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SPI RAI DPI PNPI

DPI

SPI

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DPI SIAP

PNPI EPI SPI BMDI

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PNPI ()
 (DPI) (, ,) -

Decile

(PNPI)

(RAI)

$$PAI = \pm 3 \frac{P - \bar{P}}{\bar{E} - \bar{P}}$$

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$$PNPI = \frac{P_i}{P} \times 100 \quad ()$$

: \bar{E}

\bar{P}

: P

()

Deciles of Percipitation Index

Gibbs and Maler

Rainfall Anomaly Index

Rooy

Percent of Normal Precipitation Index

$$G(x) = \frac{1}{\Gamma(\hat{\alpha})} \int_0^x t^{\hat{\alpha}-1} e^{-t} dt$$

X=0

()

\bar{E}

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$$H(x) = q + (1-q)G(x)$$

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q

()

m

(SPI)

n m

q

G(x)

()

SPI

H(X)

Z

SPI

()

SPI

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$$G(x) \int_0^x g(x) dx = \frac{1}{\hat{\beta}^{\hat{\alpha}} \Gamma(\hat{\alpha})} \int_0^x x^{\hat{\alpha}-1} e^{-x/\hat{\beta}} dx$$

$$t = x/\beta$$

:

$$Z = SPI = -\left(t - \frac{c_0 + c_2t + c_2t^2}{1 + d_2t + d_2t^2 + d_3t^3}\right) \quad \text{for } 0 < H(x) \leq 0.5 \quad ()$$

$$Z = SPI = -\left(t - \frac{c_0 + c_2t + c_2t^2}{1 + d_2t + d_2t^2 + d_3t^3}\right) \quad \text{for } 0.5 < H(x) < 1.0 \quad ()$$

$$t = \sqrt{\ln\left(\frac{1}{(H(x))^2}\right)} \quad \text{for } 0.5 < H(x) \leq 0.5 \quad ()$$

$$t = \sqrt{\ln\left(\frac{1}{(1.0 - H(x))^2}\right)} \quad \text{for } 0.5 < H(x) < 1.0 \quad ()$$

:

$$c_0 = 2.515517$$

$$c_1 = 0.802853$$

$$c_2 = 0.010328$$

$$d_1 = 1.432788$$

$$d_2 = 0.189269$$

$$d_3 = 0.001308$$

(Z-Score)Z

SPI

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% = :* % = :**

$$|Z| \leq 1.64$$

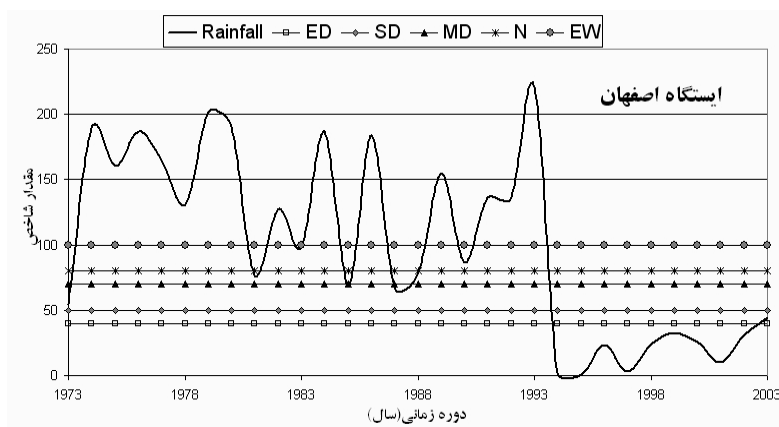
%

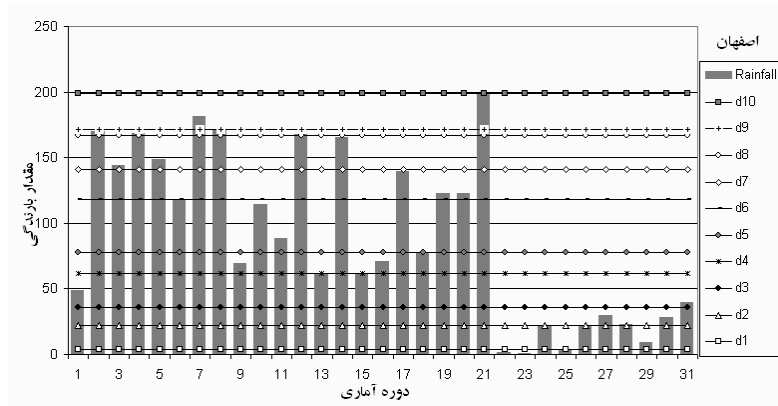
Z

...

