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# Detection of Drought Tendency Based on Precipitation in Southeastern Anatolian Project (GAP) Region, Turkey

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**Abstract:** In this study, drought tendency in Southeastern Anatolian Project (GAP) area was analyzed by using the Mann-Kendal (MK) and Theil-Sen Slope estimator (TSE) approaches. For this purpose, the data sets of the 3- and 12-month timescales, based on monthly rainfalls of rain gauging stations in the area, was considered in the study. There is a decreasing trend in the 53% of total number of months concerning with the data sets of the 3-month timescale for nine sites when the entire months of seven stations have a downward trend for the data sets related to the 12-month timescale. This shows that the tendency of drought increases at the longer periods of timescale. The direction and magnitude of trend in any station was detected with the TSE method.

**Key words:** GAP, rainfall trend, Mann-Kendal test

**Türkiye, Güneydoğu Anadolu Proje (GAP) Bölgesinde Yağışa Dayalı Kuraklık Eğiliminin Belirlenmesi**

**Öz:** Bu çalışmada, Güneydoğu Anadolu Proje (GAP) alanında kuraklık eğilimi ,Mann- Kendal (MK) ve Theil-Sen Eğim (TSE) yaklaşımları kullanılarak analiz edildi. Bu amaç için, bölgedeki yağış istasyonlarının aylık yağmurlarına dayalı olarak 3- ve 12 aylık zaman ölçeğinin veri setleri çalışmada göz önüne alındı. Yedi istasyonun 12-aylık zaman ölçeğinin veri seti tüm aylarda azalan trende sahipken, dokuz istasyonun 3- aylık zaman ölçeği için elde edilen veri setleriyle ilgili olarak ayların toplam sayısının % 53'ünde azalan trend bulunmaktadır. Bu, kuraklık eğilimi zaman ölçeğinin daha uzun periyotlarında artış olduğunu gösteriyor. Herhangi bir istasyondaki trendin yön ve büyüklüğü TSE yöntemiyle belirlendi.

**Anahtar Kelimeler:** GAP, yağış trendi, Mann-Kendal test

**Notations**

n, the number of observations,

$x_i$, $x_j$, the ith and jth observations,

$t_i$, the number of ties of extent i,

M, the number of tied groups,

$r_k$, the ACF of $x_i$ at lag k,

$Q_{med}$ ,Theil-Sen's estimator,

$Y_i'$, the residual series,

$Y_i''$, the pre-whitening series.

## 1. Introduction

The analysis of drought tendency in Southeastern Anatolian Project (GAP) region, planned in the boundaries of the upper Euphrates and Tigris river basin in Turkey being a main riparian country such as Syria and Iraq, is very crucial owing to the inherent climate characteristic reigned in the GAP area. The GAP project is the largest investment in terms of regional development throughout the history of Turkish Republic and the fourth largest irrigation project in the world. The main objective of the GAP is to eliminate socio-economic disparities between the GAP region and the other regions of Turkey by increasing the income levels and the living standards of the inhabitants in the region, furthermore, to contribute to the achievement of national development targets. In the 1970s, the GAP was originally planned to be made up of projects for irrigation and hydraulic energy production on the Euphrates and Tigris river systems. In the 1980s, the project was inverted into a multi-sector, integrated and sustainable regional development program. The development of the GAP region was originally deliberated on its water and land resources. Therefore, a probable drought event would cause the failure of the GAP because of the water resources development program as relating to the GAP consists of 13 groups of irrigation and energy projects, seven of which are on the Euphrates River and, the largest and comprehensive project including Atatürk Dam and Urfa Tunnels is on the lower Euphrates. The three riparian countries have engaged in development works in the river system basin since 1960s. In this sense, the most comprehensive attempt to the date is the GAP (Altınbilek 2004; Kibaroğlu and Unver 2000; Morvaridi 1990; Unver 1997).

