

HOW SOIL HYDROLOGY REACTS DURING STRONG PRECIPITATION EVENTS?

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Experimental Protocol

❑ 15 lysimeters → 4 exploited
water content/matrix pressure/drainage

❑ 13 intense rainfall events
(by the daily quantile 99 >=30mm/day)

❑ ISBA diffusion scheme
3 models

a) Brooks and Corey model (1966)

$$\Psi(\omega) = \Psi_s * \left(\frac{\omega}{\omega_s}\right)^{-b} \quad K(\Psi) = K_s * \left(\frac{\Psi}{\Psi_s}\right)^{-\left(\frac{2b+3}{b}\right)}$$

b) Van Genuchten model (1980)

$$\Psi(\omega) = \frac{1}{\alpha} * \left[\left(\frac{\omega}{\omega_s}\right)^{-n/n-1} - 1 \right]^{1/n}$$
$$K(\Psi) = K_s * \frac{((1+|\alpha\Psi|^n)^m - |\alpha\Psi|^{n-1})^2}{(1+|\alpha\Psi|^n)^{m(l+2)}}$$

c) A combination of Van Genuchten and
Brooks and Corey models

$$\Psi(\omega) = \frac{1}{\alpha} * \left[\left(\frac{\omega}{\omega_s}\right)^{-n/n-1} - 1 \right]^{1/n}$$
$$K(\Psi) = K_s * \left(\frac{\Psi}{\Psi_s}\right)^{-\left(\frac{2b+3}{b}\right)}$$

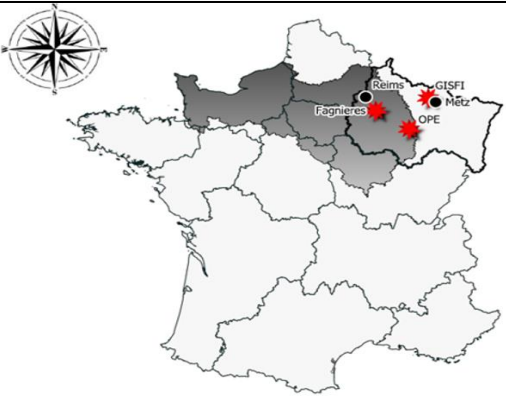
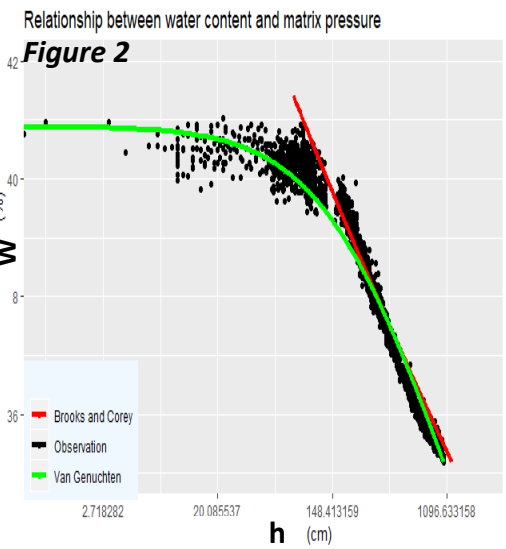


