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LIST OF SYMBOLS AND ACRONYMS

a - Constant for neutron probe calibration equation that depends upon substances in the soil

ADL - Allowable depletion level

b - Slope of the neutron probe calibration equation

CF - Crop Factor

d_d - Depth of placement of the detector (m)

DOY - Day of the year

D_r - Drainage (mm)

E_{pan} - Evaporation from a class A pan (m)

E_s - Direct evaporation from the soil surface (m)

E_{sp} - Potential soil evaporation (kg m^{-2} s^{-1})

ET - Evapotranspiration (m)

ET_a - Actual evapotranspiration (m)

ET_m - Maximum crop evaporation (m)

ET_o - Reference evapotranspiration (m)

FC - Field capacity

FS1 - FullStop 1

FS2 - FullStop 2

K_c - Crop coefficient

K_{pan} - pan coefficient

MACH - Machingilana

N - Count ratio for the neutron probe

NP - Neutron probe

O - Overhead from a wetting front detector

P - Precipitation (mm)

PAW - Plant available water

PET - Potential evapotranspiration (mm)

PT - Potential transpiration (mm)

PWP - Permanent wilting point

R - Run-off from the soil surface (mm)

SWB - Soil Water Balance model

T - Transpiration (mm)

T_d - Daily transpiration (mm day^{-1})