In addition to the cases described above, it has been reported that the global climate change would cause drought in the region. According to Intergovernmental Panel on Climate Change (IPCC 2007), the increased concentrations of greenhouse gases caused by human activities would alter the magnitude and seasonal variations in temperature and precipitation patterns in many parts of the globe. Global climate changes triggered with increasing concentrations of greenhouse gases in the atmosphere have been received increasing attention in recent years, due to its crucial impacts on society and ecosystem.

The effects of increased population and global climate change on water resources aggravate the water disputes in the basin. The disputes over water allocation among the riparian countries have been already continuing for years, and this conflict is more likely to worsen in the future. Furthermore, the dominant arid and semi-arid climate characteristics of the basin have been contributing this undesirable condition. The drought events have been frequently experienced due to inherent climate in the basin. Karabulut and Cosun (2009) and Giorgi (2006) highlighted that the Mediterranean and Southeastern regions have been sensitive to climate variability from anthropogenic intervention. Many researches associated with change in precipitation are based on a spatial and temporal analysis of annual and seasonal rainfall series (e.g., Duhan and Pandey 2013; Some'e et al. 2012; Tabari and Talaee 2011; Sayemuzzaman and Jha 2014). Some studies on precipitation changes and variability of Turkey pointed out that its spatial and temporal change characteristics were worthy of attention (Kutiel et al. 2002; Tatli 2006; Turkes and Erlat 2003). Turkes et al.( 2009) searched on spatio-temporal variability of precipitation total series over Turkey and, found a decreasing trend in total winter precipitation, upward trends in the precipitation totals in spring, summer and autumn seasons. Partal and Kahya (2006) pointed out a remarkable downward trend in the annual mean precipitation in considerable part of western and southern Turkey. Unal et al. (2012) stressed a decreasing trend in annual precipitation throughout Anatolia, including west, and southwest sections, an increasing trend in only northeast Black Sea region of Turkey. Toros (2012) detected the existence of a decreasing trend in the long-term annual precipitation averages during the last decades. Yurekli (2015) investigated the annual and seasonal rainfall series from the sites in the upper Euphrates and Tigris river basin and, found upward and downward trend in the rainfall series of some gauging stations.

The main objectives of this study were: to make up new data set to be analyzed by summing up monthly precipitation of the stations in the study area at timescales of 3- and 12-month according to the work of Mckee et al. (1993), and to apply Mann-Kendal (MK) and Sen Slope estimators tests to new data set in order to detect the direction and magnitude of a trend.

## 2. Material and Methods

### 2.1. Study Area and Data

The Euphrates–Tigris basin is largely fed from snow precipitation over the uplands of north and eastern Turkey, Iraq and Iran. Precipitation in the basin, largely falls during the winter months from October to April. A large proportion of precipitation in this period occurs as snow on the uplands and it remains in solid form until temperatures increase up to the spring or early summer. Thereupon, snow-melt is decisive in the flow characteristics of both the Euphrates–Tigris. A substantial amount of precipitation which converts to runoff or groundwater in the basin takes places over Turkey (Beaumont 1998; Ozdogan 2011).

In order to analyze of drought tendency based on precipitation in the GAP region, including 9 provinces, monthly rainfall amounts from 9 rain gauges (site) operated by Turkish State Meteorological Service were used in the analysis. The geographical locations of the 9 stations on the GAP are presented in the Figure 1 and, characteristic information and data availability about all the stations are given in Table 1. The data quality control of monthly rainfall series concerning with the corresponding sites was performed in the work of Yurekli (2015) in the context of the missing data and homogeneity. Each station provided the homogeneity condition.

The researchers focused on climate change have been specifying that the southern parts in Turkey would be affected by drought owing to the impact of global warming. As a consequence, this human-induced case would adversely contribute the dominant arid climate feature in the GAP region. In this sense, the monthly data sets of the 9 sites were arranged at the time scales of 3- and 12-month (TS-3 and TS-12) according to the principles mentioned in McKee et al. (1993) who first introduced the standardized precipitation index (SPI) to detect the presence of a change towards drought in the study area. In this reason, monthly precipitation time series were summed up to obtain the data set to be analyzed for each station at time scales of interest.

