

Chapitre A

Annexes

A.1 Liste des symboles

Symbole	Unité	Signification
h	cm	potentiel matriciel exprimé en hauteur de colonne d'eau
θ	%	teneur en eau
γ	N/m	tension superficielle du liquide
α	-	angle de contact entre le liquide et la paroi du pore
ρ	g/cm ³	masse volumique du liquide
g	m/s ²	intensité de la pesanteur
$\delta^{13}C$		discrimination isotopique du carbone 13
K	cm/s	conductivité hydraulique
S_e	-	saturation effective du fluide
l	-	paramètre de tortuosité ou connectivité des pores
θ_m	%	teneur en eau massique
M_h	g	masse humide
M_s	g	masse sèche
θ_v	%	teneur en eau volumique
ρ_a	g/cm ³	densité apparente du sol
V_t	cm ³	volume total
P_a	g	poussée d'Archimède
ρ_p	g/cm ³	densité du pétrole
h_M	cm	succion appliquée par le vase de Mariotte
h_D	cm	pression ou succion due à la différence de hauteur entre le disque et le reste du dispositif
θ_i	%	teneur en eau volumique initiale
θ_f	%	teneur en eau volumique finale
ϵ	%	porosité totale
IMacro	%	indice de macroporosité
$I(t)$	cm ³ /s	infiltration cumulée
K_s	cm/s	conductivité hydraulique à saturation
λ	-	coefficient de tortuosité des pores

A.2 Liste des abréviations

Abréviations	
AOC	appellation d'origine contrôlée
IH	indice de Huglin
REU	réserve en eau utile
PF	point de flétrissement
CR	courbe de rétention en eau du sol
CH	fonction de conductivité hydraulique
vGM	modèle de van Genuchten-Mualem
Pi	Pianelli
Gi	Gilberto
Ma	les Marnières
X	le vignoble X
SC	sommet convexe
P	versant plan
Pl	plaine alluviale
K	méthode de détermination de la CR sur kopécky
M	méthode de détermination de la CR sur mottes
BP	basse pressions
HP	hautes pressions

A.3 Informations collectées durant le forage au Vignoble X

Description de Profil Vignoble X - Point A

Auteurs : Bruno Delvaux, Vincent Dienst, Danaé Falesse, André Lannoye, H  l  ne Sosnowski, Hugo Lejeune

Date : 04 juin 2018

1. Conditions environnementales

- Physiographie : Pente convexe
- Pente :
- Erosion : Pas de traces d'érosion superficielle
- Drainage du site : bon
- Exposition : Est
- Coordonnées : N 50°36'43.8'', E 4°31'18.5'' / x = 160833, y = 144622 (Lambert 72)
- Altitude : 119 m
- Occupation du sol : vignes (plantation : 2014 ; écartement interligne 160 cm, intercep 80 cm) ; lignes de plantation dans le sens de la pente.

2. Description des horizons

Description générale : Zone de la parcelle plus précoce (floraison, ...) , sable bruxellien à profondeur modérée.

Ap (00-10 cm) : dull yellowish brown

AB (10-18 cm) : dull yellowish brown

B (18-50 cm) : dull yellowish brown. Entre 30 et 32 cm on observe une semelle de labour avec des agrégats plus larges que hauts dû aux tassements. Cela est typique des sols limoneux. Une autre semelle de labour est observée à 25 cm de profondeur.

D1 (50-70 cm) : bright brown. Entre D1 et D2 on observe des pierres siliceuses (agglomération de quartz) sur 3 cm d'épaisseur. Apparition du sable bruxellien.

D2 (70-120cm) : olive brown. Glauconite altérée.



Figure 1 Forage Vignoble X - Profil au point A entre 0 et 50 cm. Photo par H  l  ne Sosnowski.



Figure 2 Forage Vignoble X - Profil au point A entre 50 et 100 cm. Photo par H  l  ne Sosnowski.



Figure 3 Forage Vignoble X - Profil au point A, semelle de labour visible entre 30 et 40 cm. Photo par H  l  ne Sosnowski.

Description de Profil Vignoble X - Point B

Auteurs : Bruno Delvaux, Vincent Dienst, Dana   Falesse, Andr   Lannoye, H  l  ne Sosnowski, Hugo Lejeune

Date : 04 juin 2018

1. Conditions environnementales

- Physiographie : Pente convexe
- Pente :
- Erosion : Pas de traces d'  rosion superficielle
- Drainage du site : Bon
- Exposition : Est
- Coordonn  es : N 50  36'50.1'', E 4  31'15.4'' / x = 160772, y = 144816 (Lambert 72)
- Altitude : 109 m
- Occupation du sol : vignes (plantation : 2014 ;   cartement interligne 160 cm, intercep 80 cm) ; lignes de plantation dans le sens de la pente.

2. Description des horizons

Description générale : L'horizon humifère est très mince. On n'observe le sable bruxellien sur le forage d'1m20 mais bien la présence de sable fin de dernier carottage.

Ap (00-13 cm) : dull yellowish brown

AB (13-31 cm) : dull yellow orange

Bt1 (31-63 cm) : dull brown

Bt2 (63-77 cm) : dull brown

BC (77-120 cm) : dull yellow orange



Figure 4 Forage Vignoble X - Profil au point B entre 0 et 40 cm. Photo par H  l  ne Sosnowski.



Figure 5 Forage Vignoble X Profil au point B entre 50 et 110 cm. Photo par H  l  ne Sosnowski.

Description de Profil Vignoble X - Point C

Auteurs : Bruno Delvaux, Vincent Dienst, Dana   Falesse, Andr   Lannoye, H  l  ne Sosnowski, Hugo Lejeune

Date : 04 juin 2018

1. Conditions environnementales

- Physiographie : Pente concave
- Pente :
- Erosion : Pas de traces d'  rosion superficielle
- Drainage du site : Bon
- Exposition : Est
- Coordonn  es : 50  36'44.0''N 4  31'20.3'' / x = 160868 y = 144628 (Lambert 72)
- Altitude : 116 m

- Occupation du sol : vignes (plantation : 2014 ; écartement interligne 160 cm, intercep 80 cm) ; lignes de plantation dans le sens de la pente.

2. Description des horizons

Description générale : Sol en pentes avec des colluvions. Teneur en argile plus importante que dans les autres profils, commence vers 25% pour descendre jusqu'aux alentours de 18%.

Ap (00-08 cm) : dull yellowish brown

AB (08-16 cm) : dull yellow orange

B (16-30 cm) : dull yellowish brown. La semelle de labour est à 20 cm, elle est très petite.

Bt (30-59 cm) : entre brown et dull brown. Horizon d'accumulation en argile qui est plus rouge/brun.

BC1 (59-72 cm) : dull yellow orange

BC2 (72-92 cm) : dull yellow orange

BC3 (92-120 cm) : dull yellow orange



Figure 6 Forage Vignoble X - Profil au point C entre 0 et 50 cm. Photo par Hélène Sosnowski.



Figure 7 Forage Vignoble X - Profil au point C entre 50 et 120 cm. Photo par Hélène Sosnowski.

Description de Profil Vignoble X - Point D

Auteurs : Bruno Delvaux, Vincent Dienst, Danaé Falesse, André Lannoye, Hélène Sosnowski, Hugo Lejeune

Date : 04 juin 2018

1. Conditions environnementales

- Physiographie : pente plane
- Pente :
- Erosion : Pas de traces d'érosion superficielle
- Drainage du site : Modéré
- Exposition : Est
- Coordonnées : N 50°36'50.0'', E 4°31'18.0'' / x = 160823, y = 144813 (Lambert 72)
- Altitude : 106 m
- Occupation du sol : vignes (plantation : 2014 ; écartement interligne 160 cm, intercep 80 cm) ; lignes de plantation dans le sens de la pente.

2. Description des horizons

Description générale : Ici on n'atteint pas le sable bruxellien. Le sondage est argilo-limoneux (20% argile) assez humide. L'horizon humifère relativement épais.

Ap1 (00-13 cm) : dull yellowish brown

Ap2 (13-31 cm) : brown

Bt (31-65 cm) : yellowish brown

BC1 (65-86 cm) : dull yellowish brown

BC2 (86-120cm) : dull yellowish brown



Figure 8 Forage Vignoble X - Profil au point D entre 0 et 50 cm. Photo par Hélène Sosnowski.



Figure 9 Forage Vignoble X - Profil au point D entre 50 et 120 cm. Photo par Hélène Sosnowski.

Description de Profil Vignoble X - Point E

Auteurs : Bruno Delvaux, Vincent Dienst, Danaé Falesse, André Lannoye, Hélène Sosnowski, Hugo Lejeune

Date : 04 juin 2018

1. Conditions environnementales

- Physiographie : Pente concave (bas de pente)
- Pente :
- Erosion : Pas de traces d'érosion superficielle
- Drainage du site : Modéré
- Exposition : Est
- Coordonnées : N 50°36'50.1'', E 4°31'19.8'' / x = 160858, y = 144817 (Lambert 72)
- Altitude : 103 m
- Occupation du sol : vignes (plantation : 2014 ; écartement interligne 160 cm, intercep 80 cm) ; lignes de plantation dans le sens de la pente.

2. Description des horizons

Description générale : Il s'agit de colluvions. La texture du sol est argilo-limoneuse et l'horizon humifère est relativement épais. Vigne plus tardive. Températures plus froides qu'en haut de pente.

Ap1 (00-18 cm) : dull yellowish brown

Ap2 (18-36 cm) : dull yellowish brown

B1 (36-64 cm) : dull brown

B2 (64-80 cm) : yellowish brown

B3 (80-120cm) : yellowish brown



Figure 10 Forage Vignoble X - Profil au point E entre 0 et 50 cm. Photo par H  l  ne Sosnowski.



Description de Profil Vignoble X - Point X (Point supplémentaire pour Vincent Dienst)

Auteurs : Bruno Delvaux, Vincent Dienst, Danaé Falesse, André Lannoye, Hélène Sosnowski, Hugo Lejeune

Date : 04 juin 2018

1. Conditions environnementales

- Physiographie : Plateau (haut de parcelle)
- Pente : 0%
- Erosion : Pas de traces d'érosion superficielle
- Drainage du site : Modéré
- Exposition : Est
- Coordonnées : N 50°36'46.2'', E 4°31'15,6'' / x = 160776 y = 144696 (Lambert 72)
- Altitude : 118 m
- Occupation du sol : vignes (plantation : 2014 ; écartement interligne 160 cm, intercep 80 cm) ; lignes de plantation dans le sens de la pente.

2. Description des horizons

Description générale : Apparition du sable bruxellien dans la partie supérieure du forage..

Ap (00-20 cm) : dark brown. Texture L

AB (20-37 cm) : yellowish brown. Texture L, limon sableux.

D1 (37-50 cm) : yellowish brown. Texture S

D2 (60-84 cm) : yellowish brown. Texture Z. (Pierre entre 50 et 60 cm)

D3 (84-120cm) : olive. Texture Z. Glauconite : mica ferrique verdâtre.



Figure 12 Forage Vignoble X - Profil au point X entre 0 et 50 cm. Photo par H  l  ne Sosnowski.



Figure 13 Forage Vignoble X - Profil au point X entre 50 et 120 cm. Photo par H  l  ne Sosnowski.

A.4 Informations collectées durant le forage au Domaine des Marnières

Description de Profil « Les Marnières » - Point A

Auteurs : Hélène Sosnowski, Hugo Lejeune

Date : 08 juin 2018

1. Conditions environnementales

- Physiographie : Pente convexe
- Pente :
- Erosion : Pas de traces d'érosion superficielle
- Drainage du site : Bon
- Exposition : Nord-Est
- Coordonnées : N 50°43'11.4'', E 5°47'14.0'' / x = 250160, y = 157545 (Lambert 72)
- Altitude : 220 m
- Occupation du sol : vignes (plantation : 2010 ; écartement interligne 240 cm , intercep 100 cm) ; lignes de plantation dans le sens de la pente.

2. Description des horizons

Description générale :

Ap (00-10 cm) : lourd, argilo limoneux 10YR 3/2 vers 2/2, pas de réaction à l'HCl

AB (10-20 cm) : 10YR 3/2, pas de réaction à l'HCl

B1 (20 - 37 cm) : Détente du sol entre 20 et 30 cm., limonoargileux, 10YR3/3, pas de réaction à l'HCl

B2 (37- 60cm) : Sol très collant et malléable (comme de la terre glaise), argile. silex, 10YR 5/5



Forage Marnières - Figure 1 : Profil au point A entre 0 et 60 cm. Photo par Hélène Sosnowski.

Description de Profil « Les Marnières » - Point B

Auteurs : Hélène Sosnowski, Hugo Lejeune

Date : 08 juin 2018

1. Conditions environnementales

- Physiographie : Pente convexe
- Pente :
- Erosion : Pas de traces d'érosion superficielle
- Drainage du site : Bon
- Exposition : Nord-Est
- Coordonnées : N 50°43'11.1'', E 5°47'16.6'' / x = 250212, y = 157537 (Lambert 72)
- Altitude : 218 m
- Occupation du sol : vignes (plantation : 2010 ; écartement interligne 240 cm , intercep 100 cm) ; lignes de plantation dans le sens de la pente.

2. Description des horizons

Description générale :

A (00-10 cm) : 10YR 2/2, réaction faible à l'HCl, argilolimoneux

AB (10-20 cm) :, 10YR 2/2-3/2, très noir, pas de réaction à l'HCl, argilolimoneux

B1 (20 - 30 cm) : Mélange entre l'horizon noir et orange., 10YR 3/4, réaction faible à l'HCl, argilolimoneux

B2 (30- 68cm) : Sol très collant et malléable (comme de la terre glaise). 10YR 5/6, argile, pas de réaction à l'HCl



Forage Marnières - Figure 2 : Profil au point C entre 0 et 68 cm. Photo par Hélène Sosnowski.

Description de Profil « Les Marnières » - Point C

Auteurs : Hélène Sosnowski, Hugo Lejeune

Date : 08 juin 2018

1. Conditions environnementales

- Physiographie : Pente plate
- Pente :
- Erosion : Pas de traces d'érosion superficielle
- Drainage du site : Bon
- Exposition : Nord-Est
- Coordonnées : N 50°43'10.2'', E 5°47'13.8'' / x = 250157, y = 157508 (Lambert 72)
- Altitude : 213 m

- Occupation du sol : vignes (plantation : 2010 ; écartement interligne 240 cm , intercep 100 cm) ; lignes de plantation dans le sens de la pente.

2. Description des horizons

Description générale :

A (00-10 cm) : 10YR 2/1 très noir, pas de réaction à l'HCl, argilo-limoneux, bcp argile (certainement 30-35%)

AB (10-30 cm) : 10YR 2/2-3/2, pas de réaction à l'HCl,

B1 (28 - 50 cm) : Mélange du sol noir et orangé. 10YR 2/2 2/3

B2 (50 – 67 cm) : Sol très collant et malléable (comme de la terre glaise). Présence de craie. 10YR 5/6, pas de réaction à l'HCl, 10YR 5/6

B2 (67- 105cm) : Sol très collant et malléable (comme de la terre glaise). Présence de gros nodules de craie. Tâches ocre. 10YR 5/6-6/6, réaction immédiate à l'HCl



Forage Marnières - Figure 3 : Profil au point D entre 0 et 43 cm. Photo par Hélène Sosnowski.



Forage Marnières - Figure 4 : Profil au point D entre 43 et 105 cm. Photo par Hélène Sosnowski.



*Forage Marnières - Figure 5 : Profil au point D entre 67 et 70 cm.
Nodules de craie. Photo Par Hélène Sosnowski.*

Description de Profil « Les Marnières » - Point D

Auteurs : Hélène Sosnowski, Hugo Lejeune

Date : 08 juin 2018

1. Conditions environnementales

- Physiographie : Pente plate
- Pente :
- Erosion : Pas de traces d'érosion superficielle
- Drainage du site : Bon
- Exposition : Nord-Est
- Coordonnées : N 50°43'09.4'', E 5°47'16.2'' / x = 250205, y = 157484 (Lambert 72)
- Altitude : 208 m
- Occupation du sol : vignes (plantation : 2010 ; écartement interligne 240 cm , intercep 100 cm) ; lignes de plantation dans le sens de la pente.

2. Description des horizons

Description générale :

A (00-10 cm) : Présence de craie. 10YR3/2, réaction à l'HCl, argile

AB (10-20 cm) : Présence de craie. 10YR 3/2-3, réaction à l'HCl, argile

B1 (20 - 30 cm) : Présence de craie, mélange entre sol noir et orangé. 10YR 4/5 réaction à l'HCl, argile

B2 (30 – 40 cm) : Présence très importante de craie, en gros nodules. 10YR 5/5, réaction à l'HCl, argile

B2 (40- 70cm) : Sol très collant et malléable (comme de la terre glaise). Présence de craie. Beaucoup de graviers. 10YR 5/6, argile, réaction à l'HCl



*Forage Marnières - Figure 6 : Profil au point F entre 0 et 15 cm.
Photo par Hélène Sosnowski.*



Forage Marnières – Figure 7 : Profil au point F entre 10 et 70 cm. Photo par Hélène Sosnowski.



