Geoscience and Remote Sensing (2024)
Clausius Scientific Press, Canada

DOI: 10.23977/geors.2024.070101
ISSN 2523-2592 Vol. 7 Num. 1

Time Series Characteristics of Terrain Data

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Keywords: Time series, DEM, Feng Shui, Goguryeo

Abstract: Traditional Chinese geography has a basic concept: people choose the terrain, and the corresponding terrain is also related to people. For a long time, the analysis of mountainous terrain from the perspective of people has influenced the understanding of terrain, but today, the explanation of terrain from the perspective of terrain profiles, Digital Elevation Model (DEM) data has updated the method of understanding terrain. DEM data provides data support for terrain profiles. This article treats terrain profiles as time series data, although there is a view that time can be studied in a fixed spatial position, or space can be analyzed at a fixed period [1]. In the specific example of the Goguryeo Mountain City, this article compares the archeological and historical data of the mountain city and finds spatial correlation between the terrain features of the mountain city and the historical development features. Traditional Chinese geography believes that terrain influences the development of history, and the connection between the two can be explained by "image". This article believes that the connection between the two can also be solved by "number". This explanation is not only applicable to the historical field, but also to other issues explaining terrain features. This article finds that time series data can represent a force in the terrain. This article proposes an analysis method that can find time series feature analysis, which can be combined with the target terrain.

1. Introduction

Traditional Chinese geography believes that terrain is dynamic. Different from the modern plate movement theory's focus on the formation of the crust[2][3][4][5][6],the ancient Chinese paid more attention to the impact of dynamic terrain on the real world in everyday life[7]. However, the West takes a different approach[8]. Perhaps the ancient Chinese people's thinking in exploring geography[9] was not based on an ideal model, but for practical purposes. After all, the Chinese philosophy is a philosophy of practical rationality, while the West followed the Greek philosophy of pure rationality[10]. In the past thousand years, the topographic characteristics of the place and its historical development characteristics have been connected by the "image" from the human perspective[11] . This article interprets the connection between the two through "number", that is, using the analysis method of time series data to solve the terrain profile. In the era of using "images" from a human perspective to connect the terrain and its historical development, errors exist, because being based on a human perspective means that a change in viewpoint, or even a change in visual height[12], will lead to changes in the picture. Although there are ways to compensate for this possible error[13] errors are widespread. This kind of error also affects the description of geographical documents, because even if the visual height and viewpoint are almost the same, or can be compensated, people's description of the scene at a specific visual height or viewpoint is still emotional. It is subjective for people to understand the characteristics of human perspective. However, this article uses data to extract terrain features, which provides a way to use machine language to analyze and extract terrain features, when terrain digitization has been completed. There are abundant studies on spatial time series[14]. This paper finds that time series data can represent a force moving within the terrain. This force is described by traditional Chinese geography, although it seems almost metaphysical today. This article first analyzes the concepts of traditional Chinese geography, and use the analysis methods for time series data to extract terrain features, and compare the terrain features with the historical data of the era where the case is located. It is found that the spatial location of the terrain features that are clustered into one category can be mutually corroborated with historical data in terms of spatial distribution. If topographic data can be extracted from time series features, this will form the technical foundation for addressing broader issues. It will become possible to analyze a wider range of topographic data through algorithm-based analysis to extract features, and to correlate these topographic features with features from human history.

2. The driving force of dynamic terrain

The reasons that traditional Chinese geography believes to promote terrain movement were first recorded in the "Burial Sutra". Guo Pu said in "The Burial Sutra": "The "Qi" will disperse when it rides on the wind, and it will stop when it is bounded by water. The ancients gathered it so that it does not disperse, and propeled it so that it will stop. Therefore, it is called 'Feng Shui'."[15] "When it rides on the wind, it will disperse, and when it is bounded by water, it will stop."[16] is considered to be the explanation of the term 'Feng Shui'. The wind and water described in the original text refer to the wind and water in nature, but this description starts from the phenomenon, not the cause. If we start from the reasons, it should be that where the wind can blow, the earth's energy will disperse, and where the water can gather, the earth's energy will stop. Regarding "Qi", the "Burial Sutra" also says: "The Qi moves in the shape of the earth, and things are born from it. The Qi moves in the earth and emerges to produce all things. Its movement is due to the power of the earth. Its gathering is due to the force of the earth. The subject of the original definition of "Feng Shui" is "Qi", and the verb after Qi: "rides, bounded," is the behavior of Qi, and "disperse, stop" is the result of "rides, bounded". The ancients here described Qi as actively "rides, bounded". However, if interpreted from a worldly perspective, Qi should be regarded as a passive party. That is to say, it can be dispersed by the wind and stopped by the water boundary.