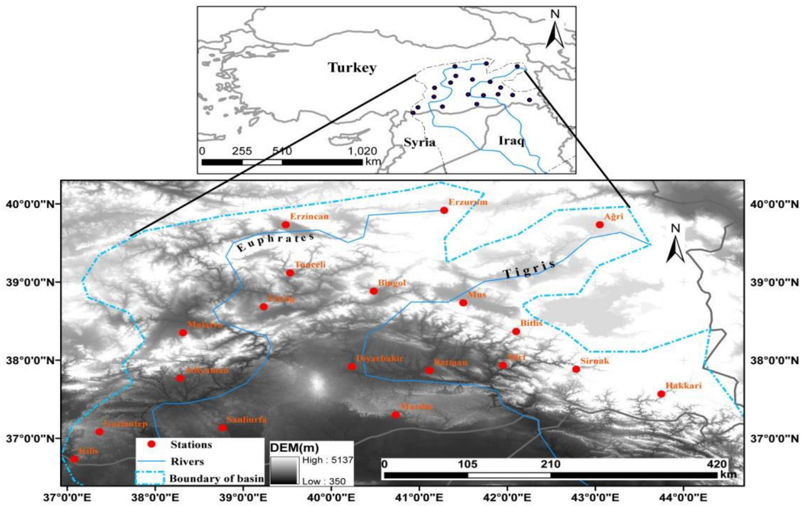


**Figure 1.** The geographical location of the stations on the GAP area in the Euphrates–Tigris basin

**Table 1.** Characteristics of the sites in the GAP area

| Gauging Stations | Station Code | Longitude (E) | Latitude (N) | Elevation (Meter) | Annual Rainfall Mean (mm) | Data Period |
|---|---|---|---|---|---|---|
| Gaziantep | GA-1 | 37°22′ | 37°05′ | 840 | 554 | 1940-2013 |
| Kilis | KS-2 | 37°05′ | 36°44′ | 680 | 498 | 1960-2013 |
| Adiyaman | AD-3 | 38°17′ | 37°46′ | 669 | 713 | 1963-2013 |
| Sanliurfa | SU-4 | 38°46′ | 37°08′ | 547 | 453 | 1929-2013 |
| Mardin | MA-5 | 40°44′ | 37°18′ | 1150 | 678 | 1940-2013 |
| Diyarbakir | DB-6 | 40°14′ | 37°55′ | 677 | 487 | 1929-2008 |
| Batman | BA-7 | 41°07′ | 37°52′ | 550 | 492 | 1952-2013 |
| Sirnak | SIR-8 | 42°47′ | 37°53′ | 1350 | 673 | 1970-2013 |
| Siirt | SI-9 | 41°57′ | 37°56′ | 895 | 718 | 1938-2013 |

### 2.2. Analysis of change in the data

Variation in meteorological variables has been tested both parametric or non-parametric approaches over years (e.g., Abaurrea et al. 2011; Abdul Aziz and Burn 2006; Dinpashoh et al. 2011; Espadafor et al. 2011; Hamed 2008; Liang et al. 2010; Some'e et al. 2012; Tabari and Talae 2011; Tang et al. 2011; Yenilmez et al. 2011; Zhang et al. 2010).