۰	۰/۳۷۱	-۰/۳۵	-۰/۷۲	۰/۳۷	-۰/۳۵	۰/۳۷	-۲/۵	۱/۴۶	۰/۳۷	۱/۸۳	۰/۳۷	Z
۱	۰/۷۱	۰/۷۱	۰/۴۶	۰/۷۱	۰/۷۱	۰/۷۱	۰/۰۱	۰/۱۴	۰/۷۱	۰/۰۶	۰/۷۱	
-۰/۰۵	-۰/۱۲	-۰/۱۶	۰/۱۶	-۰/۰۸	-۰/۱۲	۰/۲۸	-۰/۶۵	-۰/۰۲	-	-	۰/۰۸	
۰/۷۵	۰/۴۹	۰/۳۷	۰/۳۷	۰/۶۳	۰/۵۰	۰/۱۳	۰	۰/۸۹	۰/۵۶	۰/۵۰	۰/۶۴	

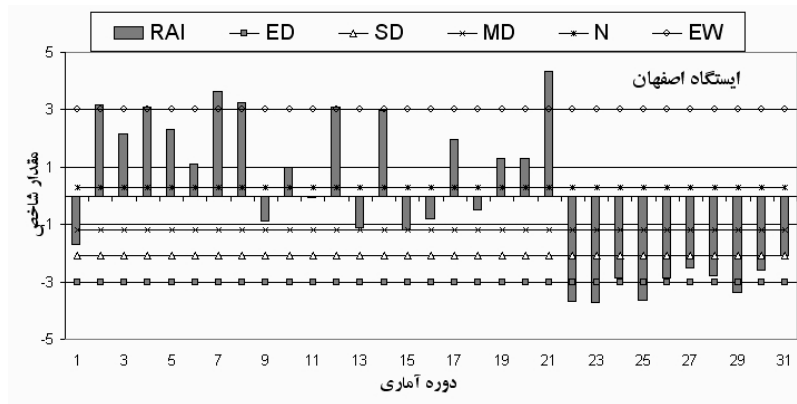
SPSS



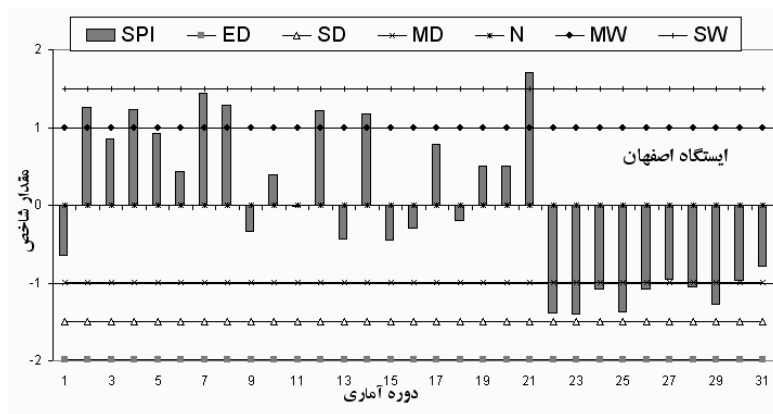


(d_{10} d_1)

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SPI



/	/	PNPI
/	/	DPI
/	/	SPI
/	/	RAI

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(% = : ** %= : ***)

-۰/۶۳*	-۰/۶۹*	-۰/۷۵**	-۰/۷۴**	-۰/۷۳**	-۰/۶۵*	-۰/۶۶*	-۰/۶۶*	-۰/۶۳*	-۰/۶۳*	
۰/۰۵۷	۰/۰۸۶	۰/۰۳۲	-۰/۰۳	-۰/۰۲۹	-۰/۰۴۴	-۰/۰۵۷	-۰/۰۴۵	۰/۰۲۲	۰/۰۵	

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The analysis of drought extension over Isfahan province based on four drought indices

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Abstract

The analysis of spatial extension of drought is an important issue in drought risk management. The estimation of influenced region of drought in Isfahan province is the aim of this study. To do this, the annual rainfall data of 12 stations of the most important stations of Isfahan province were used in the period of 1973-2003. First, trend and homogeneity tests were applied and Isfahan station was detected to show a significant trend. Then, drought condition for each year was determined using four indices including PNPI, DPI, RAI and SPI. The results showed that drought covers 31, 37, 23 and 52% of entire province at each single year based on the above indices, respectively. The study also showed that, among different indices, only DPI has a significant relationship with longitude. This implies that drought intensity and frequency increase eastward. However, other indices did not show the same relationship. According to SPI, as the most important index, 50% of the entire province has been influenced by drought during 30 years period. This revealed the importance of launching a regional drought monitoring and management system to reduce drought disaster.

Keywords: Drought, Deciles indices, Standardized Precipitation Index, Isfahan province, Drought spatial variations