Specifically, "it can be dispersed by the wind and stopped by the water boundary" can be described like this.

From the origin of Zulong's veins, the Qi gradually rises and falls from its maximum value until it disappears at the level. The terrain profile reflects the ups and downs of Qi movement, that is, the Qi veins can be represented by the terrain. Just as, if you look at a nadir in isolation, it behaves like a ball dropped from its highest point, and bounces back and forth over the land as resistance gradually comes to rest. On the one hand, when it is at a low point on the path of rebound movement, and there are no mountains are blocking it on both sides, that is, there are no other air veins are running aside, the natural wind may blow through the valley[17], and the movement path of the air veins is at this point. It may turn in multiple directions, manifesting as "dispersion". On the other hand, when it becomes stationary at the end of its operation, the terrain gradually becomes flat, and natural water may accumulate in the flat places[18], which is expressed as "stop".

Therefore, in this explanation: "can be dispersed when the wind rides on it, and can be stopped by the water boundary", if the subject is completed, it should be: "Qi", which can be dispersed when the terrain can be ridden by the wind, and can be spread when the terrain can be stopped by the water boundary. Therefore, in the theory of ancient geography, the ups and downs of the terrain are considered to reflect the movement of the Qi vessels, that is, the Qi vessels are represented by the terrain. Phenomenonally, the causes of this movement are summarized as: wind and water.

Practically speaking, the ancients paid attention to the movement of Qi vessels, and one of the reasons was to determine the location of cities suitable for human habitation. The Qi veins connecting cities may be long or short, and this distance is believed to determine whether the city corresponding to a specific Qi vein is the imperial capital, a county, a town, or a village[11]. As for the reason for this correspondence, the Qi veins running from the same starting point will continue to branch, and some branches will form cities. The farther the one-to-one corresponding Qi veins run in these cities, the higher the level of the town is. The reason why the starting point is the same and the result runs far is that the dissipation in the route is small. But no matter how far the path is, when the Qi veins are dissipated to a certain level, a location that can be used as a city will be nearby. The process of dissipation is similar. No matter how far the Qi veins run, it can be said that the mountain city is chosen because of the Qi veins.

In short, the Qi veins are represented by the terrain, and the mountain city was chosen because of the Qi veins. It can be seen that the terrain representing the Qi veins reveals the reasons for the city's location. Each branch of the same air vein is similar in the dissipation process. If the air vein can represent terrain relief, the terrain relief data of each branch on the same air vein should also have related characteristics, that is, the correlation between mountain cities selected for different air veins. Therefore, the undulations of the terrain can represent the operation of the Qi veins, and the degree of dissipation of the Qi veins reveals the site selection of the city. Therefore, the location of a city can be characterized by the topographic relief of its veins.

3. Method

The mountain city point data is compiled from "Research on the Ancient City of Goguryeo"[19], and the geographical coordinates are recorded from archaeological data and inferred from descriptions. On the one hand, the archaeological data record is based on the "Research on the Ancient City of Goguryeo"[19]; on the other hand, the location of the ancient city inferred from the description is based on the "Research on the Ancient City of Goguryeo"[20] and "Compilation of Research on the Sites of the Ancient Bohai City of Goguryeo"[21].

3.1. DEM data, mountain city location data and sampling

First, the mountain city data with existing coordinates is directly used. Secondly, the description of archaeological data is mainly based on the administrative division and the relationship between the mountain peaks, rivers and the administrative division where the mountain city is located. Generally speaking, to infer the coordinates of a mountain city based on the description, first determine the approximate location based on the specific location of the village, then confirm the location of the mountain peak according to the described direction and distance, and then determine the coordinates based on the relative position of the river. The mountain cities of Goguryeo are surrounded by mountains and waterways, but there are also a few mountain cities without rivers nearby. Explicitly speaking, first, the location of a mountain city is generally determined by the orientation and distance of the mountain peak from the nearby village. If a river flows through the mountain city, it will also indicate whether it is on the left bank or the right bank of the river, and which direction the river is in the mountain city. Second, there are railways or roads near some mountain towns, which is also a reference. Third, some mountain cities appear in groups, with positions and distances referenced between them. Fourth, of course, some essential mountain cities have been marked on the map. Such mountain cities are based on the location automatically located by retrieving the name of the mountain city on the map.

