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EXTENDED ABSTRACTS

Flood Forecasting Via Daily Scale Standardized Precipitation Index

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1. Introduction

Most investigations on the SPI (Standard Precipitation Index) have focused on drought analysis yet. A few researchers including Seiler et al. (2002) and Du et al. (2012) using monthly data showed SPI2, SPI12, and SPI24 have the potential to forecast floods occurrence.

The present research aimed at using SPI for flood occurrence forecasting. The results of the study are important from two points of view: first, the applied model uses just one parameter that imposes less uncertainty through decreasing errors in preparing and introducing data to the model, and second, the model uses the most commonly available data with acceptable length everywhere; i.e. precipitation.

While in drought analysis monthly scale is common, in this research the SPI was used in daily scale to fit the purpose of the study. For the case study, two different watersheds were selected; one in a humid area (Kasilian watershed in the north of Iran) and the other in a semi-dry region with a river of rainfall-snowy hydrologic regime (Kailak Darahsi watershed in the north-west of Iran).

2. Methodology

The SPI is calculated through fitting a probability density function, mostly the gamma function, on cumulative precipitation of different time scales (McKee et al., 1993). For this study, 5 climatologic stations in Kasilian watershed and Ashan station in east Azarbayjan were used.

To distinguish the best time scale of SPI for flood occurrence forecast three different indices, namely Probability of Detection (POD), False Alarm Ratio (FAR), and Critical Success Index (CSI) were employed. The equations of the indices are as follows:

$$POD = \frac{H}{H+M} \quad (1)$$

$$FAR = \frac{F}{H+F} \quad (2)$$

$$CSI = \frac{H}{H+M+F} \quad (3)$$

In which "H" is observation number during wet period, "M" is the number of missed observations in wet period, and F is the number of false reported observations (Hao and Aghalouchak, 2014).

3. Results and Discussion

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For investigating on the potential of SPI in detecting and monitoring flood occurrence, SPI for all climatological stations in the two watersheds were calculated and then were compared with the time of flood occurrence in the pertinent rivers. Fig. (1) is an example for illustrating the calculated SPI for the two watersheds at different time scales, along with the time of the occurrence of floods during the rainy periods.

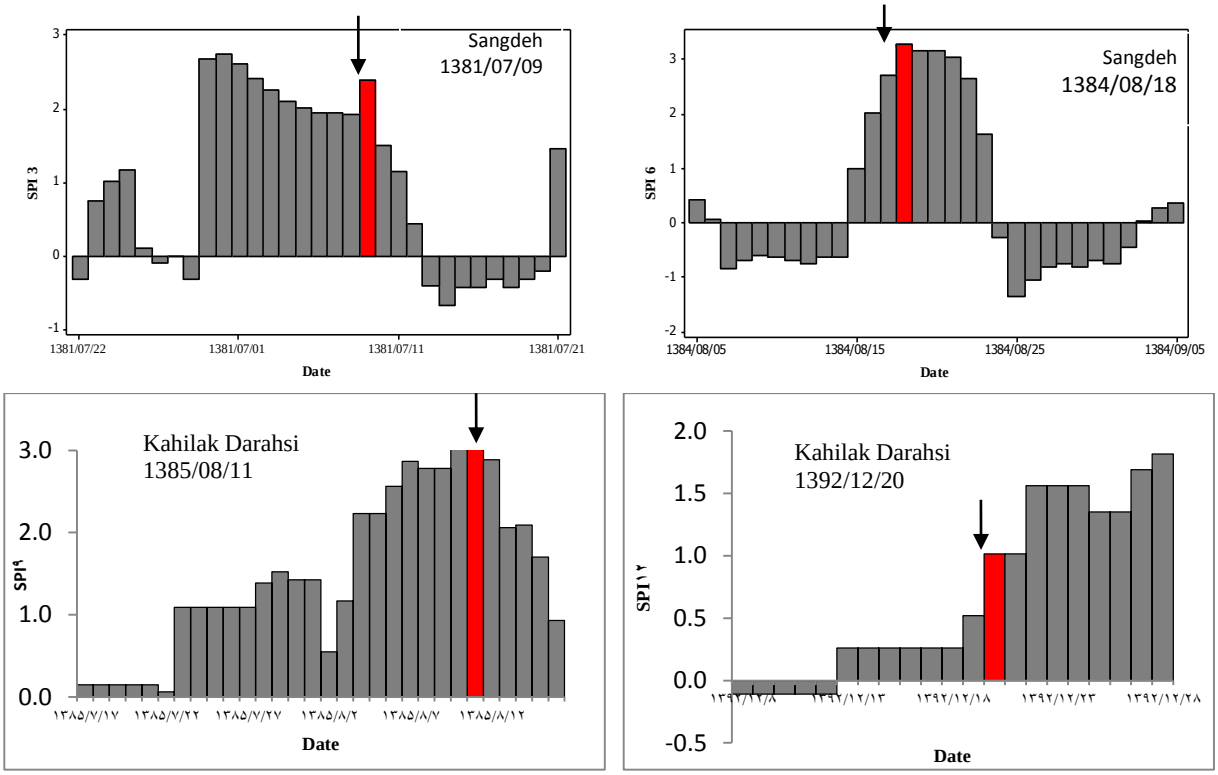

Fig. 1. SPI with different time scales in study regions (The arrow in the figure shows the occurrence time of observed floods)

4. Conclusions

The Results for 3, 6, 9, and 12 days SPI showed the success of the method in the two study watersheds. In the Kasilian watershed, located in a humid area and having precipitation all year long, SPI could predict flood occurrence 7 days ahead, while for Kahilak darahsi the lead time was 3 days at most. According to the obtained POD, FAR and CSI, SPI6 and SPI3 were the most accurate time scales for Kasilian and Kahilak Drarhsi watersheds, respectively.

5. References

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