*Forage Marnières – Figure 8 : Profil au point F entre 30 et 40 cm.
Gros nodules de craie. Photo par Hélène Sosnowski*



*Forage Marnières - Figure 9 : Profil au point F, dans le fond de la gouge.
Présence importante de graviers. Photo par Hélène Sosnowski.*

A.5 Succions appliquées pour les mesures d'infiltrométrie à succion contrôlée

Parcelle	Site de mesure	h_1 (cm)	h_2 (cm)	h_3 (cm)	h_4 (cm)
Les Marnières	A	-3,80	-1,20	/	/
	B	-8,20	-2,90	/	/
	C	-9,10	-4,60	/	/
	D	-10,80	-5,30	-0,60	/
Vignoble X	A	-12,60	-8,00	-3,90	/
	B	-14,10	-8,80	-3,50	/
	C	-14,10	-9,00	-3,60	/
	D	-15,60	-9,80	-4,50	/
Pianelli	A	-14,00	-7,00	/	/
		-12,80	-7,00	-1,90	/
	B	-17,00	-7,50	-3,90	-1,90
	C	-13,80	-5,80	-4,00	-2,00
Gilberto	A	-20,80	-17,60	-14,30	-11,30
		-6,00	-4,00	/	/
	B	-12,90	-9,30	-4,00	-2,60
	C	-13,00	-9,90	-6,10	-2,60
	D	-13,60	-10,20	-7,10	-3,90
	E	-12,10	-8,90	-5,70	-2,50
	D	-12,00	-9,80	-6,60	-2,00

Annexe A.1 – Succions appliquées pour les différents sites de mesures d'infiltrométrie.

A.6 Tendances linéaires de la variation de la densité apparente des mottes pour les sols italiens

Sol	Tendance linéaire	R ²
PiAa	$y = 0.0623x + 1.2461$	$R^2 = 0.4397$
PiAb	$y = 0.0404x + 1.3136$	$R^2 = 0.5208$
PiBa	$y = 0.0347x + 1.3271$	$R^2 = 0.0962$
PiBb	$y = 0.0141x + 1.4808$	$R^2 = 0.0588$
PiCa	$y = 0.0279x + 1.2843$	$R^2 = 0.2945$
PiCb	$y = 0.0352x + 1.308$	$R^2 = 0.137$
GiAa	$y = 0.0181x + 1.3778$	$R^2 = 0.0216$
GiAb	$y = -0.0168x + 1.6119$	$R^2 = 0.0376$
GiBa	$y = 0.0848x + 1.1857$	$R^2 = 0.3476$
GiBb	$y = 0.0229x + 1.5592$	$R^2 = 0.2116$
GiCa	$y = -0.0014x + 1.4828$	$R^2 = 1E-04$
GiCb	$y = 0.0347x + 1.5224$	$R^2 = 0.427$
GiDa	$y = 0.0642x + 1.2662$	$R^2 = 0.664$
GiDb	$y = 0.0151x + 1.5216$	$R^2 = 0.1396$
GiEa	$y = 0.0515x + 1.403$	$R^2 = 0.4652$
GiEb	$y = 0.0313x + 1.5217$	$R^2 = 0.5337$
GiFa	$y = -0.0103x + 1.537$	$R^2 = 0.0158$
GiFb	$y = 0.0125x + 1.587$	$R^2 = 0.0608$

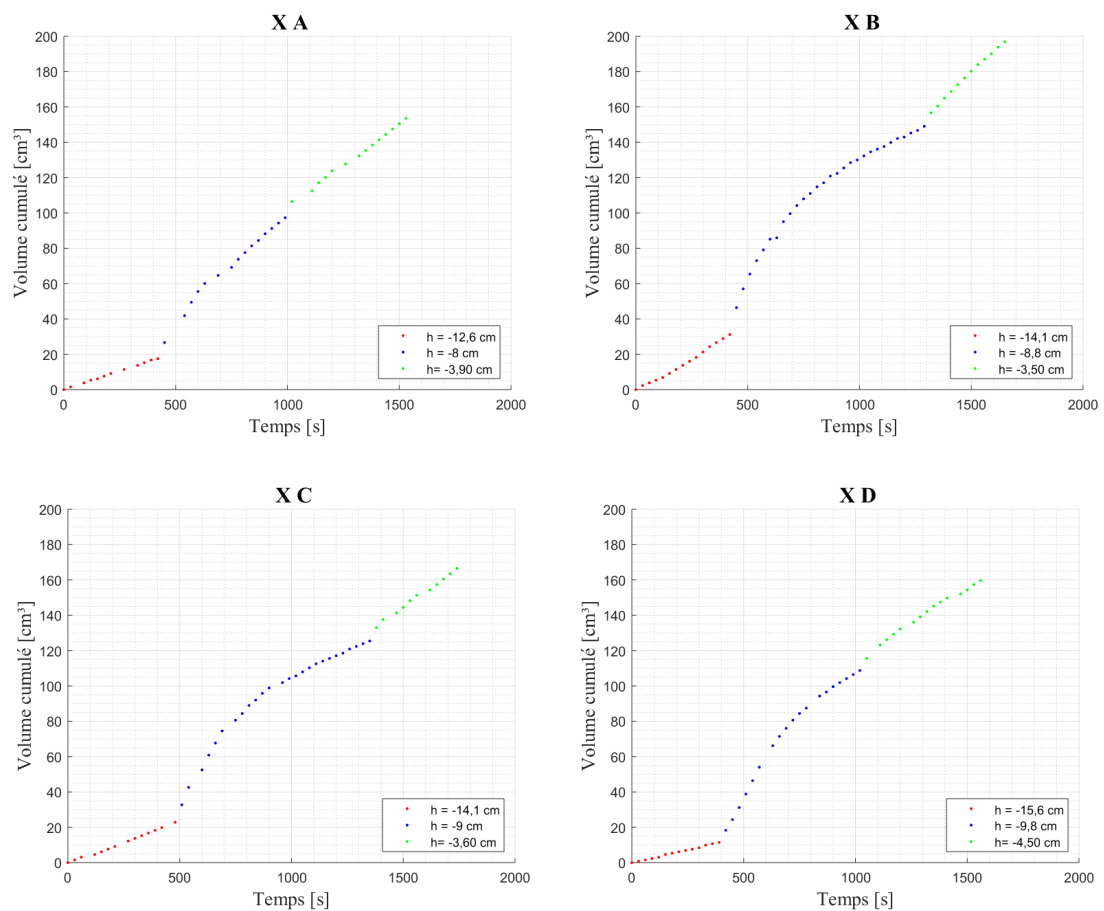
Annexe A.2 – Tendances linéaires de la variation de la densité apparente des mottes pour les sols italiens et leurs R². x = pF et y = densité apparente [g/cm³]

A.7 Tendances quadratiques de la variation de la densité apparente des mottes pour les sols italiens

Sol	Tendance quadratique	R ²
PiAa	$y = -0.022x^2 + 0.1695x + 1.1414$	R ² = 0.4779
PiAb	$y = 0.0046x^2 + 0.017x + 1.3385$	R ² = 0.527
PiBa	$y = -0.0187x^2 + 0.1318x + 1.2224$	R ² = 0.1228
PiBb	$y = 0.001x^2 + 0.0089x + 1.48644$	R ² = 0.0591
PiCa	$y = -0.0181x^2 + 0.1217x + 1.18884$	R ² = 0.3818
PiCb	$y = 0.0206x^2 - 0.0727x + 1.42354$	R ² = 0.1749
GiAa	$y = 0.0535x^2 - 0.2625x + 1.6781$	R ² = 0.1738
GiAb	$y = -0.0318x^2 + 0.1468x + 1.4369$	R ² = 0.1576
GiBa	$y = 0.0731x^2 - 0.3004x + 1.5984$	R ² = 0.5645
GiBb	$y = -0.0054x^2 + 0.0506x + 1.5292$	R ² = 0.2226
GiCa	$y = -0.0443x^2 + 0.2219x + 1.2459$	R ² = 0.0919
GiCb	$y = -0.0216x^2 + 0.1467x + 1.4031$	R ² = 0.5705
GiDa	$y = 0.0042x^2 + 0.042x + 1.29$	R ² = 0.6663
GiDb	$y = -0.0065x^2 + 0.0482x + 1.4866$	R ² = 0.1631
GiEa	$y = -0.0236x^2 + 0.1733x + 1.2728$	R ² = 0.5533
GiEb	$y = -0.0086x^2 + 0.0758x + 1.4738$	R ² = 0.5689
GiFa	$y = 0.0039x^2 - 0.0302x + 1.5586$	R ² = 0.0178
GiFb	$y = -0.0323x^2 + 0.1792x + 1.4089$	R ² = 0.425

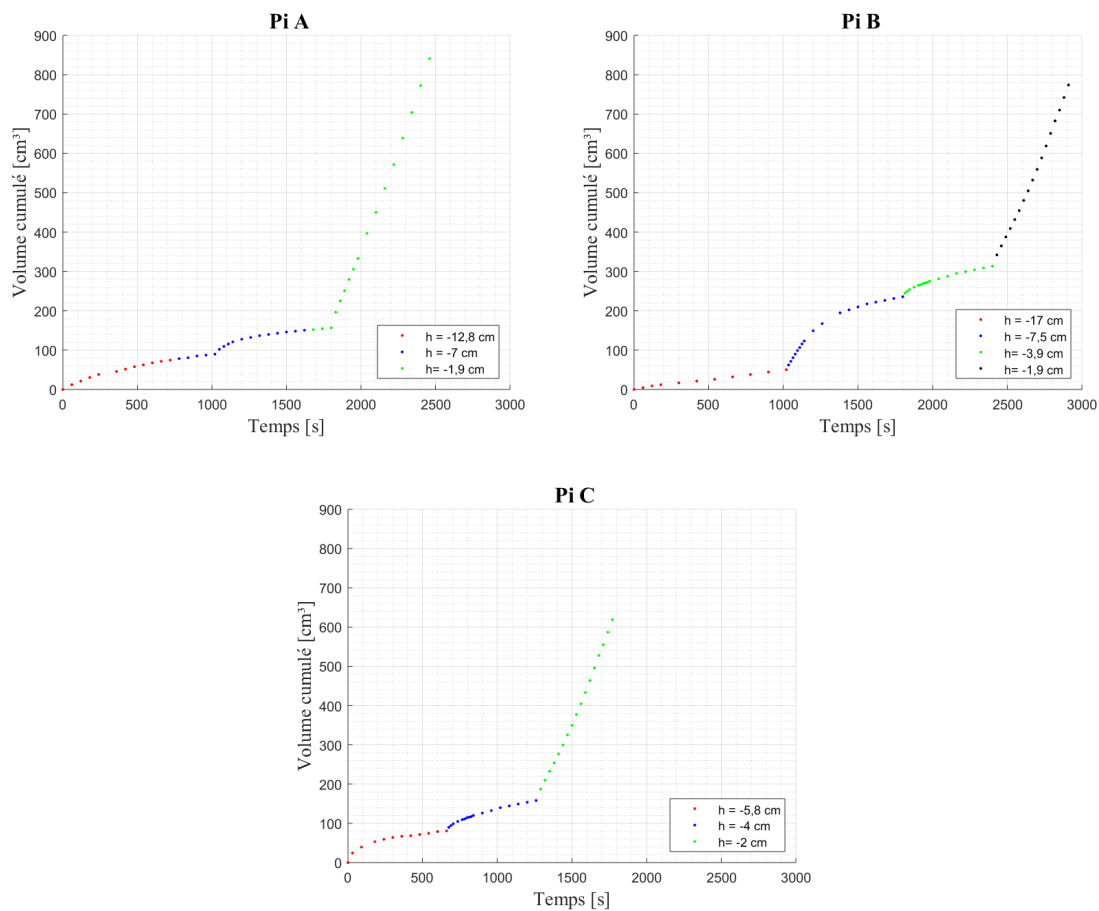
Annexe A.3 – Tendances quadratiques de la variation de la densité apparente des mottes pour les sols italiens et leurs R². x = pF et y = densité apparente [g/cm³]

A.8 Infiltration cumulée mesurée par infiltrométrie à succion contrôlée au Vignoble X



Annexe A.1 – Infiltration cumulée mesurée pour les différents sites d'échantillonnages au Vignoble X. A et B sont situés en position topographique SC. C et D sont situés en P.

A.9 Infiltration cumulée mesurée par infiltrométrie à succion contrôlée à Pianelli, Terracuda



Annexe A.2 – Infiltration cumulée mesurée pour les différents sites d'échantillonnages à Pianelli. A,B et C sont situés sur une plaine alluviale.

Chapitre B

Annexes relatives aux analyses statistiques

B.1 GLM 1 - Densité apparente : Résultats SAS

GLM1 – Densité apparente

The GLM Procedure

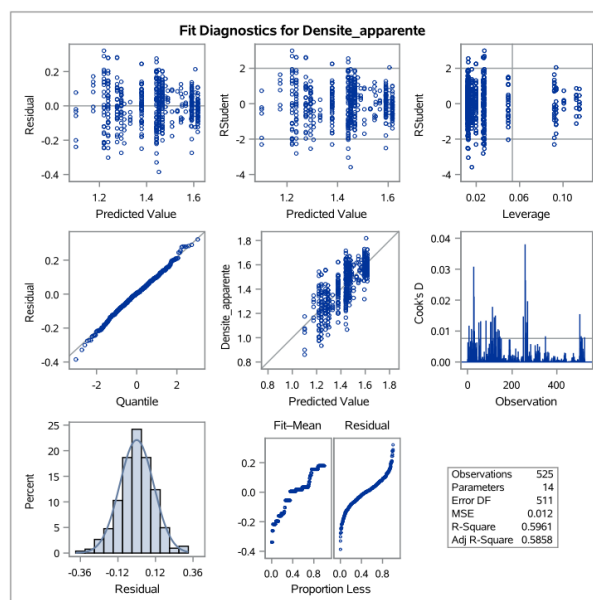
Dependent Variable: Densite_apparente Densite_apparente

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	13	9.08196498	0.69861269	58.01	<.0001
Error	511	6.15414979	0.01204335		
Corrected Total	524	15.23611478			

R-Square	Coeff Var	Root MSE	Densite_apparente Mean
0.596081	7.642919	0.109742	1.435867

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Parcelle	3	6.03781849	2.01260616	167.11	<.0001
Profondeur	1	1.09693775	1.09693775	91.08	<.0001
Parcelle*Profondeur	3	0.54466762	0.18155587	15.08	<.0001
Pente(Parcelle)	3	0.14693293	0.04897764	4.07	0.0072
Methode(Parcelle)	3	1.25560819	0.41853606	34.75	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Parcelle	3	3.70701690	1.23567230	102.60	<.0001
Profondeur	1	0.37225830	0.37225830	30.91	<.0001
Parcelle*Profondeur	3	0.55835803	0.18611934	15.45	<.0001
Pente(Parcelle)	3	0.14526104	0.04842035	4.02	0.0076
Methode(Parcelle)	3	1.25560819	0.41853606	34.75	<.0001



The GLM Procedure

Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	Profondeur	Densite_apparente LSMEAN	LSMEAN Number
Gi	a	1.38597769	1
Gi	b	1.53472910	2
Ma	a	1.26521330	3
Ma	b	1.24763959	4
Pi	a	1.23872593	5
Pi	b	1.31223518	6
X	a	1.51802243	7
X	b	1.57815326	8

The GLM Procedure

Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	Densite_apparente LSMEAN	LSMEAN Number
Gi	1.46035339	1
Ma	1.25642645	2
Pi	1.27548055	3
X	1.54808784	4

Least Squares Means for effect Parcelle Pr > t for H0: LSMEAN(i)=LSMEAN(j)				
Dependent Variable: Densite_apparente				
i\j	1	2	3	4
1		<.0001	<.0001	0.0003
2	<.0001		0.7680	<.0001
3	<.0001	0.7680		<.0001
4	0.0003	<.0001	<.0001	

Least Squares Means for effect Parcelle*Profondeur Pr > t for H0: LSMEAN(i)=LSMEAN(j)								
Dependent Variable: Densite_apparente								
i\j	1	2	3	4	5	6	7	8
1		<.0001	<.0001	<.0001	<.0001	0.0395	0.0001	<.0001
2	<.0001		<.0001	<.0001	<.0001	<.0001	0.9990	0.8021
3	<.0001	<.0001		0.9905	0.9618	0.5224	<.0001	<.0001
4	<.0001	<.0001	0.9905		1.0000	0.1377	<.0001	<.0001
5	<.0001	<.0001	0.9618	1.0000		0.0073	<.0001	<.0001
6	0.0395	<.0001	0.5224	0.1377	0.0073		<.0001	<.0001
7	0.0001	0.9990	<.0001	<.0001	<.0001	<.0001		0.6812
8	<.0001	0.8021	<.0001	<.0001	<.0001	<.0001	0.6812	

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Tukey-Kramer

Methode	Parcelle	Densite_apparente LSMEAN	LSMEAN Number
K	Gi	1.39158333	1
M	Gi	1.52912346	2
M	Ma	1.25642645	3
K	Pi	1.13575000	4
M	Pi	1.41521111	5
K	X	1.54025000	6
M	X	1.55592569	7

Least Squares Means for effect Methode(Parcelle) Pr > t for H0: LSMean(i)=LSMean(j)							
Dependent Variable: Densite_apparente							
i/j	1	2	3	4	5	6	7
1		<.0001	<.0001	<.0001	0.9636	0.0006	<.0001
2	<.0001		<.0001	<.0001	<.0001	0.9997	0.9231
3	<.0001	<.0001		0.0060	<.0001	<.0001	<.0001
4	<.0001	<.0001	0.0060		<.0001	<.0001	<.0001
5	0.9636	<.0001	<.0001	<.0001		0.0005	<.0001
6	0.0006	0.9997	<.0001	<.0001	0.0005		0.9995
7	<.0001	0.9231	<.0001	<.0001	<.0001	0.9995	

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Tukey-Kramer

Pente	Parcelle	Densite_apparente LSMEAN	LSMEAN Number
P	Gi	1.47367540	1
SC	Gi	1.44703139	2
P	Ma	1.22870404	3
SC	Ma	1.28414885	4
PI	Pi	1.27548055	5
P	X	1.52871326	6
SC	X	1.56746243	7