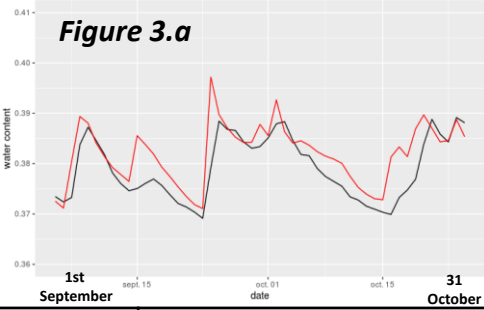
Figure 1 : Location of lysimeters



Results : One intense precipitation event (October 2010) for lysimeter 1

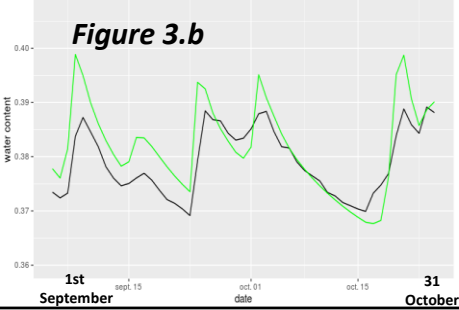
Brooks and Corey

❑ Figure 3 Water Content



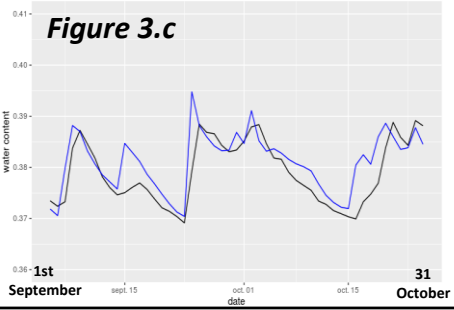
R ²	0,61
Biais (m ³ /m ³)	-0,003

Van Genuchten



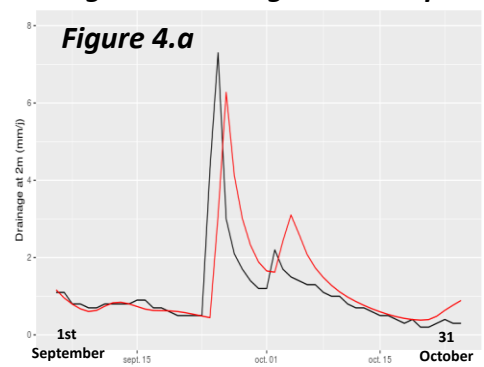
R ²	0,69
Biais (m ³ /m ³)	-0,0028

Brooks and Corey + Van Genuchten

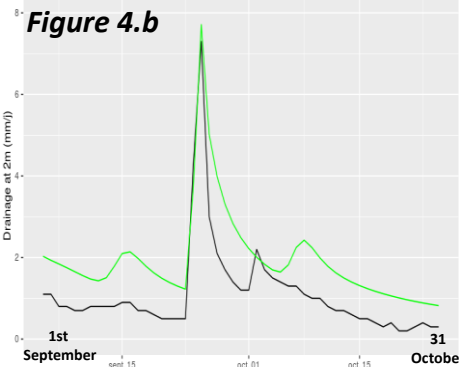


R ²	0,62
Biais (m ³ /m ³)	-0,0021

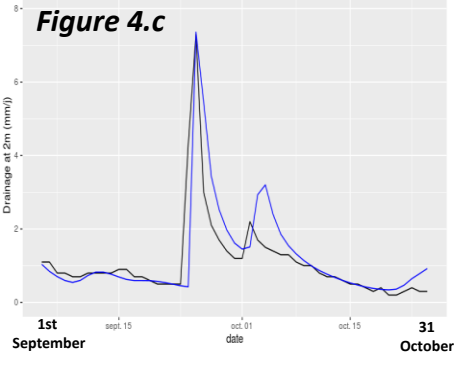
❑ Figure 4 Drainage at 2m depth



R ²	0,3
Biais (mm/day)	-0,15
NASH	0,42



R ²	0,85
Biais (mm/day)	-0,85
NASH	0,59



R ²	0,65
Biais (mm/day)	-0,13
NASH	0,82

Conclusion The model coupling the Van Genuchten retention curve with the hydraulic conductivity of Brooks and Corey significantly improves the drainage dynamics and will be tested on other lysimeters.

References

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Brooks, R H, et A T Corey., (1966). « HYDRAULIC PROPERTIES OF POROUS MEDIA », s. d., 37.
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Van Genuchten, M. Th. (1980). « A Closed-Form Equation for Predicting the Hydraulic Conductivity of Unsaturated Soils. » *Soil Science Society of America Journal*, 44 (5), 892–898.