

Investigation of Blocking Pattern Role on Precipitation in North East of Iran Using Data Mining Analysis

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Extended Abstract

Introduction

The importance of atmospheric precipitation in human life turns it into one of the most common subject of various studies. Minimal changes in the amount and intensity of precipitation would face the communities' social and economic infrastructures to serious problems. Even though these studies have yielded very precious results but in most cases atmospheric precipitation patterns were analyzed not only at a limited regional scales but also only for heavy precipitation (high intensity precipitation). However, synoptic weather patterns, creating precipitation or other atmospheric phenomena, are formed within hemisphere-scale pattern. Among them, blocking pattern is one of the most important large scale circulations. As sometimes blockings embrace a wide range of western Atlantic coast to the Far East. Undoubtedly the identification of these patterns naturally requires a study area much wider than synoptic scope. In addition, understanding of the extreme natural phenomenon like heavy precipitation requires the knowledge of their normal modes. Therefore, this study aims at examination of hemispheric and synoptic circulations along with both heavy (high) and normal (moderate) precipitation (intensities) in Khorasan Razavi and Khorasan Shomali provinces. Investigation of relationship between precipitation amount in Khorasan Razavi and Khorasan Shomali provinces and blocking pattern is the main purpose of this study.

Methodology

To achieve considered goals, statistical data of daily precipitation were obtained from 20 stations located in the mentioned regions. Given the amount of precipitation is different in each area, the intensity of the precipitation cannot be determined based on a fixed number and it should be calculated according to its average quantity in given place. Hence, precipitation rate between ± 0.2 and above 7 were considered respectively as normal and heavy precipitation in a

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normalized scores scale. Besides taking into account aforementioned intensities in at least one station, precipitation rates greater than 1 and 0.1 mm in at least 50% of the stations are also required for choosing heavy and normal cases. As a result of precipitation data processes, 46 and 92 days were identified with normal intensity respectively.

Results and Discussion

Having determined precipitation cases, atmospheric circulations were analyzed for two synoptic and hemispheric scales. Geopotential height at 500 level extracted from US atmospheric database called National Centers for Environmental prediction (NCEP) was used to identify synoptic and hemispheric patterns. Similarly the study has two kinds of methodologies. Synoptic patterns were analyzed by manual (subjective) method whereas hemispheric circulations were investigated through quantitative blocking index to determine whether block has happened within large scale circulations. Manual analysis indicates that the only synoptic circulation, creating precipitation whether heavy and normal quantities, is trough pattern. This result is completely expectable for places like north east of Iran. Because in such regions far from massive water bodies, synoptic-scale dynamic processes play a big role in formation of rainfall. Through this pattern, the study area is located under trough front or upper convergence and surface divergence section. After determination of predominant precipitation synoptic pattern, the main part of study is put forward. In this step, the role of hemispheric blocking pattern on creation and location of trough pattern was investigated based on blocking index.

Conclusion

According to results, 67% of high intensities and 64% of normal cases are formed (affected) by blocking patterns. This condition not only shows very important role of these circulation in formation of precipitation in north east of Iran but also it would explicate that most precipitation cases in the mentioned areas are prepared by an unusual atmospheric pattern called blocking. The characteristics of block pattern, being unusual and infrequent, justify high annual fluctuations in Khorasan Razavi and Khorasan Shomali's precipitation. Spatial distribution blocking patterns indicates that Atlantic and Western is the main host for most blocking cases during both heavy and normal intensities. In addition to spatial distribution of the blocking pattern, its model is also significant; Omega block has the relative frequency of 74/2 and 72.9 simultaneous with high and normal intensities respectively. Based on block pattern temporal regime, late cold period of year and spring has the highest frequency of

blocking pattern along with heavy precipitation, whereas blocking pattern creating normal precipitation takes place mostly during wintertime.

Keywords: *Heavy And Normal Precipitation, Synoptic Analysis, Trough Pattern, Blocking Index.*