

() , ()

:)

(

*

(Geometric standard deviation of soil particles : σ_g)

Geometric)

)

σ_g

LISS-III

IRS-P₆

(

(mean particle diameter or GMPD : d_g)

σ_g

(

) $\sigma_g \geq$

$\sigma_g d_g$

(

) $\sigma_g <$

:

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)

-) (-) (Ultra Violet)

/ - / (Shortwave Infrared)

() (

- (Thermal Infrared)

(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)

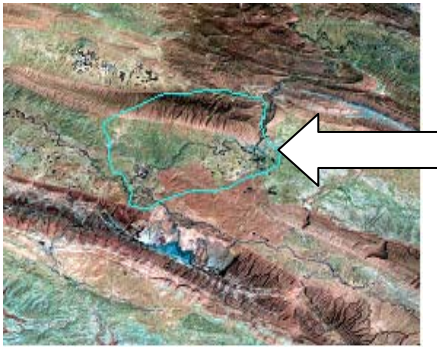
(Hoffer and Johannsen, 1969)

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

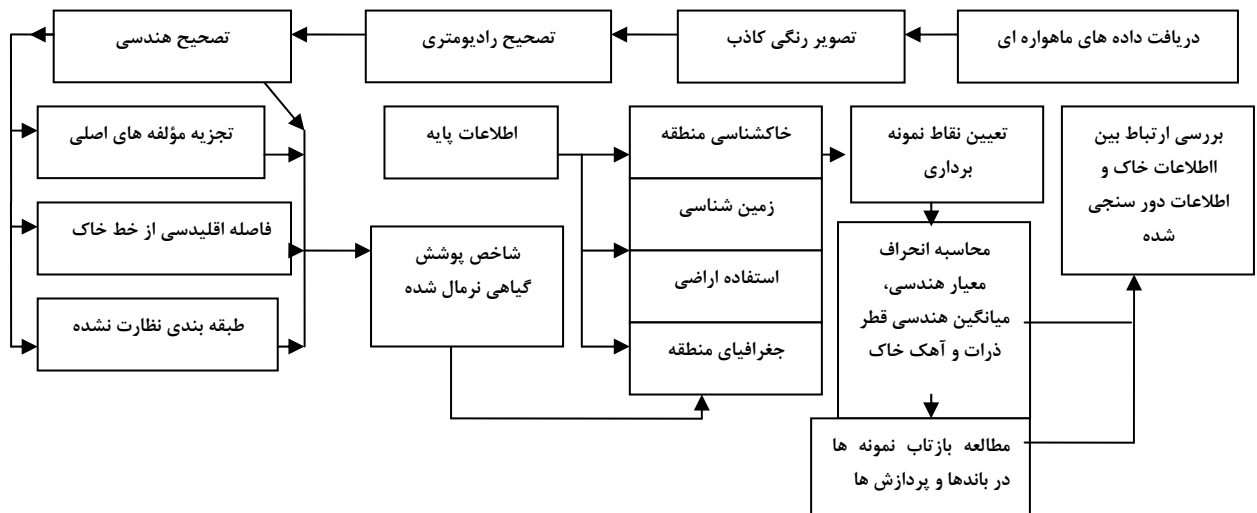
()

()

(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

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

D

r

nir

B

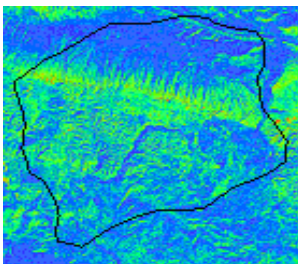
A

(False Color Composite(FCC))

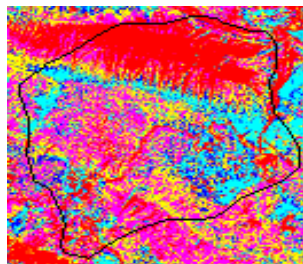
) .

(PCA₁)

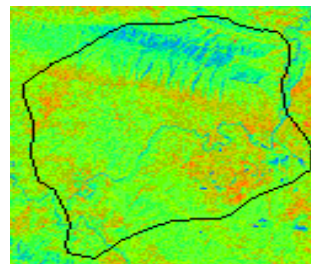
(



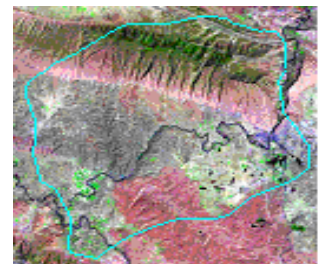
د



ج



ب



الف

()

Huette, 1988; Rondeaux)

()

() . (et al., 1996

(FCC)

(OIF)

()

:(Bannari et al., 1995)