Least Squares Means for effect Pente(Parcelle) Pr > t for H0: LSMean(i)=LSMean(j)							
Dependent Variable: Densite_apparente							
i/j	1	2	3	4	5	6	7
1		0.4536	<.0001	<.0001	<.0001	0.4722	0.0168
2	0.4536		<.0001	<.0001	<.0001	0.0702	0.0005
3	<.0001	<.0001		0.1107	0.3521	<.0001	<.0001
4	<.0001	<.0001	0.1107		0.9997	<.0001	<.0001
5	<.0001	<.0001	0.3521	0.9997		<.0001	<.0001
6	0.4722	0.0702	<.0001	<.0001	<.0001		0.9276
7	0.0168	0.0005	<.0001	<.0001	<.0001	0.9276	

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Tukey-Kramer

Profondeur	Densite_apparente LSMEAN	H0:LSMean1=LSMean2
		Pr > t
a	1.35198484	<.0001
b	1.41818928	

B.2 GLM 2 - Densité apparente : Résultats SAS

GLM 2 – Densité Apparente

The GLM Procedure

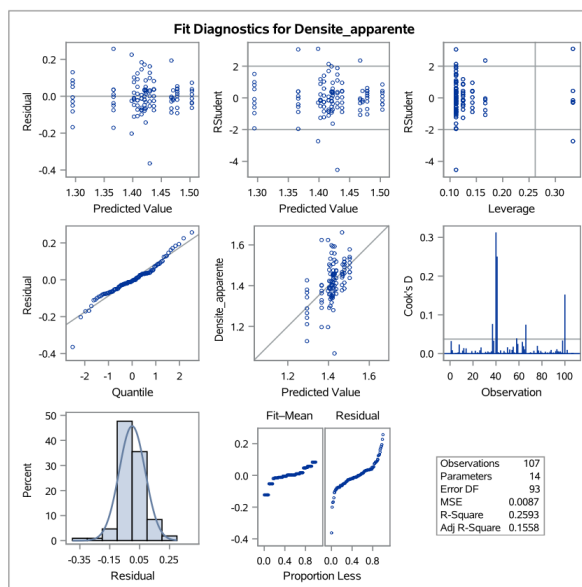
Dependent Variable: Densite_apparente Densite_apparente

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	13	0.28254228	0.02173402	2.50	0.0055
Error	93	0.80702465	0.00867768		
Corrected Total	106	1.08956693			

R-Square	Coeff Var	Root MSE	Densite_apparente Mean
0.259316	6.564818	0.093154	1.418990

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Profondeur	1	0.08182404	0.08182404	9.43	0.0028
pF	6	0.16311769	0.02718628	3.13	0.0077
Profondeur*pF	6	0.03760055	0.00626676	0.72	0.6328

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Profondeur	1	0.05136391	0.05136391	5.92	0.0169
pF	6	0.16483311	0.02747219	3.17	0.0072
Profondeur*pF	6	0.03760055	0.00626676	0.72	0.6328



F

The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Tukey-Kramer

	Densite_apparente LSMEAN	H0:LSMean1=LSMean2 Pr > t
Profondeur		
a	1.39889661	0.0169
b	1.44598289	

pF	Densite_apparente LSMEAN	LSMEAN Number
1	1.35131556	1
2	1.40938202	2
3	1.46888567	3
1.5	1.39094593	4
2.5	1.42608125	5
3.5	1.44027314	6
4.2	1.47019469	7

Least Squares Means for effect pF Pr > t for H0: LSMean(i)=LSMean(j)							
Dependent Variable: Densite_apparente							
i\j	1	2	3	4	5	6	7
1		0.7281	0.0561	0.8610	0.2071	0.0820	0.0077
2	0.7281		0.8435	0.9990	0.9994	0.9840	0.7158
3	0.0561	0.8435		0.4412	0.9321	0.9913	1.0000
4	0.8610	0.9990	0.4412		0.9167	0.7051	0.1979
5	0.2071	0.9994	0.9321	0.9167		0.9993	0.8249
6	0.0820	0.9840	0.9913	0.7051	0.9993		0.9709
7	0.0077	0.7158	1.0000	0.1979	0.8249	0.9709	

B.3 GLM 3 - Densité apparente : Résultats SAS

GLM 3 – Densité Apparente

The GLM Procedure

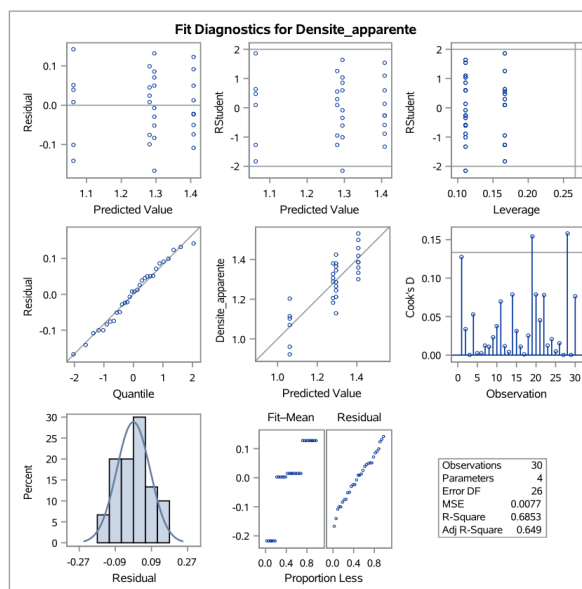
Dependent Variable: Densite_apparente Densite_apparente

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.43566288	0.14522096	18.88	<.0001
Error	26	0.20002676	0.00769334		
Corrected Total	29	0.63568964			

R-Square	Coeff Var	Root MSE	Densite_apparente Mean
0.685339	6.855924	0.087712	1.279356

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Profondeur	1	0.18247008	0.18247008	23.72	<.0001
Methode	1	0.23301799	0.23301799	30.29	<.0001
Profondeur*Methode	1	0.02017480	0.02017480	2.62	0.1174

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Profondeur	1	0.19975741	0.19975741	25.96	<.0001
Methode	1	0.23301799	0.23301799	30.29	<.0001
Profondeur*Methode	1	0.02017480	0.02017480	2.62	0.1174



The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey

Profondeur	Densite_apparente LSMEAN	H0: LSMean1=LSMean2
		Pr > t
a	1.17808333	<.0001
b	1.34464889	

The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Methode	Densite_apparente LSMEAN	H0: LSMean1=LSMean2
		Pr > t
K	1.17141667	<.0001
M	1.35131556	

The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Profondeur	Methode	Densite_apparente LSMEAN	LSMEAN Number
a	K	1.06166667	1
a	M	1.29450000	2
b	K	1.28116667	3
b	M	1.40813111	4

Least Squares Means for effect Profondeur*Methode Pr > t for H0: LSMean(i)=LSMean(j)				
Dependent Variable: Densite_apparente				
i/j	1	2	3	4
1		0.0002	0.0011	<.0001
2	0.0002		0.9914	0.0495
3	0.0011	0.9914		0.0497
4	<.0001	0.0495	0.0497	

B.4 GLM 4 - Densité apparente : Résultats SAS

GLM 4 – Densité Apparente

The GLM Procedure

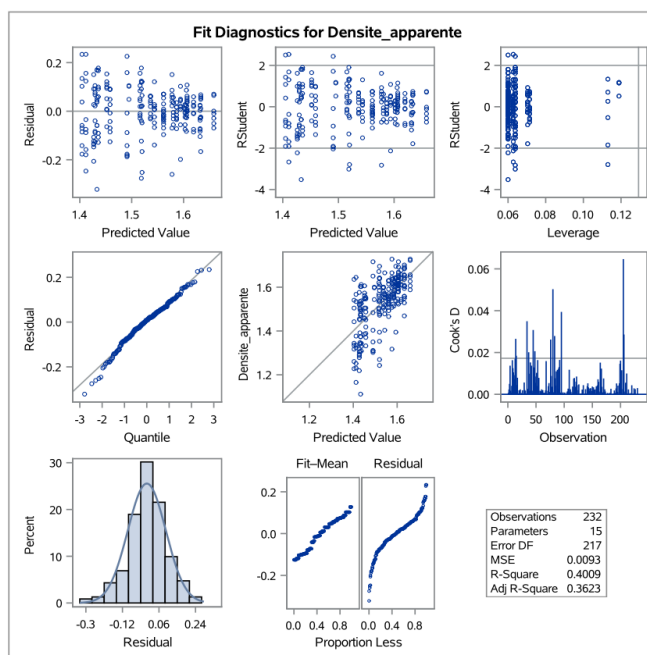
Dependent Variable: Densite_apparente Densite_apparente

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	14	1.35694976	0.09692498	10.37	<.0001
Error	217	2.02752716	0.00934344		
Corrected Total	231	3.38447692			

R-Square	Coeff Var	Root MSE	Densite_apparente Mean
0.400933	6.315121	0.096661	1.530635

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Profondeur	1	1.01258916	1.01258916	108.37	<.0001
pF	6	0.22928403	0.03821401	4.09	0.0007
Profondeur*pF	6	0.07930053	0.01321675	1.41	0.2101
Pente	1	0.03577604	0.03577604	3.83	0.0517

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Profondeur	1	0.94985755	0.94985755	101.66	<.0001
pF	6	0.21853391	0.03642232	3.90	0.0010
Profondeur*pF	6	0.07725219	0.01287536	1.38	0.2246
Pente	1	0.03577604	0.03577604	3.83	0.0517



The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

	Densite_apparente LSMEAN	H0:LSMean1=LSMean2 Pr > t
Profondeur		
a	1.46669483	<.0001
b	1.59675055	

The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

pF	Densite_apparente LSMEAN	LSMEAN Number
1	1.48289639	1
2	1.50834396	2
3	1.57651205	3
1.5	1.50982942	4
2.5	1.52906931	5
3.5	1.54652387	6
4.2	1.56888379	7

Least Squares Means for effect pF Pr > t for H0: LSMean(i)=LSMean(j)							
Dependent Variable: Densite_apparente							
i\j	1	2	3	4	5	6	7
1		0.9327	0.0071	0.9003	0.4010	0.0906	0.0047
2	0.9327		0.1437	1.0000	0.9750	0.6813	0.1503
3	0.0071	0.1437		0.1419	0.5324	0.9145	1.0000
4	0.9003	1.0000	0.1419		0.9799	0.6907	0.1455
5	0.4010	0.9750	0.5324	0.9799		0.9888	0.6018
6	0.0906	0.6813	0.9145	0.6907	0.9888		0.9631
7	0.0047	0.1503	1.0000	0.1455	0.6018	0.9631	

B.5 GLM 5 - Densité apparente : Résultats SAS

GLM 5 – Densité Apparente

The GLM Procedure

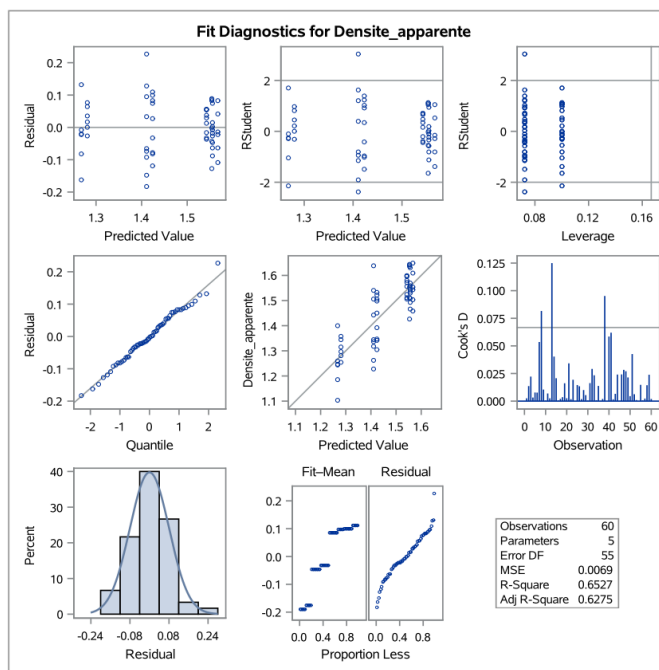
Dependent Variable: Densite_apparente Densite_apparente

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	0.71474793	0.17868698	25.84	<.0001
Error	55	0.38027300	0.00691405		
Corrected Total	59	1.09502093			

R-Square	Coeff Var	Root MSE	Densite_apparente Mean
0.652725	5.708405	0.083151	1.456638

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Profondeur	1	0.56401050	0.56401050	81.57	<.0001
Methode	1	0.06205606	0.06205606	8.98	0.0041
Profondeur*Methode	1	0.08603985	0.08603985	12.44	0.0009
Pente	1	0.00264153	0.00264153	0.38	0.5391

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Profondeur	1	0.63122710	0.63122710	91.30	<.0001
Methode	1	0.06205606	0.06205606	8.98	0.0041
Profondeur*Methode	1	0.08603985	0.08603985	12.44	0.0009
Pente	1	0.00264153	0.00264153	0.38	0.5391



Fri

The GLM Procedure Least Squares Means Adjustment for Multiple Comparisons: Tukey

Profondeur	Densite_apparente LSMEAN	H0:LSMean1=LSMean2 Pr > t
a	1.34538889	<.0001
b	1.55475750	

The GLM Procedure Least Squares Means Adjustment for Multiple Comparisons: Tukey-Kramer

Methode	Densite_apparente LSMEAN	H0:LSMean1=LSMean2 Pr > t
K	1.41725000	0.0041
M	1.48289639	

The GLM Procedure Least Squares Means Adjustment for Multiple Comparisons: Tukey-Kramer

Profondeur	Methode	Densite_apparente LSMEAN	LSMEAN Number
a	K	1.27391667	1
a	M	1.41686111	2
b	K	1.56058333	3
b	M	1.54893167	4

Least Squares Means for effect Profondeur*Methode Pr > t for H0: LSMean(i)=LSMean(j)				
Dependent Variable: Densite_apparente				
i\j	1	2	3	4
1		0.0001	<.0001	<.0001
2	0.0001		0.0001	<.0001
3	<.0001	0.0001		0.9817
4	<.0001	<.0001	0.9817	

B.6 GLM 6 - Densité apparente : Résultats SAS

GLM 6 – Densité Apparente

The GLM Procedure

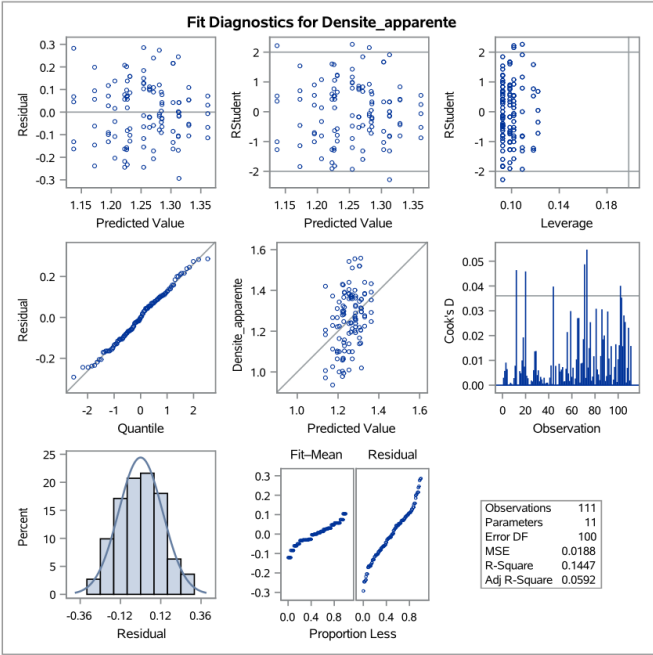
Dependent Variable: Densite_apparente Densite_apparente

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	10	0.31795661	0.03179566	1.69	0.0929
Error	100	1.87904767	0.01879048		
Corrected Total	110	2.19700427			

R-Square	Coeff Var	Root MSE	Densite_apparente Mean
0.144723	10.91166	0.137078	1.256256

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Profondeur	1	0.00717426	0.00717426	0.38	0.5380
pF	4	0.16592673	0.04148168	2.21	0.0735
Profondeur*pF	4	0.05111423	0.01277856	0.68	0.6074
Pente	1	0.09374139	0.09374139	4.99	0.0277

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Profondeur	1	0.00946956	0.00946956	0.50	0.4794
pF	4	0.17110095	0.04277524	2.28	0.0663
Profondeur*pF	4	0.05489510	0.01372377	0.73	0.5733
Pente	1	0.09374139	0.09374139	4.99	0.0277



B.7 GLM 7 - REU : Résultats SAS

GLM 7 – REU

The GLM Procedure

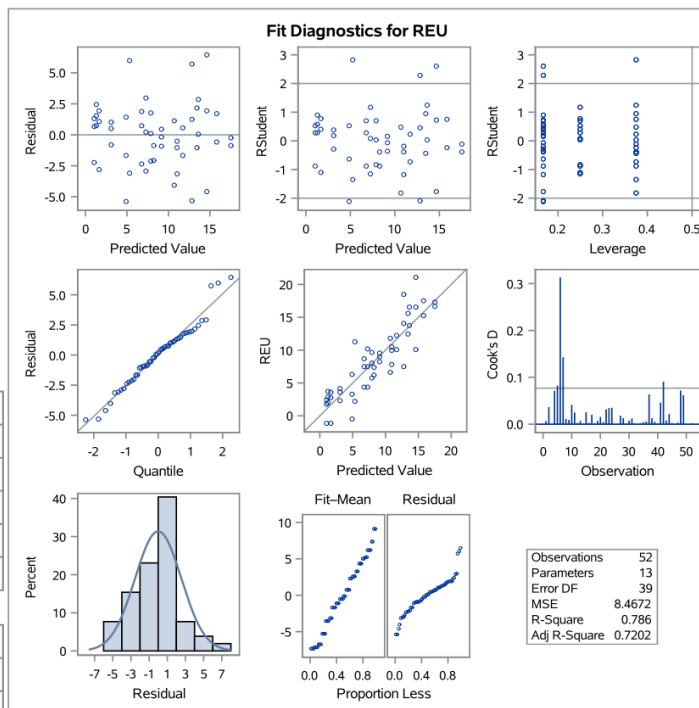
Dependent Variable: REU REU

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	12	1213.219683	101.101640	11.94	<.0001
Error	39	330.220561	8.467194		
Corrected Total	51	1543.440244			

