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GIS-based spatial analysis of place names in Yunnan, China

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**GIS-BASED SPATIAL ANALYSIS OF PLACE NAMES
IN YUNNAN, CHINA**

A Thesis

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Master of Science

in

The Department of Anthropology and Geography

by

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ABSTRACT

Yunnan, with the largest number of minority languages in China, is labeled as “The Museum of Dialects”. The rich diversity of ethnic groups is reflected in its toponyms (place names). The objectives of this study are to (1) construct a GIS database of toponyms in Yunnan at the prefecture, county and township levels from a comprehensive toponymical dictionary series of China; (2) analyze the spatial distribution of Han, Tibeto-Burman (Zang-Mian) and Kam-Tai (Zhuang-Dong) toponyms and its association with environmental factors; and (3) examine the historical evolution of toponyms. Results show that the study shows that the highest concentrations of Zang-Mian toponyms are in north and the eastern mountainous areas, and Zhuang-Dong concentrate in the southwest and southeast areas with lower elevations. Statistical analysis reveals that Zhuang-Dong toponyms tend to have lower elevations than Han toponyms, and Zang-Mian toponyms tend to in places higher than Han toponyms. Both minority groups of toponyms are slightly farther from rivers but closer to railways or the major cities than Han toponyms. The standard distance and standard deviation methods help reveal the historical trend of gradual expansion of Han settlement in Yunnan as recorded in the time stamps of toponyms. In Ming Dynasty, Han people spreaded out into south and north, especially the north area. In the Qing Dynasty, Han people expanded to the frontier areas. This suggests that the most significant spread of Han settlement in Yunnan happened in the Qing dynasty.

CHAPTER 1. INTRODUCTION

1.1 Toponymical Studies and GIS

Toponyms (place names) are the “signposts to the past” (Gelling, 1988), and provide a special angle for studying the historical and cultural heritage of particular places and even large regions. Toponyms are not just linguistic forms, but also cultural and societal artifacts that offer insights into the history, habitat, and environmental perceptions of a certain culture (Jett, 1997). A place name may bespeak the history of a nation, the culture of a people, or the hopes of those that named the place (Room, 1997). Interpretation of place names helps us examine how their variation from one area to another is related to the historical change of environments from an older to a more recent era (Grootaers, 2003). Many toponyms are derived from natural and manmade landscapes, which map their evolution history and culture: water sources, landforms and bioforms and passageways. An environmental record and indigenous knowledge system has thus been preserved in toponyms (Hartmann, 2007). However, many of the place names in ethnic minority areas such as Yunnan have been obscured by time, political change, and the work of official government map makers, and call for significant investment of time and efforts to uncover the cultural and human history they encapsulate (Wang, 2012).

The application of Geographic Information Systems (GIS) technology represents a major advancement in toponymical studies because GIS enables the systematic examination of spatial patterns of place names and their association with other human and environmental factors. Some of the examples are: Wang et al. (2006) used GIS to examine the spatial patterns of some particular Tai toponyms and their relationship with terrain characteristics in south China and Southeast Asia. Wang et al. (2012) built a GIS

database of place names in Guangxi, China, and analyzed how the spatial distributions of Zhuang and Han place names were linked to manmade and physical environments and how the patterns changed over time. This study continues to employ GIS to construct and analyze a database of place names in Yunnan, another province in China with high concentrations of multiple ethnic minorities and thus a prevalence of place names with a minority linguistic origin. It is another case study to demonstrate the potential value of GIS-based spatial analysis in toponymical studies.

1.2 Toponymical Studies in Yunnan

Yunnan Province, located in southwest China, has an area of 394,000 square kilometers, bordering Laos and Vietnam in the south, Burma in the west (Figure 1.1). According to the Yunnan Bureau of Statistics (2006), the total population in Yunnan is 44.50 million with 29.60 million (66.50%) Han and 14.90 million (33.50%) ethnic minority groups. China has a total of 56 ethnic groups (i.e., the majority Han and 55 ethnic minorities), 54 of which can be found in Yunnan. Yunnan is also called as the “Museum of Place Names” as 25 percent of the 270,000 place names in Yunnan are derived from minority languages (Wu, 1989).

Since the Li’s (1937) seminar research on Dai language, scholars from various disciplines such as linguistics, ethnics, history and geography have attempted to analyze the place names in Yunnan and provided a rich set of perspectives. These studies can be classified into four groups as follows.

