

Characterization of Spatial and Temporal Evolution of Study Tour Bases in Zhejiang Province

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Abstract: The purpose of this paper is to study the spatial and temporal evolution characteristics of study travel bases in Zhejiang Province in the past decade, with a view to providing useful references for the development of study travel. First, the number, distribution and changes of study and learning travel bases in Zhejiang Province were sorted out by collecting and analyzing relevant data. Secondly, the spatial distribution and evolutionary trend of study tour bases are visualized using geographic information system (GIS) technology, and the spatial evolutionary characteristics of the distribution of study tour bases are summarized. Finally, the main factors affecting the spatial and temporal evolution characteristics of study and learning travel bases are discussed in the context of the actual situation, including tourism resources, traveler reception capacity, and socio-economic conditions. The study found that: 1) overall number growth of study and learning travel bases in Zhejiang Province from 2013 to 2023 can be divided into three stages. 2) There are obvious differences in the development of study and research travel bases between regions, Hangzhou has been in a dominant position, Ningbo and Wenzhou are developing rapidly, and the development of Huzhou, Jinhua and Lishui is relatively stable. 3) Zhejiang research and study travel bases are evolving towards the agglomeration form and are further strengthening. 4) Zhejiang research and study travel bases have shown a gradual change from scattered "patchy" to "patchy". 5) spatial pattern of the distribution of study and travel bases shows a north-south direction, and its center of gravity is relatively stable.

Keywords: Study Tour Base; GIS; Time-space Evolution; Influence Factor.

1. Introduction

"Learning" and "travel" has a natural coupling relationship, the old saying that "read ten thousand books, travel ten thousand miles" "Knowing is the beginning of the line, the line is the knowledge of success! "It is the precise depiction of learning in traveling and learning to gain. As an emerging form of study tour that combines educational activities with tourism experience, study tour not only promotes the diversification of educational scenarios, but also empowers the high-quality development of cultural and tourism industries.[1] The study tour is a new form of study tour that combines educational activities and tourism experiences. Therefore, in recent years, the strong support of the policy as well as the huge market demand, making study tours flourish.

At present, regarding the definition of the concept of study travel, the academic community has not yet formed a unified, is still in the exploration stage, but as far as research is concerned, according to the scope of the main body of the study is mainly divided into two dimensions: broad and narrow. From a broad perspective, study travel refers to any traveler to learn to seek knowledge as the main purpose, leaving the habitual place of residence to go to a foreign place for exploratory, learning special tourism activities. From a narrow point of view, study travel refers to the education department and school arrangements, the relevant study travel agency organization planning, students travel collectively, collective accommodation to participate in the planned, themed, purposeful experiential educational tourism activities. [2-3].

The study travel base is defined in the "Study Travel Base (Camp) Facilities and Services Code" as a place that has good

catering and accommodation conditions and necessary supporting facilities in or around itself, unique study travel resources, a professional operation team, a scientific management system, and perfect safety measures, and can provide students with good learning, practice, life and other activities in the course of study travel. Place.

In terms of the scope and scale of research on research and study travel bases, most of the studies mainly focus on the spatial distribution of the national scale [4-6] or fine-grained studies of individual bases [7-8] The research scope of the research scale, most of the studies mainly focus on the spatial distribution of the national scale or the fine study of a single base [7-8]. With the continuous expansion of research content, the scope of research has gradually begun to focus on the provincial and municipal areas. [9-10] and municipal areas[11] and even county[12] The research scope has only begun to focus on provinces, cities and even counties. In terms of research methods, commonly used analytical methods include nearest-neighbor index, kernel density, spatial autocorrelation and equilibrium coefficients, etc., which are used to study the type of spatial distribution of bases, high-density agglomerations, and the degree of regional differences.

2. Study Area

Zhejiang Province is located on the southeast coast of China, neighboring Shanghai in the north, Fujian Province in the south, Anhui Province and Jiangxi Province in the west, and the East China Sea in the east. With a land area of 105,500 square kilometers, Zhejiang Province governs 11 prefecture-level cities, including Hangzhou, Ningbo, Wenzhou, Shaoxing, Huzhou, Jiaxing, Jinhua, Quzhou, Zhoushan, Taizhou and Lishui. The terrain of Zhejiang Province is

predominantly mountainous and hilly, sloping from southwest to northeast. The province's largest river, the Qiantang River, passes through Hangzhou and empties into the East China Sea. The climate of Zhejiang Province belongs to the subtropical monsoon climate with four distinct seasons and abundant precipitation.