The most essential area of data involved in this article is DEM elevation data, and the data source is the public data set of the Geospatial Data Cloud: ASTER GDEM30. Regarding the data set ASTER GDEM30, "This data set is processed using the data of the first version of ASTER GDEM (V1). It is a digital elevation data product with a global spatial resolution of 30 meters. Data period: 2009. Data type: IMG. Projection: UTM/WGS84. Coverage: Global. Spatial Resolution: 30 meters".[22]

The number of Goguryeo mountain towns is limited, so a large sample is used [23]. From the 236 mountain cities, 198 cities with detailed descriptions were selected as research objects. Excluding flat cities and mountain cities without longitude and latitude, that is, mountain cities without profile data, a total of 184 mountain cities were used as data sources for clustering.

3.2. Characteristics of the specific operation model of "Qi"

Generally speaking, the characteristics of the particular operation model of "qi" are firstly autocorrelation, secondly correlation, and finally coexistence.

Autocorrelation: Suppose we look back at the Qi vein of several sections from the mountain city. If a time series data has multiple levels of periodicity, then the running rules of the Ganlong stationed at the mountain city and the Yinglong Qi veins close to the mountain city are nested.

The “Burial Sutra” describes how Qi works: "Thousands of miles of mountains each have ancestors, and then see parents, fetal breath, pregnancy, and then take shape. Ancestor, parents, fetal breath, pregnancy, these words are explained and summarized in "Geography: What the Son of Man Is"[24] It is "the order of superiority and inferiority, and the ethics of large and small". Order and ethics are auspicious places. Specifically speaking, "ancestor, clan, father, mother, fetus, breath, pregnancy, childbirth" is a metaphor, regardless of whether it is good or bad. Interpreted from the perspective of "honor and inferiority", these metaphors are like star peaks. The star peaks of ancestors are followed by successive peaks, and then there are peaks, which are the star peaks of ancestors, and so on. The operating state before it became a city was that one peak started from a high place and then peaked again. This shows that it is not limited to eight cycles, but has a periodicity of recurring peaks. Similarly, these metaphors are interpreted from the perspective of "size", which means that between cycles, the average value of the terrain relief in each cycle has a large or small change. In short, the transformation of height and size can be described a peeling transformation, that is, the transformation of "shape", and this transformation is cyclical and trendy.

"Shaking the Dragon Sutra" describes how Qi works: "Look at him leaving the building and going down to the hall. When he comes out of the tent, he will see the shape of the rising star. The shape of the rising star will be different. This is the evidence of branching and splitting veins."[19] The place where he quits the tower and goes down to the hall is the place of ancestors and clan; in front of the star should be the city junction, and in the back should be the main clan. This means here is that there was a peak at the ancestor and ancestral peak, and then it fell repeatedly and formed various star peaks of different shapes, and the split star peak that was about to join the mountain city was called "Yingxing". In short, the characteristics of ancestors and corresponding stars are the consistency of "shape", or the correlation across the cycles mentioned above.

Combining the above two points, from the perspective of the entire operation process, there is a nested periodicity in the law of terrain fluctuations. From the top to the bottom of the operation stage, the same law repeats at different levels. Specifically, starting from the starting point, the level of dividing branches is four levels, namely: stem within stem, arise within branch, branch within stem, and branch within branch.[25] At four different levels, the dissipation process is cyclical at different levels, not only within the level, but also between levels. Looking specifically at a mountain city, a branch tracing upwards from the city can reflect this self-correlated characteristic.

Correlation: It is assumed that from the level of branches to branches, if the terrain relief between branches is related, then they have the same superior level.

