

() , ()

:)

(

*

(Geometric standard deviation of soil particles : σ_g)

Geometric)

)

σ_g

LISS-III

IRS-P₆

(

(mean particle diameter or GMPD : d_g)

σ_g

(

) $\sigma_g \geq$

(

) $\sigma_g <$

:

σ_g

(σ_g)

Bahrami et al., 2005; Ghorbani)

(d_g)

(and Bahrami, 2005

Bybordi,)

(Means and Parcher, 1964)

(2001

(σ_g)

(Shirazi and Boersma, 1984)

(Malakouti, 2006)

(Folk, 1966)

Alavipanah, 2004; Nanni and Dematte,

(2006)

bahramih@modares.ac.ir :

*

(Demattê et al., 2004)

/ / :

(Galvão et al., 1997; Stoner and Baumgardner, 1981)

(Coefficient of determination(R²))

(Okin and Painter, 2003) /

(Visible)

/ - / (Near Infrared)

/ - / (Shortwave Infrared)

- (Thermal Infrared)

:

-) (Ultra Violet)

() (

(Islam et al., 2003; Viscarra Rossel et al., 2006)

(Swain and Davis,1978; Glavao and Vitorello,1998)

)

(σ_g)

Ge et al.,)

(P₆-LISS III

(2006

(Baumgardner et al., 1985)

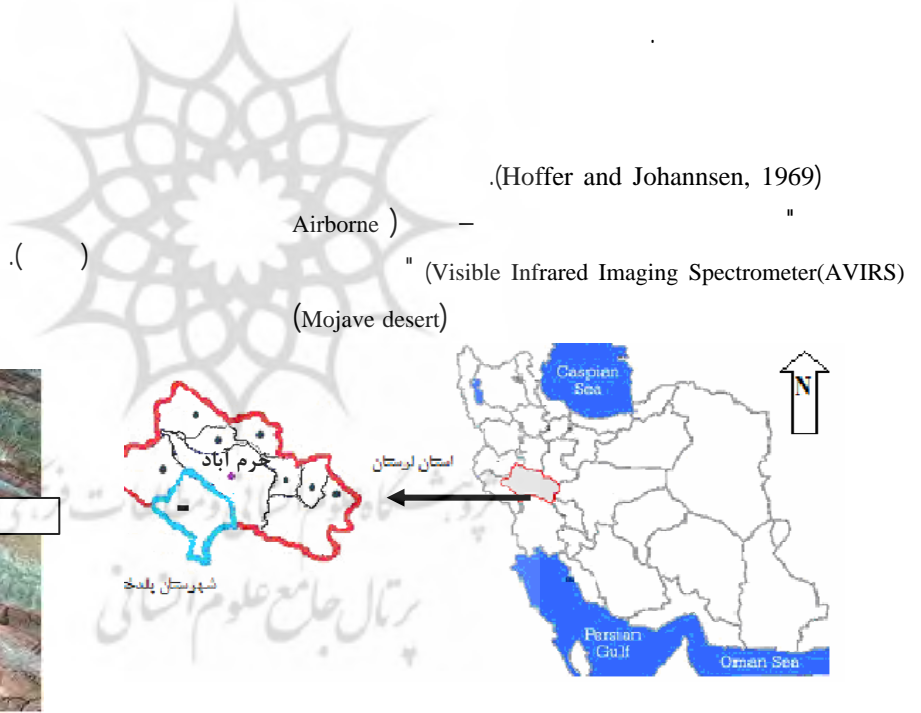
(Hoffer and Johannsen, 1969)

Airborne)

()

" (Visible Infrared Imaging Spectrometer(AVIRS)

(Mojave desert)



(Alijani, 1995)

(Geravand, 2003)

(Valipour, 2004)

/

Soil studies of Karkheh,)

Soil studies of)

(1995

(Karkheh, 1995

()

Astragalus Amygdalus(As-A)

(Darvishzadeh, 1992)

(Alluvial - Colluvial fans)

Piedmont alluvial)

(Plateaux)

(River alluvial plains)

(plains)