As a strong economic and cultural province in China, Zhejiang Province is endowed with rich natural landscapes and human resources, including a large number of historical and cultural heritages, which provide good conditions for the development of study tours. In recent years, the Zhejiang provincial government has attached great importance to the development of study tours and introduced a series of policies and measures, thus promoting the construction of study tour bases and improving the quality of study tours.

3. Data and Methods

3.1. Data Sources

As the data of the official research and study trip bases were released as early as 2019, compared with the time of 2013-2023, the content of this paper is less. As a large public social platform, "Weibo" has a large number of users and real-time data, covering a variety of travel, study and other related information. At the same time, the user participation on Weibo is high, and the data is relatively real. Therefore, this paper takes "study trip" as the keyword, and crawls the relevant data of "Weibo" website from 2013 to 2023 through python. Then we screened out the poi data in Zhejiang province, removed the invalid data, and took the remaining 518 data as the final research data.

3.2. Research Methodology

3.2.1. Nearest Neighbor Index

The nearest neighbor index is a measure of the type of spatial distribution of point elements by analyzing the proximity of nearest neighbor distances in geographic space [13] that is often used to measure the spatial distribution of tourist attractions [14-15] It is often used to measure the spatial distribution of tourist attractions. The formula is as follows:

$$R = \bar{r}_i / \bar{r}_e = \bar{r}_i / \frac{1}{2} \sqrt{N/A} \quad (1)$$

where R is the actual closest neighbor index; \bar{r}_i is the actual closest neighbor distance; \bar{r}_e is the theoretical closest neighbor distance; A is the regional land area; N is the regional study travel base. When R=1, it means that the distribution of point-like elements of research and study travel bases is random; when R>1, it means that the point-like elements of research and study travel bases tend to be uniformly distributed; when R<1, it means that the point-like elements of research and study travel bases tend to be agglomerated.

3.2.2. Kernel Density Analysis

Kernel density analysis is a quantitative estimation of the density of point objects using mobile units. The assumption is that geographic events can occur at any location in space but have different probabilities of occurring at different locations. The probability of an event occurring is high in areas with a high density of dots, while the probability of an event occurring is low in areas with a sparse density of dots[16]. Kernel density intensity clearly reflects the density of tourism elements in the surrounding neighborhood as a reflection of

the degree of density and dispersion[17], and its calculation formula is as follows:

$$\widetilde{\lambda}_h(s) = \sum_{i=1}^n \frac{3}{\pi h^4} \left[1 - \frac{(s-s_i)^2}{h^2} \lambda \right]^2 \quad (2)$$

where h is the location of the i -th research travel base within the radius space; s is the specific location of the research travel base; s_i is the research travel base that falls in the circle centered on s.

3.2.3. Standard Deviation Ellipse

The standard deviation ellipse in spatial analysis was first proposed by Lefever in 1926[18]. This method was later used to analyze the spatial distribution direction of tourist attractions[19-21]. It is a method to effectively measure the offset of the distribution centers of multiple elements and the overall clustering or dispersion trend of the target [17] The method is based on the following formula. Its calculation formula is as follows:

$$SDE_x = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{X})^2}{n}} \quad (3)$$

$$SDE_y = \sqrt{\frac{\sum_{i=1}^n (y_i - \bar{Y})^2}{n}} \quad (4)$$

$$\tan \theta = \frac{\sum_{i=1}^n \bar{x}_i^2 - \sum_{i=1}^n \bar{y}_i^2 + \sqrt{(\sum_{i=1}^n \bar{x}_i^2 - \sum_{i=1}^n \bar{y}_i^2)^2 + 4(\sum_{i=1}^n \bar{x}_i \bar{y}_i)^2}}{2 \sum_{i=1}^n \bar{x}_i \bar{y}_i} \quad (5)$$

In Eq.SDE_x, SDE_y are the main and auxiliary axes of the elliptical distribution of research and study travel bases, respectively; \bar{X} and \bar{Y} are the arithmetic mean center coordinates of all RLT bases; \bar{x}_i and \bar{y}_i is the distance from each RLT base to the arithmetic mean center; x_i and y_i are the coordinates of the spatial position of each research travel base; θ is the angle of rotation of the ellipse; n is the number of research travel bases.

