DEPARTMENT OF LANDSCAPE
WATER CONSERVATION

Testing of soil aggregate stability by means of laser diffractometer Mastersizer 3000

FACULTY OF CIVIL
ENGINEERING
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Soils

- All soil samples were collected within the Czech republic (7 soil samples in total)
- PSD by laser diffraction
- pH in H_2O
- Agronomical soils

Code Name	Sampling location and GPS	Soil type (WRB 2015)	Depth of sampling (cm)	Fraction (%)			pH H_2O
				Clay < 0.002	Silt 0.002 - 0.05	Sand 0.05 - 2.0	
NUC	Nučice; 14.8617398° E 49.9663870° N	Cambisols	0 - 10	2.43	62.08	35.49	5.6
ROH	Rohozec; 15.3522415° E 49.9785102° N	Phaeozems		2.93	36.47	60.6	5.4
RIS	Řisuty; 14.0174110° E 50.2173800° N	Chernozems		8.97	54.82	36.21	4.3
ZEH	Žehušice; 15.4290595° E 49.9710047° N	Fluvisols		8.04	75.4	16.56	6.2
BYK	Býkovice; 14.8217265° E 49.7776512° N	Cambisols		5.81	71.61	22.58	6.2
SOK1	Sokolnice 1; 16.7122728° E 49.1146483° N	Chernozems		7.12	72.1	20.78	7.5
SOK2	Sokolnice 2; 16.7408884° E 49.1091658° N	Chernozems		9.27	69.97	20.76	7.5

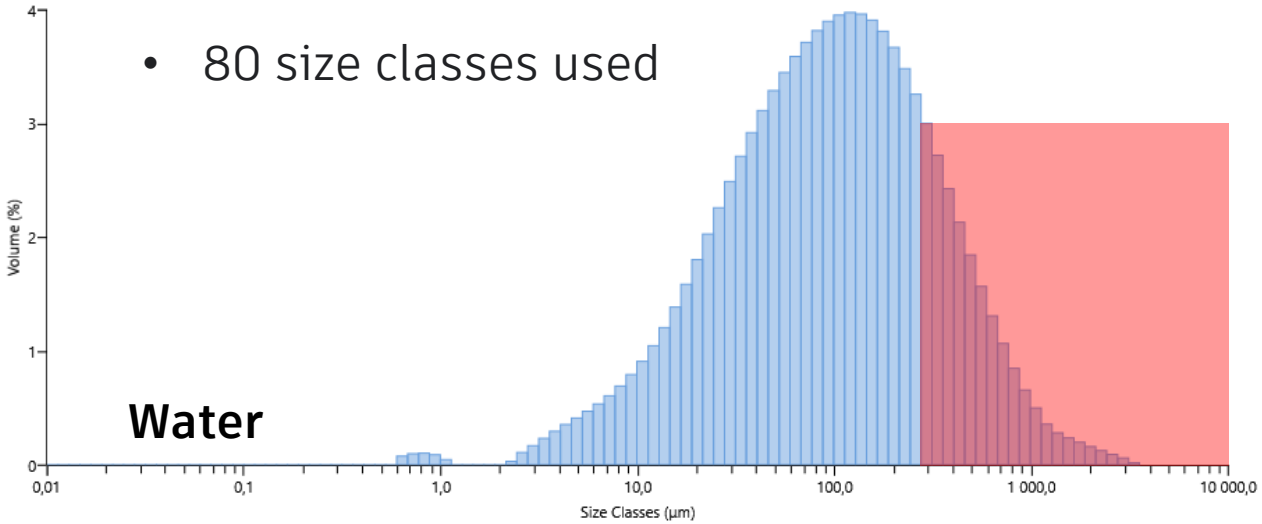
Measurement by the Mastersizer 3000

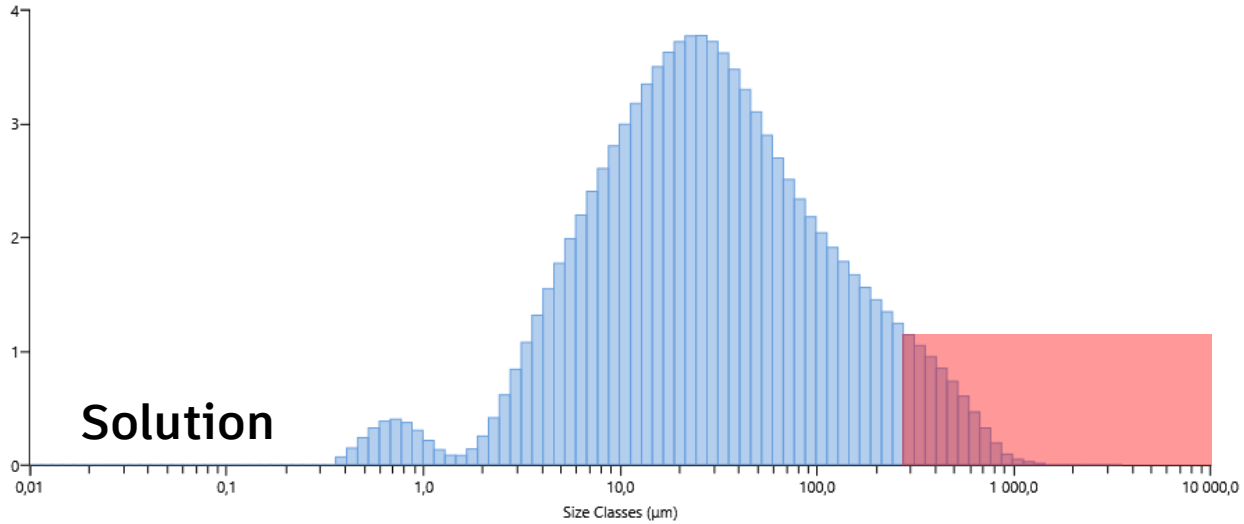
- Air-dried
- Sieved 1 – 2 mm
- Prewetted with very fine plant sprayer (5 min)
- Weighted residua must be under 1 %
- Histogram of disrupted size classes