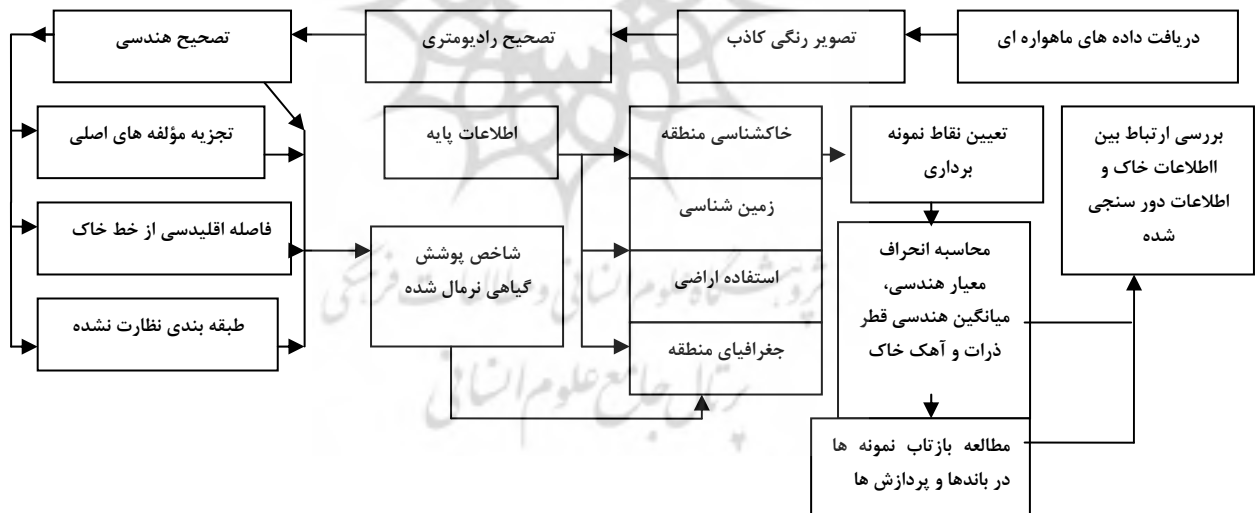
()

(Upper terrace)

()

(Lowlands)

(Lower terrace)



ILWIS 3.3

LISS-III

P6

Coordinate)

(Indian Remote)

(Universal)

(system)

Sensing Satellite(IRS)

Transverse Mercator (UTM)

(

(Haze correction)

(Geometric correction)

(Ground Control Point(GCP))

/

() .(Mather, 1987; Jensen, 1996; Jensen, 2000)

Map to)

((image

.(Image to image))

:

Normalized Difference Vegetation)

() (Richards, 1993; Lillesand and Kiefer, 1994)

Principal Component)

(Index (NDVI)

Unsupervised)

(Analysis(PCA)

Soil Line)

(Classification

(Euclidean Distance (SLED)

Richardson)

.(and Wiegand, 1977; Fox et al., 2003

Baret et al., 1993; Fox and) ()

() : (Sabbagh, 2002

(False Color Composite(FCC))

$$D = ((nir - A)^2 + (r - B)^2)^{0.5} \quad ()$$

D nir) .

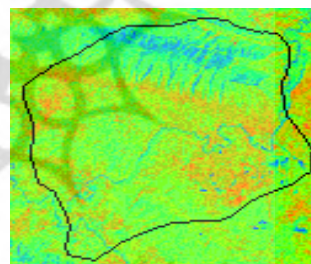
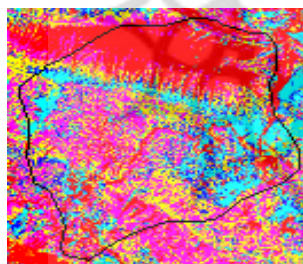
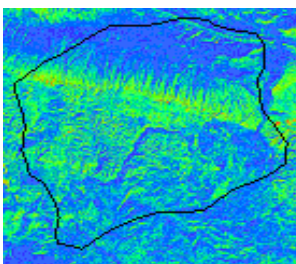
r

(

B

A

(PCA₁)



د

الف

(Huette, 1988; Rondeaux)

()

() . (et al., 1996

(FCC)

(OIF)

()

:(Bannari et al., 1995)

$$NDVI = (NIR-R) / (NIR+R) \quad ()$$

: (shade effect)

NIR

R

(spectral rationing)

(Gupta, 1991)

ILWIS

(Filling)

(PCA)

(Aitchison, 1986)

(clustering)

Stratified)

Khajehdin, 2001; Naiej) (Randomized Sampling(SRS)