"Shaking the Dragon Sutra" describes how Qi works: "As soon as the gathering is completed, the lectures are separated, and the ancestors are separated. The ancestors have traveled a long way. Looking for the ancestors, the direct descendants, and the children, the dragon coming here is the most suspicious.[19]" Specifically speaking, "gathering" refers to the "leaving the building and going down to the hall" mentioned above, which is divided into a series of levels of "ancestors and ancestors". Although the above text only says: "ancestors, direct descendants, children", in fact Without being limited to this, this article just points out that Qi vessels have a tree-like structure like a pyramid.[26]

Specifically, branches at other levels will gather at different levels. For example, at the level of branches within branches, different branches themselves have periodicity. As branches at the same level, they have a common branch-in-branch, and there is a Correlation. That is, each level is developed with a typical pattern and the mountain cities are scattered among various branches. In short, the correlation can be found through hierarchical clustering based on the correlation of Qi veins.

Coexistence: Assume that the same superior and its subordinates are nested, that is, autocorrelation and correlation are established simultaneously. If a tree structure diagram can be obtained based on correlation hierarchical clustering, then the mountain city organizational structure is this tree diagram.

Specifically, whether it is the periodicity between the terrain undulations of a single vein itself, or the hierarchical branch structure between different vein branches, they are all based on the topography of the same area. That is to say, autocorrelation and correlation are other aspects of the same event. Autocorrelation and correlation can be compared to: cross-sectional view and plan view, which can be used to illustrate the organizational form of Qi channels.

In short, autocorrelation is seen from the undulations of the profile, and correlation is seen from the plane branches. Historically, the descriptions of the ancients were based on explanations from one side, and this article strives to present the laws of common correlation between the two sides. This paper uses DEM elevation data to first characterize the movement of air veins with terrain fluctuations and record them as time series data. Then, it explores periodicity through autocorrelation and partial autocorrelation, explores the similarity of branches through correlation coefficients, and uses correlation coefficients for hierarchical clustering. Finally, a tree diagram of the organizational form of the mountain city obtained by combining the cross-sectional perspective and the planar perspective is presented.

3.3. Mathematical operations that represent features

Generally speaking, the mathematical operations of the operating characteristics of "qi" also correspond. First is autocorrelation, second is correlation, and finally is coexistence.

Autocorrelation: Taking Sandaogou Mountain City in Baishan as an example, the selection of sections goes back along the mountain. Its autocorrelation plot is greater than the confidence interval for a long time, indicating the existence of autocorrelation, as shown in Figure 1. The partial autocorrelogram peaks appear after lags of 1, 2, 3, and 15 orders, as shown in Figure 2, indicating the existence of multi-period periodicity,[27] and spectral transformation also confirms these two points, as shown in Figure 3-4.

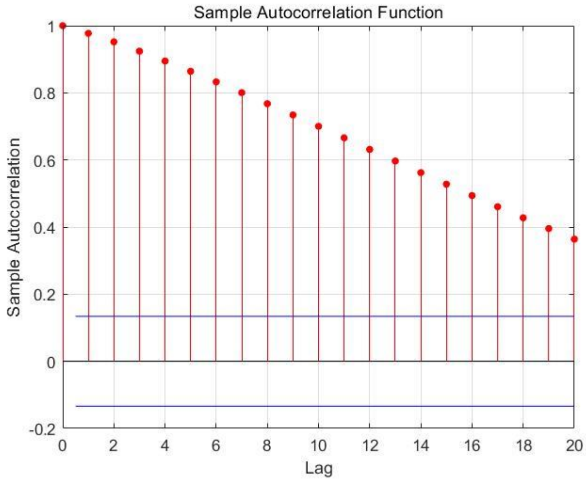

Figure 1: ACF.

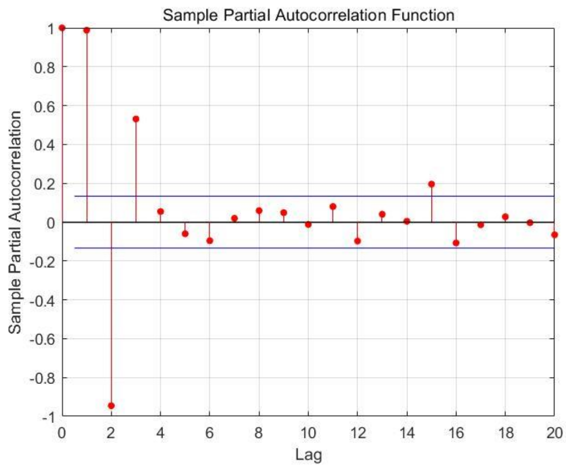

Figure 2: PACF.