4. Characteristics of Temporal Changes in the Distribution

4.1. Overall Volume Growth can be Divided into Three Stages

Table 1. Number of Research and Study Travel Bases in Zhejiang Province, 2013-2023 (Source: Author's own drawing)

vintages	Number	increase	development rate	growth rate
2013	29	-	-	-
2014	62	33	213.79	113.79
2015	86	24	138.71	38.71
2016	127	41	147.67	47.67
2017	138	11	108.66	8.66
2018	229	91	165.94	65.94
2019	280	51	122.27	22.27
2020	399	119	142.50	42.50
2021	439	40	110.03	10.03
2022	493	54	112.30	12.30
2023	518	25	105.07	5.07

The changes in the number of study and learning travel bases in Zhejiang Province during the period of 2013-2023 are sorted out to analyze the change rule of its time dimension. As can be seen from Table 1, since 2013, the overall number of study and learning travel bases in Zhejiang Province has increased year by year, and during the ten years, it has grown more than ten times from the initial 29 to 518 today. However, there is a significant difference in the rate of increase in the number of study and research travel bases in different years, with a large overall fluctuation, with a minimum of 11 new

bases and a maximum of 119 new bases; the minimum growth rate is only 5.07%, and the maximum growth rate can reach 113.79%. On this basis, taking into account the absolute increment and the size of the year-on-year growth rate, and combining with the development of research and study travel base landmark events, the evolution of the total number of research and study travel bases in Zhejiang Province is divided into three phases: the slow development phase, the rapid growth phase, and the development and recovery phase.

4.1.1. Slow Development Phase (2013-2017)

From 2013 to 2017, the development of research and study trip bases in Zhejiang Province was relatively slow, and the acceptance of most people was still not high, with an average annual growth of only 21.8. This may be due to a number of reasons. First, it is the low market awareness. In the early stages of development, the concept of study tours is not yet widely recognized and understood. Many people lack an understanding of its purpose, meaning and value, leading to relatively limited market demand. Secondly, policies and support are insufficient. Compared with the tourism industry at the time, study tours did not receive sufficient policy support and financial investment at that time. The government and relevant departments did not pay enough attention to it, leading to the slow development of the industry. At the same time, at that stage, there was insufficient integration of educational resources, a lack of cross-border cooperation, and a lack of multisectoral and multidisciplinary cooperation and support, which affected the pace of development of study tours. Study tours usually involve students traveling outside, and safety has always been a key concern for parents and schools, including transportation safety, accommodation safety, and experience safety. At that stage, the lack of sufficient experience and safeguards has led to concerns about the safety of study tours, resulting in limited market demand.

In order to encourage and support the development of study tours, the Government has issued a series of policy documents, which, on the one hand, clearly define the concept, objectives, implementation requirements and safeguards for study tours, providing strong policy support for the development of study tours; and, on the other hand, require regions to strengthen the safety management of study tours and to formulate contingency plans to ensure the safety of students in the course of study tours. At the same time, Zhejiang Province has actively promoted education reform and incorporated study tours into the education teaching program of primary and secondary schools. Schools have begun to explore study-travel curricula that suit the characteristics and needs of students and improve the educational effectiveness of study-travel. Moreover, the provincial government encourages regions to integrate tourism resources and develop study tour routes with educational significance to attract students to visit and learn; it encourages social forces to participate in study tours, including enterprises, museums, science and technology museums, and so on, and enriches the contents of study tours and improves the quality of study tours by cooperating with all sectors of the society. This has led to the growth in the number of study trip bases in Zhejiang Province, from 29 to 138.

4.1.2. Rapid Growth Phase (2018-2020)

The number of study travel bases in Zhejiang Province grew from 138 in 2017 to 399 in 2020, with the absolute increment accounting for more than 50% of the total increment in the past ten years, and an average of 87 new bases per year, with an average annual growth rate of more

than 40%, showing an explosive growth trend. Since 2017, the Department of Basic Education of the Ministry of Education released "the first batch of national primary and middle school students study and practice education bases or camps" publicity list, study travel in the domestic development in full swing, and many provinces and cities are actively involved in the creation of local-level study travel demonstration bases. Zhejiang Province, on the other hand, announced the first batch of Zhejiang Province primary and middle school students study and practice education base camp list in February 2019, and announced the second batch of Zhejiang Province primary and middle school students study and practice education base camp list in December at the same time. Counties (cities, districts) for primary and secondary school study travel respectively to determine the elementary school, junior high school, high school each more than 1 school first pilot, in the fall semester of 2020 began, but also in the province of all cities, counties (cities, districts) spread. This makes the study trip still in explosive growth after the epidemic appeared at the end of 2019.

