



METER
ENVIRONMENT

HOW DO SATURO READINGS COMPARE TO DOUBLE-RING INFILTROMETER READINGS?

Contributors

The SATURO and the double-ring infiltrometer are both ring infiltrometers that infiltrate water from the surface into soils. Overall, they compare fairly well (see comparison below). The main difference is how they deal with three-dimensional flow in the field saturated [hydraulic conductivity](#) (K_{fs}) calculation. The SATURO uses the multiple-ponded head analysis approach to get a more direct estimation of alpha, which is used to determine how the soil pulls the water laterally. The double-ring infiltrometer uses a larger outer ring to act as a buffer from three-dimensional flow. This requires more water, and literature suggests that it doesn't perform well. Also, with a double-ring infiltrometer, there is still a need to estimate alpha in the equations. This is typically done from a look-up table based on soil type and often results in error.

TWO INFILTROMETERS GO HEAD TO HEAD

We compared the SATURO with a six-inch (15.24 cm) inner ring diameter against a double-ring infiltrometer with a six-inch (15.24 cm) inner ring diameter and an outer ring with a 12-inch (30.48 cm) diameter. The test was conducted on the METER soccer field at seven different locations. The measurements between the SATURO and the double-ring were conducted at the same time within the same 1 m² area. SATURO and double-ring infiltrometer measurements compared well except in cases where the flow was primarily dominated by large macropores (Figure 1). Measurements at locations SF3 and SF4 were primarily dominated by large macropores. This behavior was consistent in many measurements across the south end of the field.

Location	Double-Ring K_{fs}	SATURO K_{fs}	ΔK_{fs}
	cm/hr	cm/hr	cm/hr
SF 1	21.27	18.1	-3.19
SF 2	20.43	11.4	-9.05
SF 3	1.23	62.6	61.41
SF 4	1.49	44.3	42.79
SF 5	6.07	7.6	1.48
SF 6	2.82	1.3	-1.50
SF 7	1.69	3.4	1.67

Table 1. Field saturated hydraulic conductivity values from double-ring infiltrometer and the SATURO

When installing the double-ring infiltrometer, it was apparent that the structure of the soil was being disturbed by the amount of force required to install the double-ring infiltrometer. Because of this disturbance, the field saturated hydraulic conductivities (K_{fs}) from the double-ring infiltrometer were one to two orders of magnitude lower than the SATURO measurements (Table 1). Overall, the two methods compare well, except in cases where there are large structural macropores that can be destroyed when subjected to the amount of force required to install the double-ring infiltrometer.

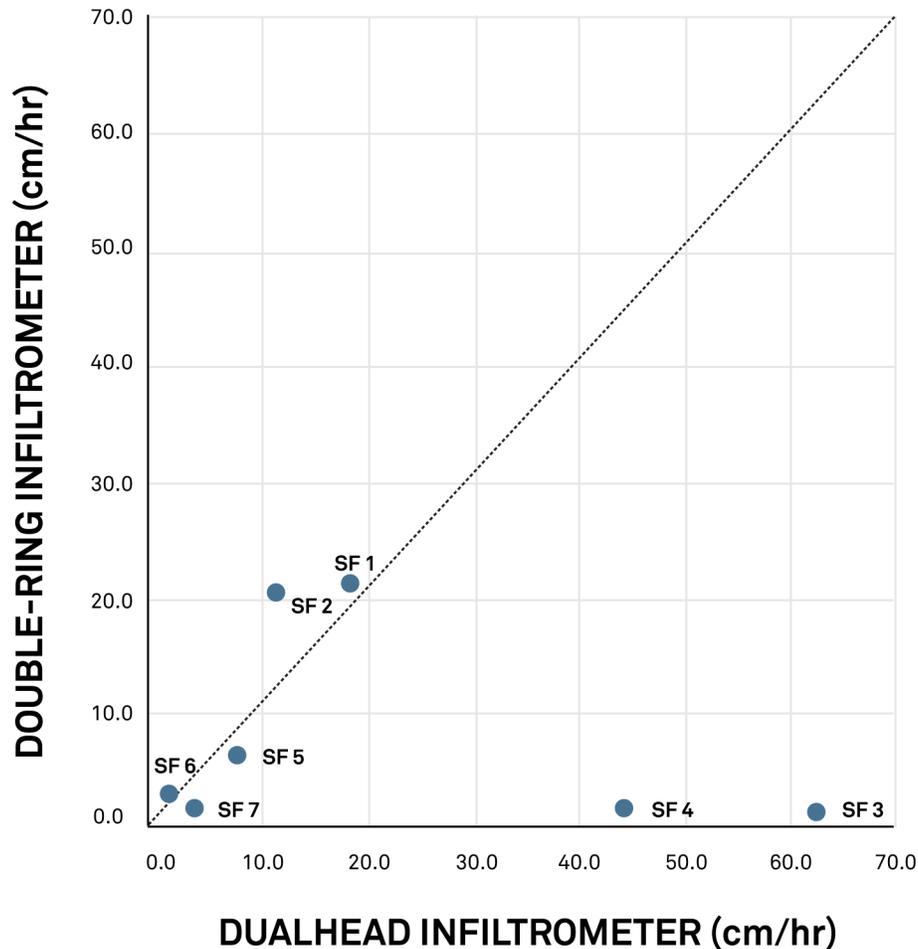


Figure 1. 1:1 plot of Kfs measurements from a double-ring infiltrometer and the SATURO dual head Infiltrrometer

THE SCIENCE BEHIND SATURO

In the video [here](#), Dr. Gaylon S. Campbell teaches the basics of hydraulic conductivity and the science behind the SATURO automated dual head infiltrometer.

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