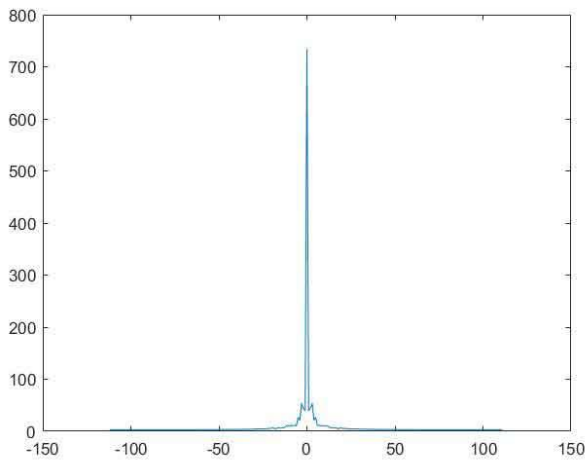

Figure 3: Fourier_ALL.

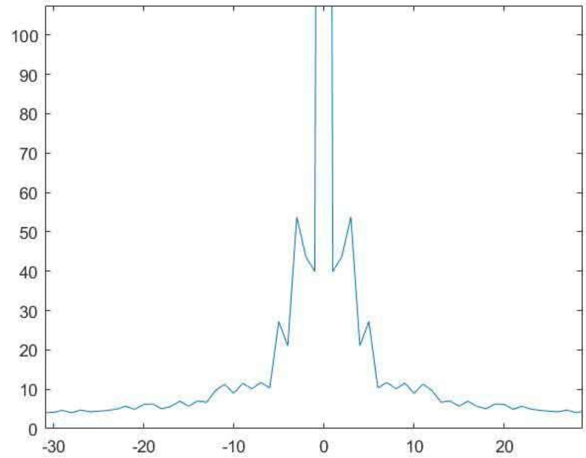

Figure 4: Fourier_PART.

Specifically, by presenting the layers in the traditional geographical location selection method in ARCGIS, and overlaying the surface layer: DEM elevation data, and the point layer: mountain city points, we can trace the formation source path of the mountain city location on the terrain. A section line in space is obtained.

Correlation: Interpolate [28] lines in space to obtain a series of elevation time series data. Find the similarity of all elevation time series data in MATLAB. Because the data is not normally distributed, the Spearman coefficient (1) is used.[29]

If all ranks in each column are different, the equation simplifies to:

$$\text{rho(a,b)} = 1 - \frac{6\sum d^2}{n(n^2-1)} \tag{1}$$

where d is the difference in ranks of the two columns and n is the length of each column. In formula (1), a and b denote two sequences used to calculate the correlation.In this article, the correlation between all data sequences is calculated and represented as a matrix.The row and column headings of the matrix correspond to the same sequence of mountain names, ensuring the consistency of information conveyed by both the upper and lower triangular matrices.The diagonal, however, has a value of 1. This is merely a formula demonstration of the calculation algorithm for the correlation between two sequences.

Precisely, the Spearman correlation coefficient was calculated in MATLAB based on the time series data, and the correlation coefficients calculated for 16,836 mountain cities were obtained. Among them, significant ($p<0.05$) data accounted for 97.3%, and very substantial ($p<0.01$) data. Accounting for 96.5%, that is, 97.3% of the data can exclude the influence of random errors, most of which are significant.

Coexistence: After obtaining the similarity matrix, convert it into a distance matrix.

Similarity coefficients usually have to be converted into dissimilarity (distance) coefficients.[30] Owing to the inherent nature of the correlation, its maximum value being 1, if the correlation is 1, it signifies that the two items being compared are identical. Conversely, if the correlation is 0, it implies that the two items are distinct. Thus, the subsequent conversion formula (2) embodies the concept of non-correlation. Given the data characteristics examined in this article, the sum of non-correlation and correlation is 1.

$$\delta rs = 1 - Srs \tag{2}$$

Specifically, hierarchical clustering using the WARD.D2 calculation method in R is a clustering method that minimizes variance in variance analysis. Variance is a statistical concept,[31] which corresponds to the meaning of difference in sociology,[32] and this algorithm is used to pay attention to the difference of each piece of data, as well as the similar relationship at this level. Thus, the clustering results of mountain cities based on terrain similarity are obtained.