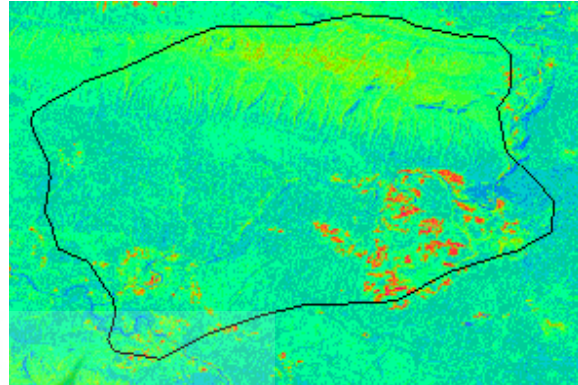
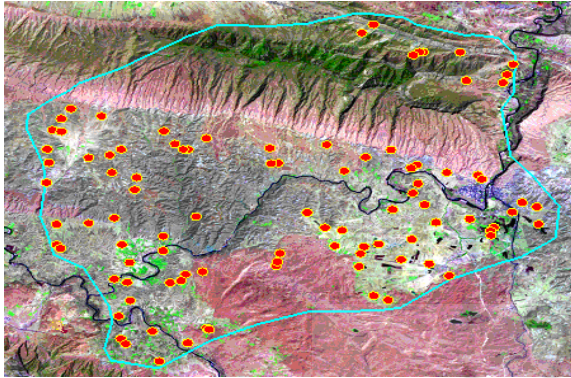
(Noori, 2002

(Lillesand and Kiefer, 1994)

ILWIS

()

: ()



ب

الف

(NDVI)

(σg)

(dg)

()

() Global)

(Positioning System(GPS)

$$a = 0.01 \sum_{i=1}^n f_i \ln M_i$$

$$b^2 = 0.01 \sum_{i=1}^n f_i \ln^2 M_i - a^2$$

σg

fi

Mi ()

/

Mi

/

σg

(Soil Survey Staff, 1996)

σg ≥

σg <

(Shirazi & Boersma soil texture triangle)

Shirazi and)

(Scatter plot)

SPSS

(Boersma, 1984

(σg)

()

()

NIR

(Correlation matrix)

/ / PC1 / /)

(

NIR

(dg)

()

/ / PC1 / /

(dg)

NIR

(SLED)

(PC1)

() $\sigma_g <$

SLED PC₁

	green	red	NIR	SWIR	PCA ₁	SLED
dg	/ **	/ **	/ **	/ **	/ **	/
CaCO ₃	/ **	/ **	/ **	/ **	/ **	/

() $\sigma_g \geq$

SLED PC₁

	green	red	NIR	SWIR	PCA ₁	SLED
dg	0.468**	-0.377**	0.363**	0.347**	0.416**	-0.058
CaCO ₃	-0.301*	-0.313*	-0.453**	-0.327*	-0.357**	-0.021

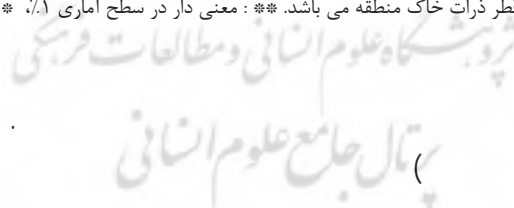
()

SLED PC₁

	green	red	NIR	SWIR	PCA ₁	SLED
dg	0.712**	0.688**	0.604**	0.589**	0.642**	-0.082
CaCO ₃	-0.608**	-0.611**	-0.621**	-0.590**	-0.610**	-0.038

(green) باند سبز، red باند قرمز، NIR: باند مادون قرمز نزدیک، SWIR: باند مادون قرمز میانی، PC₁: لایه اول تجزیه مؤلفه های اصلی، SLED: فاصله اقلیدسی از خط خاک،

CaCO₃: آهک و dg: میانگین هندسی قطر ذرات خاک منطقه می باشد. *: معنی دار در سطح آماری 0.1، **: معنی دار در سطح آماری 0.05



σ_g

: (σ_g)

(curve estimation)

σ_g

(Bates and Watts, 1988) SPSS

()

() (Cubic (nonlinear))

σ_g

(trend line)