From 2018 to 2020, the per capita GDP of Zhejiang Province exceeded 110,000 yuan, the per capita disposable income reached more than 50,000 yuan, and the per capita consumption expenditure of the province's residents was nearly 40,000 yuan. With the improvement of people's living standards, parents and students have a growing demand for quality education. Study tours, as a new type of education, have gradually received attention and recognition from all walks of life. Social capital has begun to accelerate its entry into the study travel market, and more and more enterprises and platforms have begun to actively participate in the construction of study travel bases, promoting the rapid development of study travel bases. For example, Touniu.com has set up a study trip division in Zhejiang Province to provide customized study trip services for students in Zhejiang Province, including themed camps, practical activities, and enterprise visits, etc. Songcheng Group has launched a number of study trip routes in Zhejiang Province with the theme of history and culture, such as the Hangzhou Songcheng Study Trip, the West Lake Culture Study Trip, and the Longquan Celadon Culture Study Trip. Therefore, in a situation where the tourism industry has been seriously affected by the epidemic, study tours have continued to rise, showing strong growth momentum.

4.1.3. Development Recovery Phase (2021-2023)

From 2021 to 2023, although the number of study travelers is breaking new heights, however, the study travel market involves many fields and industries, most of which are still affected by the epidemic and are in the recovery stage. The government, enterprises and all sectors of society have taken measures to further promote the development of study travel bases. First, the government has increased its financial investment in study and travel bases, upgrading their infrastructure and improving their educational quality. Second, as the impact of the Xinguang epidemic gradually waned, the cultural and tourism market in Zhejiang Province began to recover. Demand for study tours from parents and students gradually recovered, driving the business growth of study tour bases. The new crown epidemic prompted study tour bases to seek innovation and upgrading. Not only have they launched more study tour routes with special features, but they have also adopted digital technology to improve the quality of education as well as the management level and service quality of study tours. Hangzhou successfully held the

first study travel fair in 2023, exploring new paths and new modes for the high-quality development of study travel, building a platform for the exchange and docking of information and resources, and providing assistance for the development and upgrading of the city's study travel system. At the fair, experts and scholars for the "study +" to promote the common wealth of the new model for in-depth discussions, they are from a professional point of view and unique insights for the development of study tours to provide valuable advice. Research and study travel bases in Zhejiang Province have also begun to seek international development. They cooperated with international study travel organizations, introduced international advanced education concepts and teaching methods, improved the international influence of study travel in Zhejiang Province, and provided domestic and foreign students with better quality study travel resources and broader growth space.

4.2. Significant Differences in the Development between Regions

From 2013 to 2023, the number of study and travel bases in each city of Zhejiang Province shows a general trend of growth. However, there are differences in the number of study and travel bases among different cities. Cities such as Hangzhou, Ningbo and Wenzhou have a relatively large number of study and travel bases, while cities such as Quzhou, Zhoushan and Lishui have a relatively small number of study and travel bases.

In addition to this, the development history of research and study travel bases in Zhejiang cities is also different. As shown in Figure 1, the proportion of Hangzhou's research and study travel bases has been in a dominant position from 2012-2023, with the highest proportion being 38% and the lowest being 24%, basically fluctuating up and down at 30%. Ningbo and Wenzhou, on the other hand, started to gain momentum in 2014, with rapid growth rates, from 7% and 3% in 2013 to 12% and 11% today, and relatively stable in recent years. The development of Huzhou, Jinhua and Lishui is relatively stable, and has been maintained at about 7%, 10% and 3%, of which the proportion of Jinhua and Wenzhou research and study trip bases has basically been equal in recent years. The development of Jiaxing and Zhoushan research and study travel bases is relatively slow compared to the whole province, with their share dropping from the original 14% and 7% to 5%

and 3%. Shaoxing and Quzhou started later and did not have study and learning travel bases in 2013; however, the former developed faster than the latter, and the share of Shaoxing's study and learning travel bases surpassed that of Jiaxing and Huzhou in 2018. Currently, Shaoxing has 7% of study travel bases, while Quzhou has 2.5%.

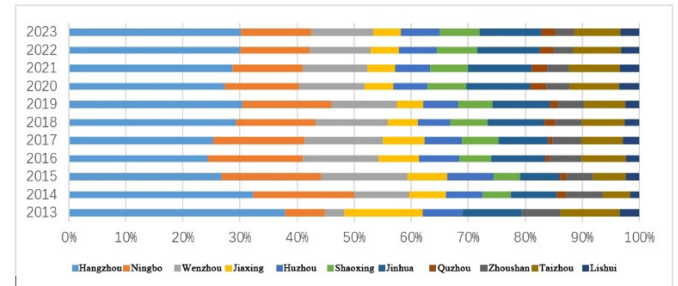


Figure 1. Structure of the proportion of study tour bases in each city of Zhejiang, 2013-2023 (Source of data: authors' own mapping)