The non-parametric approaches have some advantages over the parametric. The most attractive one of them is the assumption that values have any distribution form for non-parametric approaches, whereas the requirement of the parametric approaches is the normally distributed variables (Huth 1999; Zhang et al. 2008). The Mann-Kendall (MK) method is the most popularized non-parametric method to define variation in hydrologic variables. The null hypothesis ($H_o$) of the MK test assumes that time series values are independent, identically distributed while alternative hypothesis ($H_1$) is that there is a monotonic trend in the data set. Mathematical formulation of this test is given as following:

$$S = \sum_{i=1}^{n-1} \sum_{j=i+1}^{n} \mathrm{sgn}(x_j - x_i) \quad (1)$$

The sgn function takes the following values:

$$\mathrm{sgn}(x_j - x_i) = \begin{cases} +1 & \text{if}(x_j - x_i) > 0 \\ 0 & \text{if}(x_j - x_i) = 0 \\ -1 & \text{if}(x_j - x_i) < 0 \end{cases} \quad (2)$$

According to Eq.(2), a positive or negative S value indicates upward and downward monotonic trend in the data, respectively. It is assumed that the statistic S is approximately normally distributed with the mean zero and, in case where the sample size n >10, its variance is calculated by:

$$\sigma_S^2 = 18^{-1}\left[n(n-1)(2n+5) - \sum_{i=1}^{m} t_i(t_i - 1)(2t_i + 5)\right] \quad (3)$$

The MK test statistics ( $Z_{MK}$ ) is calculated as:

$$Z_{MK} = \begin{cases} \dfrac{S-1}{\sqrt{\sigma_S^2}} & \text{if} \quad S > 0 \\ 0 & \text{if} \quad S = 0 \\ \dfrac{S+1}{\sqrt{\sigma_S^2}} & \text{if} \quad S < 0 \end{cases} \quad (4)$$

The $Z_{MK}$ test statistic here follows a standard normal distribution. This value calculated from the Eq.(4) is compared to the value of $Z_{1-\alpha/2}$ from standard normal distribution table at 5% significance level. The null hypothesis associated with no trend is accepted if the $Z_{MK}$ test statistic is smaller than the critical value of the standard normal distribution at the significance level of α. The $Z_{MK}$ test statistic having a positive or negative value signifies an increasing or decreasing trend.

Theil-Sen's estimator (TSE) (Sen 1968; Theil 1950) has been substantially considered in specifying the magnitude and direction of the trend in hydrologic variables. The brief descriptions of the statistical method are as follows:

(i) The slope estimates ($Q_k$) of N pairs of time series are first computed after sorting data in ascending order:

$$Q_k = \frac{x_j - x_i}{j - i} \text{ for } k = 1,..., N \quad (5)$$

(ii) According to condition that N is odd or even, the median concerning with total N values of $Q_k$ is calculated by.

$$Q_{med} = \begin{cases} Q_{\left[(N+1)/2\right]} & \text{if N is odd} \\ 2^{-1}\left\{Q_{\left[(N)/2\right]} + Q_{\left[(N+2)/2\right]}\right\} & \text{if N is even} \end{cases} \quad (6)$$

In order to directly apply the MK test to the raw data, there should be no serial correlation among the observations; otherwise the presence of serial correlation in the raw data would lead to misinterpretation over trend (Hamed and Rao 1998). Cox and Stuart (1955) and Yue and Wang (2002) pointed out that the existence of serial correlation in any data set would result in a significant trend. In this context, the serial correlation may be detected with the autocorrelation function (ACF) of the actual data by testing whether the ACFs are significantly different from zero. The *Q*(*r*) statistic suggested by Ljung and Box (1978) is widely used for the significance test of ACF. The hypothesis related to this test is done by comparing the value of calculated $\chi 2$ to $\chi 2$-table of critical value for a significance level. If the calculated $\chi 2$ value is smaller than the $\chi 2$-table critical value, the available data is judged to be serially independence. The *Q*(*r*) statistic at lag m is calculated by using:

$$Q_r = n(n+2)\sum_{k=1}^{m}(n-k)^{-1} r_k^2 \quad (7)$$

$$r_k = \frac{(n-k)^{-1}\left(\sum_{i=1}^{n-k}(x_i - \bar{x}_i)(x_{i+k} - \bar{x}_i)\right)}{\frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x}_i)^2} \quad (8)$$