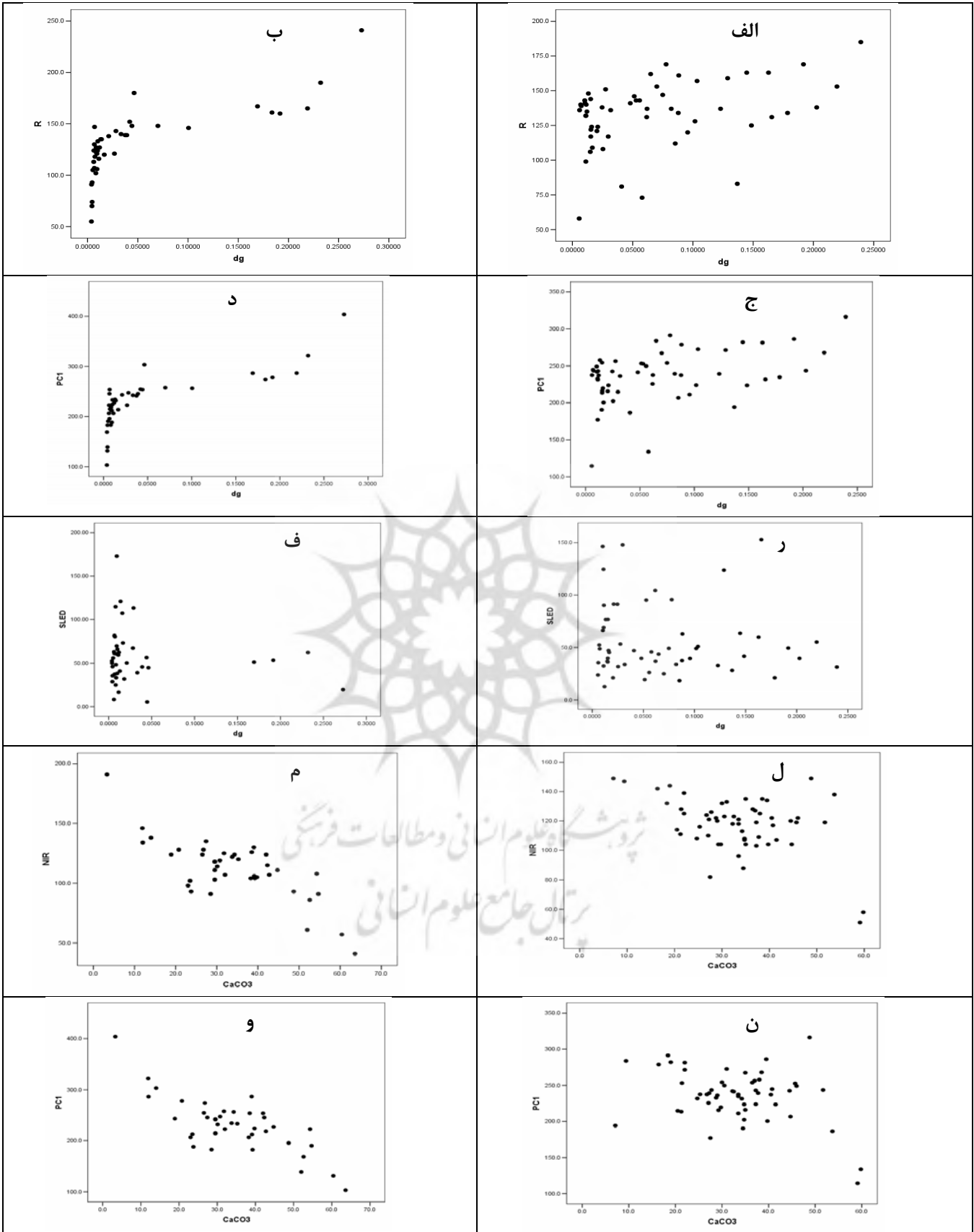
()

