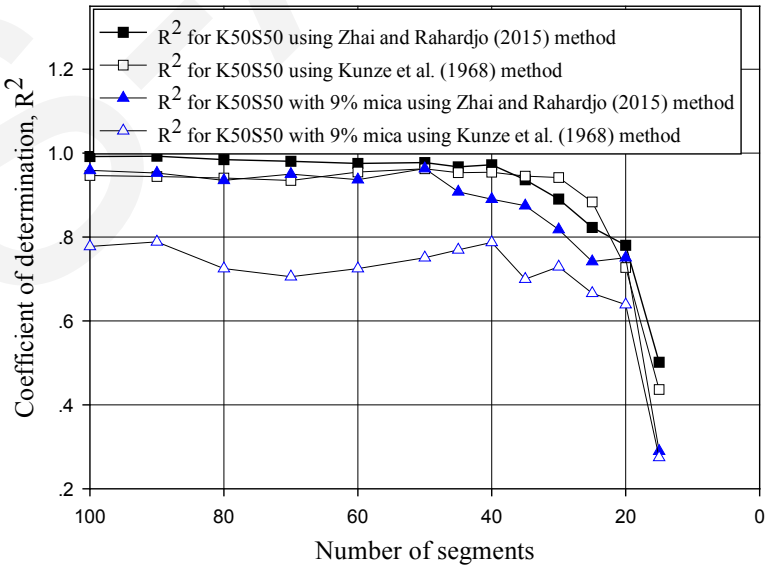

Estimated results for K50S50 and K50S50 with 9% mica from Zhai and Rahardjo (2015)'s method

# Coefficient of determination with respect to the number of segments

## Unimodal SWCC




## Bimodal SWCC

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# Conclusions

1, Statistical method is rigorous for the estimation of the permeability of unsaturated soil, but the estimated results could still be affected by the procedures for the division of the SWCC and the numbers of SWCC segments.

2, It is observed that the method as recommended by Zhai and Rahardjo (2015) provides more consistent results with decrease in the number of SWCC segments.

3, It is observed the coefficient of determination, $R^2$, become to be consistent when the number of SWCC segments were more than 40 regardless which method was adopted.

4, Consequently, Zhai and Rahardjo (2015)'s method with minimum 40 nos. of SWCC segments is recommended for the estimation of the coefficient of permeability for the unsaturated soil.

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