INTERNATIONAL ATOMIC ENERGY AGENCY
UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION

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SMR/220- 41

COLLEGE ON SOIL PHYSICS
2 - 20 November 1987

TRANSPARENCIES 2

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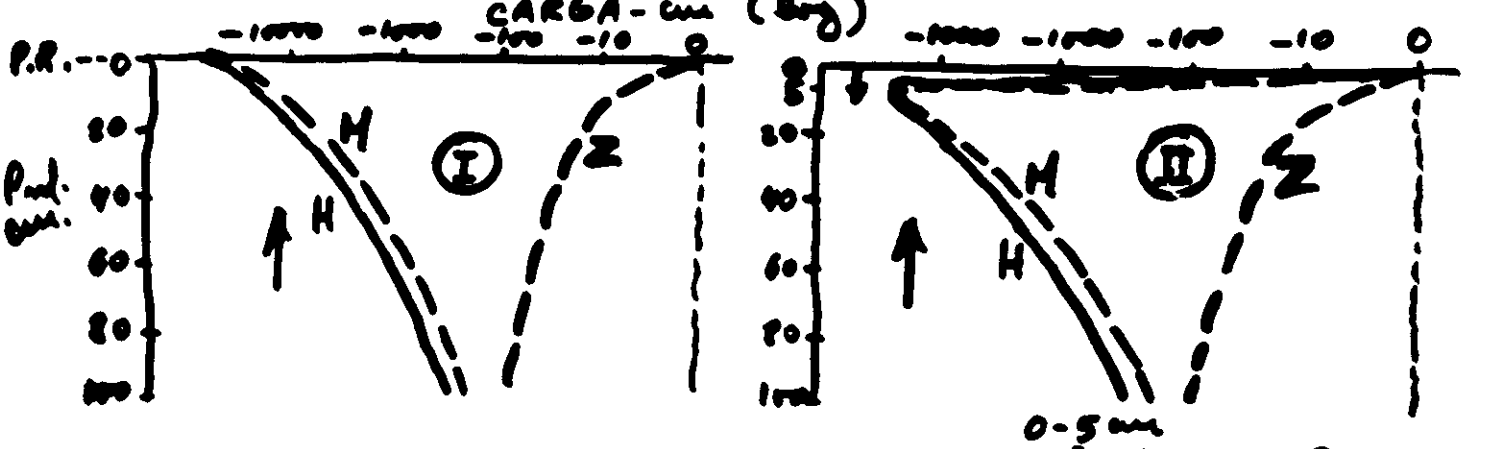
Universidad Central de Venezuela
Maracay, Venezuela

SUELO UNIFORME
(Sin nivel freático; sin estratos)

Fase humedecimiento

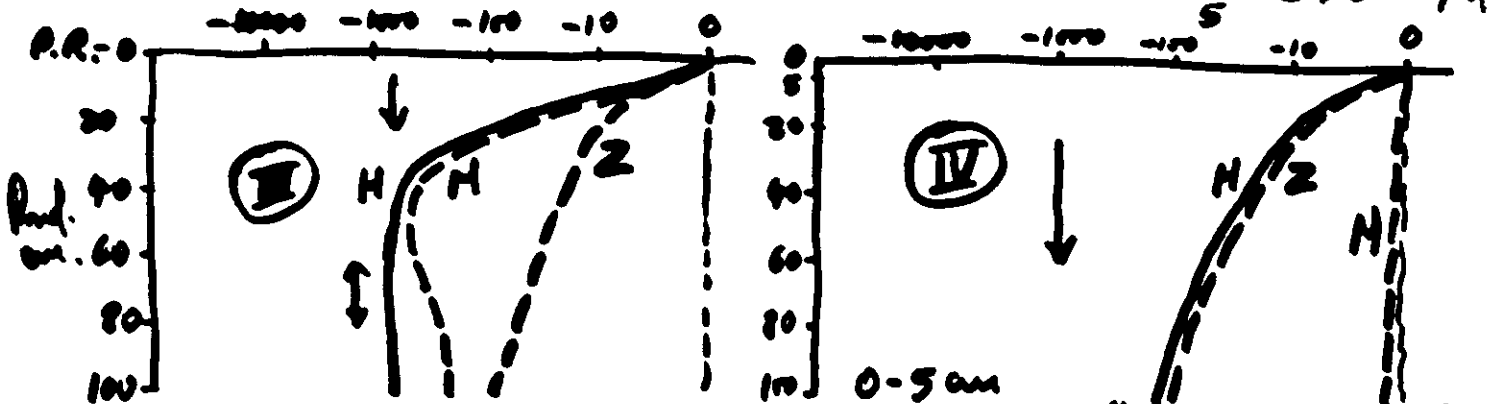


0-5 cm

$\Delta z = 5cm$; $K = 10^{-2} cm/h$; $\Delta H = \Delta P + \Delta Z$

$\Delta P = \Delta H = -20000 - 0 = -20000 cm$; $\Delta Z = -5 - 0 = -5 cm$

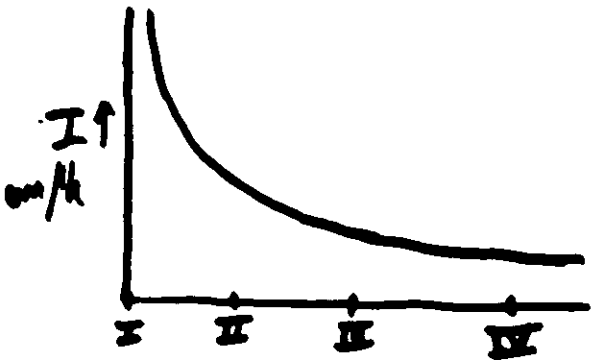
$\Delta H = -20005 cm$; $V = -10^{-2} \cdot \frac{-20.005}{5} = 40 cm/h$

