

## Analysis the sea level pressure anomalies during extreme cold temperature days of Iran

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### Extended abstract

#### 1- Introduction

Knowledge as to how climatic extremes are changing, during the instrumental period and the recent period of strong (global-scale) warming, is currently an important scientific goal, as climatic extremes have high environmental and socio-economic impacts. According to Rusticucci and Vargas (2002), the two parameters that mostly affect the human being and their living activities, are the extreme daily temperature values and their persistence, as well. Weather extremes (extremely hot or extremely cold days and nights) have numerous negative effects on natural (plant and animal communities, forest fires, soil erosion, etc.) and human (infrastructure damage, human health, water supply, etc.) systems.

Statistical characteristics of extreme temperature events have long been investigated because of their obvious impacts on nature and human. heavy damages are caused by severe winter weather, or by extreme cold weather during the vegetation period. Although worldwide changes in extreme climate events have been detected in the past few decades, various studies have attempted to assess regional level (IPCC, 2001). Climate change-related extreme events at Temperature extremes occur as a result of the interaction between large-scale atmospheric circulation and the local characteristics of a place (for example, topographical features and altitude). To better understand the underlying causes for the occurrence of temperature extreme events, it is important to identify the circulation patterns associated with these events. The objective of this study is to clarify sea level pressure anomalies in extreme cold temperature days of Iran.

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## 2- Methodology

In order to studying sea level pressure anomalies in extreme cold temperature days of Iran, temperature data of 663 synoptic and climatic stations during 21/3/1961 to 19/3/2004 has been used. Then temperature on 18\*18 kilometer pixels by using Kriging method interpolated for Iran. A matrix that was 15705\*5214 has been created. Data of sea level pressure during study period extracted from NCEP/NCAR data site that relevant to United States national oceanic and atmospheric center. At first the extreme cold days recognized with Fumiaki Index and then data arranged according to intense and extend. The first 500 days that were Coldest and most extended selected as sample. In sample days, sea level pressure anomaly calculated. Cluster analysis has been carried out on sea level pressure anomaly in 500 days of extreme cold temperature days of Iran. Then the temperature anomaly for 5214 pixel has been calculated for each pattern.

## 3- Discussion

Cluster analysis of sea level pressure anomaly in 500 days of extreme cold temperature days of Iran shows that four distinctive patterns result in extreme colds. Extreme colds mostly occur in January; almost 29 per cent of extreme colds occur in this month. July experience the least extreme colds. Only the pattern No. 2, that is weak dipole of North Sea-North Russia, occurs mostly in November. Although this pattern exists in 24 per cent of extreme colds, has the least effect on Iran temperature anomaly

compared to the other patterns. The pattern of positive anomaly of sea level pressure on North Sea – North Russia mostly occurs in extreme colds. It is seen in almost 30 per cent of extreme colds. The dipole pattern of Atlantic-Scandinavia, while has the least frequency of occurrence, shows 37 per cent of Iran which holds negative temperature anomaly of -6 to -8 °C. Pressure anomaly, while this pattern is occurring, reaches at 11 hPa in northeast of Iran. Therefore, effect of this pattern is less than that of pattern No. 1 and more than those of patterns No. 2 and 4.

## 4- Conclusion

The least occurrence of extreme colds is for summer and especially in July which is 0.8 per cent of total extreme colds. Roughly speaking, extreme colds are not particular to cold seasons of a year and may occur in warm seasons as well. For all patterns, negative temperature anomaly in south areas of the country and south areas of Caspian Sea is trifling due to the atmosphere humidity.

**Keywords:** Sea level pressure anomaly, Temperature, Extreme cold temperature, Iran.

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