

Humidity seasons of Iran

Sohrab Ghaedi. Assistant professor of climatology, Shiraz University, Iran¹
Mojtaba Ghaedi, Shiraz University, Iran

Abstract:

Among the components of atmosphere, water vapour which its variability is very high, has a great importance. The role of water vapour in energy exchanges between earth's surface and atmosphere is very remarkable, and it is one of the most important agents in energy balance of the planet earth. Water vapour regionalization of Iran may be used as an indicator of major mechanisms of temporal and spatial distribution of atmospheric water vapour. In this paper, humidity regions of Iran are detected using monthly water vapour pressure data (h.p) in 120 climatology and synoptic stations (Jan 1951 till Dec 2000).

Cluster analysis shows that there are 5 humidity regions in Iran. The most important agent for classification of the humidity regions is distance from sea. On the other hand, it means the more the distance from the sea, the less the amount of humidity.

Keywords: water vapour pressure, Iran, clustering analysis, regionalization.

Introduction:

Spatial-temporal partitioning and classification into relatively independent units on the basis of one or more assumed criterion always has been in the centre of attention of geographers. Although first attempts in this case have been done in climatology, but determining the boundary between different continental regions, has remained as a problem. Greeks by means of the change in the angle of sunshine divided the earth surface into three regions: warm, cold and mild and divided the year into four seasons. Though from the middle of the ago century different people in the world, have given continental division plans which have been used in macro and micro level.

Jackson and his cooperators (1995) performed the comparison between different methods of cluster analysis in the division of climatology stations of the Torrid Zone. Baldwin and his cooperators (2002) used cluster analysis to classify precipitation zones. In Iran, Heydari and Alijani (1999) with factor analysis, and cluster analysis, specified six homogeneous continental regions, and twelve sub regions. Sari Sarraf and Zolfaghari (1999) used cluster analysis to verify the precipitation of the north west of Iran.

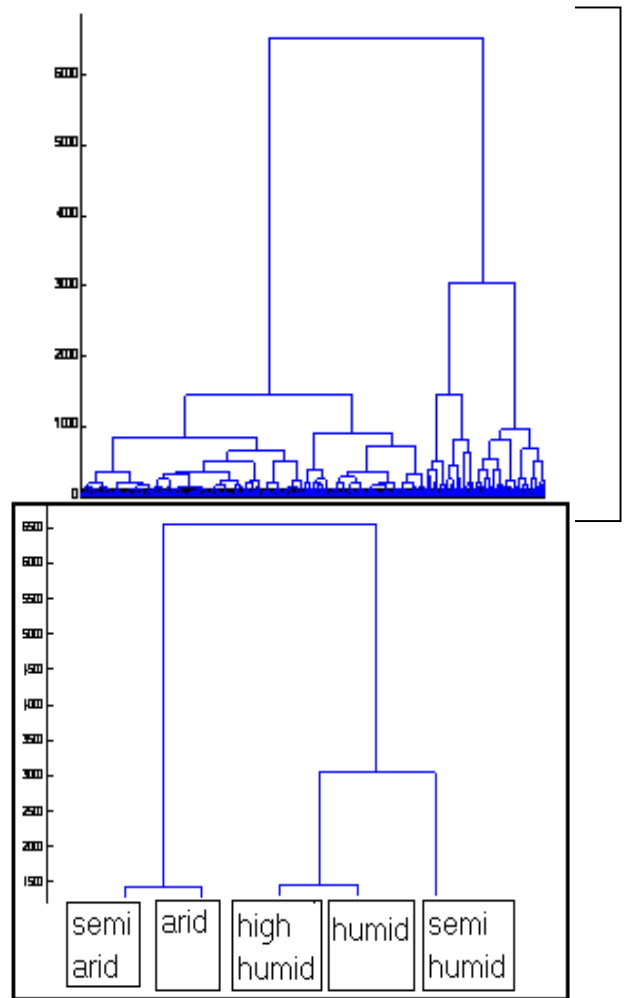
Ghanavati and Farajzadeh Asl (2000) used factor analysis method for identifying the partitioning of the latrine basins of physiographic. Masoudian (2003) with verifying 27 continental elements, stated that six factors are effective in creation of continental region

¹ -sohrabghaedi@gmail.com

of Iran and spatial configuration of this continental regions confirms the role of neighboring with seas and altitudes. Masoudian (2003) with rotation factor analysis method in Iran has identified three rainy. Torabi and Jahanbakhsh (2004) in introducing effective principle variables in classification climatically regions, stated that the most effective component is relative humidity and in the next order maximum and minimum temperature. Masoudian and Ataii (2004) with the use of cluster analysis identified five precipitation regions in Iran.