3.4. Analytical method

First, the one-dimensional array elevation data based on DEM elevation data is obtained through the interpolation method. Because it is obtained based on the operation of Qi veins, it is regarded as time series data. The interpolation is calculates the DEM elevation value of the point at the longitude and latitude position of each step based on line data on the DEM data layer and the equivalent step size. In traditional geography, the terrain formation is regarded as a kind of driving force spreading from the Zulong Dharma to the surrounding areas. If this dynamic factor is viewed as the driving force that causes terrain fluctuations, then the elevation fluctuation of the terrain is like a distance function diagram of the occurrence time of this dynamic factor. Then, when the elevation of the terrain is known, the result of interpolation according to a specific step size may be understood as time series data. In this article, this step size is set according to the spatial resolution of the DEM elevation data, that is, 30 meters is an interpolation step size. In this way, the accuracy of the DEM elevation data will not be wasted, nor will the step size be too precise, causing uncertainty in the system's estimation.

Specifically, in one-dimensional time series data, by analyzing the autocorrelation coefficient (ACF), partial correlation coefficient (PACF), and spectral transformation,[33] it can be concluded that there is periodicity in a Qi vein. In time series data, the physical meaning of the calculation of autocorrelation coefficient (ACF) and partial correlation coefficient (PACF) is the correlation between the new time series data and the original time series after excluding the data at one or specific time points of the time series data.[34] When the autocorrelation coefficient (ACF) and the partial correlation coefficient (PACF) exist, it can indicate the existence of its correlation, and the occurrence of a peak in the spectral transformation, which means that there is periodicity at this peak[35]. Therefore, both types of data processing represent cycles that exist cpmpared to oneself. The existence of such characteristics in the data also confirms the above analysis of the pattern of terrain profiles.

Then, by calculating the correlation coefficient of multiple columns of time series data, the degree of correlation between Qi pulses can be obtained. In the above model reasoning, there is also a more comprehensive range of periodicity between terrains of the same vein. In data processing, it is shown that the correlation between different time series exists.

Finally, through hierarchical clustering based on the correlation coefficient, the organizational relationship diagram of the mountain city is drawn. When the correlation between additional time series is measured, the stability of the correlation is different. Based on the strength of the correlation, it may be possible to calculate the mountain city organizational chart. For the corresponding model analyzed above, the context of the same starting point will be split, and there will be periodicity in the same context. Therefore, when subdivided, there will also be periodicity related to the initial starting point, although the stability of the periodicity is different. Clustering based on periodicity, that is, clustering based on the strength of correlation, may be able to describe the data characteristics that exist periodically but have hierarchical differences in the model. This differentiated organizational chart also extracts the relationship between mountains and cities at an abstract level.

As a result, in R language, use the correlation distance matrix based on the correlation coefficient matrix to perform bottom-up hierarchical clustering to obtain a cluster diagram. The number of clusters is divided into three levels as shown in Figure 5: large, medium and small, that is: 4 Category, Category 8, Category 12.