TDR - Time Domain Reflectometry

Σ - The sum of

I - Neutron probe count rate

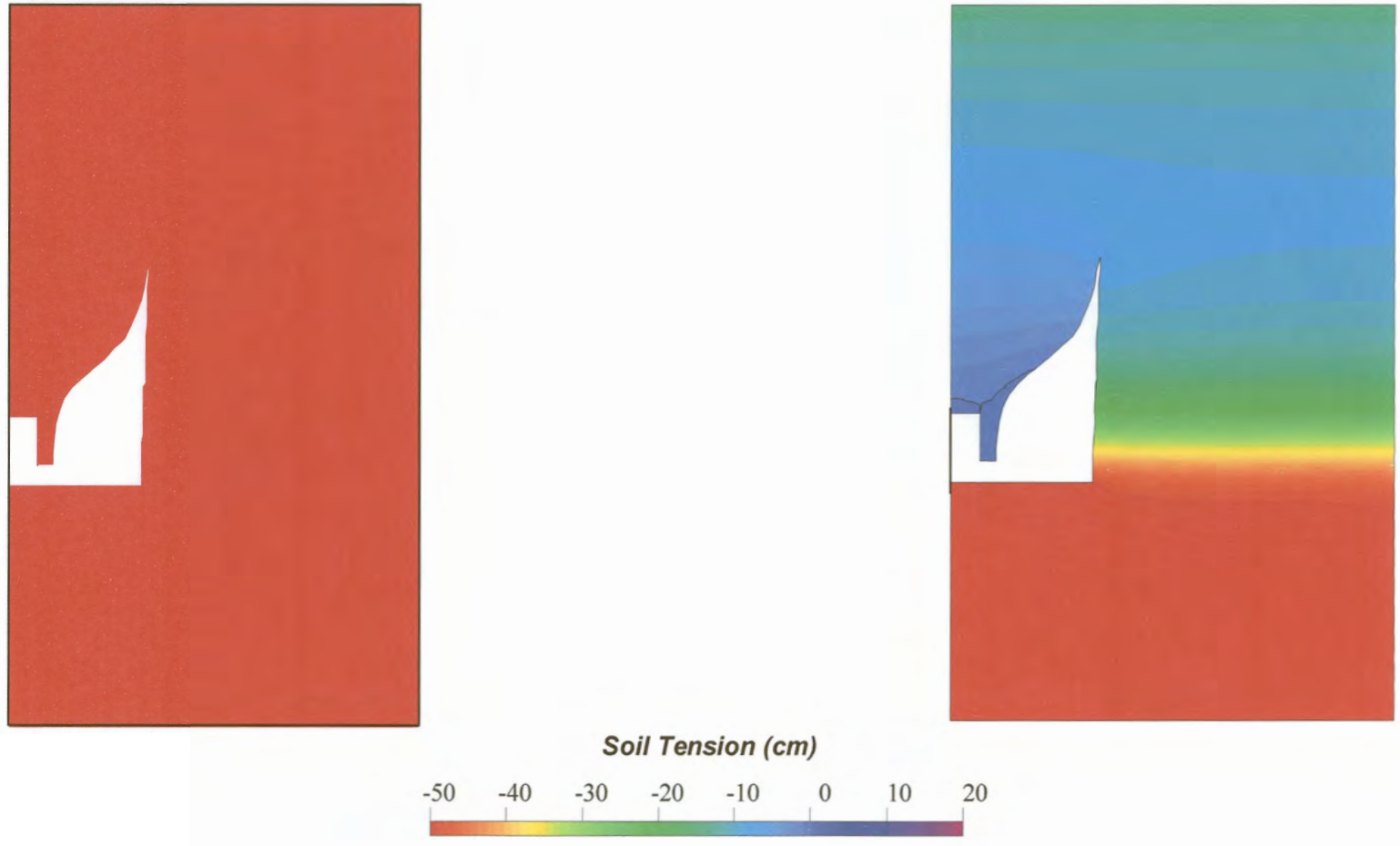
I_{std} - Neutron probe standard counts

θ	-	Volumetric soil water content (m m^{-1})
θ_{dul}	-	Volumetric water content at drained upper limit (m m^{-1})
θ_i	-	Initial water content in the soil
θ_{ll}	-	Volumetric water content at lower limit (m m^{-1})
θ_{rf}	-	Volumetric water content at refill point (m m^{-1})
θ_{wf}	-	Volumetric water content at the wetting front (m m^{-1})
ΔS	-	Change in soil water storage (mm)
®	-	Original trade name for product x
ℓ	-	litre
ψ_L	-	Leaf water potential (J kg^{-1})

APPENDIX A

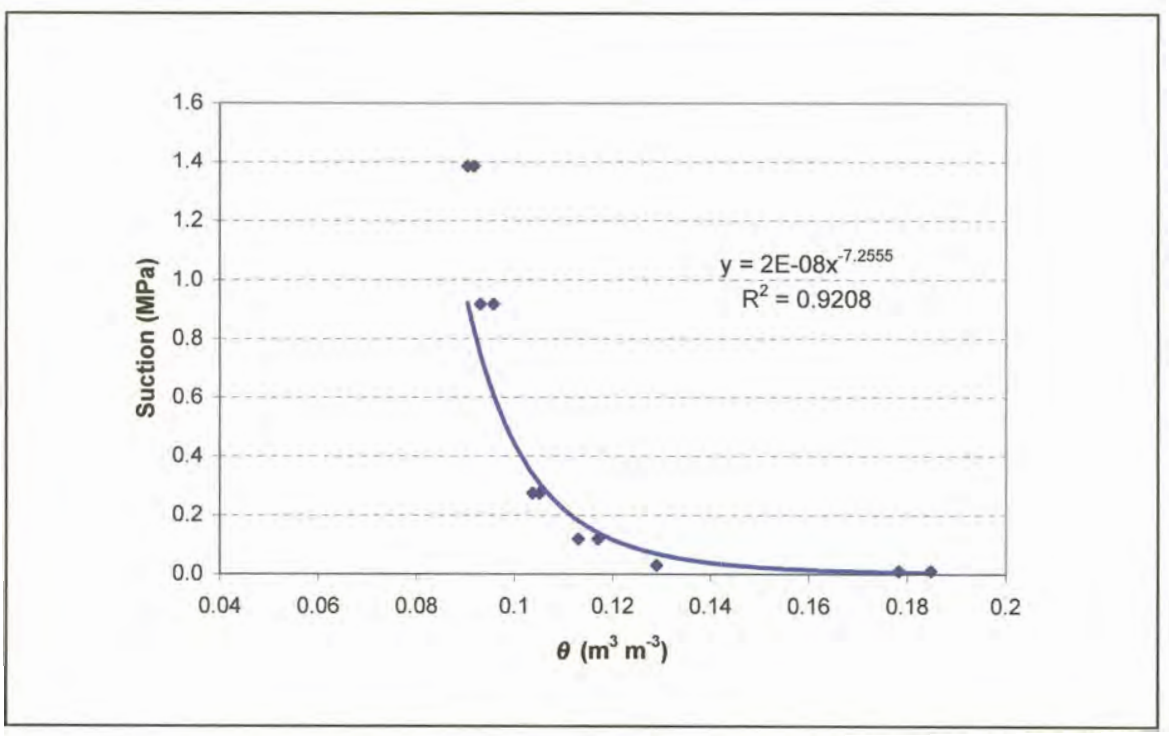
(I) A Hydrus simulation of how soil suction plays a critical role in the operation of the wetting front detector. In an initially dry soil, gravity and suction are the driving force for water movement, and therefore the build-up suction in the WFD will cause water to flow into the detector. (II) The position of the wetting front (and the soil tension above and below it) after detection by the WFD.