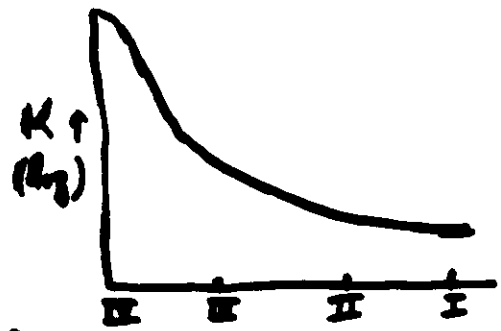


0-5 cm

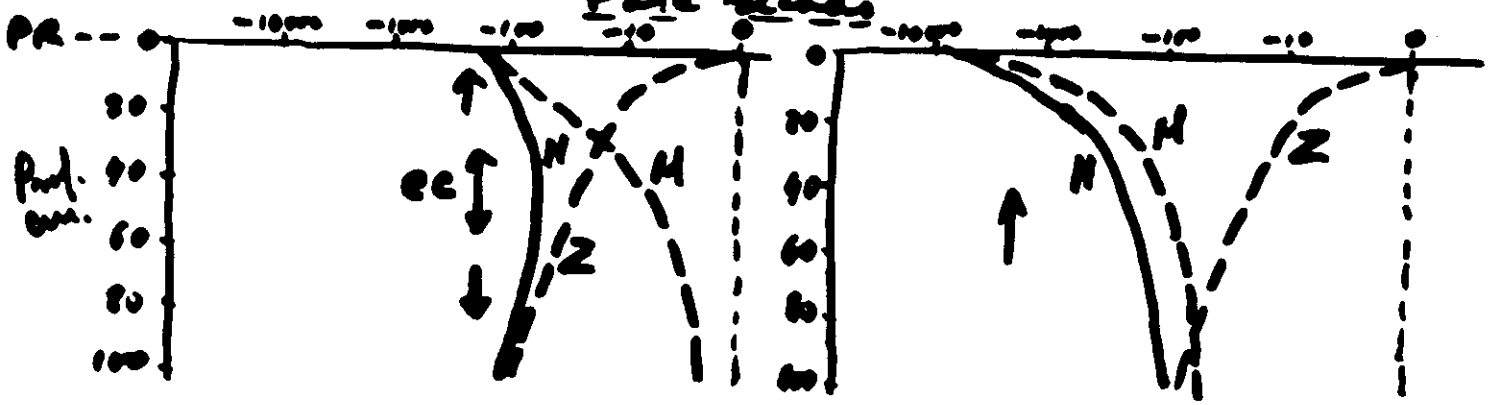
$\Delta z = 5cm$; $K = 5 cm/h$; $\Delta H = \Delta H + \Delta Z = 0 -$

$\Delta H = -5 cm$; $V = -5 cm/h \cdot \frac{-5cm}{5cm} = 5 cm/h$

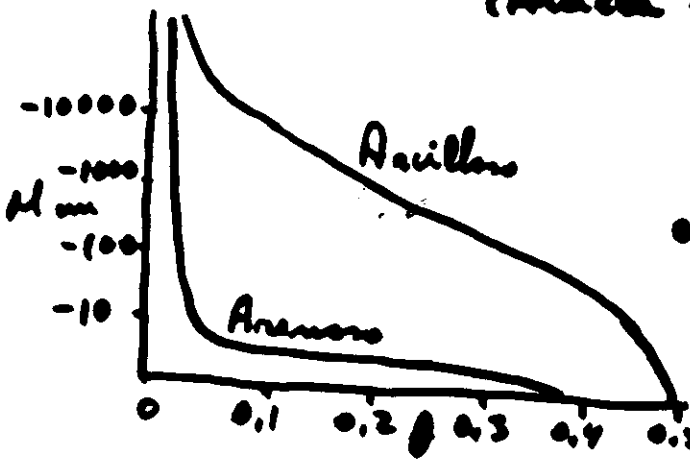


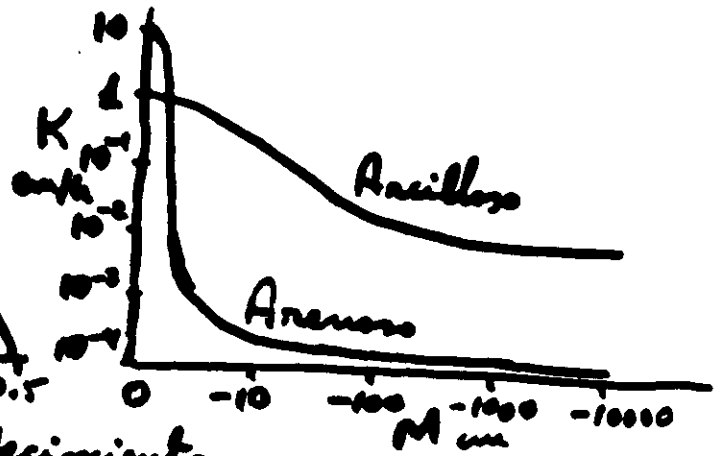


Fase secundaria

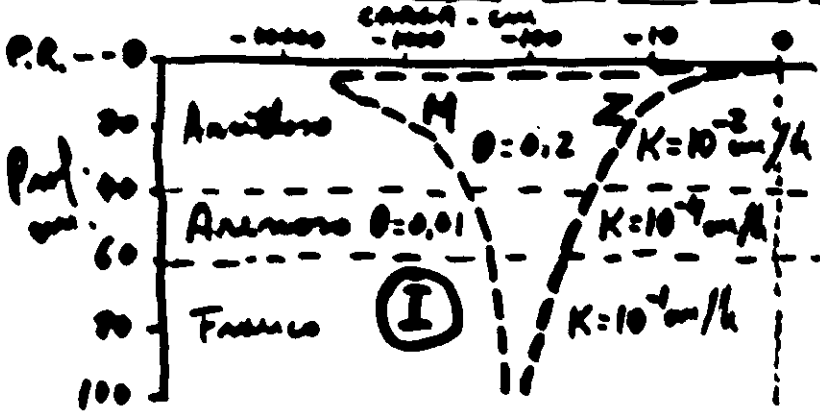


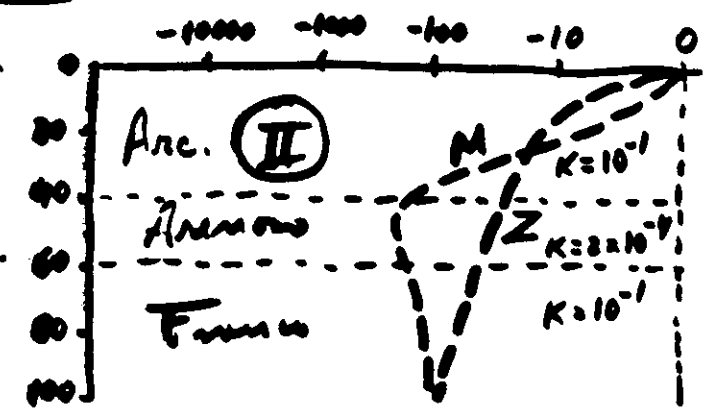
SUELO ESTRATIFICADO
(Arcilla sobre arena)