(

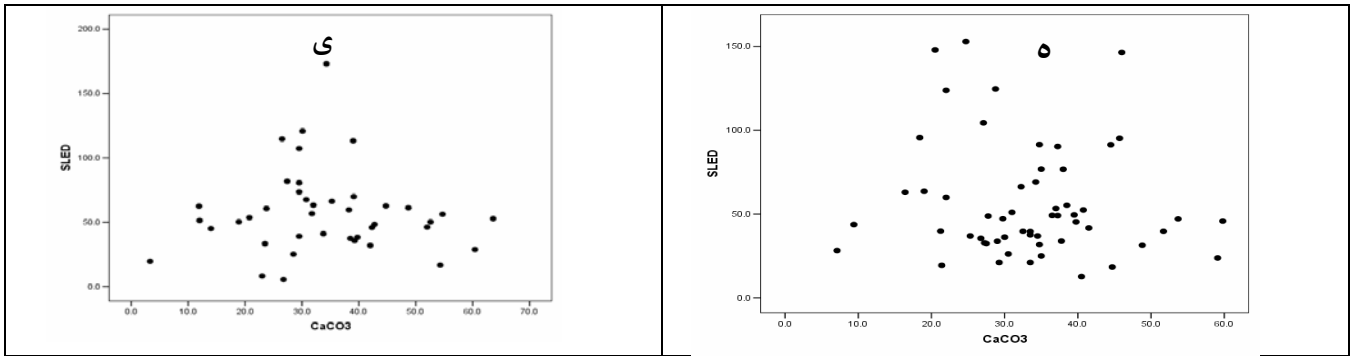
)

()

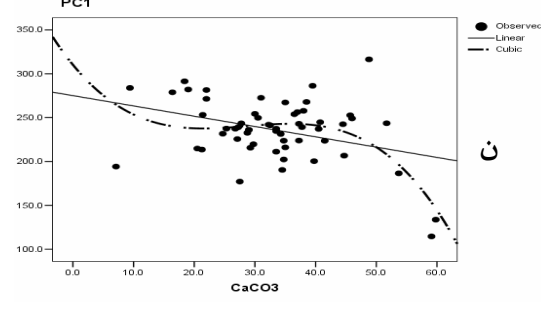
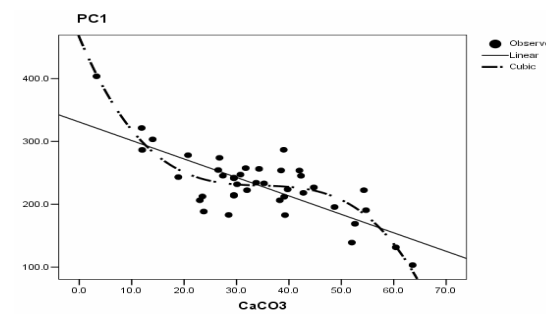
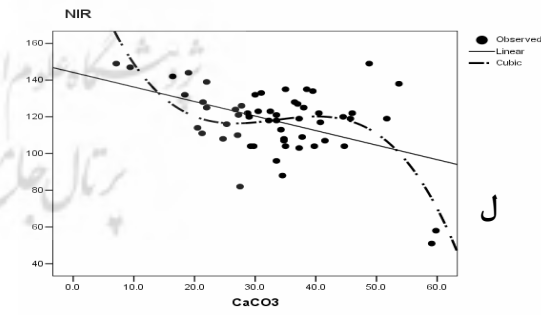
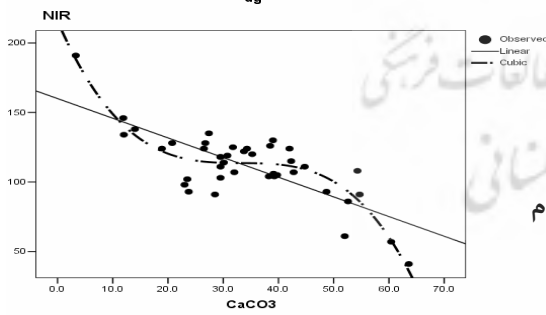
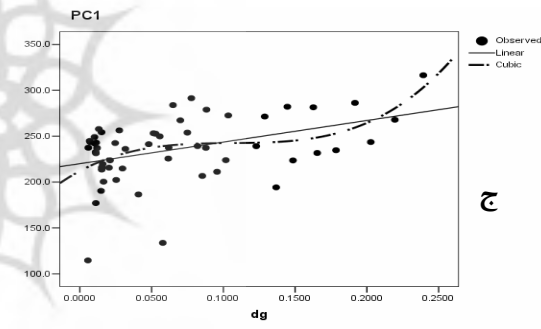
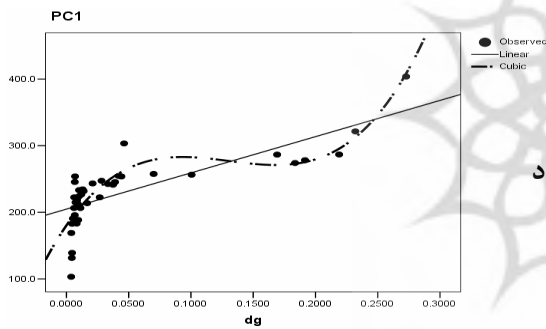
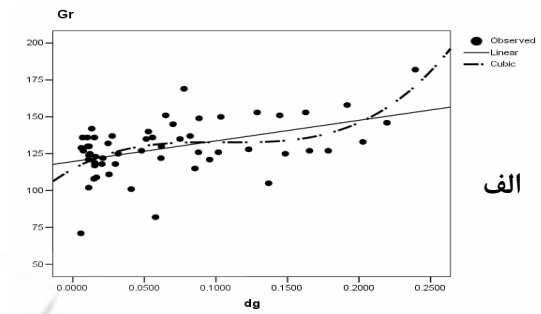
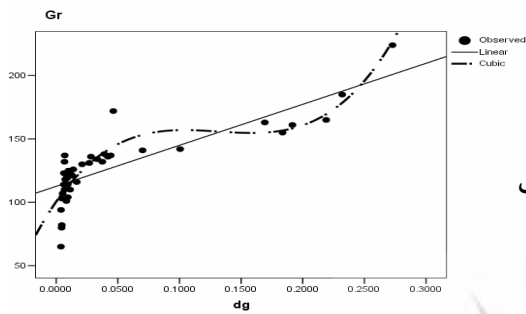
() . ()