5. Characteristics of Spatial Changes in the Distribution

5.1. Evolution of Research and Study Travel Base Clustering Pattern in Zhejiang

By applying the closest neighbor index method, the evolution of the clustering pattern of study and learning travel bases in Zhejiang Province is derived. As shown in Figure 2, the closest neighbor index range of Zhejiang study and learning travel bases is 0.4844-1.1607 for the six time periods from 2013 to 2023, which is less than 1 in all stages except for 2013, and through the significance test of P-value and Z-value, it shows that study and learning travel bases in Zhejiang Province have significant spatial correlation, and the overall study and learning travel base agglomeration pattern evolution shows a clear trend of agglomeration. In 2013, because the number of study tour bases was relatively small, and they were scattered in different administrative divisions and far away from each other, it resulted in the overall study tour bases showing a scattered pattern. In terms of different stages of development, the closest neighbor index basically shows a shrinking trend year by year, indicating that its spatial agglomeration is constantly strengthening.

Table 2. Nearest neighbor index and spatial structure type of research and study travel bases in Zhejiang Province, 2013-2023 (Source of data: authors' own mapping)

vintages	Number of study tour bases	nearest neighbor exponents	p-value	z-value	Type of space structure
2013	29	1.1607	0.0979	1.6553	dispersion pattern
2015	86	0.7885	0.0002	-3.7523	agglomeration pattern
2017	138	0.6679	0.0000	-7.4632	agglomeration pattern
2019	280	0.5579	0.0000	-14.1527	agglomeration pattern
2021	439	0.4844	0.0000	-20.6683	agglomeration pattern
2023	518	0.4922	0.0000	-22.1109	agglomeration pattern

Note: Z value less than -2.58 indicates clustering; P value less than 0.01 indicates significant.

5.2. Evolution of the Spatial Structure of Study and Travel Bases in Zhejiang

The kernel density tool was used to visually express the clustering area of Zhejiang's study and learning travel bases. In order to obtain a suitable kernel density evolution effect map, the radius was determined to be 30km after several tests, and the results were classified into 5 categories according to Jenks' natural discontinuity method, so as to obtain the

density map of spatial distribution of Zhejiang research and study travel bases (Figure 2).

In 2013, there were a total of 29 study travel bases, including 11 in Hangzhou, so a relatively obvious center was formed. At this stage, the overall degree of agglomeration of the spatial distribution of research and study travel bases in Zhejiang Province is not high, and it is more scattered, and there are a lot of blind zones in the distribution of research and study travel bases. From 2013 to 2017, the number of

research and study travel bases in Zhejiang Province continued to increase, and a more obvious centralized area appeared successively in Ningbo, Wenzhou, Jinhua, and Taizhou, but the distance of the distribution of each cluster is large, and the scope of the radiation area is small, which leads to There is a certain degree of fragmentation in the process of research and study travel.

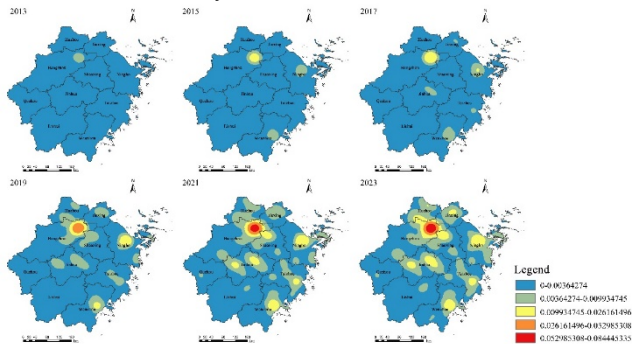


Figure 2. Spatial distribution density map of study tour bases in Zhejiang Province, 2013-2023 (Source: Author's own drawing)

From 2017 to 2019, there is a clear expansion trend in the scale of the cluster space in Hangzhou, which on the one hand shows a more obvious circle-type structure, and on the other hand, it is also the case that the area has formed a piecewise cluster space at the municipal level. At the same time, Jinhua has formed two relative agglomeration areas, which may be influenced by the distribution of study resources in Jinhua City. From 2019 to 2023, the density of study travel bases in Zhejiang Province has increased significantly, and the agglomeration scope of hotspot areas has further expanded in all directions, and the area of the main nucleus is also expanding, so that Zhejiang Province has formed the spatial pattern of "one nucleus and many points". Spatial pattern. Among them, Taizhou City has formed a concentration belt that runs through the whole city, and there are signs that it will continue to extend to the north, and may eventually form an axis with the main core of Hangzhou, running through the whole territory of Jiangsu and Zhejiang. Despite the fact that Ningbo and Wenzhou started to have agglomeration zones earlier, the dense zones have so far remained within the city, with less connection to other city areas. This may also be a dynamic that needs to be broken through in the spatial distribution of Zhejiang's research and study travel bases afterward. In short, from 2013 to 2023, Zhejiang study and

travel bases in space showed a gradual shift from scattered "patchy" to "piece-like".