R-Square	Coeff Var	Root MSE	REU Mean
0.786049	34.61970	2.909844	8.405168

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Parcelle	3	509.2178998	169.7392999	20.05	<.0001
Profondeur	1	12.3833514	12.3833514	1.46	0.2338
Parcelle*Profondeur	3	131.8461243	43.9487081	5.19	0.0041
Pente(Parcelle)	3	71.4041294	23.8013765	2.81	0.0519
Methode(Parcelle)	2	488.3681782	244.1840891	28.84	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Parcelle	3	509.2178998	169.7392999	20.05	<.0001
Profondeur	1	0.2658362	0.2658362	0.03	0.8603
Parcelle*Profondeur	3	131.8461243	43.9487081	5.19	0.0041
Pente(Parcelle)	3	71.4041294	23.8013765	2.81	0.0519
Methode(Parcelle)	2	488.3681782	244.1840891	28.84	<.0001



The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	REU LSMEAN	LSMEAN Number
Gi	7.9499583	1
Ma	9.4649750	2
Pi	4.4656433	3
X	14.6202800	4

Least Squares Means for effect Parcelle Pr > t for H0: LSMean(i)=LSMean(j)				
Dependent Variable: REU				
i/j	1	2	3	4
1		0.5838	0.0085	<.0001
2	0.5838		0.0030	0.0055
3	0.0085	0.0030		<.0001
4	<.0001	0.0055	<.0001	

The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Methode	Parcelle	REU LSMEAN	LSMEAN Number
K	Gi	11.8912500	1
M	Gi	4.0086667	2
M	Ma	9.4649750	3
K	Pi	7.5688333	4
M	Pi	1.3624533	5
K	X	14.6202800	6

Least Squares Means for effect Methode(Parcelle) Pr > t for H0: LSMean(i)=LSMean(j)						
Dependent Variable: REU						
i/j	1	2	3	4	5	6
1		<.0001	0.4611	0.0531	<.0001	0.3315
2	<.0001		0.0025	0.1655	0.4660	<.0001
3	0.4611	0.0025		0.8310	0.0001	0.0124
4	0.0531	0.1655	0.8310		0.0082	0.0008
5	<.0001	0.4660	0.0001	0.0082		<.0001
6	0.3315	<.0001	0.0124	0.0008	<.0001	

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	Profondeur	REU LSMEAN	LSMEAN Number
Gi	a	9.7686667	1
Gi	b	6.1312500	2
Ma	a	6.7744000	3
Ma	b	12.1555500	4
Pi	a	4.1662450	5
Pi	b	4.7650417	6
X	a	15.4758100	7
X	b	13.7647500	8

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Tukey

Profondeur	REU LSMEAN	H0:LSMean1=LSMean2
		Pr > t
a	9.04628042	0.8603
b	9.20414792	

Least Squares Means for effect Parcelle*Profondeur Pr > t for H0: LSMean(i)=LSMean(j)								
Dependent Variable: REU								
i/j	1	2	3	4	5	6	7	8
1		0.0695	0.6351	0.8422	0.0092	0.0276	0.0307	0.2800
2	0.0695		0.9999	0.0188	0.8733	0.9800	<.0001	0.0012
3	0.6351	0.9999		0.1812	0.8569	0.9594	0.0031	0.0307
4	0.8422	0.0188	0.1812		0.0029	0.0073	0.7394	0.9931
5	0.0092	0.8733	0.8569	0.0029		1.0000	<.0001	0.0002
6	0.0276	0.9800	0.9594	0.0073	1.0000		<.0001	0.0006
7	0.0307	<.0001	0.0031	0.7394	<.0001	<.0001		0.9901
8	0.2800	0.0012	0.0307	0.9931	0.0002	0.0006	0.9901	

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Tukey-Kramer

Pente	Parcelle	REU LSMEAN	LSMEAN Number
P	Gi	7.0291667	1
SC	Gi	8.8707500	2
P	Ma	7.9855200	3
SC	Ma	10.9444300	4
PI	Pi	4.4656433	5
P	X	16.6680000	6
SC	X	12.5725600	7

Least Squares Means for effect Pente(Parcelle) Pr > t for H0: LSMean(i)=LSMean(j)							
Dependent Variable: REU							
i/j	1	2	3	4	5	6	7
1		0.7134	0.9973	0.2558	0.3409	<.0001	0.0311
2	0.7134		0.9983	0.8763	0.0106	0.0007	0.3170
3	0.9973	0.9983		0.7780	0.3755	0.0025	0.3039
4	0.2558	0.8763	0.7780		0.0070	0.1053	0.9845
5	0.3409	0.0106	0.3755	0.0070		<.0001	0.0004
6	<.0001	0.0007	0.0025	0.1053	<.0001		0.4367
7	0.0311	0.3170	0.3039	0.9845	0.0004	0.4367	

B.8 GLM 8 - REU : Résultats SAS

GLM 8 - REU

The GLM Procedure

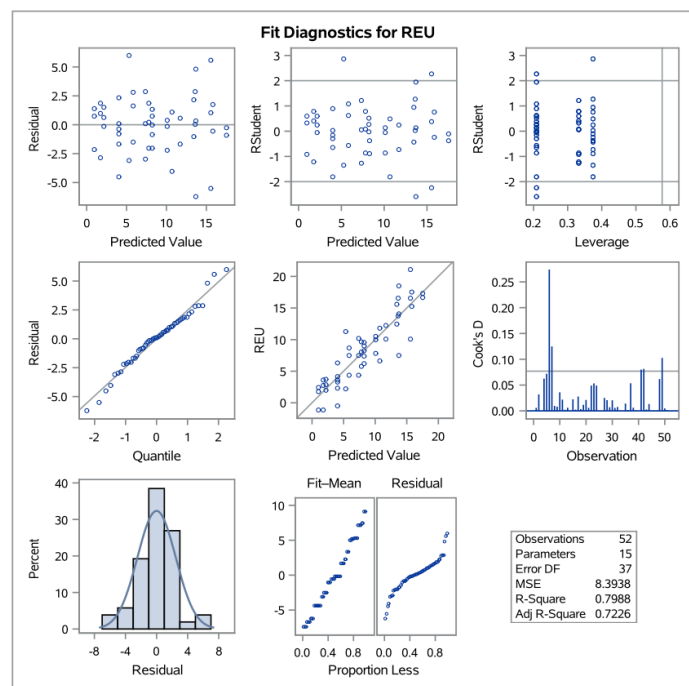
Dependent Variable: REU REU

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	14	1232.870698	88.062193	10.49	<.0001
Error	37	310.569546	8.393772		
Corrected Total	51	1543.440244			

R-Square	Coeff Var	Root MSE	REU Mean
0.798781	34.46928	2.897201	8.405168

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Parcelle	3	509.2178998	169.7392999	20.22	<.0001
Profondeur	1	12.3833514	12.3833514	1.48	0.2322
Parcelle*Profondeur	3	131.8461243	43.9487081	5.24	0.0041
Pente(Parcelle)	3	71.4041294	23.8013765	2.84	0.0513
Metho(Parcel*Profon)	4	508.0191932	127.0047983	15.13	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Parcelle	3	509.2178998	169.7392999	20.22	<.0001
Profondeur	1	0.0770127	0.0770127	0.01	0.9242
Parcelle*Profondeur	3	131.8461243	43.9487081	5.24	0.0041
Pente(Parcelle)	3	71.4041294	23.8013765	2.84	0.0513
Metho(Parcel*Profon)	4	508.0191932	127.0047983	15.13	<.0001



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The GLM Procedure

Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	REU LSMEAN	LSMEAN Number
Gi	7.9499583	1
Ma	9.4649750	2
Pi	4.4656433	3
X	14.6202800	4

Parcelle	Profondeur	REU LSMEAN	LSMEAN Number
Gi	a	9.7686667	1
Gi	b	6.1312500	2
Ma	a	6.7744000	3
Ma	b	12.1555500	4
Pi	a	4.1662450	5
Pi	b	4.7650417	6
X	a	15.4758100	7
X	b	13.7647500	8

Least Squares Means for effect Parcelle Pr > t for H0: LSMean(i)=LSMean(j)				
Dependent Variable: REU				
i/j	1	2	3	4
1		0.5806	0.0084	<.0001
2	0.5806		0.0030	0.0055
3	0.0084	0.0030		<.0001
4	<.0001	0.0055	<.0001	

Least Squares Means for effect Parcelle*Profondeur Pr > t for H0: LSMean(i)=LSMean(j)								
Dependent Variable: REU								
i/j	1	2	3	4	5	6	7	8
1		0.0687	0.6303	0.8389	0.0092	0.0274	0.0305	0.2764
2	0.0687		0.9999	0.0187	0.8705	0.9794	<.0001	0.0013
3	0.6303	0.9999		0.1788	0.8539	0.9582	0.0032	0.0305
4	0.8389	0.0187	0.1788		0.0030	0.0073	0.7351	0.9929
5	0.0092	0.8705	0.8539	0.0030		1.0000	<.0001	0.0002
6	0.0274	0.9794	0.9582	0.0073	1.0000		<.0001	0.0006
7	0.0305	<.0001	0.0032	0.7351	<.0001	<.0001		0.9898
8	0.2764	0.0013	0.0305	0.9929	0.0002	0.0006	0.9898	

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Tukey-Kramer

Methode	Parcelle	Profondeur	REU LSMEAN	LSMEAN Number
K	Gi	a	14.6133333	1
M	Gi	a	4.9240000	2
K	Gi	b	9.1691667	3
M	Gi	b	3.0933333	4
M	Ma	a	6.7744000	5
M	Ma	b	12.1555500	6
K	Pi	a	7.3430000	7
M	Pi	a	0.9894900	8
K	Pi	b	7.7946667	9
M	Pi	b	1.7354167	10
K	X	a	15.4758100	11
K	X	b	13.7647500	12

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Tukey

Profondeur	REU LSMEAN	H0:LSMean1=LSMean2
		Pr > t
a	9.04628042	0.8597
b	9.20414792	

Least Squares Means for effect Metho(Parcel*Profon) Pr > t for H0: LSMean(i)=LSMean(j)												
Dependent Variable: REU												
i/j	1	2	3	4	5	6	7	8	9	10	11	12
1		<.0001	0.0858	<.0001	0.0079	0.9718	0.0427	<.0001	0.0724	<.0001	1.0000	1.0000
2	<.0001		0.3495	0.9931	0.9970	0.0189	0.9874	0.7395	0.9560	0.9136	0.0001	0.0017
3	0.0858	0.3495		0.0347	0.9767	0.8994	0.9988	0.0135	0.9999	0.0350	0.0653	0.3960
4	<.0001	0.9931	0.0347		0.7103	0.0012	0.6426	0.9959	0.4975	0.9999	<.0001	<.0001
5	0.0079	0.9970	0.9767	0.7103		0.3019	1.0000	0.3083	1.0000	0.5090	0.0067	0.0594
6	0.9718	0.0189	0.8994	0.0012	0.3019		0.5764	0.0007	0.7088	0.0018	0.8903	0.9996
7	0.0427	0.9874	0.9988	0.6426	1.0000	0.5764		0.2725	1.0000	0.4492	0.0311	0.1818
8	<.0001	0.7395	0.0135	0.9959	0.3083	0.0007	0.2725		0.1911	1.0000	<.0001	<.0001
9	0.0724	0.9560	0.9999	0.4975	1.0000	0.7088	1.0000	0.1911		0.3364	0.0516	0.2667
10	<.0001	0.9136	0.0350	0.9999	0.5090	0.0018	0.4492	1.0000	0.3364		<.0001	0.0002
11	1.0000	0.0001	0.0653	<.0001	0.0067	0.8903	0.0311	<.0001	0.0516	<.0001		0.9994
12	1.0000	0.0017	0.3960	<.0001	0.0594	0.9996	0.1818	<.0001	0.2667	0.0002	0.9994	

B.9 GLM 9 - Porosité X : Résultats SAS

GLM 9 – Porosité X

The GLM Procedure

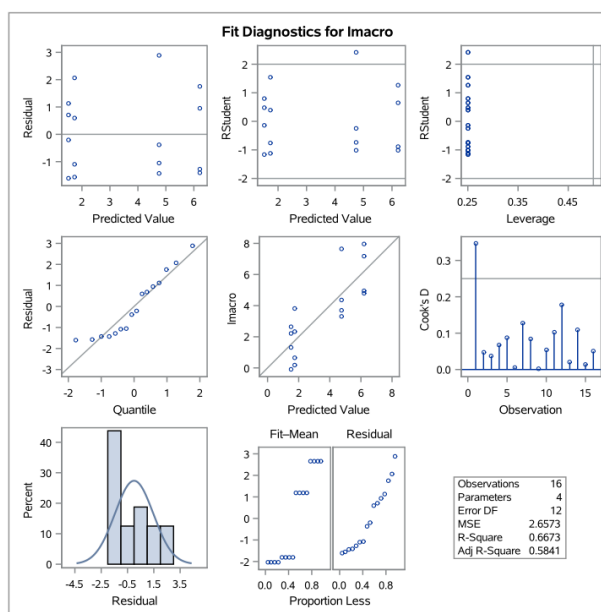
Dependent Variable: Imacro Imacro

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	63.94459365	21.31486455	8.02	0.0034
Error	12	31.88809037	2.65734086		
Corrected Total	15	95.83268402			

R-Square	Coeff Var	Root MSE	Imacro Mean
0.667252	45.88882	1.630135	3.552358

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Profondeur	1	2.84845230	2.84845230	1.07	0.3209
Pente	1	59.55034177	59.55034177	22.41	0.0005
Profondeur*Pente	1	1.54579958	1.54579958	0.58	0.4604

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Profondeur	1	2.84845230	2.84845230	1.07	0.3209
Pente	1	59.55034177	59.55034177	22.41	0.0005
Profondeur*Pente	1	1.54579958	1.54579958	0.58	0.4604



The GLM Procedure Least Squares Means Adjustment for Multiple Comparisons: Tukey

	Imacro LSMEAN	H0:LSMean1=LSMean2 Pr > t
P	1.62313679	0.0005
SC	5.48158019	

The GLM Procedure

Dependent Variable: ThetapF1 ThetapF1

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	64.94595000	21.64865000	7.43	0.0045
Error	12	34.97065000	2.91422083		
Corrected Total	15	99.91660000			

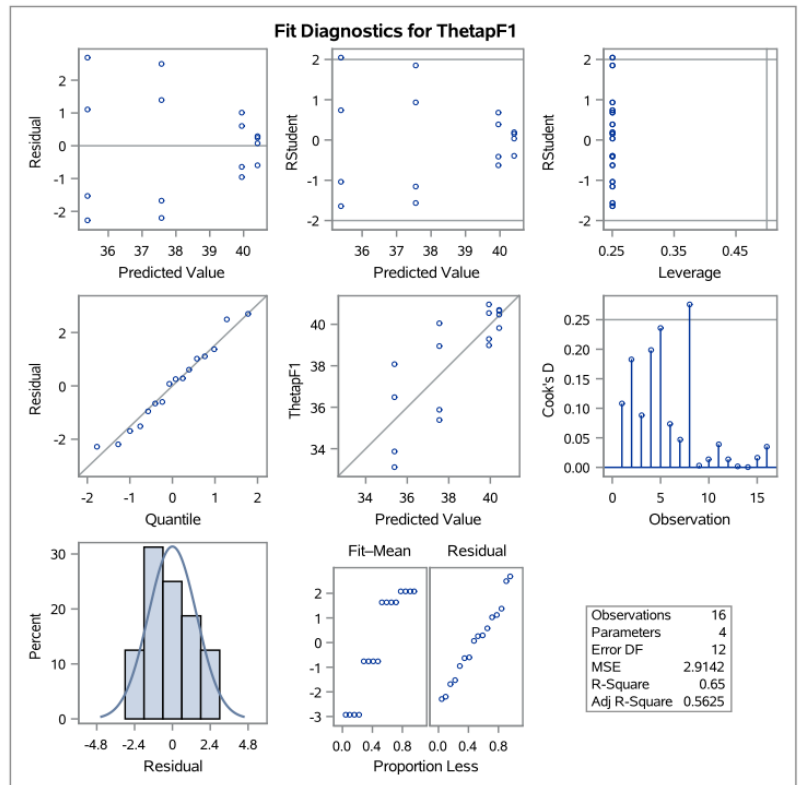
R-Square	Coeff Var	Root MSE	ThetapF1 Mean
0.650002	4.454296	1.707109	38.32500

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Profondeur	1	7.02250000	7.02250000	2.41	0.1465
Pente	1	54.98222500	54.98222500	18.87	0.0010
Profondeur*Pente	1	2.94122500	2.94122500	1.01	0.3349

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Profondeur	1	7.02250000	7.02250000	2.41	0.1465
Pente	1	54.98222500	54.98222500	18.87	0.0010
Profondeur*Pente	1	2.94122500	2.94122500	1.01	0.3349

The GLM Procedure

Dependent Variable: ThetapF1 ThetapF1



The GLM Procedure

Least Squares Means

Adjustment for Multiple Comparisons: Tukey

Pente	ThetapF1 LSMEAN	H0: LSMean1=LSMean2
		Pr > t
P	40.1787500	0.0010
SC	36.4712500	