() $\sigma_g <$:
 dg: " " " PCA dg: " " " PCA
 dg: " " " : dg: " " " :
 : " " " NIR : " " " SLED



ادامه شکل ۵- "ه" - "ی": آهک با لایه SLED.



شکل ۶- انطباق خط تمایل (trend line) با نمودار پراکندگی. ستون سمت چپ: خاک های گروه اول $\sigma_g < 10$ (خاک همگون)، ستون سمت راست: خاک های گروه دوم $\sigma_g \geq 10$ (خاک نا همگون). الف- ب: dg با باند سبز، ج- د: dg با PC_1 ، ل- م: آهک با باند NIR، ن- و: آهک با PC_1 .

جدول ۴- ضرایب تبیین (R^2) روابط میانگین هندسی قطر ذرات و آهک با باندهای اصلی و PC_1 در نمونه های گروه اول $\sigma_g < 10$ (خاک همگون)

	green		red		NIR		SWIR		PCA ₁	
رابطه	درجه سوم	خطی	درجه سوم	خطی	درجه سوم	خطی	درجه سوم	خطی	درجه سوم	خطی
dg	۰/۷۹۳	۰/۶۶۶	۰/۷۵۳	۰/۵۸۱	۰/۶۰۷	۰/۴۲۸	۰/۵۹۴	۰/۴۴۷	۰/۷۳۸	۰/۵۷۶
CaCO ₃	۰/۷۰۷	۰/۵۳۳	۰/۷۲۹	۰/۵۷۰	۰/۷۶۶	۰/۵۷۶	۰/۷۱۰	۰/۵۰۲	۰/۷۴۲	۰/۵۶۹

جدول ۵- ضرایب تبیین (R^2) روابط میانگین هندسی قطر ذرات و آهک با باندهای اصلی و PC_1 در نمونه های گروه دوم $\sigma_g \geq 10$ (خاک ناهمگون)

	green		red		NIR		SWIR		PCA ₁	
رابطه	درجه سوم	خطی	درجه سوم	خطی	درجه سوم	خطی	درجه سوم	خطی	درجه سوم	خطی
dg	۰/۲۶۳	۰/۲۱۹	۰/۱۷۰	۰/۱۴۲	۰/۱۴۸	۰/۱۳۱	۰/۱۲۵	۰/۱۱۷	۰/۲۰۲	۰/۱۷۳
CaCO ₃	۰/۲۱۴	۰/۰۹۱	۰/۲۶۲	۰/۰۹۸	۰/۴۰۶	۰/۲۰۵	۰/۳۵۸	۰/۱۰۷	۰/۲۸۷	۰/۱۲۸

σ_g

(Pearson's two tailed)

$\sigma_g <$

(bivariate) correlation

() (CaCO₃) (dg) ()
() (σ_g) ()

$\sigma_g \geq$

() () ()
() () ()

(σ_g)

%

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() () () %

%

(NIR)

() .

σ_g

() .

()

()

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