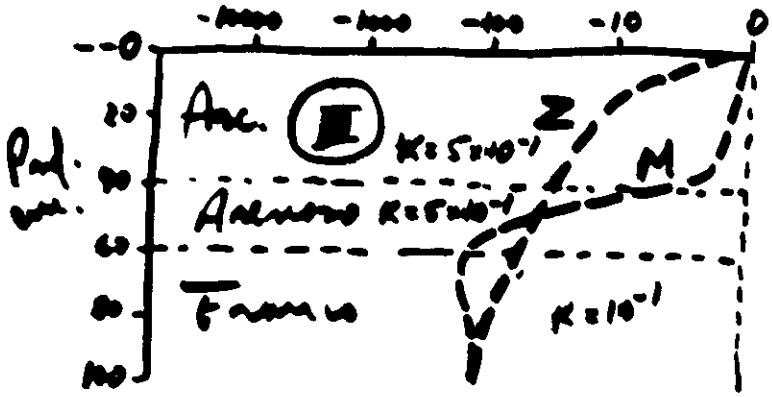


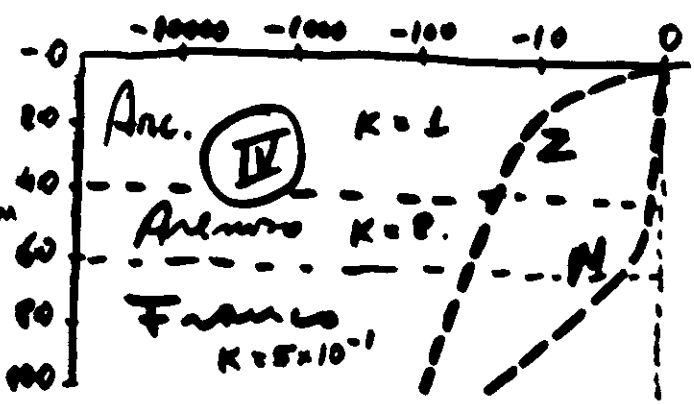


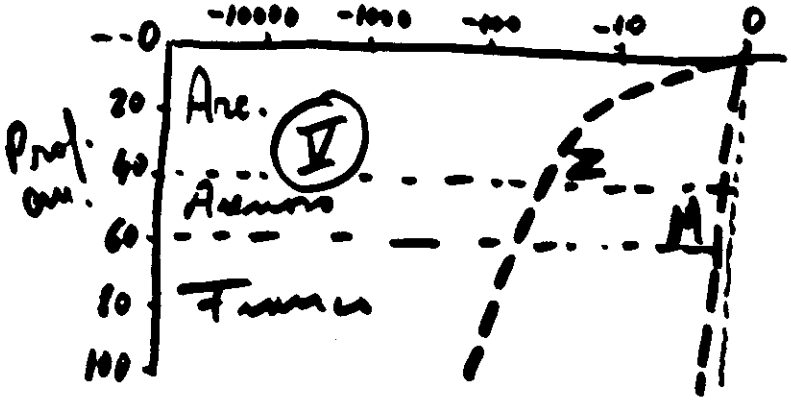
Fase humedecimiento

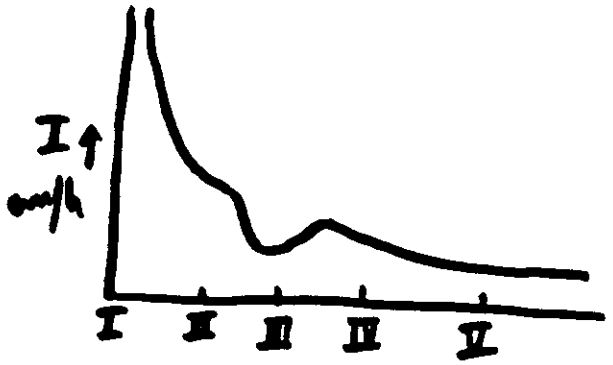






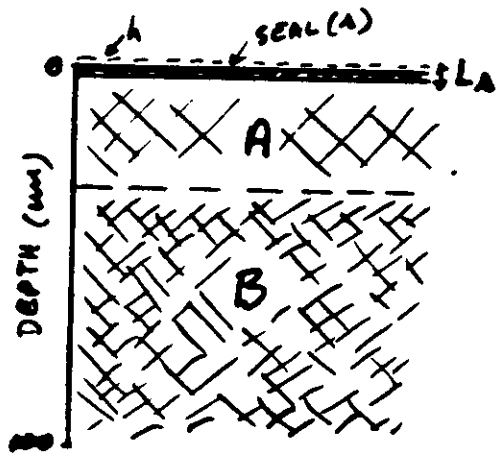


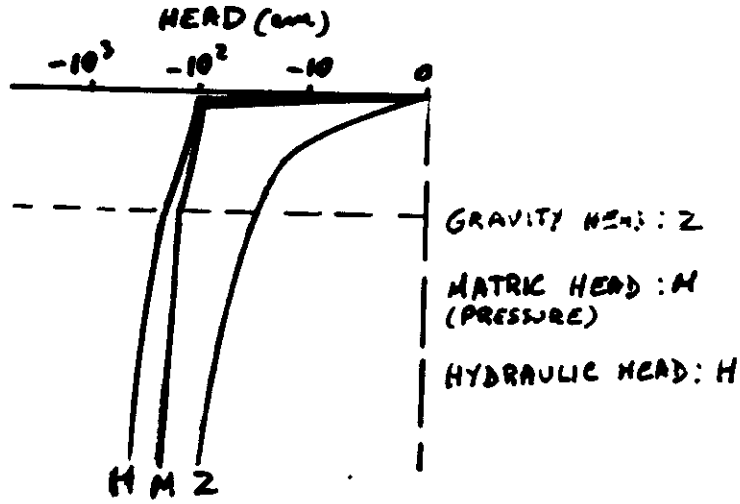


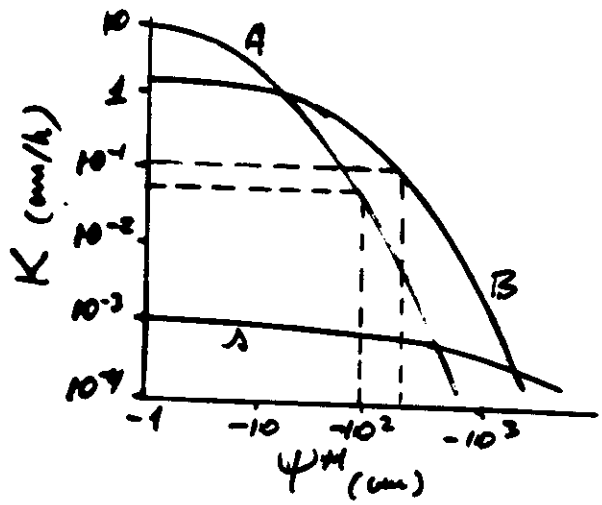


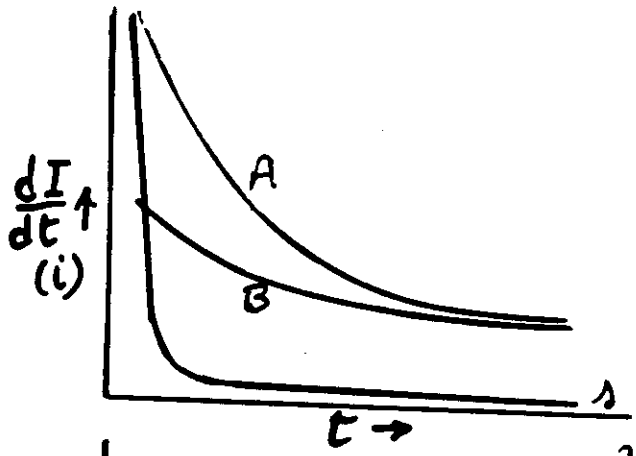
VERTICAL DOWNWARD INFILTRATION ON A SEAL-TOPPED SOIL UNDER A VERY THIN LAYER (h) OF PONDED WATER

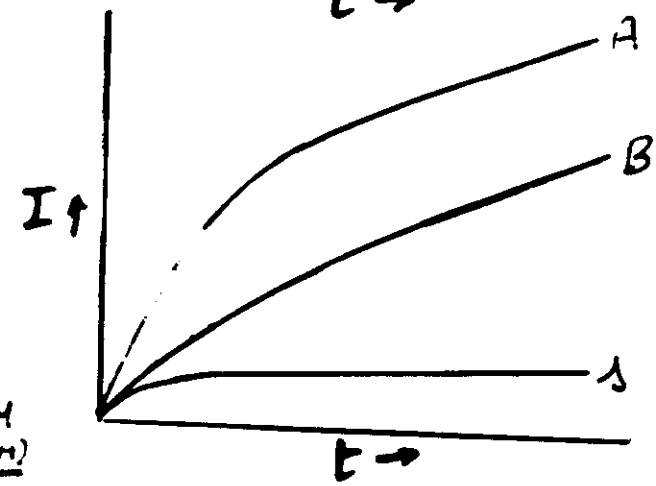
(s: seal ; A: tilled soil ; B: non-tilled soil)











s : SEAL

A : TILLED SOIL B : NON-TILLED SOIL

At steady infiltration rate i:

$$i = q_s = -K_s \frac{-(h+L_s)+\psi^M_{(s)}}{L_s}$$

$$\psi^M_{(s)} \gg h+L_s \qquad q_s \approx -K_s \frac{\psi^M_{(s)}}{L_s}$$

$$q_A = K_A(\psi^M_{(A)}) \qquad q_A = q_s \qquad K_A(\psi^M_{(A)}) = -K_s \frac{\psi^M_{(s)}}{L_s}$$