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

NIR

R

: (shade effect)

(spectral rationing)

(Gupta, 1991)

(Filling)

ILWIS

(PCA)

(Aitchison, 1986)

(clustering)

Stratified)

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

(Noori, 2002

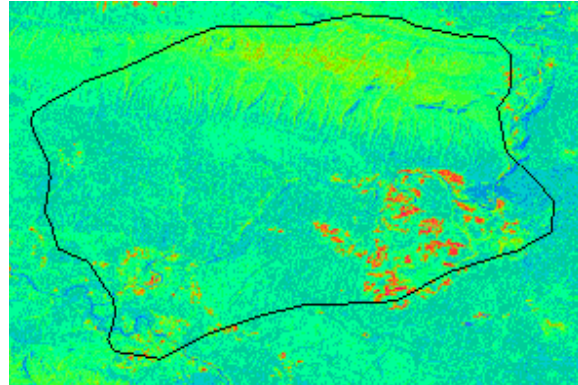
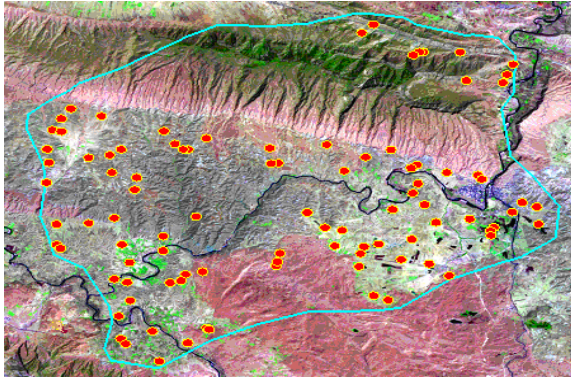
(Lillesand and Kiefer, 1994)

)

ILWIS (

()

: ()



ب

الف

: (NDVI)

(σg)

()

(dg)

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

() Global)

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

(Positioning System(GPS)

σg

dg

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	۰/۴۶۸**	-۰/۳۷۷**	۰/۳۶۳**	۰/۳۴۲**	۰/۴۱۶**	-۰/۰۵۸
CaCO ₃	-۰/۳۰۱*	-۰/۳۱۳*	-۰/۴۵۳**	-۰/۳۲۷*	-۰/۳۵۷**	-۰/۰۲۱

()

SLED PC₁

	green	red	NIR	SWIR	PCA ₁	SLED
dg	۰/۷۱۲**	۰/۶۸۸**	۰/۶۰۴**	۰/۵۸۹**	۰/۶۴۲**	-۰/۰۸۲
CaCO ₃	-۰/۶۰۸**	-۰/۶۱۱**	-۰/۶۲۱**	-۰/۵۹۰**	-۰/۶۱۰**	-۰/۰۳۸

(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 ۱٪، **: معنی دار در سطح آماری ۵٪)

σ_g

: (σ_g)

()

(curve estimation)

σ_g

(Bates and Watts, 1988) SPSS

() ()

()