The GLM Procedure

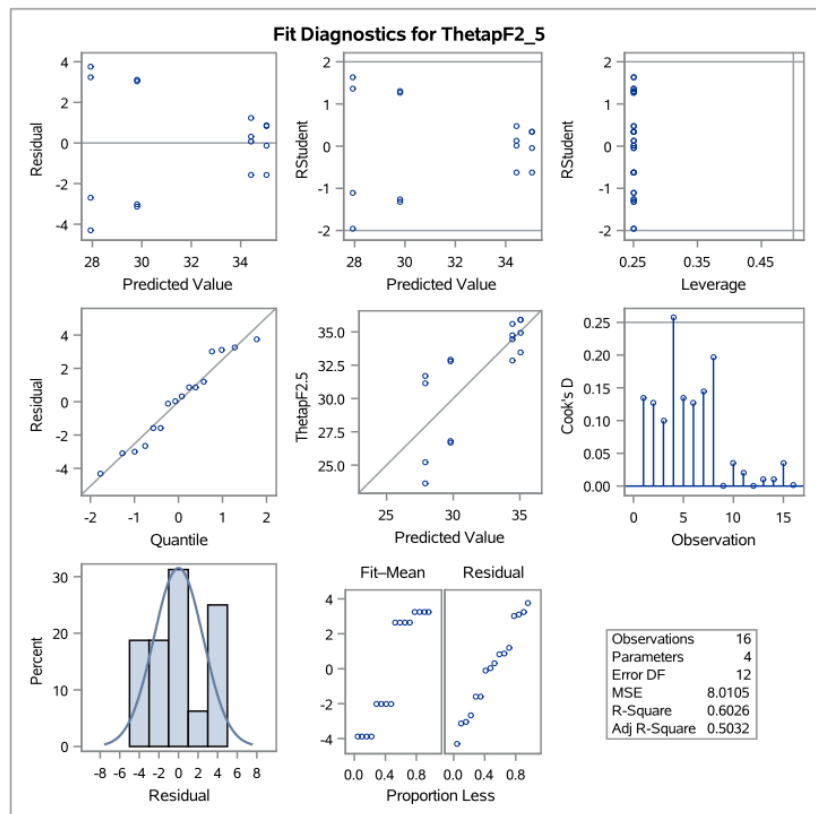
Dependent Variable: ThetapF2_5 ThetapF2.5

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	145.7426187	48.5808729	6.06	0.0094
Error	12	96.1257750	8.0104813		
Corrected Total	15	241.8683938			

R-Square	Coeff Var	Root MSE	ThetapF2_5 Mean
0.602570	8.901474	2.830279	31.79563

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Profondeur	1	6.2875562	6.2875562	0.78	0.3930
Pente	1	137.8863062	137.8863062	17.21	0.0013
Profondeur*Pente	1	1.5687562	1.5687562	0.20	0.6660

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Profondeur	1	6.2875562	6.2875562	0.78	0.3930
Pente	1	137.8863062	137.8863062	17.21	0.0013
Profondeur*Pente	1	1.5687562	1.5687562	0.20	0.6660



The GLM Procedure Least Squares Means Adjustment for Multiple Comparisons: Tukey

Pente	ThetapF2_5 LSMEAN	H0:LSMean1=LSMean2 Pr > t
P	34.7312500	0.0013
SC	28.8600000	

The GLM Procedure

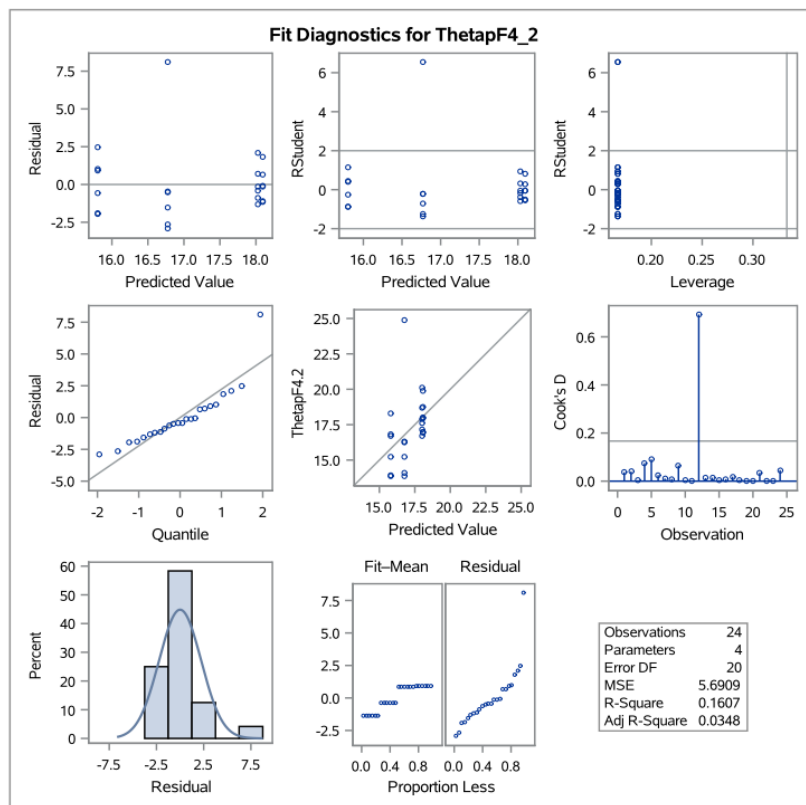
Dependent Variable: ThetapF4_2 ThetapF4.2

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	21.7962683	7.2654228	1.28	0.3094
Error	20	113.8170230	5.6908511		
Corrected Total	23	135.6132913			

R-Square	Coeff Var	Root MSE	ThetapF4_2 Mean
0.160724	13.88940	2.385550	17.17533

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Profondeur	1	1.25400817	1.25400817	0.22	0.6438
Pente	1	18.92505600	18.92505600	3.33	0.0832
Profondeur*Pente	1	1.61720417	1.61720417	0.28	0.5999

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Profondeur	1	1.25400817	1.25400817	0.22	0.6438
Pente	1	18.92505600	18.92505600	3.33	0.0832
Profondeur*Pente	1	1.61720417	1.61720417	0.28	0.5999



The GLM Procedure

Least Squares Means

Adjustment for Multiple Comparisons: Tukey

Pente	ThetapF4_2 LSMEAN	H0:LSMean1=LSMean2
		Pr > t
P	18.0633333	0.0832
SC	16.2873333	

The GLM Procedure

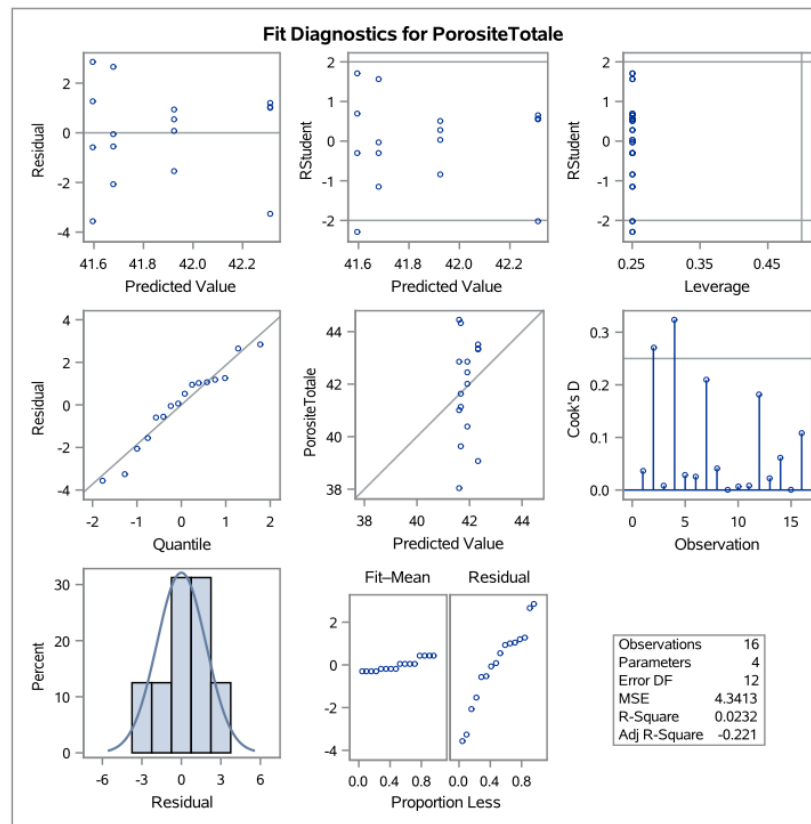
Dependent Variable: PorositeTotale PorositeTotale

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	1.23958704	0.41319568	0.10	0.9612
Error	12	52.09611962	4.34134330		
Corrected Total	15	53.33570666			

R-Square	Coeff Var	Root MSE	PorositeTotale Mean
0.023241	4.975455	2.083589	41.87736

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Profondeur	1	0.92595230	0.92595230	0.21	0.6525
Pente	1	0.09113564	0.09113564	0.02	0.8872
Profondeur*Pente	1	0.22249911	0.22249911	0.05	0.8247

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Profondeur	1	0.92595230	0.92595230	0.21	0.6525
Pente	1	0.09113564	0.09113564	0.02	0.8872
Profondeur*Pente	1	0.22249911	0.22249911	0.05	0.8247



The GLM Procedure Least Squares Means Adjustment for Multiple Comparisons: Tukey

Pente	PorositeTotale LSMEAN	H0:LSMean1=LSMean2
		Pr > t
P	41.8018868	0.8872
SC	41.9528302	

B.10 GLM 10 - Porosité Marnières : Résultats SAS

GLM 10 – Porosité Marnières

The GLM Procedure

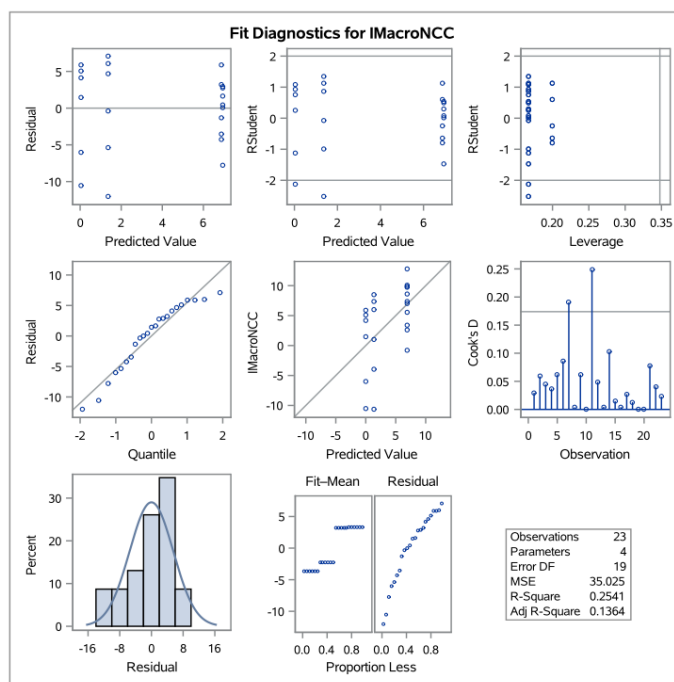
Dependent Variable: IMacroNCC IMacroNCC

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	226.7412910	75.5804303	2.16	0.1266
Error	19	665.4738156	35.0249377		
Corrected Total	22	892.2151067			

R-Square	Coeff Var	Root MSE	IMacroNCC Mean
0.254133	161.1076	5.918187	3.673437

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Profondeur	1	0.8816263	0.8816263	0.03	0.8756
Pente	1	223.0059431	223.0059431	6.37	0.0207
Profondeur*Pente	1	2.8537217	2.8537217	0.08	0.7784

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Profondeur	1	2.3546671	2.3546671	0.07	0.7982
Pente	1	220.1068946	220.1068946	6.28	0.0214
Profondeur*Pente	1	2.8537217	2.8537217	0.08	0.7784



The GLM Procedure

Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

	IMacroNCC LSMEAN	H0:LSMean1=LSMean2
		Pr > t
P	6.91012142	0.0214
SC	0.70377736	

The GLM Procedure

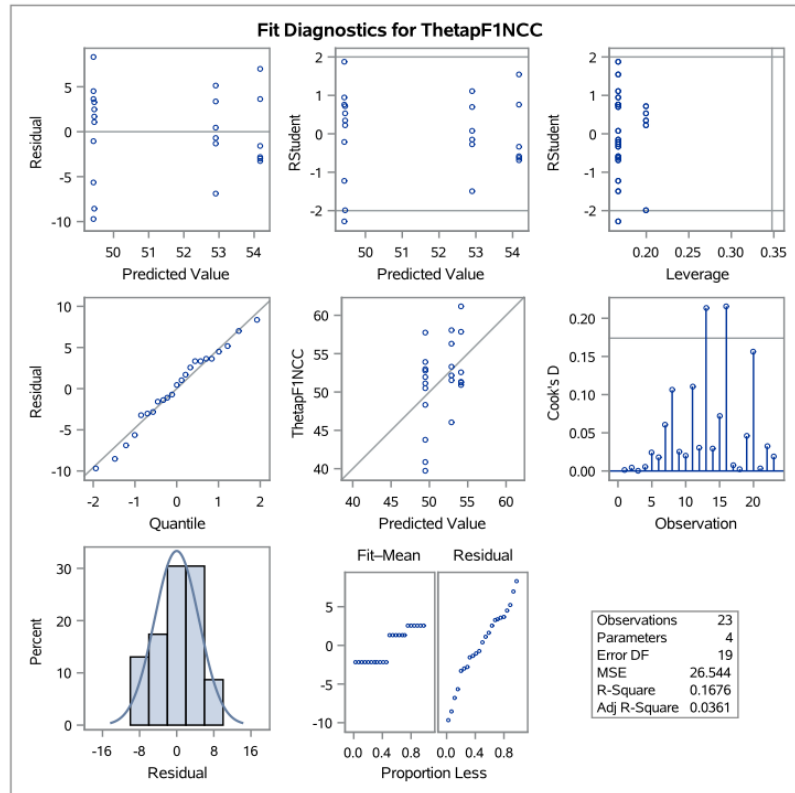
Dependent Variable: ThetapF1NCC ThetapF1NCC

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	101.5168602	33.8389534	1.27	0.3114
Error	19	504.3346611	26.5439295		
Corrected Total	22	605.8515213			

R-Square	Coeff Var	Root MSE	ThetapF1NCC Mean
0.167561	9.989181	5.152080	51.57660

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Profondeur	1	4.25825974	4.25825974	0.16	0.6932
Pente	1	95.07727224	95.07727224	3.58	0.0737
Profondeur*Pente	1	2.18132825	2.18132825	0.08	0.7775

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Profondeur	1	2.39024017	2.39024017	0.09	0.7674
Pente	1	96.23661137	96.23661137	3.63	0.0722
Profondeur*Pente	1	2.18132825	2.18132825	0.08	0.7775



The GLM Procedure Least Squares Means Adjustment for Multiple Comparisons: Tukey-Kramer

	ThetapF1NCC LSMEAN	H0:LSMean1=LSMean2
		Pr > t
P	49.4361050	0.0722
SC	53.5399333	

The GLM Procedure

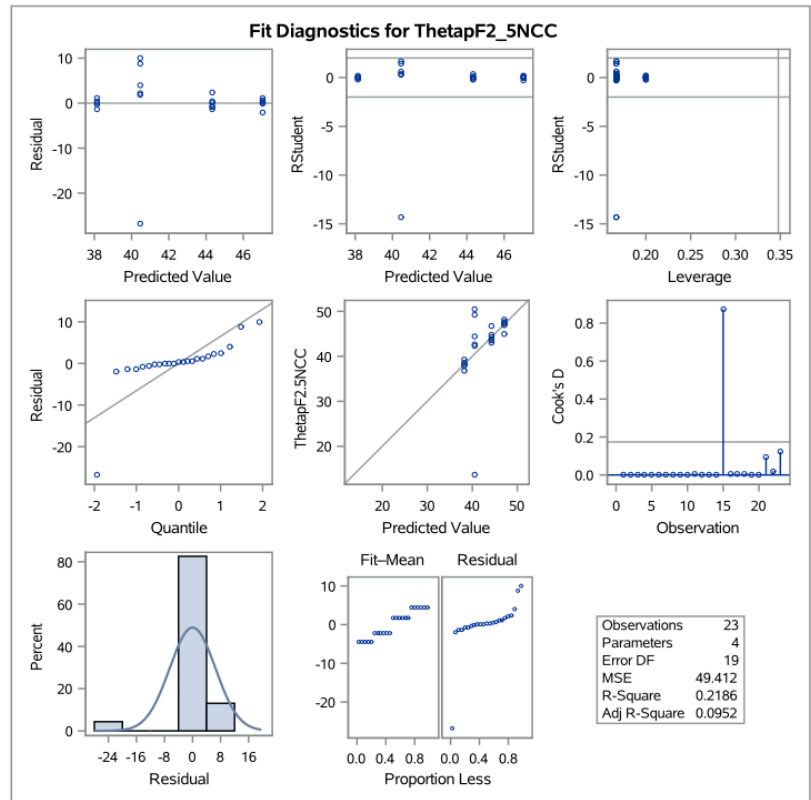
Dependent Variable: ThetapF2_5NCC ThetapF2.5NCC

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	262.619026	87.539675	1.77	0.1867
Error	19	938.830136	49.412112		
Corrected Total	22	1201.449162			

R-Square	Coeff Var	Root MSE	ThetapF2_5NCC Mean
0.218585	16.47133	7.029375	42.67642

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Profondeur	1	2.1636719	2.1636719	0.04	0.8365
Pente	1	28.1052896	28.1052896	0.57	0.4600
Profondeur*Pente	1	232.3500650	232.3500650	4.70	0.0430

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Profondeur	1	0.2511966	0.2511966	0.01	0.9439
Pente	1	36.2558951	36.2558951	0.73	0.4023
Profondeur*Pente	1	232.3500650	232.3500650	4.70	0.0430