$$-\frac{\psi^M_{(s)}}{K_A(\psi^M_{(A)})} = \frac{L_s}{K_s} = R_s$$ (HYDRAULIC RESISTANCE OF THE SEAL - TIME UNITS)

K_s (saturated) $= 10^{-3}$ cm/hour

1) SEAL (1) ON TOP OF A TILLED SOIL (A)

$\psi^M_{(A)} = -10^2$ cm $\quad K_A(\psi^M_{(A)} = -10^2\text{cm}) = 8 \times 10^{-2}$ cm/h

$Q_1 = 8 \times 10^{-2}$ cm/h $= -K_1 \dfrac{\psi^M_{(A)}}{L_1} = -10^{-3}\text{cm/h} \cdot \dfrac{-10^2\text{cm}}{L_1}$

$L_1 = 1.2$ cm $\quad R_1 = \dfrac{L_1}{K_1} = \dfrac{1.2\text{cm}}{10^{-3}\text{cm/h}} = 1.2 \times 10^3$ hours

$i = 0{,}08$ cm/h $\quad L_1 = 1{,}2$ cm $\quad R_1 = 1{,}2 \times 10^3$ h.

2) SEAL (1) ON TOP OF A NON TILLED SOIL (B)

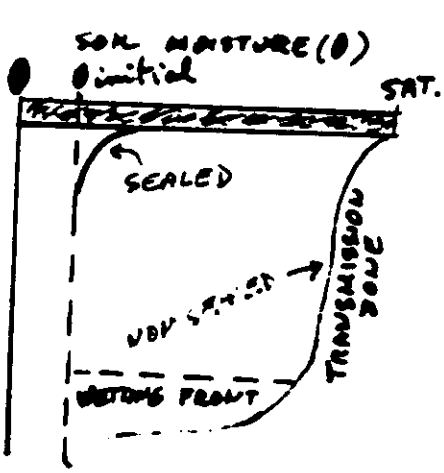
$\psi^M_{(B)} = -2 \times 10^2$ cm $\quad K_B(\psi^M_{(B)} = -2 \times 10^2\text{cm}) = 0{,}2$ cm/h

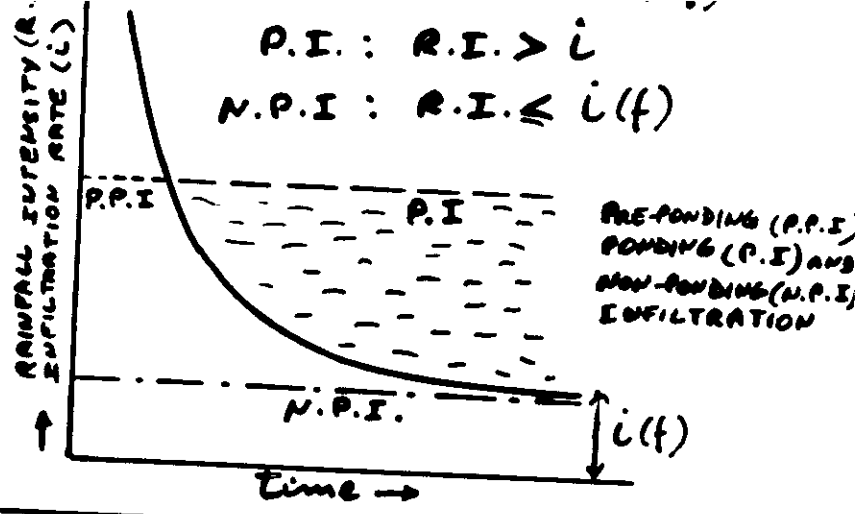
$Q_1 = 0{,}2$ cm/h $= -K_1 \dfrac{\psi^M_{(B)}}{L_1} = -10^{-3}\text{cm/h} \cdot \dfrac{-2 \times 10^2\text{cm}}{L_1}$

