

## Determine the Climatic Seasons of Zahedan by the use of Cluster Analysis Method

**Dr. Hamid Nazaripour**

Assistant Professor of Climatology, Science  
International Centre, Advanced Technology  
and Environmental Sciences, Kerman

**Dr. Rashid. Saieed Abadi**

Assistant Professor of Climatology  
University of Oromieh

### Introduction

Changeability is one of the characteristics of climatology, and natural seasons unlike the calendar seasons are variable. Therefore, natural seasons have time- spatial changes. These changes are recognizable throughout Iran .Some of natural seasons such as winter and spring are not seen in some areas of Iran, and other seasons like summer are dominant in Iran for a long time. Therefore, summer or winter does not simultaneously occur all over the land as a climatic period. While, certain climatic seasons are limited to small parts, others prevail in land wide. So, distinguishing climatic periods in a region, with regard to climate and surveying the related changing systems are considered as desirable strategy for local and national planning. Also the present research tries to provide a strategy for planning and management of energy in this part of Iran through recognizing the climatic periods of Zahedan.

### Research and Methodology

For specifying the climatic seasons of Zahedan, thermal indices from Zahedan synoptic station have been used. These thermal indices including the dry and wet temperatures measured at 00, 03, 06, 09, 12, 15, 18 and 21GMT Time, mean dry and wet temperature, maximum and minimum temperature and mean temperatures on a daily scale, which have been obtained from a 35 years period(1970-2004)from Sistan and Baluchestan Provincial Department of Meteorology. First, by using a MATLAB Software, a  $P_{m*n}$  database, with matrix dimensions 12784\*24 was developed, in which, the lines  $m$  and columns  $n$  representing, time (12784 day) and climatic elements, respectively. So, after computing the long-term daily mean for each climatic element, a new 365\*21 matrix was developed and standardized. The matrix was used as a reference basis for discerning climatic Seasons or thermal types of climate at Zahedan region. The similarity rate of days was computed on the basis of a Euclidean distance and then the similar days were linked by applying the Ward method. The rational numbers of clusters were also assessed by ANOVA test.

### Discussion and Results

The results obtained from this research show that 4 climatic seasons which are prevalent at Zahedan region are distinctively different from those assessed as per the formal calendar. They comprise of 4 distinctive climatic seasons:

1- Cold season. 2- Temperate season. 3-Warm season and 4- very warm season.

The cold season begins from mid January, prevailing up to mid April. Then, the temperate begins, continuing up to early June. The very warm after that starts continuing up to early October. Another warm season appears after the very warm season, lasting up to mid December. Then, another appearance of the temperate sets up, entailing a cold starts. So, the temperate is a period transient through the warm into the cold and vice versa, with two different appearances in the year. Similarly, the warm is a period transient to the very warm, also with two appearances.

### Conclusion

The cold seasons or the climatic winter at Zahedan region commences and also ends up later than the calendar winter. This season is not so cold and lasts about 3 months. The temperate season become prevalent before and after the cold and indicating winter tardiness and late commencement of summer. In the cold and temperate seasons, temperature changes are extreme during a day. Similarly, the warm also appears before and after the very warm season and then, the temperate climatic season's sets up as a start of the cold climatic seasons, while the warm and very warm climatic seasons are of mild round-the-clock temperature changes.

**Keywords:** Climate Seasons, Distance, Clustering Analysis, Zahedan.

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