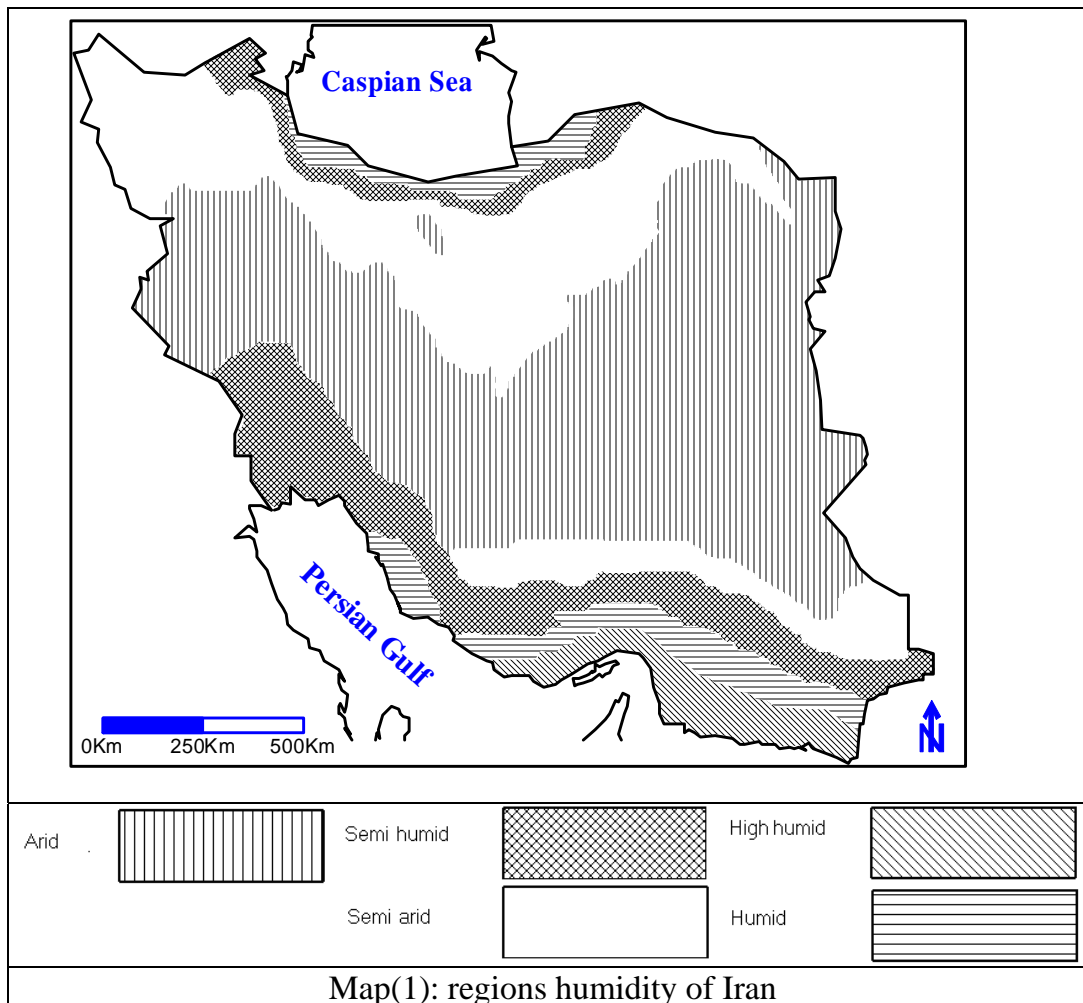
Data and methodology:

To evaluate and identify humidity seasons of Iran, first water vapour pressure data of Iran's atmosphere in hecto-Pascal (h.p) in the time interval from January of 1951 to December of 2000, about 50 years, from all of the synoptic and climatology stations are gathered and Iran water vapour data station is made. By means of Kriging interpolation method data points of stations were converted into surface. Then a principal component analysis is done on data to determine the most definition variance by components and reduce the volume of data. With the usage of cluster analysis, humidity regions.



chart(1) 5 regions of humidity classification of Iran

chart(2) humidity classification of Iran



are separated and the map of humidity regions of Iran is plotted. Statistic of each humidity region is calculated. Months of each clustered region and humidity seasons are identified. Humidity season means some months of a year which respect to atmosphere humidity content are similar.

Discussion:

Humidity regions specified in this project, are named on the basis of atmosphere water vapor pressure data of each region. These regions are: high humid region, humid region, semi humid region, semi arid region and arid region. Of course it must be noted that here the intention by humid region is high humidity of atmosphere. Since for precipitation in addition to humidity of atmosphere other factors must be available, water vapour of

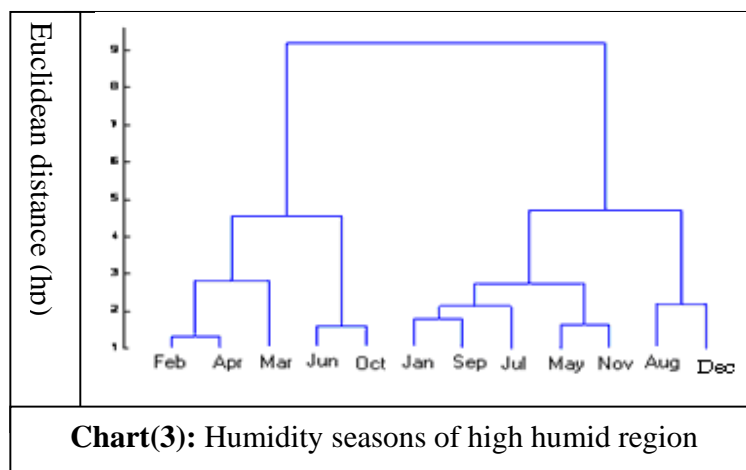
atmosphere of a place does not necessarily means a rainy place. Thus must differentiate between humid regions (full of atmosphere humidity) and rainy regions.

1- High humid region:

High humid region is as a narrow belt which starts from Gwadar Gulf and shores of Oman Sea and extends to boundaries of Kangan Seaport in the north of Persian Gulf. This region covers about 4.2% of Iran's area. The average of humidity in terms of water vapour pressure in this region is 19.7 hecto Pascal.

High humid region consists of three humidity regions. In this basis August and December months makes a separate cluster. This two months show the least amount of humidity.

November, May, July, September and January months, make other humidity season. The amount of humidity of this season is between the that of seasons of this region. Third season of this region involves October, June, March, April and February months. This season respect to two before season is heterogeneous and October and June months show high difference with other months of this region such that another clustering for this region is also applicable.

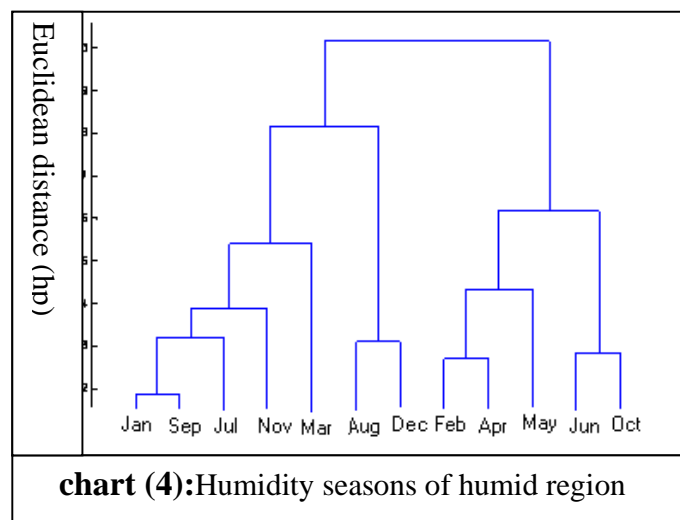


2-High humid region:

This region can be observed in the two sections of Iran. The first in the south of the country (in the north of high humid region) i.e. along with forth shores of Oman Sea which extends to Bushehr Seaport and the second in the coasts of Caspian Sea which in this section covers all of the northern shores of Iran in the south of Caspian Sea. The extent of this region is 6.4% of Iran's area. Average humidity of this region is 16.1 hecto Pascal.

The triple seasonal nature of this region can be identified in the basis of three main clusters. June, October, May, April, and February months are in one cluster. Of course June and October months, to some extent show differences with other months. In this season the most amount of humidity is observed. In contrast December and August form the low humid season of this region. March, November, July, September and January months are in other cluster of this region and makes the third humidity season of this region. (Chart 4)

The most monthly variance is related to the April month (1.7) and the least amount of that is related to the November month. (1.4).



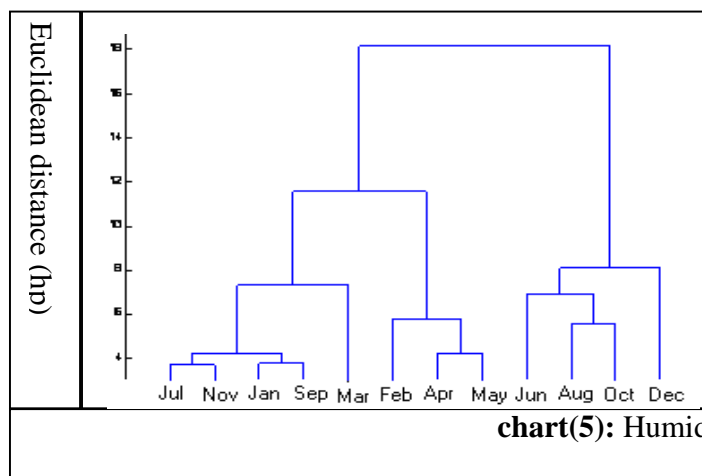
3-Semi humid region:

Semi humid region involves two belts, one in the south of Iran, which continuously in the north of humid region begins from the boundary of Iran and Pakistan in the south of Sarvan, and continues to west of the country, from the coasts of Persian Gulf to Eilam Province. Another region as a belt is located in the north of Iran (in the south of humid

region), which allocates the zone from Astara to Torkaman Sahra to itself and coincides with Alborz mountains (Map 1). This region allocates to itself 15% of the Iran's area. The average of humidity of this region is 12.7 hecto Pascal.

Humidity seasons of semi humid region like other regions can be divided into three seasons. December, October, August and June months make one of the humidity seasons of this region. The amount of humidity of this season is less than other seasons which of course the December month has the least amount of humidity among the months of this season. In contrast May, February and April months which are in one cluster, are humid season of this region. March, September, January, November and July are another humidity season of this region which the amount of its humidity is between two other seasons.

The most variance in this region is related to the May month (1.37) and the least amount is related to the September month (1.29).

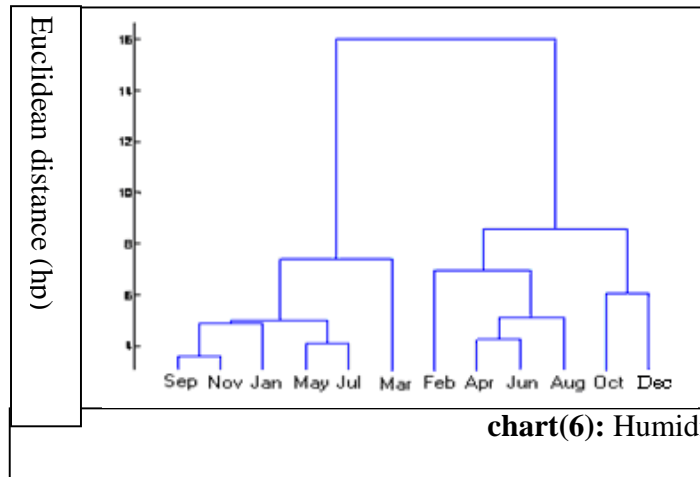


4-Semi arid region:

This region can be identified in the two sections of the country. First as a narrow and continuous belt is located in the southeast of the country which in the north of semi humid region from Taftan mountain to southwest, extends on the high mountains of Fars province. Another region covers all of the northern parts of the country in the south of semi humid region from Azerbaijan to northeast zones of the country on the mountains

of Binalood. This region which the average of its humidity is 8.8 hecto Pascal, allocates to itself the area with the extent of 26.2 % of the total area of the Iran.

The mentioned region also with respect to humidity seasons is divided into three seasons. December and October months are in one cluster and create one humidity season. The amount of the humidity of this season is less than other seasons. August, June, April and February months make another humidity season of this of this region. The amount of its humidity is more than other seasons. In this season the February month is different from other months. The third season of this region is a heterogeneous season which involves July, May, January, November and September months and the March month with a jump is under other cluster of this season. The most variance in this region is related to the March month (0.95) and the least amount of that is related to the May month (0.82).

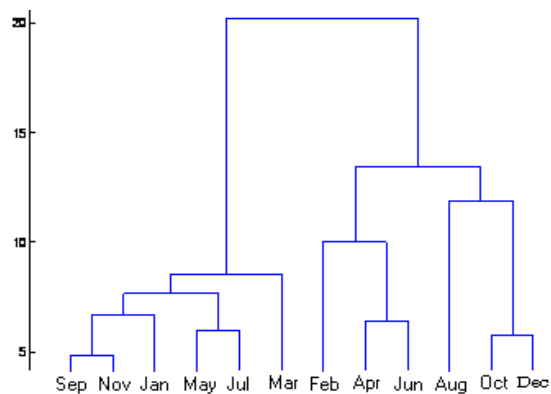


region

5- Arid region:

This region allocates to itself about half of the area of the country i.e. 48.2 %. This region begins from the northwest of Iran (north of Sanandaj) and covers the entire western Zagros. Entire sections of central Iran and northeast to southeast also are under the coverage of this region. The average of humidity of this region is 7.7 hecto Pascal which in comparison with other regions has the least amount of humidity.





chart(7): Humidity seasons of arid region

With respect to humidity arid region has triple seasonal nature. August, October and December months which make the least humidity season, are in one cluster. Among these months the August month is more heterogeneous. February, April and June are another humidity season of this region. The third season which is more heterogeneous than other seasons contains six months: March, July, May, January, November and December.

The most variance in this region is related to the May month (0.72), and the least amount of that is related to the December month (0.66).

Conclusions:

To classification Iran’s humidity into seasons, a cluster analysis is done on the water vapour data (water vapour pressure) during a 50 year time period (1951-2000). This analysis shows that five humidity region can be identified in Iran which are: 1- High humid region: It includes of a narrow belt near Oman sea with average of humidity of 19.7 hecto Pasacl. 2- Humid region: It includes of two narrow strips, first in the southern coasts of Caspian Sea, and second in the north of high humid region, so i.e.

it is located in the shores of Oman Sea. The average of humidity of this region is 16.1 hecto Pascal. 3- Semi humid region: It is located in two sections of Iran, first in the north of Iran (in the south of humid region from Astara to Torkaman Sahra) and second in the south of the country (in the north of humid region, from the most eastern part of the country to the north of the Persian Gulf). The average of humidity of this region is 12.7 hecto Pascal. 4- Semi arid region: It is in the form of two strips in the interior part of the Iran, and is confined between semi humid regions. The average of humidity of this region is 8.8 hecto Pascal. 5- Arid region: It is very wide and covers half of the area of the country. This region includes all of the central Iran and is limited to other regions. The average of humidity of this region is 7.7 hecto Pascal. Generally it can be stated that the amount of water vapour of Iran is a function of the distance from sea, and it is determined with respect to adjacency to or distance from the sea.

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