The effect of serial dependence in a given data can be removed by the pre-whitening technique (von Storch 1995). Before applying the MK test, the lag one serial correlation component referred to as "$r_1$" is examined with the *Q*(*r*) statistic. Yue and Pilon (2003) suggested a new modified technique called as a trend-free pre-whitening (TFPW) based on the pre-whitening method. This procedure is mathematically described as;

Firstly, the real data is detrended by subtracting linear trend component $[(Q_{med}) \times i]$ from the sample series ($x_i$)

$$Y_i = x_i - [(Q_{med}) \times i] \quad (9)$$

Calculating the lag one serial correlation value ($r_1$) of the detrended data, the residual series is obtained as given below:

$$Y_i' = Y_i - [(Y_{i-1}) \times r_1] \quad (10)$$

The pre-whitening series ($Y_i''$) is determined by adding the term "$[(Q_{med}) \times i]$" to the residual data from Eq. (13) as:

$$Y_i'' = Y_i' + [(Q_{med}) \times i] \quad (11)$$

## 3. Results and Discussions

In the first position, the Ljung–Box Q statistic (LBQ) was applied to all of the series (hereafter referred as ND set) arranged at the 3- and 12-month timescales to detect the presence of serial correlation among the observations. For this purpose, every ND set's LBQ statistic calculated for lag one was compared to critical value of the at 5% significant level. The results of the ND series having the LBQ value bigger than the critical value were given in Table 2. The probabilities of these LBQ statistic values in the Table 2, which were obtained from the table of the distribution, were smaller than the 5% confidence level. This implies that there is a serial dependence among the observations of the corresponding ND series. Before applying the (MK) test to the ND sets, the impact of serial correlation on trend was removed by using the (TFPW) approach.

**Table 2.** Test results of LB$Q$ statistic at lag one for some months in the GAP area

| Station | TS-3 | | | | | | TS-12 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Code** | **2** | **3** | **5** | **6** | **8** | **9** | **1** | **2** | **3** | **4** | **12** |
| **GA-1** | | | | | | | | | | 5.74 | |
| **MA-5** | | | | | | 7.10 | | | 6.47 | 4.22 | |
| **DB-6** | | | 5.87 | 6.11 | | | | | | | |
| **SI-9** | 4.96 | 4.48 | | | 3.96 | | 6.59 | 7.29 | 9.56 | 5.24 | 5.88 |

Mann-Kendal test using one-sided hypothesis at 5% significance level was applied to the serially dependence or independence ND sets of the 3- and 12- month timescales. The results of this test are presented in Table 3 and 4. In these tables, statistically significance trend was presented in bold character. As can be seen in the Table 3, The ND sets for Mardin station have a decreasing trend in three months and an increasing trend in one of the twelve months while there is an upward monotonic trend in the five of the twelve months for Sirnak station. There was an upward monotonic trend in three months for Gaziantep and Siirt stations, whereas only a month for Siirt station has a decreasing trend. Also, the three months of the Kilis station and two months for Batman station had a decreasing trend. But, none of the twelve months for Adiyaman and Diyarbakir stations had surprisingly a monotonic trend. The MK test was unperformed due to the excess of the tied values in the nineth month for Sanliurfa and Mardin stations.