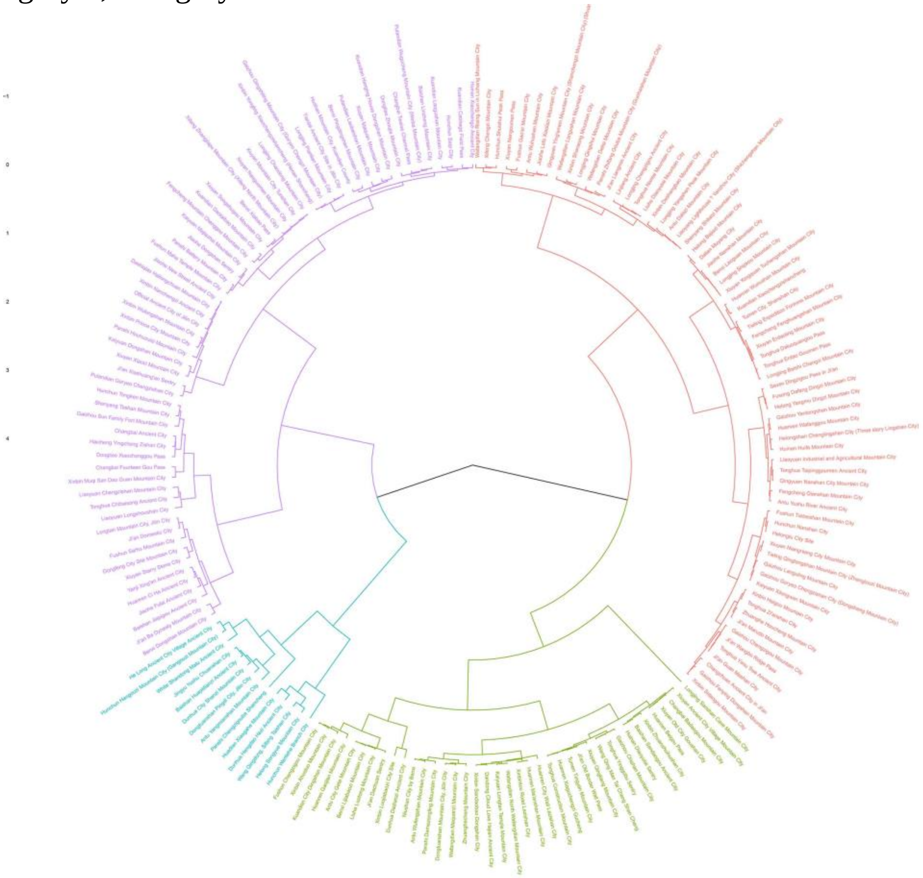

Figure 5: H-CLUSTER.

4. Data and Results

In "Reading Comprehensive Mirror Theory" Volume 19, "Emperor Yang ·Part 3", Wang Fuzhi cited the "Yang in Fifth Place" from the "I Ching Ᵽi Obstruction"[36]. He discussed the history of Gaogouli's decline[37], initially due to fears of the fall of Chen Dynasty and its diminishing power, subsequently enduring campaigns led by Emperor Wen of the Sui Dynasty, Emperor Yang of the Sui Dynasty, Emperor Taizong of the Tang Dynasty[38], and Emperor Gaozong of the Tang Dynasty, leading to the downfall of the royal temple.From the perspective of the six lines in the "Pi" hexagram, this article divides Gaogouli's history into seven stages.The correlation between the mountain cities of Goguryeo can be characterized by the time series characteristics of the terrain, and its significance needs to be explored in correspondence with the spatial distribution of historical materials. The history of Goguryeo can be divided into seven stages, namely: stage 0, departure from Buyeo, stage 1 tribe formation, stage 2 tribe annexation, stage 3 competition for development space, Stage 4 is the mutual market, stage 5 is the beginning of the country’s subjugation, and stage 6 is the country’s subjugation. There are seven stages of development, a total of six evolution processes. In comparing historical theory and topographical feature data, it involves the formation period of the Goguryeo state, that is, "stage 0 departures from Buyeo’s Kingdom" to "stage 1 tribe formation". First, the following summarizes the historical facts:

4.1. Run away from Buyeo country

Jumong, recorded in the "History of the Three Kingdoms" as Prince Buyeo, was mistreated because of his background. Buyeo Country is located in a valley and lacks communication with the outside world due to the terrain. Encouraged by his mother, Ju Mong left Buyeo and opened up new territory. The new tribe would become Goguryeo in the future.[39]

4.2. Tribe formation

When in tribal form, most of the annexations to surrounding tribes were not the use of force, but marriages with the capital Fuyu and peace talks with Song Rang, the king of Feiliu Kingdom.[39]

In short, it can be seen from the records in "Historical Records of the Three Kingdoms" that the first king of Goguryeo left the Buyeo Kingdom and joined forces with Choiwuyi, Moli, and Shaanfu who were still in tribal form to form the Goguryeo tribe. It can be seen from the "house built on boiling water" that cities have not yet appeared. But the tribal form was only temporary, and the Goguryeo people yearned for the national form. And the "gentleman" and "king established the capital" reflect the federal system established by Goguryeo's first king Jumong. In short, the Goguryeo people had lofty ambitions, which went far beyond leaving Buyeo and uniting tribes, but breaking through tribal alliances to establish a country.[40]

Secondly, at this stage, the spatial trend of Goguryeo's history was distributed in the direction of Buyeo State[41] in the northeast of its border.[42][43] The clustering result three branches are distributed in the northeast direction. The nation of Goguryeo originated in Buyeo State in the northeast, and this cluster branch diverged from the northeast toward its future hinterland along the transportation lines. At this time, there is no record of war, but it adopts alliances, peace and other actions to develop itself. The distribution of mountain cities in this branch reflects the peaceful development stage, as shown in Figure 6.