5.3. Spatial Evolution of Research and Study Travel Bases in Zhejiang

By digging deeper into the spatial distribution data of research and study trip bases in Zhejiang Province in the past decade, we used the standard deviation ellipse method to conduct a comprehensive overall spatial evolution analysis. This method can effectively assess the degree of diffusion and directional difference of point-like geographic things in the study area in order to provide valuable reference value. In order to clearly demonstrate the spatial distribution of study tour travel bases in Zhejiang Province, the results were visualized and analyzed (Figure 3), and the X-axis length, Y-axis length, ellipse area, rotation angle, and flatness of each ellipse were calculated (Table 3).

In 2013, the standard deviation ellipse of study tour bases in Zhejiang Province was nearly circular, indicating that the spatial distribution of study tour bases in Zhejiang Province was relatively uniform, with no obvious tendency of aggregation or dispersion. In the following years, the standard deviation ellipses were more consistent, showing an east-west spreading trend, which may mean that the development of study and research travel bases in Zhejiang Province gradually showed a more obvious direction.

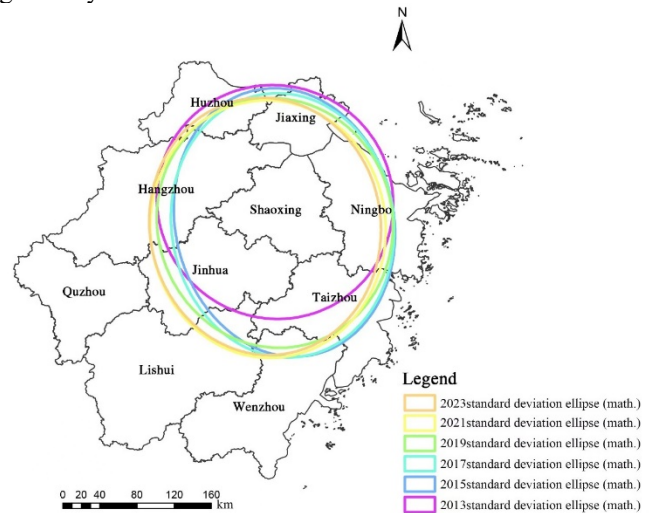


Figure 3. Ellipse of standard deviation of research and study travel bases in Zhejiang Province, 2013-2023 (authors' own drawing)

Table 3. Standard deviation ellipse parameters of research and study travel bases in Zhejiang Province, 2013-2023 (Source of data: authors' own mapping)

particular year	X-axis standard deviation (km)	Y-axis standard deviation (km)	Area of ellipse (km ²)	Corner (°)	flatness
2013	112.351	127.840	45120.167	168.751	0.121
2015	104.672	147.363	48455.247	165.920	0.290
2017	106.318	144.544	48275.942	169.094	0.264
2019	112.380	136.660	48245.658	168.448	0.178
2021	112.342	140.644	49635.008	171.889	0.201
2023	110.407	140.617	48770.760	169.815	0.215

On the basis of the analysis of the characteristics of the evolution of the overall spatial distribution of Zhejiang's study and learning travel bases, we further adopted the method of migration analysis of the center of gravity in order to determine the evolution of the core space of Zhejiang's study and learning travel bases at different stages of

development. Through this method, we can visually display the migration trajectory, diffusion direction and moving distance of the center of gravity of the distribution of research and study travel bases at each stage, thus revealing the directional characteristics of the evolution of the spatial distribution of research and study travel bases in Zhejiang. As

shown in Table 4, the dynamic migration of the center of gravity of the distribution of study and learning travel bases in Zhejiang Province is relatively stable, and in the past 10 years, it has always remained in a small range of up and down variations within Shaoxing City, and the value of the center of gravity coordinates does not change much, indicating that the centralized distribution of study and learning travel bases in Zhejiang Province has remained unchanged. Among them, the offset amplitude was the largest in 2013-2015, and then gradually stabilized, with a movement range of no more than 10km.