The GLM Procedure Least Squares Means Adjustment for Multiple Comparisons: Tukey-Kramer

Pente	ThetapF2_5NCC LSMEAN	H0:LSMean1=LSMean2 Pr > t
P	43.7470417	0.4023
SC	41.2281567	

The GLM Procedure

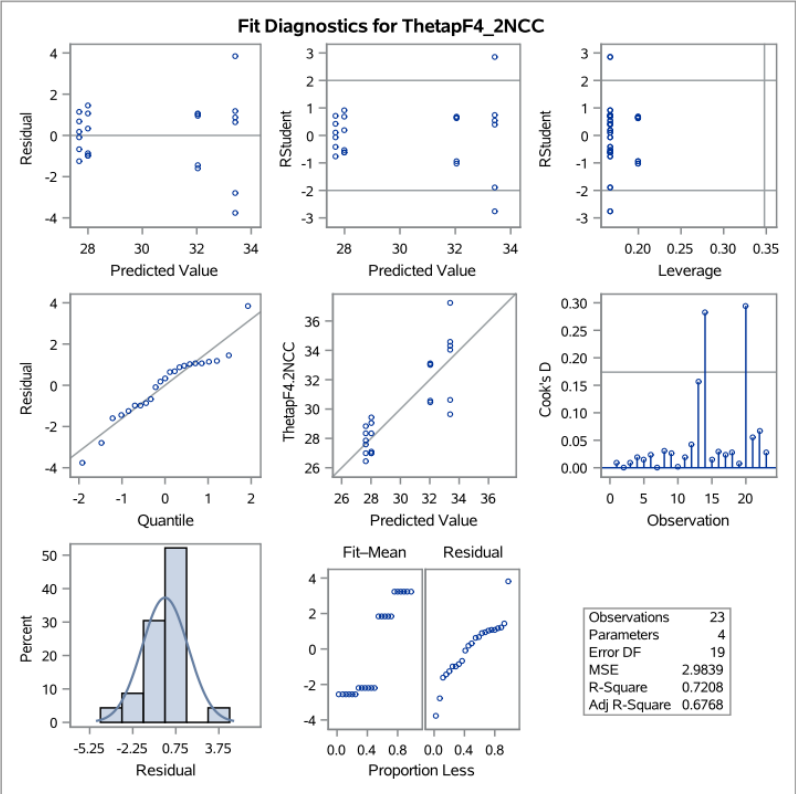
Dependent Variable: ThetapF4_2NCC ThetapF4.2NCC

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	146.3884655	48.7961552	16.35	<.0001
Error	19	56.6945045	2.9839213		
Corrected Total	22	203.0829700			

R-Square	Coeff Var	Root MSE	ThetapF4_2NCC Mean
0.720831	5.719688	1.727403	30.20100

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Profondeur	1	2.8664858	2.8664858	0.96	0.3393
Pente	1	139.3801214	139.3801214	46.71	<.0001
Profondeur*Pente	1	4.1418583	4.1418583	1.39	0.2533

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Profondeur	1	1.5632221	1.5632221	0.52	0.4780
Pente	1	136.7877768	136.7877768	45.84	<.0001
Profondeur*Pente	1	4.1418583	4.1418583	1.39	0.2533



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The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Tukey-Kramer

Pente	ThetapF4_2NCC LSMEAN	H0:LSMean1=LSMean2
		Pr > t
P	32.7238000	<.0001
SC	27.8311667	

The GLM Procedure

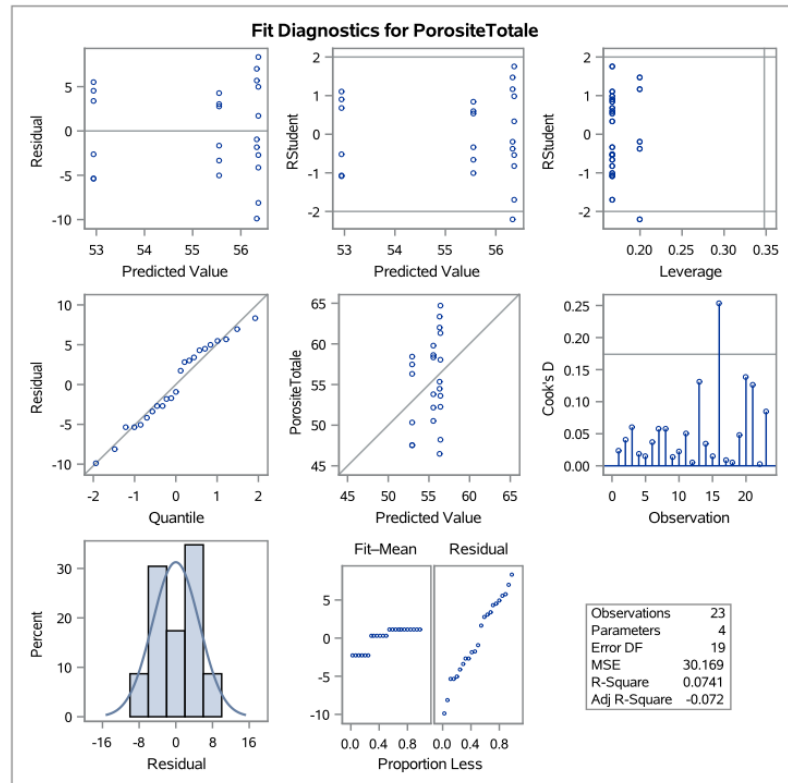
Dependent Variable: PorositeTotale PorositeTotale

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	45.8996478	15.2998826	0.51	0.6820
Error	19	573.2190483	30.1694236		
Corrected Total	22	619.1186961			

R-Square	Coeff Var	Root MSE	PorositeTotale Mean
0.074137	9.941477	5.492670	55.25004

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Profondeur	1	9.01503440	9.01503440	0.30	0.5910
Pente	1	26.85961215	26.85961215	0.89	0.3572
Profondeur*Pente	1	10.02500127	10.02500127	0.33	0.5711

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Profondeur	1	9.48968113	9.48968113	0.31	0.5815
Pente	1	25.26041352	25.26041352	0.84	0.3716
Profondeur*Pente	1	10.02500127	10.02500127	0.33	0.5711



The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

	PorositeTotale LSMEAN	H0:LSMean1=LSMean2
		Pr > t
P	56.3462264	0.3716
SC	54.2437107	

B.11 GLM 11 - Porosité Italie K : Résultats SAS

GLM 11 – Porosité Italie K

The GLM Procedure

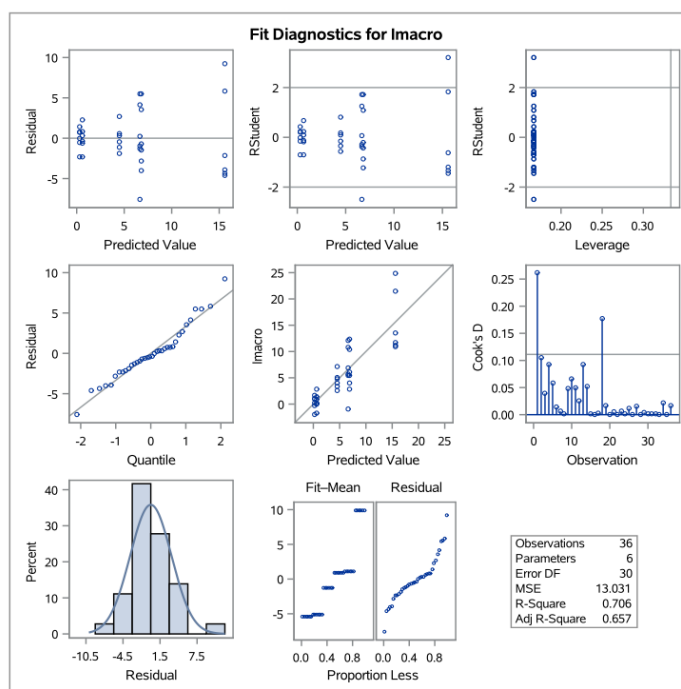
Dependent Variable: Imacro Imacro

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	938.681530	187.736306	14.41	<.0001
Error	30	390.936130	13.031204		
Corrected Total	35	1329.617661			

R-Square	Coeff Var	Root MSE	Imacro Mean
0.705979	62.73735	3.609876	5.753951

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Parcelle	1	535.3761668	535.3761668	41.08	<.0001
Profondeur	1	362.2890858	362.2890858	27.80	<.0001
Parcelle*Profondeur	1	26.5914018	26.5914018	2.04	0.1635
Pente(Parcelle)	1	5.0261817	5.0261817	0.39	0.5393
Profon*Pente(Parcelle)	1	9.3986942	9.3986942	0.72	0.4025

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Parcelle	1	535.3761668	535.3761668	41.08	<.0001
Profondeur	1	387.2285174	387.2285174	29.72	<.0001
Parcelle*Profondeur	1	26.5914018	26.5914018	2.04	0.1635
Pente(Parcelle)	1	5.0261817	5.0261817	0.39	0.5393
Profon*Pente(Parcelle)	1	9.3986942	9.3986942	0.72	0.4025



The GLM Procedure

Least Squares Means

Adjustment for Multiple Comparisons: Tukey

Profondeur	Imacro LSMEAN	H0: LSMean1=LSMean2
		Pr > t
a	10.5935582	<.0001
b	3.6412060	

The GLM Procedure

Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	Imacro LSMEAN	H0: LSMean1=LSMean2
		Pr > t
Gi	3.0270881	<.0001
Pi	11.2076761	

The GLM Procedure

Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	Profondeur	Imacro LSMEAN	LSMEAN Number
Gi	a	5.5916824	1
Gi	b	0.4624937	2
Pi	a	15.5954340	3
Pi	b	6.8199182	4

Least Squares Means for effect Parcelle*Profondeur				
Pr > t for H0: LSMean(i)=LSMean(j)				
Dependent Variable: Imacro				
i/j	1	2	3	4
1		0.0080	<.0001	0.9037
2	0.0080		<.0001	0.0072
3	<.0001	<.0001		0.0012
4	0.9037	0.0072	0.0012	

The GLM Procedure

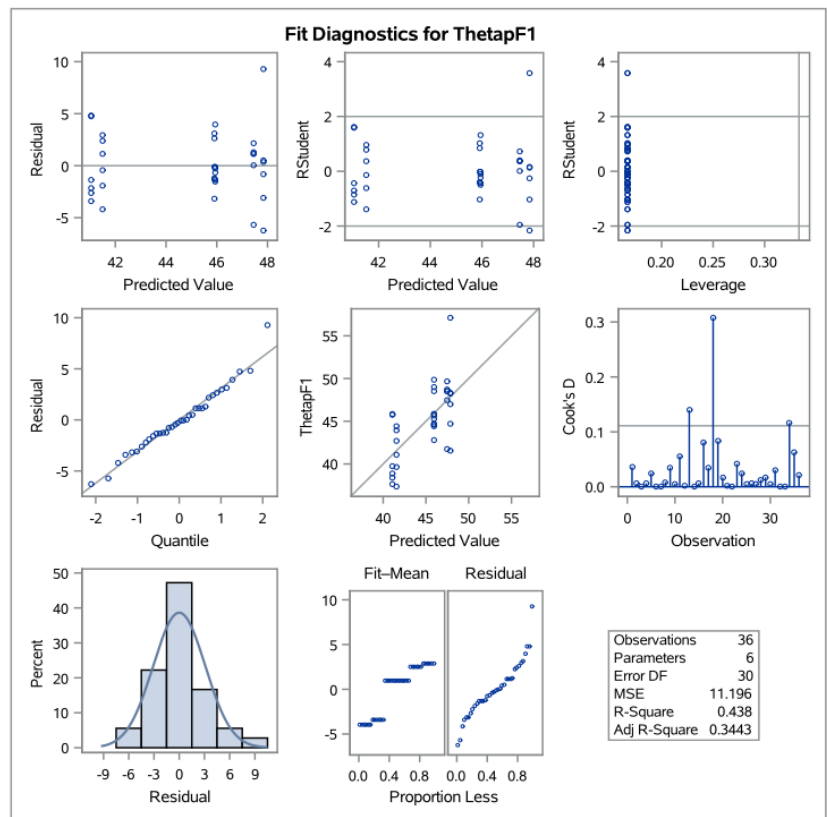
Dependent Variable: ThetapF1 ThetapF1

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	261.7682463	52.3536493	4.68	0.0028
Error	30	335.8690407	11.1956347		
Corrected Total	35	597.6372870			

R-Square	Coeff Var	Root MSE	ThetapF1 Mean
0.438005	7.443551	3.345988	44.95150

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Parcelle	1	17.3696180	17.3696180	1.55	0.2226
Profondeur	1	161.1799521	161.1799521	14.40	0.0007
Parcelle*Profondeur	1	82.1078409	82.1078409	7.33	0.0111
Pente(Parcelle)	1	0.0134427	0.0134427	0.00	0.9726
Profon*Pente(Parcelle)	1	1.0973927	1.0973927	0.10	0.7564

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Parcelle	1	17.3696180	17.3696180	1.55	0.2226
Profondeur	1	113.4188828	113.4188828	10.13	0.0034
Parcelle*Profondeur	1	82.1078409	82.1078409	7.33	0.0111
Pente(Parcelle)	1	0.0134427	0.0134427	0.00	0.9726
Profon*Pente(Parcelle)	1	1.0973927	1.0973927	0.10	0.7564



The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey

Profondeur	ThetapF1 LSMEAN	H0:LSMean1=LSMean2 Pr > t
a	46.7790833	0.0120
b	43.6150833	

The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	ThetapF1 LSMEAN	H0:LSMean1=LSMean2 Pr > t
Gi	44.4603333	0.2226
Pi	45.9338333	

The GLM Procedure Least Squares Means Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	Profondeur	ThetapF1 LSMEAN	LSMEAN Number
Gi	a	47.6441667	1
Gi	b	41.2765000	2
Pi	a	45.9140000	3
Pi	b	45.9536667	4

Least Squares Means for effect Parcelle*Profondeur Pr > t for H0: LSMean(i)=LSMean(j)				
Dependent Variable: ThetapF1				
i/j	1	2	3	4
1		0.0003	0.7310	0.7446
2	0.0003		0.0444	0.0421
3	0.7310	0.0444		1.0000
4	0.7446	0.0421	1.0000	

The GLM Procedure

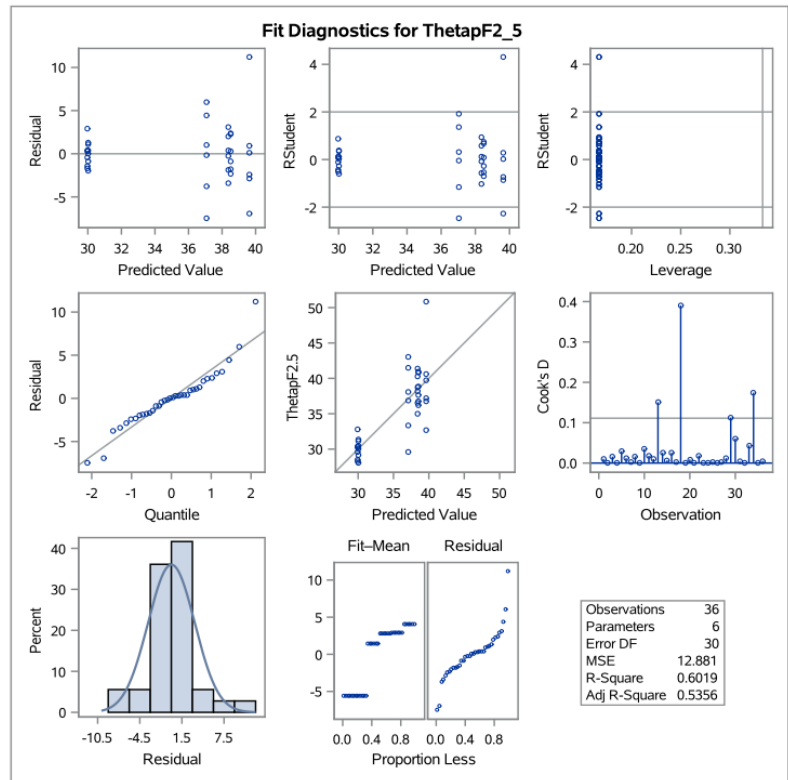
Dependent Variable: ThetapF2_5 ThetapF2.5

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	584.2930195	116.8586039	9.07	<.0001
Error	30	386.4432002	12.8814400		
Corrected Total	35	970.7362196			

R-Square	Coeff Var	Root MSE	ThetapF2_5 Mean
0.601907	10.08441	3.589072	35.59031

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Parcelle	1	145.7209014	145.7209014	11.31	0.0021
Profondeur	1	273.7535702	273.7535702	21.25	<.0001
Parcelle*Profondeur	1	144.7891445	144.7891445	11.24	0.0022
Pente(Parcelle)	1	9.4903527	9.4903527	0.74	0.3975
Profon*Pente(Parcelle)	1	10.5390507	10.5390507	0.82	0.3729

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Parcelle	1	145.7209014	145.7209014	11.31	0.0021
Profondeur	1	191.4065961	191.4065961	14.86	0.0006
Parcelle*Profondeur	1	144.7891445	144.7891445	11.24	0.0022
Pente(Parcelle)	1	9.4903527	9.4903527	0.74	0.3975
Profon*Pente(Parcelle)	1	10.5390507	10.5390507	0.82	0.3729

The GLM Procedure
Least Squares Means

Adjustment for Multiple Comparisons: Tukey

Profondeur	ThetapF2_5 LSMEAN	H0:LSMean1=LSMean2 Pr > t
a	38.3501667	0.0030
b	34.2530833	

The GLM Procedure
Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	ThetapF2_5 LSMEAN	H0:LSMean1=LSMean2 Pr > t
Gi	34.1676667	0.0021
Pi	38.4355833	