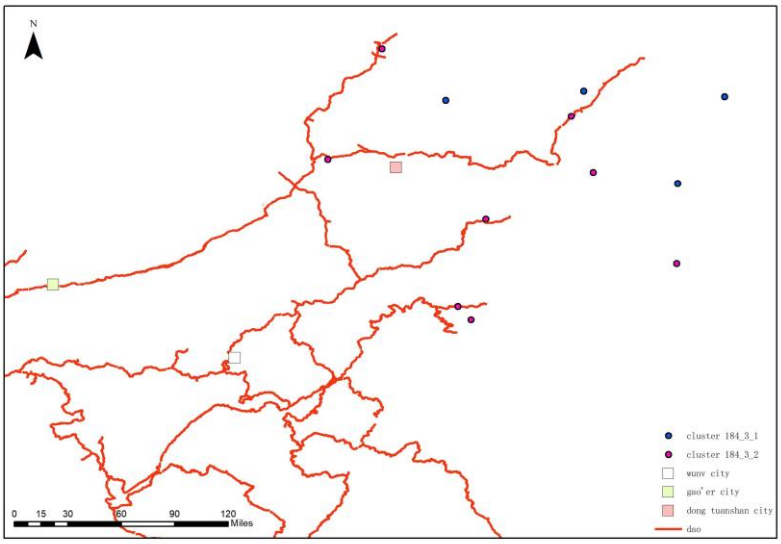

Figure 6: MAP_brunch3.

4.3. Fitting

Specifically, in branch 3, the mountain city numbered x1_103 is more prominent in terms of particularity, because its clustering node is the highest among the three branches. The mountain city numbered x1_103 is used as the representative of the particularity of branch 3 to perform model ordering and fitting, which is regarded as this Branch characteristics. The results are shown in Table 1:

ARIMA(0,1,4)(2,0,0)[12]:
Coefficients:
sigma^2 = 1.399: log-likelihood = -1331.95
AIC=2677.9 AICc=2678.04 BIC=2711.04

Table 1: Coefficients.

	ma1	ma2	ma3	ma4	sar1	sar2
	0.0277	-0.1930	-0.2332	-0.1978	0.0032	-0.0954
s.e.	0.0376	0.0426	0.0498	0.0456	0.0365	0.0396

5. Conclusions

The general spatial distribution trend of the historical materials of Goguryeo during the formation period of the country and the spatial distribution of cluster tree branch 3 are consistent in space. Therefore, the time series characteristics of cluster tree branch three represented by x1_103 are similar to the historical period of Goguryeo. In order to explore the inherent relationship between terrain and history, this article takes the mountain city of Goguryeo as an example to demonstrate the spatial data characteristics of terrain from the perspective of time series data analysis. The Goguryeo mountain cities in this article are concentrated in mountainous areas, and more diverse terrains are not included in the analysis. This article takes the mountain city of Goguryeo, a historical country, as the research object, and explores the connection between topography and history based on existing documents and archaeological data. In the future, we will start with clustering a small number of target terrain data features, select branches that can be used as labels for model fitting, and then classify more unknown terrain features with this label as the target. Perhaps we can filter out more unknown terrain features based on the target terrain features. Many places have the same meaning. R.J.RENNETT. believes in "Space Time Sequence" that time can be analyzed with fixed parameters of space, or space can be analyzed with fixed time parameters[44]. However, this article proposes another perspective that combines time series with spatial location, that is, using methods for time series data analyze terrain DEM data. This perspective provides a new way to analyze the connection between historical significance and terrain, and also provides a method to find more places with similar significance based on the existing target DEM terrain.The target terrain is diverse, and the application scenarios will be wide. According to ancient Chinese literature, the target scenes include but are not limited to: "Cinnabar Cave, fairy palace, ore, hot spring"[45].

In summary, this article suggests that time series data can represent topographic features and introduces specific analysis tools. This offers new insights into the processing of topographic data and offers potential for handling a broader range of DEM data than the case data discussed in this article. Furthermore, the processed topographic data's characteristics are not fixed, but can be tailored to the specific data features of the target location. In other words, the analysis tool proposed in this article is a framework, not constrained to specific characteristics. That is to say, this tool is adaptable and can be applied to various analysis problems.

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