The Zoning of Drought with SIAP model in Sapeedroud valley,Gilan-Iran,South western of Caspian Sea

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Abstract: Drought is a natural disaster and its repeatable in all climates .In each year more than half of earth is prone to drought occurrence, in Iran also, many times drought condition has happened ,such as in 25 years occurred and has influenced on crop yield and water resources. The aim of this paper is recognition of drought with Standard Index Annual Precipitation (SIAP model) in framework of research project .The results of research paper has shown in Sapeedrud valley drought has occurred in upland and lowland area(12-19% from total frequency) and the other area is 5-12 % drought from total frequency and also the focuses of drought years has located in south area in all research period.

1. Introduction

Despite being dominated in dry conditions in most parts of the country, drought also occurred frequently and caused water shortages in various sectors. So that in the past 25 years there have been 13 drought [1]. This phenomenon of drought in each temperature regime happening in the future and one of the major problems of humanity will be considered. Compared with other risks of climate damages, economic and social life due to drought intensity and range has enjoyed a far wider. Among the natural disasters threatening human and environment, both in terms of frequency of occurrence of drought and the amount of damages is at the top [2].

One of the major problems in drought research, defining its starting point is the simplest definition of drought; the word is usually a period of drought with below normal rainfall is defined. Of course, yet precise and comprehensive definition of scientific resources during the drought was not provided and this fits the definition differs from place to study. For example, in humid areas, rainfall distribution is uniform over the growing season and irrigation is not performed, occurrence of a period of several weeks without rain will lead to drought occurrence [3]. Instead, in dry areas, droughts only after two or more seasons without rain are identified. The significant difference between aridity and drought there. aridity, permanent feature area that is the result of inadequate rainfall amounts [4]. In contrast, temporary meteorological drought characteristics of a region just gone when the amount is below normal rainfall occurs [5].

Need to monitor and determine the degree, intensity, continuity, time, place and terminate the dry period, spatial and temporal distribution, it has had on researchers to indicators for monitoring the dry period and ways to provide the zoning. The purpose of a drought index, a simple little three features determine the intensity, continuity and extent of its location [6]. Comparison of speech recognition and requires little or events to measure them. Therefore, to study and compare the drought at different times of drought need to be monitored [7]. Rodriguez [8] also using spatial temporal patterns, annual rainfall variability Ebarine Island for 47-year period studied for 51 stations showed. Hote [9] Analysis of Sahelian annual rainfall index over the period 1896 to 2000 statistics according to its drought began. Giddings [10] using the standard index of rainfall in drought-Mexico 50-year statistical period was specified. Pashardis [11] using SPI and RDI index to assess regional drought began in Capirus areas.

Khalili [12] using meteorological drought index in several samples from different climatic concluded that the benchmark index of annual precipitation and precipitation index decile with minimum rainfall occurred in the most severe drought occurred in all stations under study reported and of severe meteorological droughts image more efficient than other icons are the icons and other SIAP for monitoring meteorological drought is more efficient. Safdari   [13] using the SPI index zoning drought frequency domain is discussed Karun watershed, results of this study show that the South East and northern areas than other areas with greater frequency of drought and the area is as areas with potential sensitivity to drought, are introduced in cases related to water resources should have special attention to it.Khorshiddost [2] using the

Standardized Precipitation SPI to study rainfall fluctuations, and determine the predicted wet and dry seasons of winter in East Azerbaijan has been discussed. The results show aspects of extreme fluctuations of rainfall in all stations studied, there are some weaknesses combined with the severity and the causes of climate fluctuations represent rainfall stations this province. Stations and dry seasons of the sequences studied and further continued to enjoy the wet seasons. Mohammadi   [14] also using the catchments area index SIAP in Maroon watershed years representing dry, normal, and they identify more with the zoning and drought in the region, areas with high risk of drought is introduced. Abyaneh [15] using statistical indicators of drought, dry conditions and trends in the region began to Hamadan. Ghavidel Rahimi [16] to study the drought and wet in the East Azerbaijan province has paid. Fatehi et al [17] to seasonal rainfall forecasts using links from around the lake catchment have paid. Ansari [6] zoning to the dry period using standardized precipitation index in Khorasan province have paid. Studies have shown that in recent years and the persistence of this phenomenon repeated in all parts of the province has increased, but its intensity is reduced. Dry period also occurred in the southern province of continuity and greater intensity than the central and northern provinces. Daneshvar   [18] to review the regional drought in central, south and south East countries began. Soltani [19] using the SPI zoning drought began in Isfahan. Ensafee [20] using the inverse distance troubleshooting IDW basin drought climatic zoning was the Salt Lake. Khosravi [21] to review drought situation in South Khorasan province began. Karimi [22] also zoning drought with two different approaches in geographic information systems began to Yazd. Ghorbani   [23] using two methods of SIAP and SPI data mining method to study the comparative profiles of meteorological drought began in the Kermanshah Province. Lshny Zand [24] to examine the possibility of drought and climate forecasts in the six basins in West and North West of Iran is discussed.