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	Profondeur	ThetapF2_5 LSMEAN	LSMEAN Number
Gi	a	38.3433333	1
Gi	b	29.9920000	2
Pi	a	38.3570000	3
Pi	b	38.5141667	4

Least Squares Means for effect Parcelle*Profondeur
Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: ThetapF2_5				
i/j	1	2	3	4
1		<.0001	1.0000	0.9997
2	<.0001		0.0003	0.0003
3	1.0000	0.0003		0.9998
4	0.9997	0.0003	0.9998	

The GLM Procedure

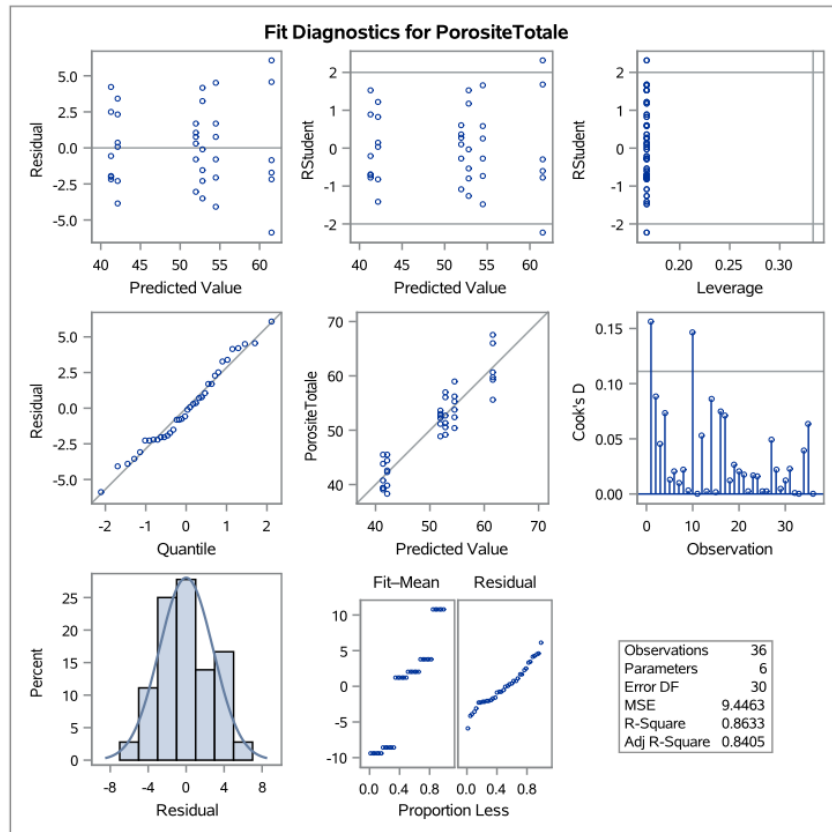
Dependent Variable: PorositeTotale PorositeTotale

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	1789.061548	357.812310	37.88	<.0001
Error	30	283.387920	9.446264		
Corrected Total	35	2072.449468			

R-Square	Coeff Var	Root MSE	PorositeTotale Mean
0.863259	6.061434	3.073478	50.70545

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Parcelle	1	745.611329	745.611329	78.93	<.0001
Profondeur	1	1006.764962	1006.764962	106.58	<.0001
Parcelle*Profondeur	1	15.246311	15.246311	1.61	0.2137
Pente(Parcelle)	1	4.519758	4.519758	0.48	0.4944
Profon*Pente(Parcel)	1	16.919188	16.919188	1.79	0.1908

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Parcelle	1	745.6113287	745.6113287	78.93	<.0001
Profondeur	1	919.7847325	919.7847325	97.37	<.0001
Parcelle*Profondeur	1	15.2463115	15.2463115	1.61	0.2137
Pente(Parcelle)	1	4.5197579	4.5197579	0.48	0.4944
Profon*Pente(Parcel)	1	16.9191883	16.9191883	1.79	0.1908



Saturd

The GLM Procedure
Least Squares Means

Adjustment for Multiple Comparisons: Tukey

Profondeur	PorositeTotale LSMEAN	H0:LSMean1=LSMean2
		Pr > t
a	57.3726415	<.0001
b	47.2562893	

The GLM Procedure
Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	PorositeTotale LSMEAN	H0:LSMean1=LSMean2
		Pr > t
Gi	47.4874214	<.0001
Pi	57.1415094	

The GLM Procedure
Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	Profondeur	PorositeTotale LSMEAN	LSMEAN Number
Gi	a	53.2358491	1
Gi	b	41.7389937	2
Pi	a	61.5094340	3
Pi	b	52.7735849	4

Least Squares Means for effect Parcelle*Profondeur
Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: PorositeTotale

i/j	1	2	3	4
1		<.0001	<.0001	0.9903
2	<.0001		<.0001	<.0001
3	<.0001	<.0001		0.0002
4	0.9903	<.0001	0.0002	

B.12 GLM 12 - Porosité Italie M : Résultats SAS

GLM 12 – Porosité Italie M

The GLM Procedure

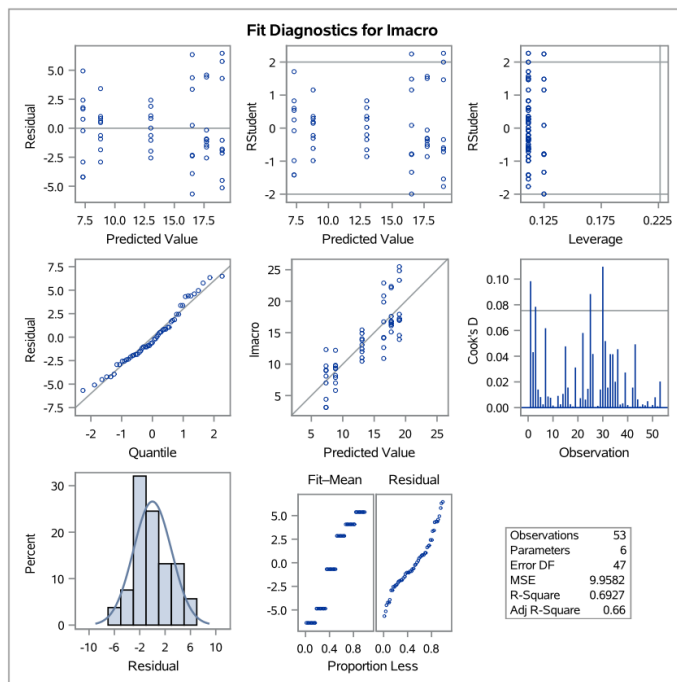
Dependent Variable: Imacro Imacro

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	1054.850675	210.970135	21.19	<.0001
Error	47	468.035169	9.958195		
Corrected Total	52	1522.885843			

R-Square	Coeff Var	Root MSE	Imacro Mean
0.692666	23.07136	3.155661	13.67783

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Parcelle	1	149.3952065	149.3952065	15.00	0.0003
Profondeur	1	860.4512304	860.4512304	86.41	<.0001
Parcelle*Profondeur	1	28.7197374	28.7197374	2.88	0.0961
Pente(Parcelle)	1	16.0674718	16.0674718	1.61	0.2103
Profon*Pente(Parcelle)	1	0.2170285	0.2170285	0.02	0.8833

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Parcelle	1	139.9247062	139.9247062	14.05	0.0005
Profondeur	1	770.6584647	770.6584647	77.39	<.0001
Parcelle*Profondeur	1	28.0577388	28.0577388	2.82	0.0999
Pente(Parcelle)	1	15.9397943	15.9397943	1.60	0.2120
Profon*Pente(Parcelle)	1	0.2170285	0.2170285	0.02	0.8833



The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

	Imacro LSMEAN	H0: LSMean1=LSMean2 Pr > t
Profondeur		
a	18.0752667	<.0001
b	10.5302060	

The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

	Imacro LSMEAN	H0: LSMean1=LSMean2 Pr > t
Parcelle		
Gi	12.5865010	0.0005
Pi	16.0189717	

The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	Profondeur	Imacro LSMEAN	LSMEAN Number
Gi	a	17.1275528	1
Gi	b	8.0454493	2
Pi	a	19.0229806	3
Pi	b	13.0149627	4

Least Squares Means for effect Parcelle*Profondeur
Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: Imacro				
i/j	1	2	3	4
1		<.0001	0.4716	0.0142
2	<.0001		<.0001	0.0019
3	0.4716	<.0001		0.0011
4	0.0142	0.0019	0.0011	

The GLM Procedure

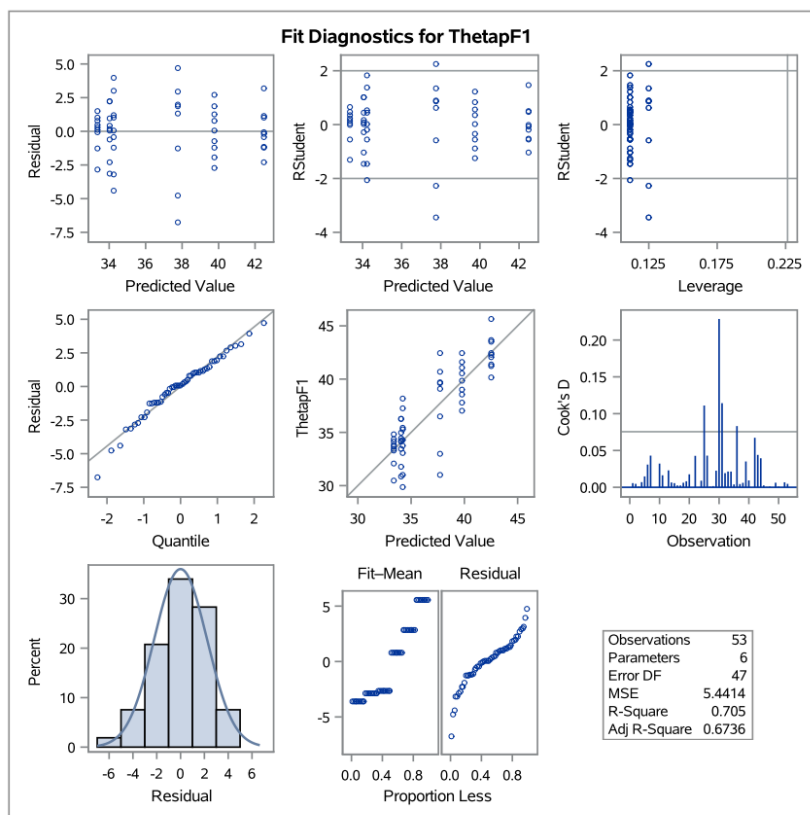
Dependent Variable: ThetapF1 ThetapF1

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	611.1550889	122.2310178	22.46	<.0001
Error	47	255.7460364	5.4414050		
Corrected Total	52	866.9011253			

R-Square	Coeff Var	Root MSE	ThetapF1 Mean
0.704988	6.318103	2.332682	36.92061

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Parcelle	1	481.2583648	481.2583648	88.44	<.0001
Profondeur	1	74.7582509	74.7582509	13.74	0.0006
Parcelle*Profondeur	1	0.8439438	0.8439438	0.16	0.6955
Pente(Parcelle)	1	37.0714675	37.0714675	6.81	0.0121
Profon*Pente(Parcel)	1	17.2230619	17.2230619	3.17	0.0817

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Parcelle	1	468.3803408	468.3803408	86.08	<.0001
Profondeur	1	78.7587845	78.7587845	14.47	0.0004
Parcelle*Profondeur	1	0.5485337	0.5485337	0.10	0.7523
Pente(Parcelle)	1	38.5839467	38.5839467	7.09	0.0106
Profon*Pente(Parcel)	1	17.2230619	17.2230619	3.17	0.0817



The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Profondeur	ThetapF1 LSMEAN	H0:LSMean1=LSMean2
		Pr > t
a	39.2390022	0.0005
b	36.7260833	

The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	ThetapF1 LSMEAN	H0:LSMean1=LSMean2
		Pr > t
Gi	34.8425477	<.0001
Pi	41.1225378	

The GLM Procedure Least Squares Means Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	Profondeur	ThetapF1 LSMEAN	LSMEAN Number
Gi	a	35.9915510	1
Gi	b	33.6935445	2
Pi	a	42.4864533	3
Pi	b	39.7586222	4

Least Squares Means for effect Parcelle*Profondeur Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: ThetapF1

i/j	1	2	3	4
1		0.0273	<.0001	0.0016
2	0.0273		<.0001	<.0001
3	<.0001	<.0001		0.0762
4	0.0016	<.0001	0.0762	

The GLM Procedure

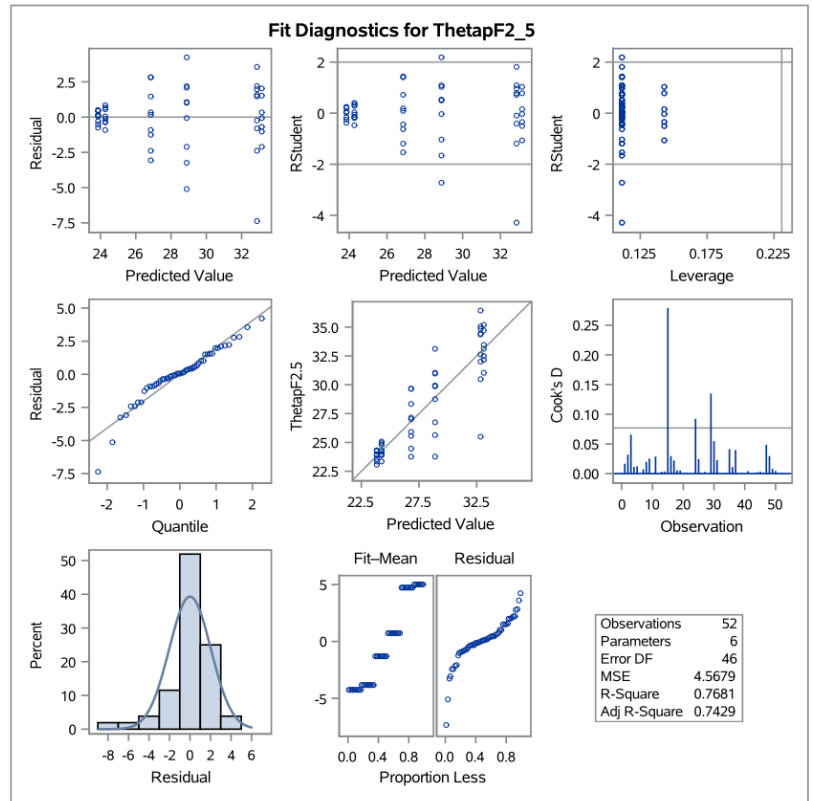
Dependent Variable: ThetapF2_5 ThetapF2.5

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	696.1247591	139.2249518	30.48	<.0001
Error	46	210.1244158	4.5679221		
Corrected Total	51	906.2491749			

R-Square	Coeff Var	Root MSE	ThetapF2_5 Mean
0.768138	7.600859	2.137270	28.11879

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Parcelle	1	547.1217967	547.1217967	119.77	<.0001
Profondeur	1	95.9924475	95.9924475	21.01	<.0001
Parcelle*Profondeur	1	33.7165898	33.7165898	7.38	0.0093
Pente(Parcelle)	1	5.7555904	5.7555904	1.26	0.2675
Profon*Pente(Parcel)	1	13.5383346	13.5383346	2.96	0.0919

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Parcelle	1	543.9046446	543.9046446	119.07	<.0001
Profondeur	1	63.1305478	63.1305478	13.82	0.0005
Parcelle*Profondeur	1	33.7165898	33.7165898	7.38	0.0093
Pente(Parcelle)	1	5.7555904	5.7555904	1.26	0.2675
Profon*Pente(Parcel)	1	13.5383346	13.5383346	2.96	0.0919



The GLM Procedure

Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Profondeur	ThetapF2_5 LSMEAN	H0:LSMean1=LSMean2
		Pr > t
a	30.4979242	0.0028
b	28.4604466	

The GLM Procedure

Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	ThetapF2_5 LSMEAN	H0:LSMean1=LSMean2
		Pr > t
Gi	25.9563283	<.0001
Pi	33.0020426	

The GLM Procedure

Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	Profondeur	ThetapF2_5 LSMEAN	LSMEAN Number
Gi	a	27.8521799	1
Gi	b	24.0604766	2
Pi	a	33.1436686	3
Pi	b	32.8604167	4

Least Squares Means for effect Parcelle*Profondeur Pr > t for H0:LSMean(i)=LSMean(j)				
Dependent Variable: ThetapF2_5				
i/j	1	2	3	4
1		<.0001	<.0001	<.0001
2	<.0001		<.0001	<.0001
3	<.0001	<.0001		0.9935
4	<.0001	<.0001	0.9935	