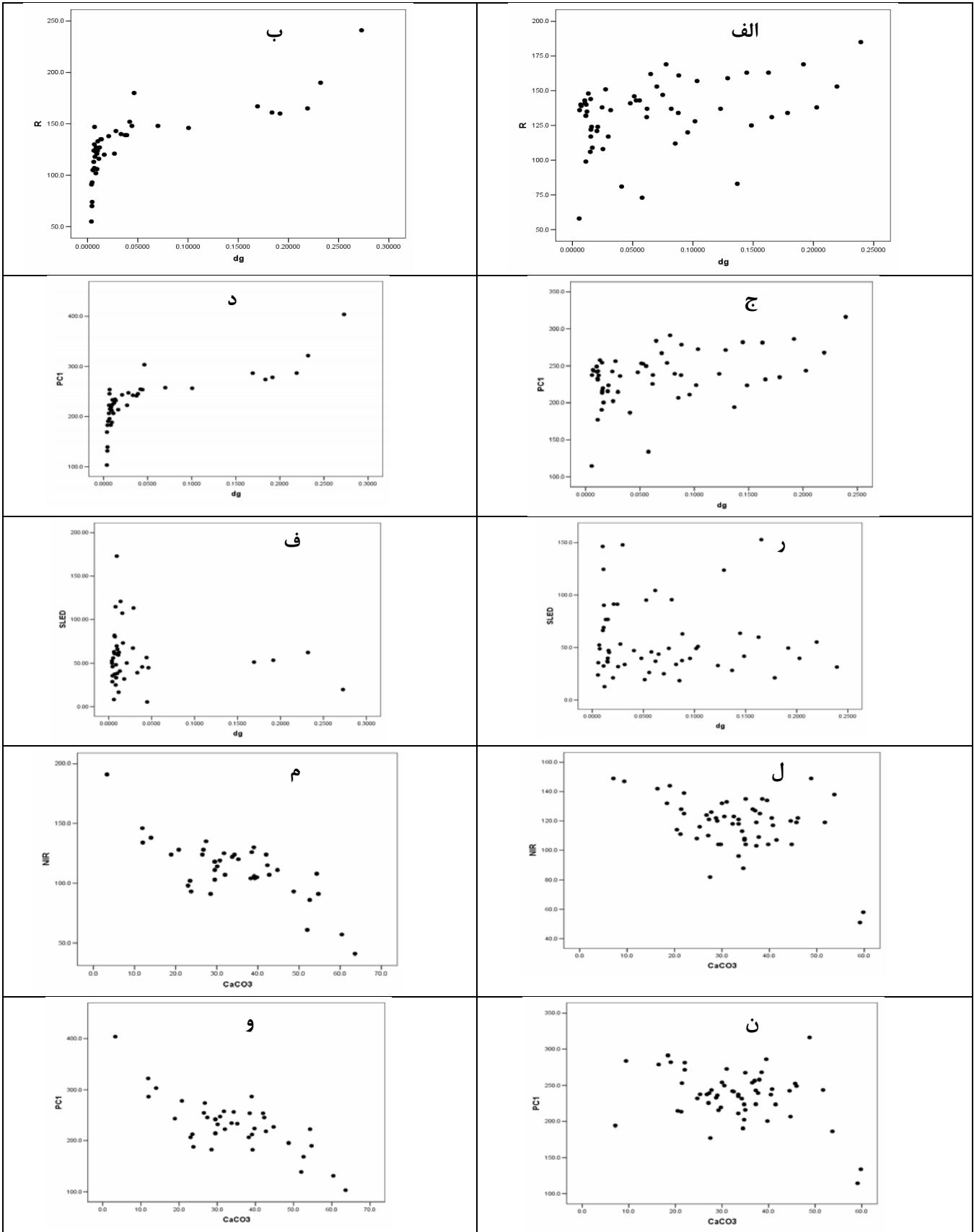
() (Cubic (nonlinear))

σ_g

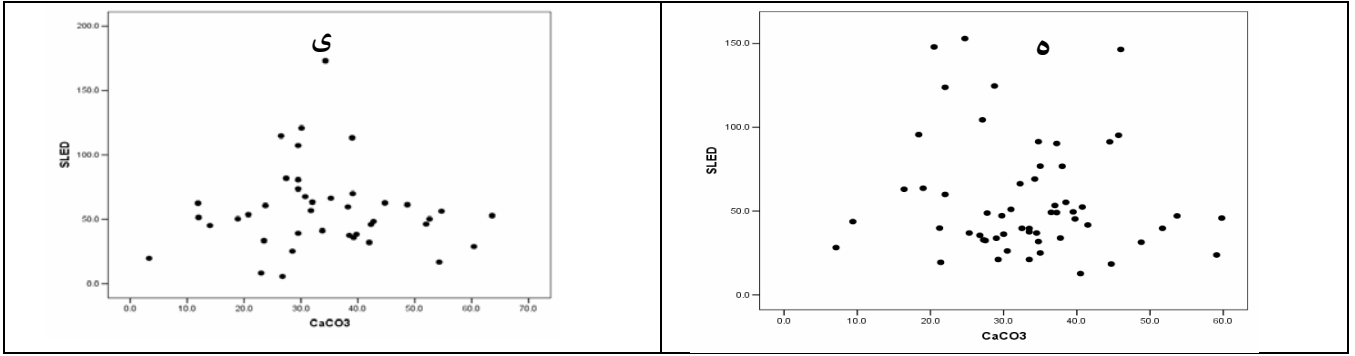
(trend line) ()

() ()