The main goal of this study attributes the frequency, intensity, continuity and extent of drought in regional and seasonal time scale annual Safeedrud Valley area to help with the Standardized Index annual Precipitation zoning maps drought during normal, dry and wet on the time scale annual and seasonal.

2. Material and Methods

Monthly rainfall data stations in   period 1388-1359 was used and by statistical software were analyzed (Table 1 and Figure 1).

Table 1: profile stations studied

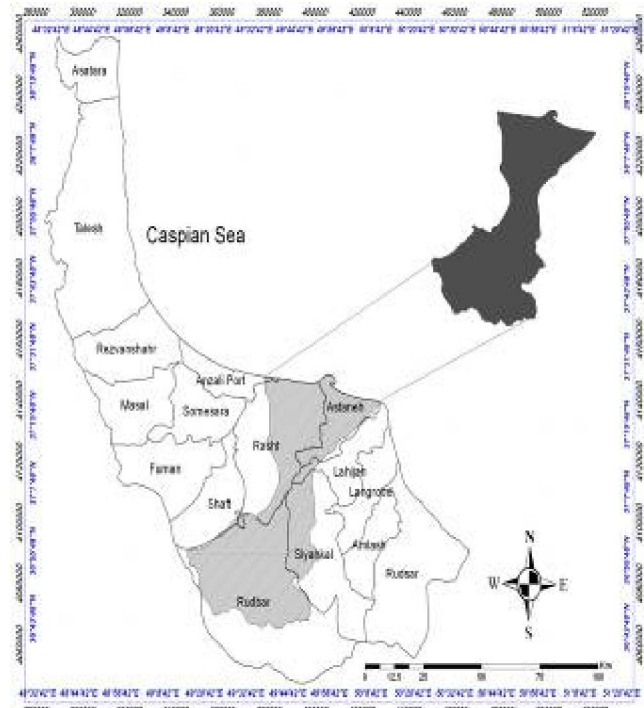| Station	Longitude	Latitude	Elevation
Astaneh	04 56 49	19 15 37	5-
Rasht	42 36 49	30 15 37	1
Parudbar	34 43 49	26 36 36	495
Manjil	25 23 49	54 45 36	232
Gilvan	58 07 49	42 46 36	311
Shahrbej	23 38 49	35 00 37	140
Totaki	26 52 49	08 04 37	185
Totkabo	30 34 49	49 50 36	260
Shalman	12 13 50	34 09 37	16-
Anzali	00 28 49	00 28 37	24-

Figure 1: The position of Sapeedroud Valley in Gilan and Caspian Sea.

SIAP Index

To review the process trend of droughts in the study area of the SIAP benchmark index is the annual precipitation (Khalili, 1998), was used and it is when a long period of minimum rainfall climate is at least represents a severe drought this way are identified.

$$SIAP = P_i - \bar{P}/SD$$

Where: P_i = Precipitation in the desired ; $\bar{P}$ = mean SD = Standard deviation of Precipitation

SIAP: Standard Index Annual Precipitation That identify with descriptive measurement quality with table 2.

Then, using of Geographic Information System (GIS) software and submitted maps with Kriging methods for obtaining of zoning maps.

Table 2: Classification criteria SIAP index classes and describe the status indicator value

Index Descriptive	Status
More Wet	More 0.84
Wet	0.52-0.84
Normal	0.52-(-0.52)
Dry	-0.52-(-0.84)
More Dry	Less -0.84

3. Results

Features 30-year rainfall stations within the study are described in Table 3.

Table 3: characteristics of the study area rainfall

Station	Mean Rain	SD	C.V	Max	Min
Astaneh	8/1287	7/190	8/14	1635	5/890
Rasht	2/1307	4/167	8/12	5/1696	5/985
Parudbar	9/312	106	9/33	626	146
Manjil	1/260	9/86	4/33	484	8/97
Gilvan	2/185	8/63	4/34	8/394	4/90
Shahrbej	5/1227	3/188	3/15	1607	801
Totaki	6/1520	7/293	3/19	2233	955
Totkabo	5/526	129	5/24	37/788	5/259
Shalman	6/1178	2/171	5/14	1561	5/907
Anzali	7/1767	5/253	3/14	7/2359	7/1351

Features of rainfall in the range of heterogeneity within the desired time of the precipitation climate of Iran is a feature of shows . So that the maximum precipitation in the study area in the second half of the year (fall and winter) will happen and summer precipitation has the minimum required storage that this winter, and artificial feeding of underground water table shows, because fluctuations in rainfall could ultimately lead to dryness and drought is created. Maximum and

minimum rainfall recorded in order for the station in 1767 and Anzali amount with the amount of 185 mm Gilvan station reported. Most SD value for Tutky Station 293/7 and the lowest value for the station Gilvan 63/8 has been calculated. Maximum coefficient of variation of rainfall stations and the minimum Gilvan and Rasht station has been read. This indicates has represented of instability in Givan station and stability of precipitation of quality rainfall stations in Rasht Frequency Index SIAP according to criteria categories were extracted and subsequently with regard to values index in time series of annual stations studied area, its frequency was extracted (Table 4).The periods of drought, normal and The more specific and related to the zoning map prepared and analyzed. Map drying period (2008) According to this method (Fig. 2) shows that the region is very dry conditions.