**Table 3.** The results of Mann-Kendal test ( $Z_{MK}$ ) for the 3-month timescale

| Months | Station Code | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **GA-1** | **KS-2** | **AD-3** | **SU-4** | **MA-5** | **DB-6** | **BA-7** | **SIR-8** | **SI-9** |
| **1** | 0,10 | -0,45 | -0,43 | -0,53 | **-2,16**$^{*}$ | -0,68 | -0,38 | **1,86**$^{+}$ | **-2,49**$^{*}$ |
| **2** | -0,35 | -0,87 | 0,30 | -1,20 | **-1,79**$^{*}$ | -0,74 | 0,10 | **2,11**$^{+}$ | -1,64 |
| **3** | -1,12 | **-1,98**$^{*}$ | -0,41 | -1,43 | **-2,10**$^{*}$ | -0,47 | -1,44 | 1,33 | **-2,13**$^{*}$ |
| **4** | 0,09 | **-2,08**$^{*}$ | -0,89 | -0,93 | -1,52 | -0,43 | **-1,74**$^{*}$ | 0,22 | -0,45 |
| **5** | -0,19 | **-2,02**$^{*}$ | -1,25 | -0,75 | -1,57 | -0,22 | **-1,80**$^{*}$ | -0,61 | -0,93 |
| **6** | 0,60 | -1,00 | -0,64 | -0,33 | -0,76 | -0,41 | -0,92 | -0,85 | -0,79 |
| **7** | 1,11 | 0,07 | 0,24 | 0,93 | 1,06 | 0,70 | -0,02 | 0,31 | 0,23 |
| **8** | 0,97 | 0,72 | 0,58 | 0,94 | **1,68**$^{+}$ | 0,12 | 0,62 | 1,11 | **1,86**$^{+}$ |
| **9** | 1,13 | 1,64 | 0,51 | *** | *** | -0,67 | -0,47 | **2,96**$^{+}$ | 0,89 |
| **10** | **1,94**$^{+}$ | 0,44 | 0,92 | 1,32 | 0,16 | 0,34 | -0,05 | **1,97**$^{+}$ | 0,73 |
| **11** | **1,98**$^{+}$ | 0,81 | 0,54 | 1,16 | -0,48 | 0,22 | -0,99 | 0,82 | -0,26 |
| **12** | **1,77**$^{+}$ | -0,12 | 0,06 | 0,16 | -0,71 | 0,30 | -0,50 | **1,92**$^{+}$ | -0,63 |

The "+" shows increasing monotonic trend in the data of interest

The "*" shows decreasing monotonic trend in the data of interest

The "***"shows that the MK test could not be carried out due to many years with no precipitation

**Table 4.** The results of Mann-Kendal test ( $Z_{MK}$ ) for the 12-month timescale

| Months | Station Code | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **GA-1** | **KS-2** | **AD-3** | **SU-4** | **MA-5** | **DB-6** | **BA-7** | **SIR-8** | **SI-9** |
| **1** | 0,84 | -1,25 | -0,63 | -0,52 | **-2,51*** | -0,18 | -1,51 | **2,09**+ | **-1,74** |
| **2** | 0,94 | -1,54 | -0,19 | -0,44 | **-2,74*** | -0,31 | -1,33 | **1,93**+ | **-1,88** |
| **3** | 1,00 | **-1,68*** | -0,23 | -0,69 | **-2,31*** | -0,26 | -0,92 | **2,00**+ | -1,43 |
| **4** | 1,25 | -1,62 | -0,28 | -0,97 | **-2,45*** | -0,22 | -0,60 | 1,61 | -1,12 |
| **5** | 1,10 | -1,36 | -0,26 | -0,73 | **-1,98*** | -0,18 | -0,91 | **1,75**+ | -1,52 |
| **6** | 1,13 | -1,36 | -0,19 | -0,71 | **-2,04*** | -0,24 | -0,88 | **1,93**+ | -1,41 |
| **7** | 1,07 | -1,44 | -0,21 | -0,70 | **-2,01*** | -0,25 | -0,91 | **1,82**+ | -1,41 |
| **8** | 1,17 | -1,48 | -0,19 | -0,62 | **-2,02*** | -0,23 | -0,91 | **1,82**+ | -1,41 |
| **9** | 1,10 | -1,64 | -0,18 | -0,67 | **-2,04*** | -0,24 | -0,99 | **1,71**+ | -1,41 |
| **10** | 0,49 | **-1,69*** | -0,26 | -0,74 | **-1,81*** | -0,17 | -1,09 | 1,53 | -1,39 |
| **11** | 0,76 | **-1,74*** | -0,19 | -0,72 | **-1,79*** | -0,31 | -1,13 | 1,28 | -1,34 |
| **12** | 0,79 | **-1,77*** | -0,33 | -0,72 | **-2,11*** | -0,47 | -1,47 | 1,56 | **-1,66** |

