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The role of Siberian high in distribution of the daily minimum temperatures in Iran

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Extended abstract

1- Introduction

Siberian high is a large synoptic system in planet scale that considers the most important center of atmosphere action for cold period in Eurasia. This high that depend on the coldest and the most condensed air mass in north hemisphere, concentrate itself as a seasonal and semi – permanent synaptic system between Baykal and Balkhash lakes , and it's western tongue affect the climate of extensive regions of Iran. Therefore, the goal of this synoptic study is to explain key interactions between the atmosphere and surface environment and in other words exploration of the relationship between the circulation patterns of Siberian high pressure and minimum temperatures in Iran. Up to now, many studies about Siberian high have been done by several individuals that we will refer to some studies which have been done in Iran and world. In the world, Lydolph(1977), Ding and Krishnamurti(1987), Sahsamanoglou et al (1991) , Zhang et al (1996) , Mokhov and Petukhov (1999), Choen et al (2001), Haghton et al(2001), Gong et al(2001,2002), Takaya and Nakamura (2004), Panagiotopoulos et al (2005) and Lingis and Thompson(2005) are individuals that have carried out investigations about siberian high. In Iran, the investigations have been done too which can point to investigations of Abdolhoseini (1358), Alijani (1369), Balighi (1375), Chokhachizadeh

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(1376), Jahanbakhsh et al (1378), Azizi and Yousefi (1384) and kaviani et al (2007). This research try to reveal the climatic impacts of pressure systems on Iran climate by using the statistic and synoptic methods study the role of Siberian high system at the Slp in spatial distribution of the minimum temperatures in Iran.

2- Methodology

In this research, for analyzing the temporal variations of the Siberian system have been applied the daily data of sea level pressure at 12GMT in NCEP NCAR database with spatial resolution of 2.5×2.5 in a 55 years period including 20089 days from Dey, 11th, 1329 to Dey, 10th,1384). To recognize and analyze the temporal patterns of Siberian high system and by considering the mean position of this system and it's spatial developing relative to Iran and the maximum of it's action intensity in sea level that often is conformity with surrounding and middle limits of Balkhash and Baykal lakes (Lingis and Thompson,2005, Gong et al 2002, Sahsamanoglou et al ,1991, kaviani et al, 1386 and Chokhachizadeh ,1376) we have selected the suitable framework of 62.5 – 120° east and 40 – 62.5° north for this system. Then, calculation and standardization of mean daily of sea level pressure have been done from 1330 to 1383. Thus, a matrix with size 19724×1 was obtained as standardized Siberian high index (SSHI) that included the anomalies of positive phase (Siberian high presentation) and negative phase (absence of the Siberian high) in each day. To analyze and interpret the effect of Siberian high system on minimum temperatures in Iran, have been applied the information of 663 synoptic and climatology stations in Iran with statistical period of 1961 – 2004 from minimum daily temperature data of stations that at least had statistical period of 10 years. On this basis, the data of minimum daily temperature of 423 stations have selected and analyzed. At first, the value of minimum daily temperatures was standardized for analyzing the effect of Siberian high on minimum temperatures of Iran. After standardization, two calendars have been conformed as standardized value of daily minimum temperature and standardized Siberian high index and selected a temporal period from 1340 to 1382 consist of 15705 days from 16071 days for studying the effect of Siberian high system on daily minimum temperature in Iran. Then, for understanding how effects of the Siberian high system on daily minimum temperature in Iran, the contingency table method and the χ^2 statistic calculated in math-lab soft ware were appleid.

3- Discussion

The study of time series of index value for intensity of this high system in studied time period indicate that the lowest anomaly was equal to -2 and the highest anomaly in studied period was equal to +3/5. The lowest anomaly of negative phase has occurred on Tir, 25th, 1335 and the highest anomaly of positive phase was on Azar, 5th, 1366. The results of study the time series of intensity index indicated that the nature of index behavior at mentioned level vary alternately and tendency to change between two positive and negative phase is evident in the half - year time periods. In addition, it indicates the decreasing and increasing behavior in itself internal-year variability continuously. The anomaly of negative phase relate to non Siberian high and predominance the Asia low in hot period of year and the anomaly of positive phase of index indicate predominance the Siberian high in cold period of year. The average of positive phase intensity for Siberian system is 0.88 and the average of negative phase intensity is -0.80. The frequency of occurrence days of positive phase is 9469 days and the frequency of occurrence days of negative phase is 10255 days. Therefore, in mentioned statistical period, the positive phase (Siberian high) was dominant in 48% of period and the negative phase (non Siberian system and Asia low presentation) was dominant in 52% of period. The study of time series of average the Siberian high intensity index in positive phase indicate that the most violent positive anomaly was occurred in 1335 and 1355 and the most weak of it were in 1357 and 1370. In addition, the study of time series for days frequency of existence and absence of the Siberian high in occurrence the negative and positive phase indicate that the average of negative phase dominant was nearly 190 days and the average of positive phase dominant was about 175 days. The least period of dominant for positive phase was 143 days (1338) and the greatest was 210 days (1370). The period of dominant for negative phase wasn't shorter than 155 days (1370) and longer than 222 days (1338). By study the time variations of the frequency of Siberian high activity days in positive phase occurrence that had ascending behavior during recent 50 years, it seems that in spite of relative decrease of the frequency of days for Siberian high activity in 1930's, totally, the frequency of days for activity of this system have been increased during recent 50 years.

In this research, applying the contingency table method in studied time period (1340 – 1382) for understanding the role of Siberian high in sea level (Slp) in spatial distribution of daily minimum temperatures (night temperature), showed that daily minimum temperature isn't under

effect of Siberian high system in this atmosphere level at only 7% of studied stations (30 stations of totally 423 stations) and in other words is independent of this dynamical – thermal high. On the other hand, on the basis of this statistical method, the daily minimum temperature is under effect of this high system at nearly 93% of studied stations (393 stations of totally 423 stations) and isn't independent of the effect of this high system in studied atmosphere level.

4- Conclusion

This research indicated that standardized intensity Siberian high index is able to revealing the time variations of Siberian high. The analysis of time series of standardized intensity Siberian high index in positive phase period (predominance and presentation the Siberian high) indicated that intensity of Siberian high activity have the alternate behavior. Comparison between frequency of positive phase occurrence days and negative phase event days in the studied level showed that during recent 50 years the appearance and activity days of SH were definitely less than absence days of this system. At he same time, the frequency of activity days for this system was increasing during recent 50 years. In the other hand, this study indicated that the frequency of presentation days Siberian high have tendency to increase. The study of obtained results by using the contingency table method at time period (1340 – 1382) for revealing the effect of Siberian high system on occurrence of daily minimum temperatures in Iran showed that at the 95% confidence level, daily temperature minimum in about 93% of studied stations (393 out of 423) isn't independent of influence of Siberian high pressure at the Slp. this subject indicate the strong relationship and connection between daily minimum temperatures in extensive regions of Iran and Siberian high at the Slp.

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