I. II.



APPENDIX B

Soil water characteristic curve for the WFD experiment, Hatfield experimental farm, determined according to the *'desorption'* method described by Hillel (1998); and Gardner (1986). The samples collected with a core sampler of a known volume were subject to different suction levels with a pressure plate until equilibrium was reached. The bulk density the soil sample was also determined.



APPENDIX C

Schematic layout of the WFD trial – Hatfield Experimental Farm showing only the treatment plots; border plots are excluded.

Rep1 SWB (21)	Rep1 FS1 (22)	Rep2 CF (23)	Rep2 MACH (24)	Rep3 FS1 (25)	Rep3 NP (26)	Rep4 SWB (27)	Rep4 NP (28)	Rep5 MACH (29)	Rep5 FS2 (30)
Rep1 MACH (20)	Rep1 NP (19)	Rep2 FS2 (18)	Rep2 FS1 (17)	Rep3 CF (16)	Rep3 MACH (15)	Rep4 FS1 (14)	Rep4 FS2 (13)	Rep5 SWB (12)	Rep5 CF (11)
Rep1 FS2 (1)	Rep1 CF (2)	Rep2 SWB (3)	Rep2 NP (4)	Rep3 SWB (5)	Rep3 FS2 (6)	Rep4 CF (7)	Rep4 MACH (8)	Rep5 FS1 (9)	Rep5 NP (10)

Legend

FS1 – FullStop 1
FS2 – FullStop 2
MACH – Machingilana
SWB – SWB model
NP – Neutron probe
CF – WFD generated crop factor

N

APPENDIX D

The irrigation controller configuration of WFD experiment at Hatfield experimental farm showing the flow rates as well the stations that controlled each solenoid valve.

Treatment	FS1 rep 1	FS1 rep 2	FS1 rep 3	FS1 rep 4	FS1 rep 5	FS2 rep1	FS2 rep 2	FS2 rep 3	FS2 rep 4	FS2 rep 5	NP	SWB	CF	Machingilana	Main meter
Solenoid valve	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Water meter number	1	1	1	1	1	6	6	6	6	6	2	3	5	4	7
Control station	1		2		3	8	9	10	11	12	4	5	6	7	
Number of plots	*8		*8		4	4	4	4	4	4	5	5	5	5	
Flow rate	*544		*544		272	272	272	272	272	272	340	340	340	340	

N:B * Indicates that the solenoid valves for this replicates where connected to a common control station although each one shuts-off irrigation separately.

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