$L_1 = 1{,}0$ cm. $\quad R_1 = \dfrac{L_1}{K_1} = \dfrac{1{,}0\text{cm}}{10^{-3}\text{cm/h}} = 10^3$ hours

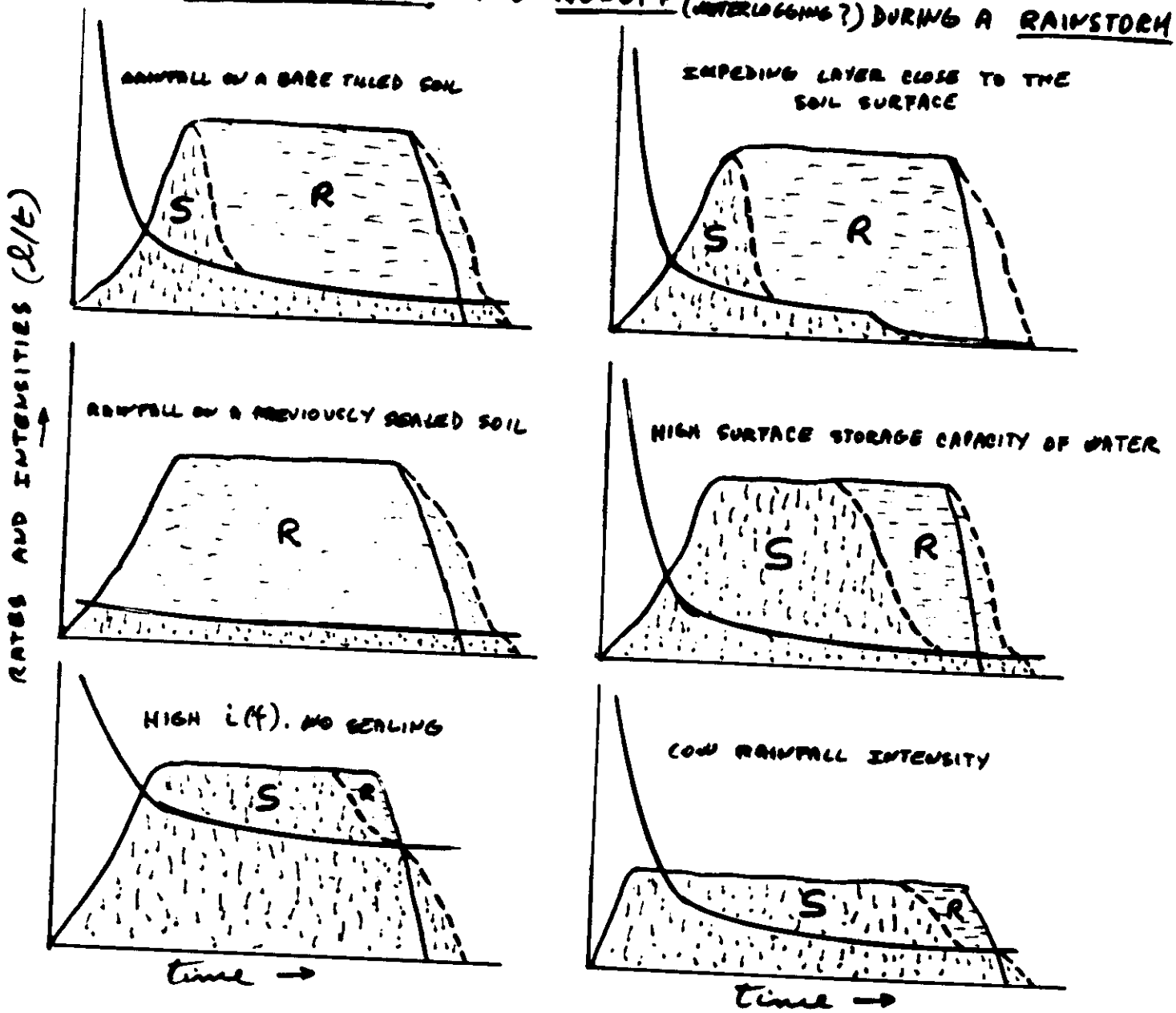
$i = 0{,}2$ cm/h $\quad R_1 = 10^3$ h

$L_1 = 1{,}0$ cm