6. Influences on the Spatial and Temporal Evolution of the Distribution

6.1. Tourism Resources

Tourist attractions are the basis for the development of study and learning travel bases, as can be seen from the list of study and learning practice education bases and the list of study and learning practice education camps that have been launched in Zhejiang Province, there are a number of study and learning travel bases that correspond to A-level scenic spots in Zhejiang Province, especially in the historical and cultural category and the natural ecology category, and most of them rely on the tourist attractions that have been developed for many years in Zhejiang Province as an initial support for the construction of the bases. This is one of the important factors that support the rapid development of the study and learning travel bases in this category. In addition, existing studies have shown [10] that there is a significant correlation between the number of study and learning travel bases in Zhejiang Province and the number of 4A and 5A level tourist attractions in the province. Many scholars' studies show that [9, 11, 22] that tourism resources are an important factor influencing the spatial differentiation of study and learning travel bases.

6.2. Passenger Reception Capacity

As a special form of cultural tourism, study tours are a new type of industry that includes the basic elements of tourism. Among them, passenger reception capacity is an important manifestation of the basic elements of tourism, which is an important indicator of the service quality and operation level of a tourist destination or travel service provider. Strong passenger reception capacity means that the study tour base is of a higher grade, can serve more people, has an outstanding ability to provide services, and has a better study tour experience and effect.

6.3. Socio-economic Conditions

The level of socio-economic development is one of the key factors in the spatial distribution of geographic elements, and it can be seen from the kernel density analysis in the previous section that the study and learning travel bases in Zhejiang Province are mainly concentrated in Hangzhou, Ningbo and other areas with more developed economic strength. In order to further clarify the relationship between the spatial distribution of study and learning travel bases and the level of socio-economic development, the gross domestic product (GDP) of each city in Zhejiang Province was divided into five categories of different levels of economic development zones from high to low and analyzed in superposition with the study and learning travel bases in Zhejiang Province (Figure 4). The

results show that the distribution of study travel bases in Zhejiang Province is positively correlated with the regional GDP level, i.e., a high level of GDP corresponds to a high number of study travel bases, and the stronger the degree of agglomeration is in relative terms. For example, in Hangzhou, which has the highest level of GDP, a large number of research and study travel bases have been brought together, and its distribution has the highest level of agglomeration.

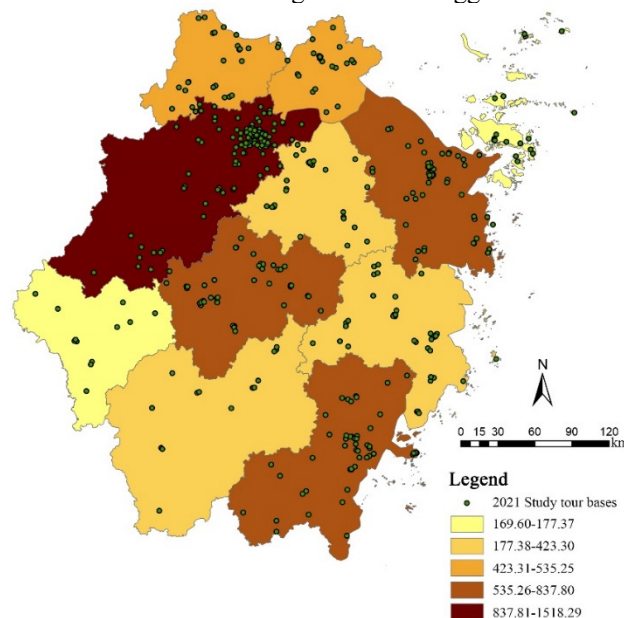


Figure 4. Relationship between study tour bases and GDP of each region in Zhejiang in 2021 (Source: Author's own drawing)

6.4. Level of Educational Development

One of the most important features of study tour that distinguishes it from cultural tourism is that it contains educational attributes, which makes the service level of study tour most directly affected by the level of education, especially the spatial distribution of study tour bases of history and culture, science and technology education and social practice. On the one hand, regions with high education levels have a better service supply capacity for study and travel bases. It is easier to get better teachers, better educational policies and more educational resources, such as museums, science and technology museums, art museums, etc. in these areas. This all helps to promote the construction and development of study tour bases. On the other hand, regions with a higher level of education tend to deposit students and parents with a higher demand for education. They are more inclined to choose study tours as a form of education to broaden their children's horizons and enhance their practical abilities, thus increasing the market demand for study tour bases.