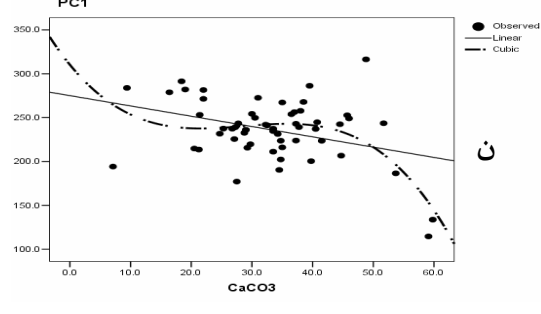
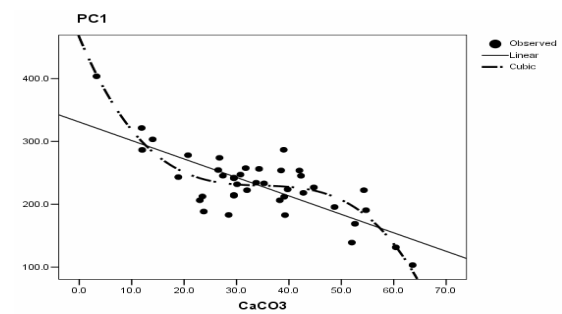
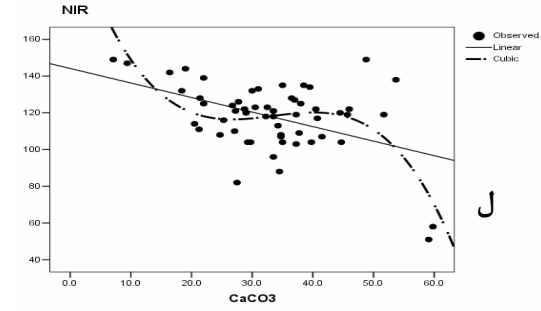
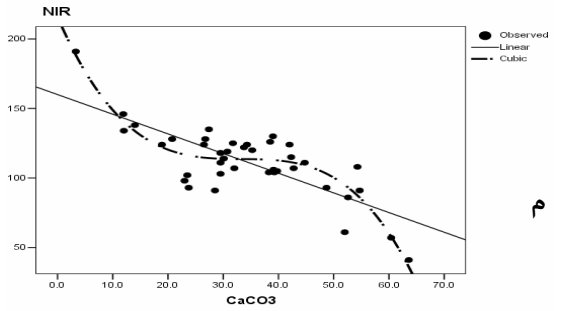
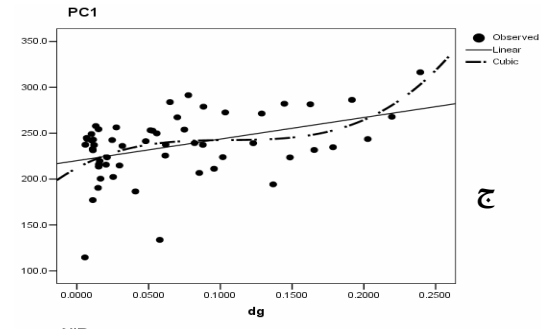
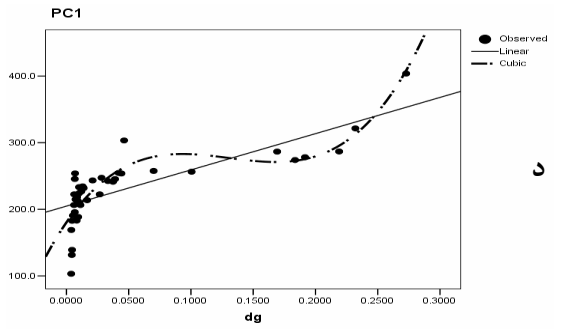
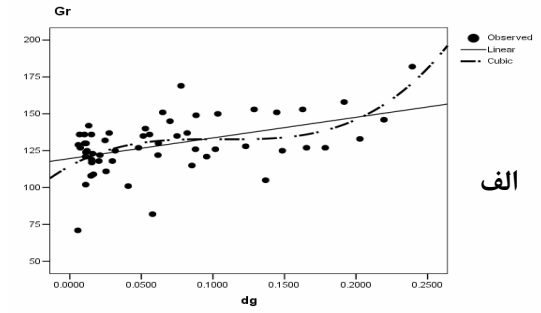
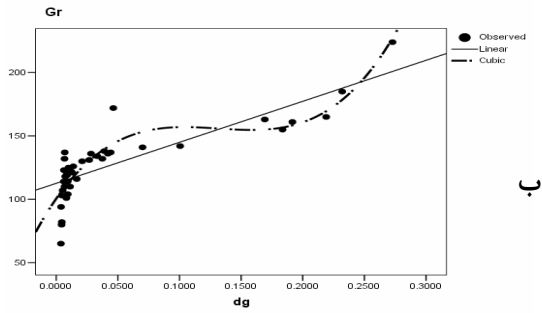
... :
 () . ()



() $\sigma_g <$:
 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 PC₁، ل- م: آهک با باند NIR، ن- و: آهک با PC₁.

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 نا همگون)

	green		red		NIR		SWIR		PCA ₁	
رابطه	درجه سوم	خطی	درجه سوم	خطی	درجه سوم	خطی	درجه سوم	خطی	درجه سوم	خطی
dg	۰/۲۶۳	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)

%

σ_g

%

%

(NIR)

σ_g

()

()

()

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