INFILTRATION AND RUNOFF (WATERLOGGING?) DURING A RAINSTORM

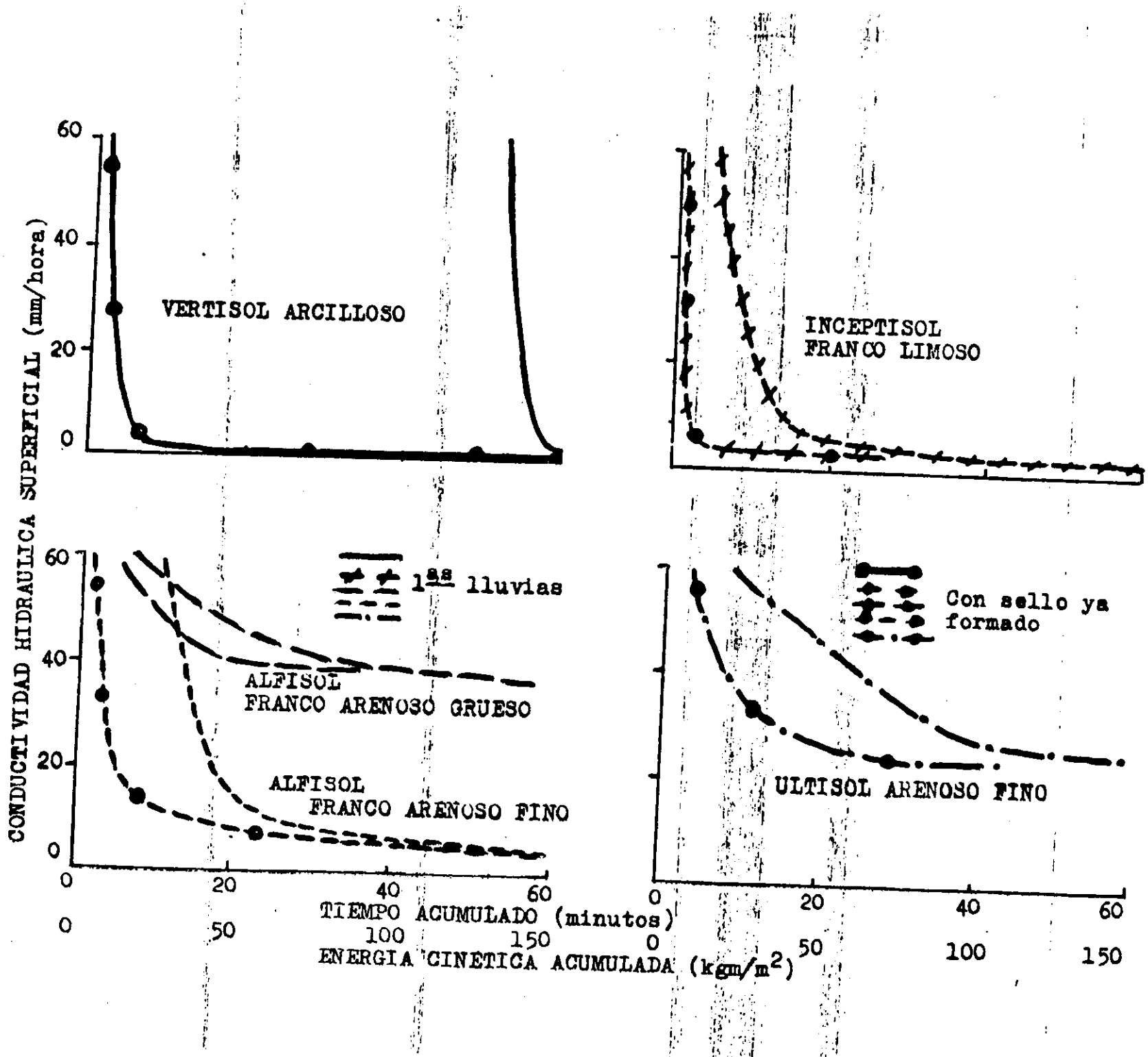


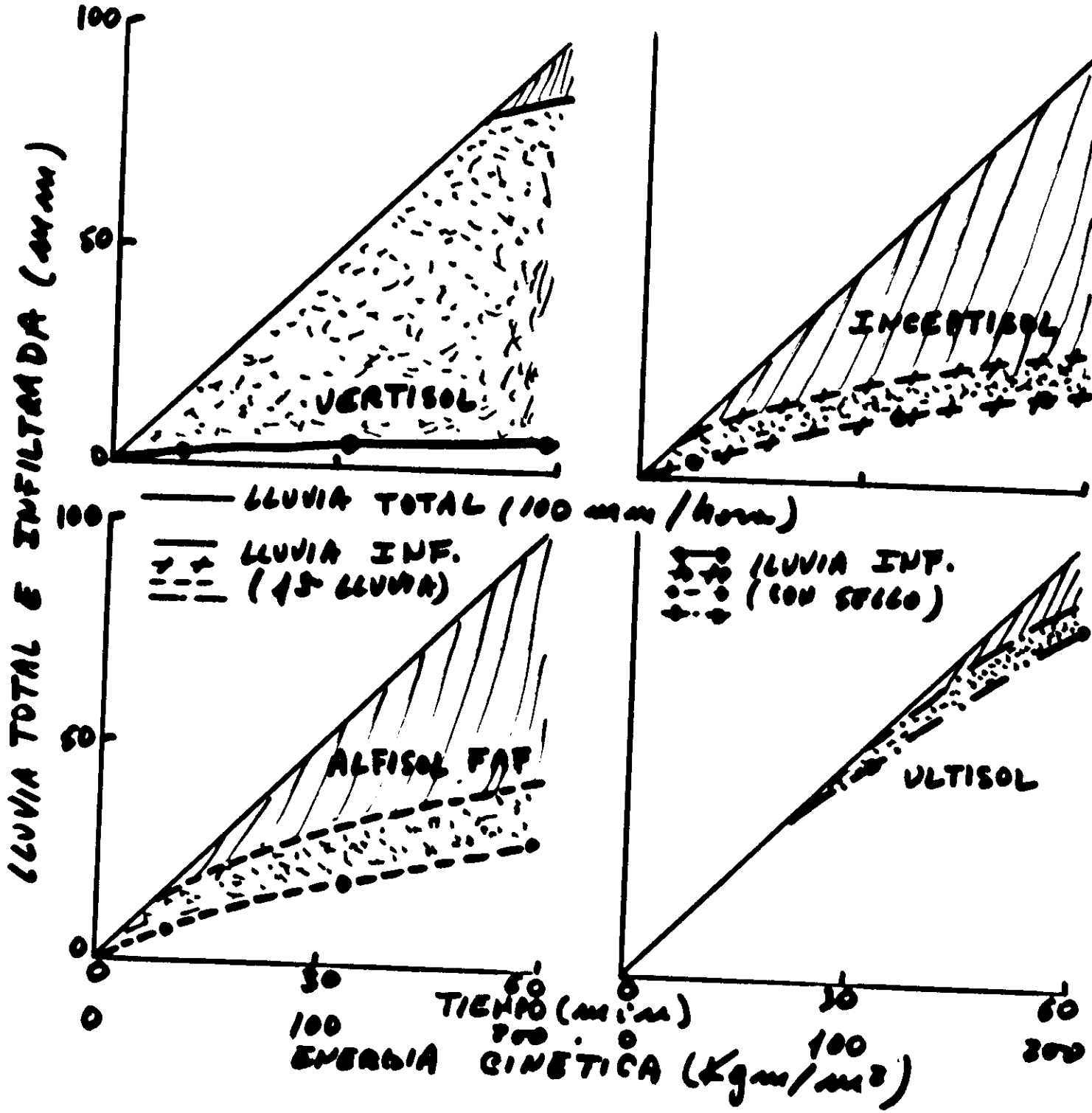
S : SURFACE STORAGE OF WATER

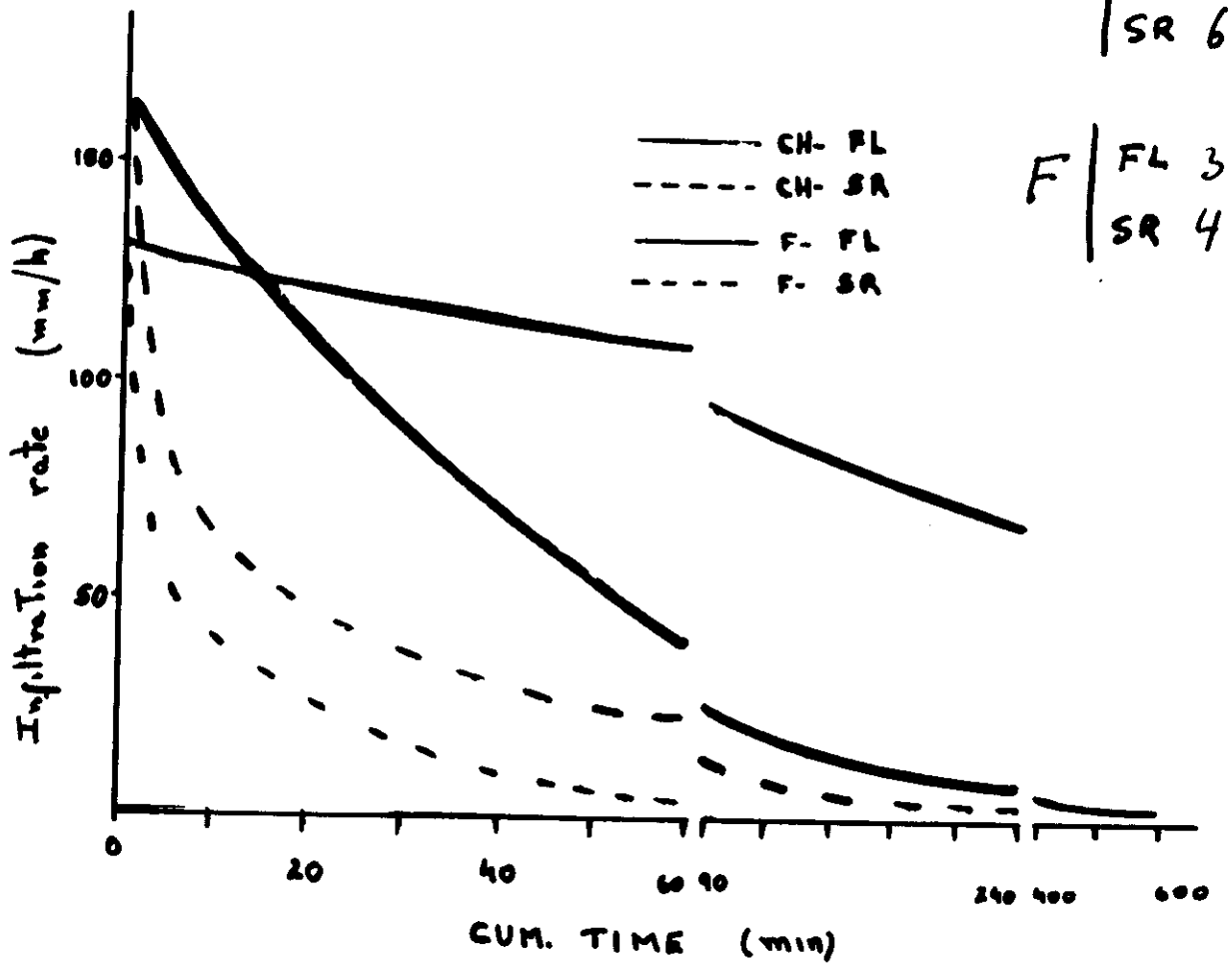
R : RUNOFF (WATERLOGGING ?)