6.5. Level of Transportation

Using the ArcGIS 10.8.1 software buffer tool, a 5km and 10km buffer zone was established along the major highways in Zhejiang Province, represented by the 2023 study travel bases (Figure 5), and the results of the analysis showed that: within 5km of the major transportation arteries, there were 235 study travel bases, which accounted for 45.37% of the whole; and within 10km, 411 study travel bases were distributed, which This is equivalent to 79.34% of all the bases, which shows that the distribution of study and travel bases in Zhejiang Province along the main transportation

routes is obvious. At the same time, the denser the highway, the more study tour bases are distributed, on the contrary, the farther the distance from the road, the fewer the number of study tour bases, which also highlights that there is a close relationship between transportation and the spatial distribution of study tour bases.

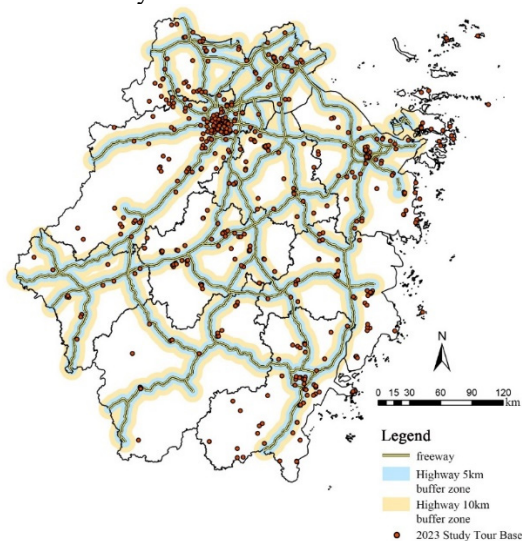


Figure 5. Relationship between study tour bases and highways in Zhejiang Province in 2023
(Source: Author's own drawing)

6.6. Policies and Systems

Studies have [4] shown that the creation and layout of study and learning travel bases in China are obviously guided by policies, and the policy system plays an important role in this regard. As we all know, the formulation and implementation of policies and systems can promote or inhibit the increase in the number of study and learning travel bases. For example, financial subsidies, tax incentives, and land policies introduced by the government can reduce the cost of base construction and increase the return on investment, thus promoting the increase in the number of study and learning travel bases; the government has formulated relevant regulations to standardize the construction and operation of study and learning travel bases, reduce the number of undesirable or hidden safety hazards bases, raise the threshold, and promote the improvement of the service quality of study and learning travel bases, so as to guarantee the benign operation of study and learning market.

7. Conclusion and Discussion

7.1. Policies and Systems

In this paper, the research and study trip bases in Zhejiang Province from 2013 to 2023 are selected as the research object, combined with Arc GIS analysis tools, and geospatial analyses such as the closest neighbor index, kernel density analysis, and standard deviation ellipse are used to explore the spatial and temporal distribution characteristics of the research and study trip bases in Zhejiang Province, and the conclusions are as follows:

1) overall growth in the number of study travel bases in Zhejiang Province from 2013 to 2023 can be divided into three stages. 2) There are obvious differences in the development of study and research travel bases between

regions, Hangzhou has been in a dominant position, Ningbo and Wenzhou are developing rapidly, and the development of Huzhou, Jinhua and Lishui is relatively stable. 3) Zhejiang research and study travel bases evolve to the agglomeration form and are further strengthening. 4) Zhejiang research and study travel bases have shown a gradual change from scattered "patchy" to "patchy". 5) spatial pattern of the distribution of study and travel bases shows a north-south direction, and its center of gravity is relatively stable.

7.2. Policies and Systems

As a product of the development of educational tourism to a certain stage, the research and study travel base [4], its influencing factors and mechanism of action are indeed very complicated. This paper has briefly discussed six aspects: tourism resources, passenger reception capacity, socio-economic conditions, education development level, transportation level, policy and system. Combined with the current characteristics of the spatial distribution of study travel bases in Zhejiang Province, the following suggestions are made: 1) policy should be tilted to the western region and the coastal region, on the one hand, to ensure that the administrative regions have the ability to carry out study activities nearby, on the other hand, so that the study travel bases in the coastal region can produce a closer interaction between the study travel bases, so as to enrich the study travel routes. 2) municipal study travel base should fully explore their own resource advantages, integration and optimization, the formation of unique educational resources; similar tourism resources in the province should be fully linked to give full play to the radiation effect and agglomeration effect, the formation of study activities in a large area, to drive the development of the surrounding areas. 3) spatial layout of study tour bases in Zhejiang Province should follow the law of "along the line, neighboring scenery" in the future, and form a more complete "point - line - surface" three-layer spatial pattern.

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