Table 4: Frequency of many dry years in each station with SIAP method.

| Frequency Index	More Dry	Dry	Normal	Wet	More wet
1980	3	2	4	0	1
1981	2	0	5	1	2
1982	5	3	2	0	0
1983	0	0	3	1	6
1984	1	2	7	0	0
1985	1	3	4	1	1
1986	2	1	5	2	0
1987	0	1	7	0	2
1988	0	1	2	0	7
1989	2	1	7	0	0
1990	2	2	5	0	1
1991	5	1	4	0	0
1992	0	0	5	1	4
1993	1	0	3	3	3
1994	0	0	4	1	5
1995	3	0	2	0	2
1996	1	0	3	4	1
1997	2	3	4	0	2
1998	1	1	7	0	1
1999	7	2	1	0	0
2000	1	2	5	0	2
2001	1	1	6	0	2
2002	1	1	7	0	1
2003	0	1	3	1	5
2004	0	0	5	2	3
2005	0	0	5	1	4
2006	6	2	2	0	0
2007	0	0	5	2	3
2008	9	1	0	0	0
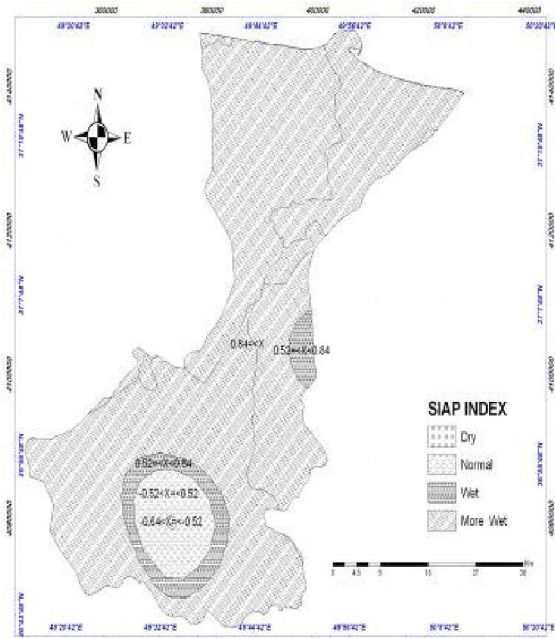
Figure 2: Map drought with   SIAP Index in 2008. The index station for review, many obtained all the stations and converted of frequency drought classes This indicator was the percentage of the maps were presented (Table 5).

Table 5: Frequency of years with many phenomena (wet -dry) in accordance with SIAP index

Station	More Wet	Wet	Normal	Dry	More Dry
Astaneh	7	4	10	2	7
Rasht	7	1	14	3	5
Parudbar	6	2	12	6	4
Manjil	6	0	13	5	6
Gilvan	4	1	16	3	6
Shahrbej	5	3	15	1	6
Totaki	5	3	13	3	6
Totkabo	6	4	13	4	3
Shalman	6	2	11	4	7
Anzali	6	3	10	5	6

Among the stations studied, with seven stations Shalman threshold and the frequency and Totkabn station with three frequency respectively the highest and lowest years are very dry. Gillvan station with the highest frequency in 16 normal and water stations and Anzali ahead with the 10 lowest frequency normal water years have been allocated to. And also the highest and lowest frequency more wet years, respectively, including the seven stations and Rasht threshold frequency and Totky Shihbijar and is the fifth frequency.

4. Discussions

Major features of rainfall stations, the coefficient of variation is studied, the highest value to Gylvan stations, and Manjil Parvdbar (above 30% by value) in the South and South West study area are located, the lack of rainfall, the quality of order In these stations shows. Lowest coefficient of variation associated with the amount of Rasht Station 8 / 12% respectively. In terms of the amount of annual rainfall stations and station Anzali Maximum Gilvan receive the least amount. Also moving average stations showed the station a decreased Manjil more tangible than any other station has. The index of the SIAP 2007 and 2008 years, dry years have been established, so that the whole region is very dry status, as well as a 1987 year period is considered normal, so that the whole region has a normal situation. Blue 1987 ,1988 years was known as the wet period. Which shows that periods of dry, normal and wet years with the same index was SIAP. According to the indicators and threshold Station SIAP Shalman Totkabn highest and lowest stations in the state is very dry, also the location of the region with 18/7% equivalent to 5 years with this condition (very dry) is. Dry conditions in parts of the South, South West and North the most part is able to. In examining the relationship between height and rainfall stations were found between these two parameters is established Relation reversed, so that with increasing altitude, rainfall decreases. However, no relationship between height and occurrence of drought . The intensity and persistence of drought in the above method was determined according to the station Manjil longest continuous drought for 5 years is allocated to Shirbijar station also has a maximum value observed, and is the longest in terms of spatial continuity of the South West region and also in terms of intensity of the southern parts, South West, North, North East has the highest intensity of droughts. Investigated of graphs trend for SIAP index ,changes in the stations has showed the highest deviation from Manjil station .

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