— RAINFALL INTENSITY

— POTENTIAL INFILTRATION RATE

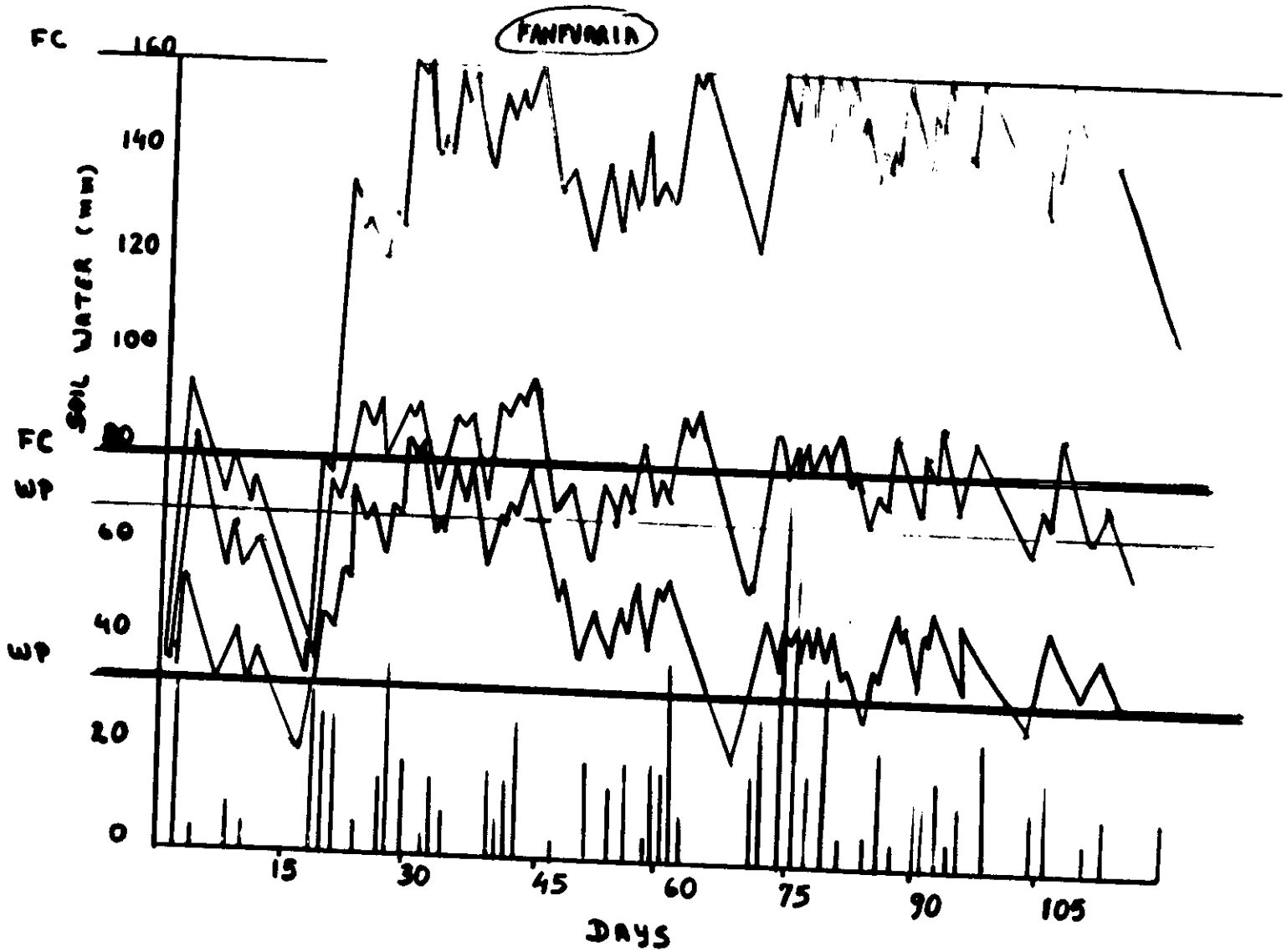

VERTISOL ARCILLOSO
INCEPTISOL
FRANCO LIMOSO
1as lluvias
Con sello ya
formado
ALFISOL
FRANCO ARENOSO GRUESO
ALFISOL
FRANCO ARENOSO FINO
ULTISOL ARENOSO FINO
CONDUCTIVIDAD HIDRAULICA SUPERFICIAL (mm/hora)
TIEMPO ACUMULADO (minutos)
ENERGIA CINETICA ACUMULADA (kgm/m2)
0
20
40
60
50
100
150

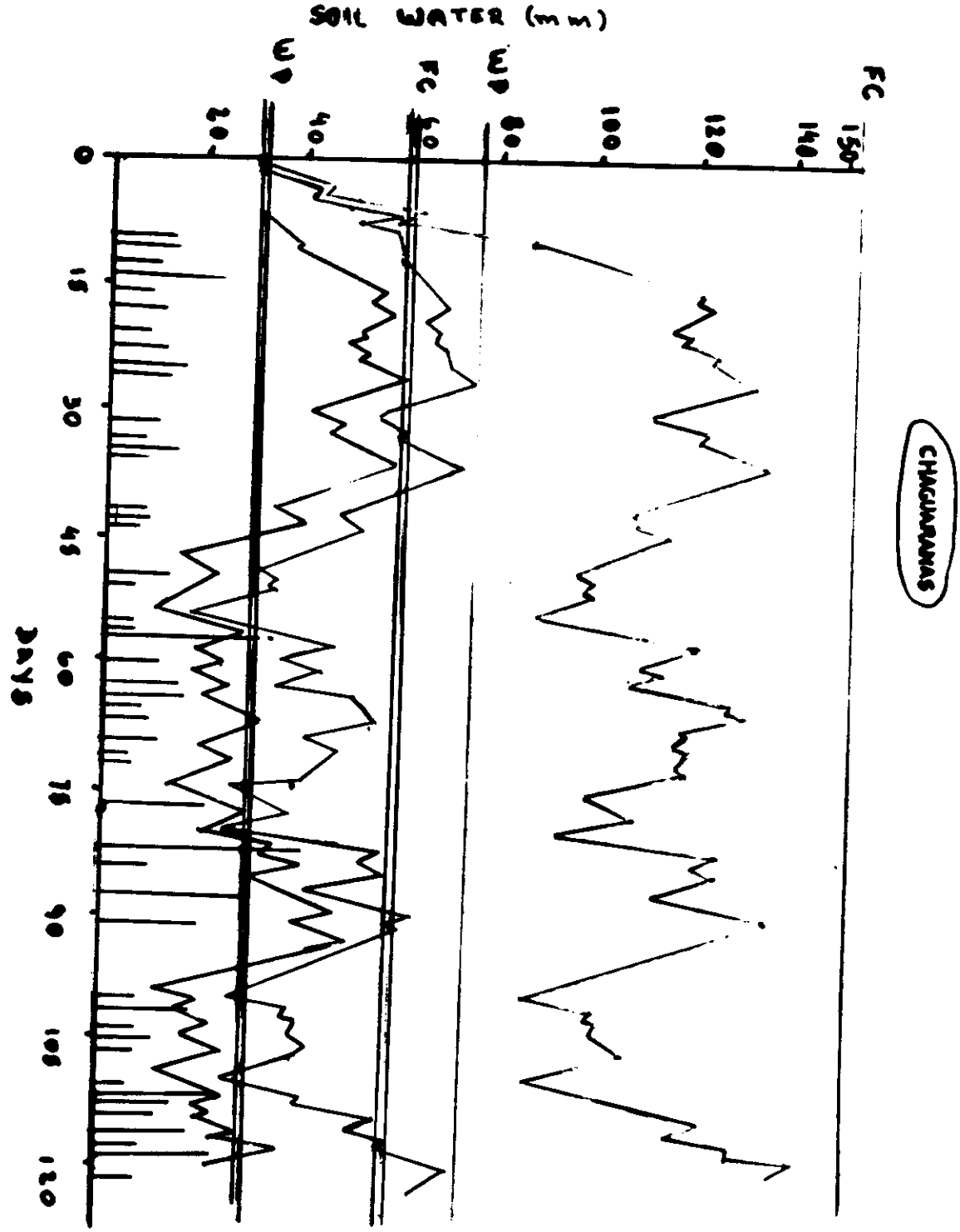

100
50
0
VERTISOL
INCEPTISOL
LLUVIA TOTAL (100 mm/hora)
LLUVIA INF. (1ª LLUVIA)
LLUVIA INF. (CON SUELO)
LLUVIA TOTAL E INFILTRADA (mm/hr)
ALFISOL FAF
ULTISOL
0
30
60
TIEMPO (min)
100
200
ENERGIA CINETICA (Kgm/m²)



		FIELD i (mm/h)	CONDITIONS I (mm)		
		240'	30'	60'	240'
CH	FL	10	94	132	225
	SR	6	30	42	70
F	FL	3	70	120	330
	SR	4	20	28	40

		LABORATORY K (mm/h)	
		NO SEAL	SEAL
CH	A	36,8	5,0 (30')
	A-B	10,9	—
F	A	12,0	2,5 (20')
	A-B	3,2	—


FANFURRIA
FC
160
140
120
100
80
FC
WP
60
40
WP
20
0
SOIL WATER (mm)
15
30
45
60
75
90
105
DAYS


SOIL WATER (mm)
WP
FC
WP
FC
0
15
30
45
60
75
90
105
120
DEPTH
CHAGUARAMAS