According to the MK test results concerning with the ND series of the 12-month timescales (Table 4), none of the twelve months has monotonic trend for Gaziantep, Adiyaman, Sanliurfa, Diyarbakir, Batman stations while there is an decreasing trend in the whole months for Mardin station. But, it is noticed that the MK results belonging to these stations (except Gaziantep station) present negative values owing to the presence of statistically insignificant trend in these stations. The four months and three months for Kilis and Siirt stations, respectively, had a decreasing trend, whereas there was an upward trend in the eight of the twelve months for Sirnak stations. In the Table 3, approximately 53% of the total number of the months (56 months) for nine sites has a downward tendency. However, according to the Table 4, there is a decreasing tendency in the whole months of seven stations when the entire months for Gaziantep and Sirnak stations have an upward tendency. These inferences imply that the tendency of drought increases at the longer periods of timescale.

In the Table 5 and 6, the TSE results of the nine sites for the months with monotonic trend are given. This test quantifies the direction and magnitude of current trend in any data set. The increasing monotonic trend related to the data sets of the 3-month timescale ranged from 0.01 to 5.23 mm per year, whereas the decreasing trends from -1.44 to -1.044 mm per year. For the ND sets of the 12-month timescale, the magnitude of the decreasing trends ranged from -2.54 to -1.52 mm per year whereas from 4.93 to 7.064 mm per year for the upward trends.

**Table 5.** The TSE ($Q_{med}$) results for the 3-month timescale

| Months | Station Code | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **GA-1** | **KS-2** | **AD-3** | **SU-4** | **MA-5** | **DB-6** | **BA-7** | **SIR-8** | **SI-9** |
| **1** | | | | | -1,440 | | | 3,500 | -1,275 |
| **2** | | | | | -1,292 | | | 5,230 | - |
| **3** | | -1,185 | | | -1,305 | | | | -1,044 |
| **4** | | -1,271 | | | | | -1,236 | | |
| **5** | | -1,144 | | | | | -1,243 | | |
| **6** | | | | | | | | | |
| **7** | | | | | | | | | |
| **8** | | | | | 0,010 | | | | 0,089 |
| **9** | | | | | | | | 0,133 | |
| **10** | 0,300 | | | | | | | 1,050 | |
| **11** | 0,539 | | | | | | | | |
| **12** | 0,713 | | | | | | | 2,514 | |

**Table 6.** The TSE ($Q_{med}$) results for the 12-month timescale

| Months | Station Code | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **GA-1** | **KS-2** | **AD-3** | **SU-4** | **MA-5** | **DB-6** | **BA-7** | **SIR-8** | **SI-9** |
| **1** | | | | | -2,476 | | | 6,713 | -1,610 |
| **2** | | | | | -2,539 | | | 5,973 | -1,523 |
| **3** | | -1,759 | | | -2,257 | | | 4,929 | |
| **4** | | | | | -2,481 | | | | |
| **5** | | | | | -2,355 | | | 6,066 | |
| **6** | | | | | -2,366 | | | 6,500 | |
| **7** | | | | | -2,350 | | | 7,064 | |
| **8** | | | | | -2,362 | | | 7,047 | |
| **9** | | | | | -2,314 | | | 6,662 | |
| **10** | | -1,888 | | | -2,273 | | | | |
| **11** | | -1,853 | | | -2,236 | | | | |
| **12** | | -1,793 | | | -2,360 | | | | -1,654 |

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