The GLM Procedure

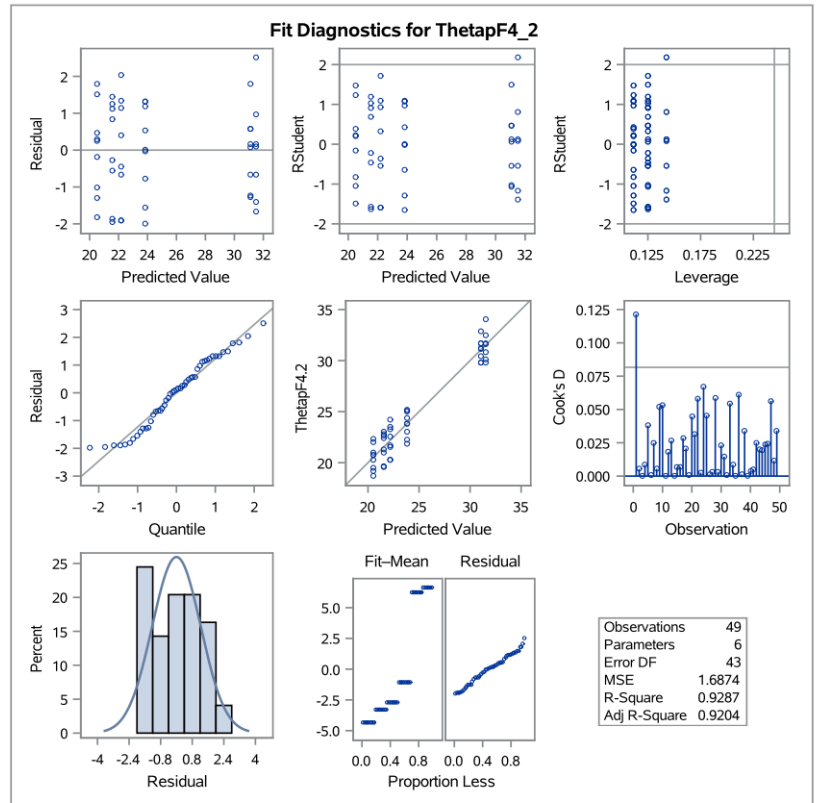
Dependent Variable: ThetapF4_2 ThetapF4.2

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	944.976323	188.995265	112.01	<.0001
Error	43	72.557377	1.687381		
Corrected Total	48	1017.533700			

R-Square	Coeff Var	Root MSE	ThetapF4_2 Mean
0.928693	5.226363	1.298992	24.85461

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Parcelle	1	892.5179165	892.5179165	528.94	<.0001
Profondeur	1	29.3279874	29.3279874	17.38	0.0001
Parcelle*Profondeur	1	6.8513459	6.8513459	4.06	0.0502
Pente(Parcelle)	1	15.5410777	15.5410777	9.21	0.0041
Profon*Pente(Parcelle)	1	0.7379953	0.7379953	0.44	0.5119

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Parcelle	1	893.1737163	893.1737163	529.33	<.0001
Profondeur	1	19.3275389	19.3275389	11.45	0.0015
Parcelle*Profondeur	1	6.1894580	6.1894580	3.67	0.0621
Pente(Parcelle)	1	15.5410777	15.5410777	9.21	0.0041
Profon*Pente(Parcelle)	1	0.7379953	0.7379953	0.44	0.5119



The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Profondeur	ThetapF4_2 LSMEAN	H0:LSMean1=LSMean2
		Pr > t
a	27.2485477	0.0051
b	26.0566608	

The GLM Procedure Least Squares Means

Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	Profondeur	ThetapF4_2 LSMEAN	LSMEAN Number
Gi	a	22.9934868	1
Gi	b	21.0288467	2
Pi	a	31.5036086	3
Pi	b	31.0844750	4

The GLM Procedure Least Squares Means

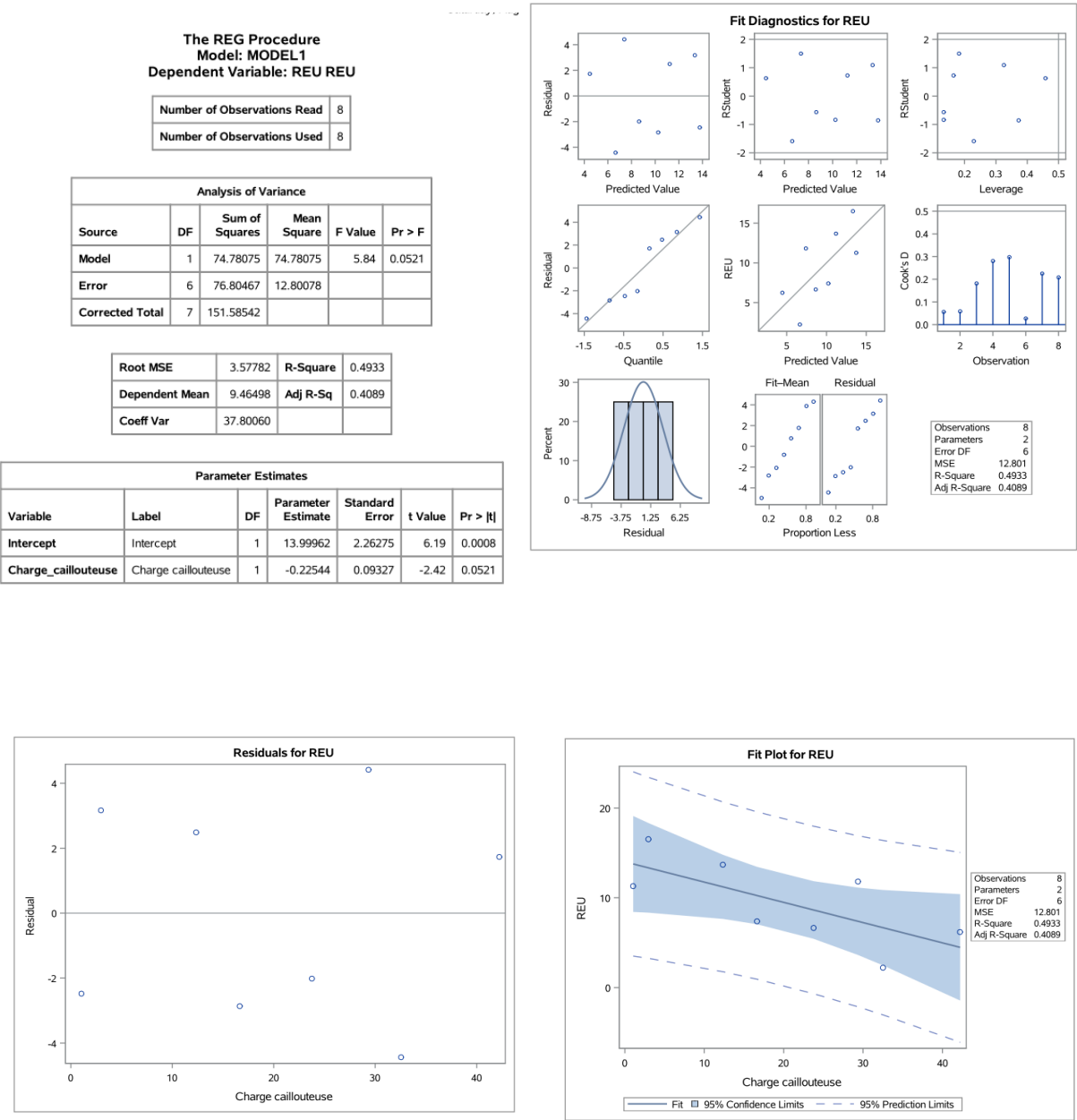
Adjustment for Multiple Comparisons: Tukey-Kramer

Parcelle	ThetapF4_2 LSMEAN	H0:LSMean1=LSMean2
		Pr > t
Gi	22.0111667	<.0001
Pi	31.2940418	

Least Squares Means for effect Parcelle*Profondeur Pr > t for H0: LSMean(i)=LSMean(j)				
Dependent Variable: ThetapF4_2				
i/j	1	2	3	4
1		0.0004	<.0001	<.0001
2	0.0004		<.0001	<.0001
3	<.0001	<.0001		0.9240
4	<.0001	<.0001	0.9240	

B.13 REG 1 : Résultats SAS

REG 1



B.14 Codes SAS

GLM 1 – Densité apparente

```
PROC GLM data=WORK.densapp plots=diagnostics;  
CLASS Parcelle Profondeur Pente Methode pF;  
MODEL Densite_apparente=Parcelle Profondeur Parcelle*Profondeur  
Pente(Parcelle) Methode(Parcelle) ;  
LSMEANS Parcelle / ADJUST=TUKEY;  
LSMEANS Profondeur / ADJUST=TUKEY;  
LSMEANS Parcelle*Profondeur / ADJUST=TUKEY;  
LSMEANS Methode(Parcelle) / ADJUST=TUKEY;  
LSMEANS Pente(Parcelle) / ADJUST=TUKEY;  
run;
```

GLM 2 – Densité apparente

```
PROC GLM data=WORK.densapp_PiM plots=diagnostics;  
CLASS Profondeur pF;  
MODEL Densite_apparente=Profondeur pF Profondeur*pF ;  
LSMEANS Profondeur / ADJUST=TUKEY;  
LSMEANS pF / ADJUST=TUKEY;  
run;
```

GLM 3 – Densité apparente

```
PROC GLM data=WORK.DENSAPP_PIMK1 plots=diagnostics;  
CLASS Profondeur Methode;  
MODEL Densite_apparente=Profondeur Methode Profondeur*Methode;  
LSMEANS Profondeur / ADJUST=TUKEY;  
LSMEANS Methode / ADJUST=TUKEY;  
LSMEANS Profondeur*Methode / ADJUST=TUKEY;  
run;
```

GLM 4 – Densité apparente

```
PROC GLM data=WORK.DENSAPP_GIM plots=diagnostics;  
CLASS Profondeur pF Pente;  
MODEL Densite_apparente=Profondeur pF Profondeur*pF Pente ;  
LSMEANS Profondeur / ADJUST=TUKEY;  
LSMEANS pF / ADJUST=TUKEY;  
run;
```

GLM 5 – Densité apparente

```
PROC GLM data=WORK.DENSAPP_GIMK1 plots=diagnostics;  
CLASS Profondeur Methode Pente;  
MODEL Densite_apparente=Profondeur Methode Profondeur*Methode Pente;  
LSMEANS Profondeur / ADJUST=TUKEY;  
LSMEANS Methode / ADJUST=TUKEY;  
LSMEANS Profondeur*Methode / ADJUST=TUKEY;  
run;
```

GLM 6 - Densité apparente

```
PROC GLM data=WORK.DENSAPP_MA plots=diagnostics;  
CLASS Profondeur pF Pente;  
MODEL Densite_apparente=Profondeur pF Profondeur*pF Pente ;  
run;
```

GLM 7 – REU

```
PROC GLM data=WORK.reu plots=diagnostics;  
CLASS Parcelle Profondeur Pente Methode;  
MODEL REU=Parcelle Profondeur Parcelle*Profondeur Pente(Parcelle)  
Methode(Parcelle);  
LSMEANS Parcelle / ADJUST=TUKEY;  
LSMEANS Methode(Parcelle) / ADJUST=TUKEY;  
LSMEANS Parcelle*Profondeur / ADJUST=TUKEY;  
LSMEANS Profondeur / ADJUST=TUKEY;  
run;
```

GLM 8 – REU

```
PROC GLM data=WORK.reu plots=diagnostics;  
CLASS Parcelle Profondeur Pente Methode;  
MODEL REU=Parcelle Profondeur Parcelle*Profondeur Pente(Parcelle)  
Methode(Parcelle*Profondeur);  
LSMEANS Parcelle / ADJUST=TUKEY;  
LSMEANS Methode(Parcelle*Profondeur) / ADJUST=TUKEY;  
LSMEANS Parcelle*Profondeur / ADJUST=TUKEY;  
LSMEANS Profondeur / ADJUST=TUKEY;  
run;
```

GLM 9 – Porosité X

```
PROC GLM data=WORK.TH_BO_I125 plots=diagnostics;  
CLASS Profondeur Pente;  
MODEL Imacro=Profondeur Pente Profondeur*Pente;  
LSMEANS Pente/ ADJUST=TUKEY;  
run;
```

```
PROC GLM data=WORK.TH_BO_I125 plots=diagnostics;  
CLASS Profondeur Pente;  
MODEL ThetapF1=Profondeur Pente Profondeur*Pente;  
LSMEANS Pente/ ADJUST=TUKEY;  
run;
```

```
PROC GLM data=WORK.TH_BO_I125 plots=diagnostics;  
CLASS Profondeur Pente;  
MODEL ThetapF2_5=Profondeur Pente Profondeur*Pente;  
LSMEANS Pente/ ADJUST=TUKEY;  
run;
```

```
PROC GLM data=WORK.TH_BO_42 plots=diagnostics;  
CLASS Profondeur Pente;
```

```
MODEL ThetapF4_2=Profondeur Pente Profondeur*Pente;
LSMEANS Pente/ ADJUST=TUKEY;
run;
```

```
PROC GLM data=WORK.TH_BO_I125 plots=diagnostics;
CLASS Profondeur Pente;
MODEL PorositeTotale=Profondeur Pente Profondeur*Pente;
LSMEANS Pente/ ADJUST=TUKEY;
run;
```

GLM 10 – Porosité Ma

```
PROC GLM data=WORK.TH_MA_I142 plots=diagnostics;
CLASS Profondeur Pente;
MODEL ImacroNCC=Profondeur Pente Profondeur*Pente;
LSMEANS Pente/ ADJUST=TUKEY;
run;
```

```
PROC GLM data=WORK.TH_MA_I142 plots=diagnostics;
CLASS Profondeur Pente;
MODEL ThetapF1NCC=Profondeur Pente Profondeur*Pente;
LSMEANS Pente/ ADJUST=TUKEY;
run;
```

```
PROC GLM data=WORK.TH_MA_25 plots=diagnostics;
CLASS Profondeur Pente;
MODEL ThetapF2_5NCC=Profondeur Pente Profondeur*Pente;
LSMEANS Pente/ ADJUST=TUKEY;
run;
```

```
PROC GLM data=WORK.TH_MA_I142 plots=diagnostics;
CLASS Profondeur Pente;
MODEL ThetapF4_2NCC=Profondeur Pente Profondeur*Pente;
LSMEANS Pente/ ADJUST=TUKEY;
run;
```

```
PROC GLM data=WORK.TH_MA_I142 plots=diagnostics;
CLASS Profondeur Pente;
MODEL PorositeTotale=Profondeur Pente Profondeur*Pente;
LSMEANS Pente/ ADJUST=TUKEY;
run;
```

GLM 11 – Porosité Italie K

```
PROC GLM data=WORK.TH_IT_I125K plots=diagnostics;
CLASS Parcelle Profondeur Pente;
MODEL Imacro=Parcelle Profondeur Parcelle*Profondeur Pente(Parcelle)
Profondeur*Pente(Parcelle);
LSMEANS Profondeur/ ADJUST=TUKEY;
LSMEANS Parcelle/ ADJUST=TUKEY;
LSMEANS Parcelle*Profondeur/ ADJUST=TUKEY;
run;
```

```

PROC GLM data=WORK.TH_IT_I125K plots=diagnostics;
CLASS Parcelle Profondeur Pente;
MODEL ThetapF1=Parcelle Profondeur Parcelle*Profondeur Pente(Parcelle)
Profondeur*Pente(Parcelle);
LSMEANS Profondeur/ ADJUST=TUKEY;
LSMEANS Parcelle/ ADJUST=TUKEY;
LSMEANS Parcelle*Profondeur/ ADJUST=TUKEY;
run;

```

```

PROC GLM data=WORK.TH_IT_I125K plots=diagnostics;
CLASS Parcelle Profondeur Pente;
MODEL ThetapF2_5=Parcelle Profondeur Parcelle*Profondeur Pente(Parcelle)
Profondeur*Pente(Parcelle);
LSMEANS Profondeur/ ADJUST=TUKEY;
LSMEANS Parcelle/ ADJUST=TUKEY;
LSMEANS Parcelle*Profondeur/ ADJUST=TUKEY;
run;

```

```

PROC GLM data=WORK.TH_IT_I125K plots=diagnostics;
CLASS Parcelle Profondeur Pente;
MODEL PorositeTotale=Parcelle Profondeur Parcelle*Profondeur
Pente(Parcelle) Profondeur*Pente(Parcelle);
LSMEANS Profondeur/ ADJUST=TUKEY;
LSMEANS Parcelle/ ADJUST=TUKEY;
LSMEANS Parcelle*Profondeur/ ADJUST=TUKEY;
run;

```

GLM 12 – Porosité Italie M

```

PROC GLM data=WORK.TH_IT_I1M plots=diagnostics;
CLASS Parcelle Profondeur Pente;
MODEL Imacro=Parcelle Profondeur Parcelle*Profondeur Pente(Parcelle)
Profondeur*Pente(Parcelle);
LSMEANS Profondeur/ ADJUST=TUKEY;
LSMEANS Parcelle/ ADJUST=TUKEY;
LSMEANS Parcelle*Profondeur/ ADJUST=TUKEY;
run;

```

```

PROC GLM data=WORK.TH_IT_I1M plots=diagnostics;
CLASS Parcelle Profondeur Pente;
MODEL ThetapF1=Parcelle Profondeur Parcelle*Profondeur Pente(Parcelle)
Profondeur*Pente(Parcelle);
LSMEANS Profondeur/ ADJUST=TUKEY;
LSMEANS Parcelle/ ADJUST=TUKEY;
LSMEANS Parcelle*Profondeur/ ADJUST=TUKEY;
run;

```

```

PROC GLM data=WORK.TH_IT_25M plots=diagnostics;
CLASS Parcelle Profondeur Pente;
MODEL ThetapF2_5=Parcelle Profondeur Parcelle*Profondeur Pente(Parcelle)
Profondeur*Pente(Parcelle);
LSMEANS Profondeur/ ADJUST=TUKEY;
LSMEANS Parcelle/ ADJUST=TUKEY;

```

```

LSMEANS Parcelle*Profondeur/ ADJUST=TUKEY;
run;

PROC GLM data=WORK.TH_IT_42M plots=diagnostics;
CLASS Parcelle Profondeur Pente;
MODEL ThetapF4_2=Parcelle Profondeur Parcelle*Profondeur Pente(Parcelle)
Profondeur*Pente(Parcelle);
LSMEANS Profondeur/ ADJUST=TUKEY;
LSMEANS Parcelle/ ADJUST=TUKEY;
LSMEANS Parcelle*Profondeur/ ADJUST=TUKEY;
run;

```

REG 1

```

proc reg data=WORK.MA_CHARGECAILL_REU;
    model REU = Charge_caillouteuse;
run;

```