	Dispersant	Water	Solution
Material properties	Refractive index	1.457	
	Absorption index	0.010	
	Particle density ($g.cm^{-3}$)	2.640	
	Sample amount (g)	0.400	
Dispersant properties	Refractive index	1.330	
Unit properties	Sonicating level (%)	0	100
	Sonicating time (s)	0	70
	Stirrer/pump speed (rpm)	2500	
Measurement properties	Red light time (s)	10	
	Blue light time (s)		
	Cycles	5	
	Weighted residua (%)	< 1	
Total time of measurement (s)		100	170

Calculation of the Water Resistant Index

- Size classes over 240 μm were omitted
- 80 size classes used





$$WRI_{LD} = \frac{\sum_{o}^{i} \frac{S_{sol,i}}{S_{w,i} + S_{sol,i}}}{i}$$

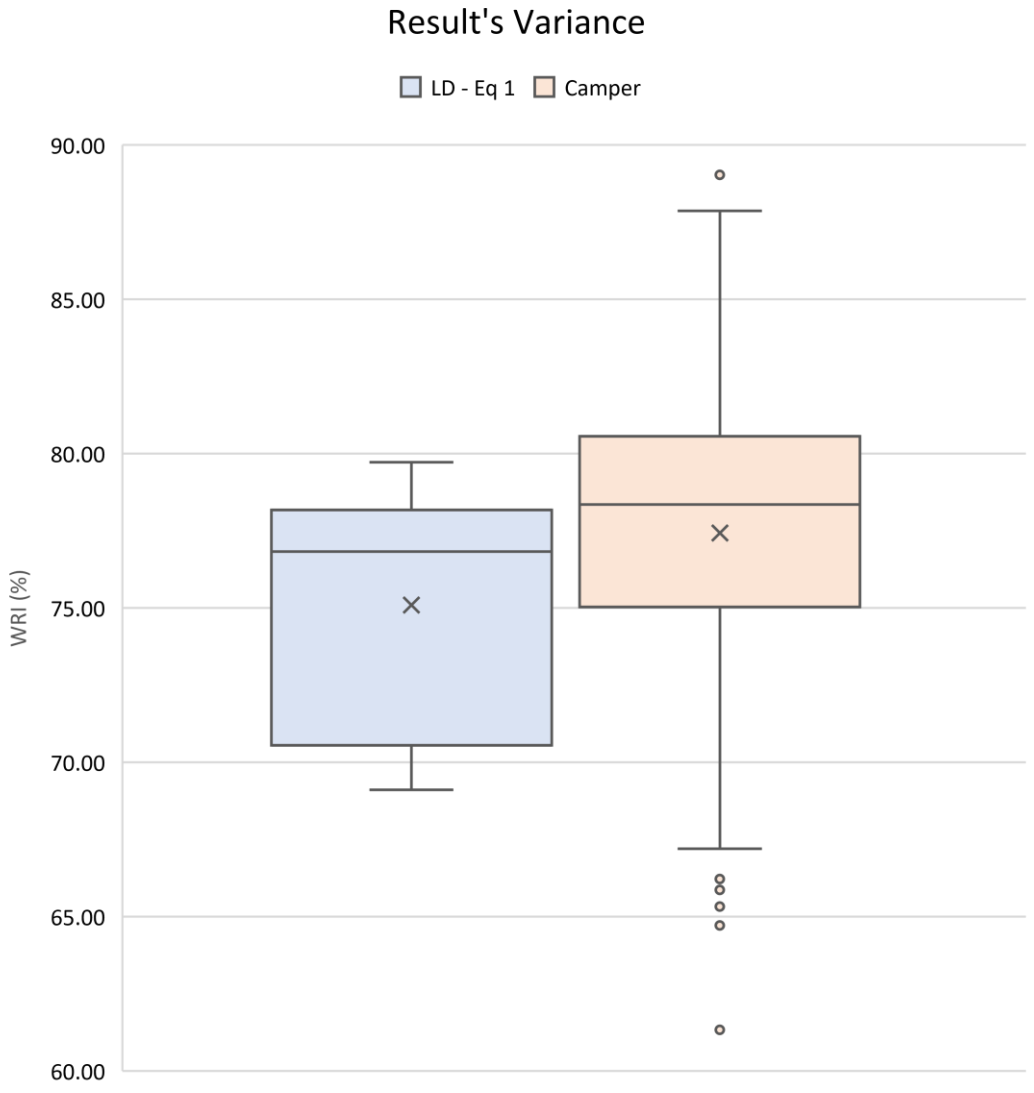
$S_{sol,i}$ – volume in solution for size class (%)

$S_{w,i}$ – volume in water for size class (%)

i – number of size classes

Results and Discussion

- The method was developed with an emphasis on comparability with wet sieving
- Average standard deviation between WRI of coresponding samples was 3,58 %
- Total of 214 WRI were measured
- Advantage of the method
  - Fast
  - Reproducible
  - Easy

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thank you for your attention...