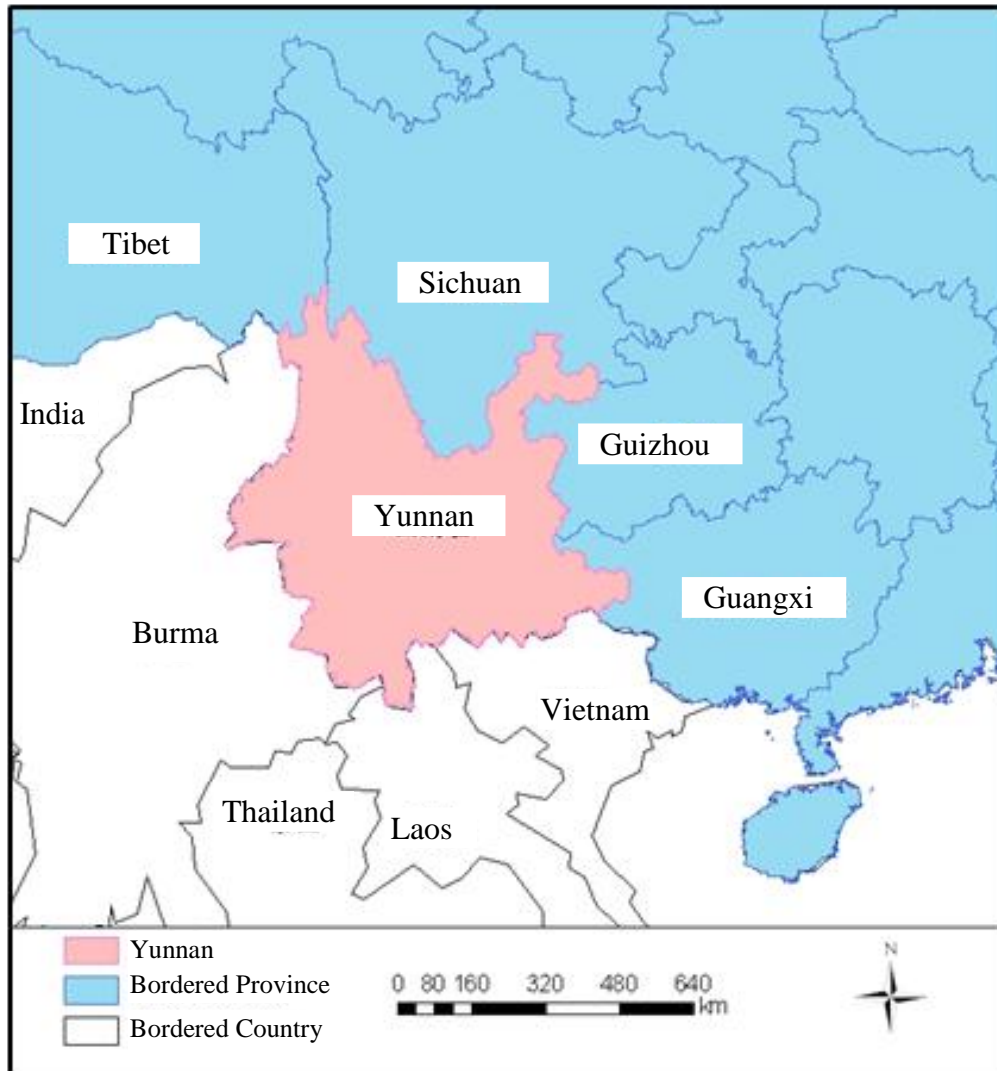


Figure 1.1 Location of Yunnan.

(1) Spatial distribution of place names and ethnic migration

As early as in the 1930s, Xu (1936, 1990) documented the settlement patterns of Zhuang-Dong ethnic groups and the spatial distribution of their place names and examined their migration history. More recently, Zhu (1994), Wu (2000) and Guan (2007) conducted more in-depth studies of ethnic minority place names in Yunnan, and analyzed their association with the geographical environments and historical

development. Fang (1997) and Jiang (1983) discussed the distribution of Dai people and the historical evolution. Bamo (1987), Li (2001), Shama (2005) and Su (2008) explored the social history of Yi and their migration. The Zhao (1988), Yang (2005) and Zhao (2008) studied the Bai place names in the Erhai region in west Yunnan, and summarized the etymology and changes of Bai Place names over different eras. Lu (2005) analyzed the historical development of Han place names and discussed its implications in changes of ethnic composition in Yunnan over time.

(2) Place naming practices by various ethnic groups and related cultures

Li (1937) was the first to develop a table for translating Dai place names to Chinese (Han) and the Roman alphabet. Xu (1990), Wu (1998) and Wang (2005) classified Buyi place names and discussed its relationship with the wet rice culture. Li (2003) analyzed the rules about how Yi place names are translated to Chinese. Wu (2000) outlined the origin, meaning and classification of Yi place names, and promoted the study of “Yi toponymy”. Zhaxi (1990) analyzed the Zang Place Names in Luding region, and sorted out their naming rules, evolution trends and characteristics.

(3) Comparative studies of place names of various ethnic minorities and historical studies of place names over time

Tan (2005, 2006a, 2006b and 2006c) examined the place naming practice of Zhuang people and its reflection of their cognitive characteristics of geographic orientations and colors, and identified the similarities and differences between Zhuang and Han place names. Dai (2004) revealed the close relationship among the Dai, Zhuang, Buyi people by comparing their place names. Chen (2010) compared the Yi and Han places names and analyzed Yi’s place naming practices. Wu (2010) compared the

historical place names documented in “*Xu Xiake's Travel Diaries*” to their present place names in Yunnan and examined the changes.

(4) *Compilation of gazetteers including place name dictionaries*

In recent years, each county in Yunnan has published one or multiple gazetteers that are intended to provide a comprehensive inventory of local place names. Zhu (1994) edited “*Toponymical Dictionary of People's Republic of China: Yunnan Province*”, and Cui (2000) edited “*Mega-Dictionary of Toponyms of People's Republic of China*. Both included the origins, development and evolution of place names in Yunnan, and were the results of major efforts of large editorial teams.

However, none of the above studies used the GIS to manage the database of place names in Yunnan. Furthermore, all those studies are descriptive in nature and have not used any quantitative methods to examining how the geographic patterns of various place names are related to environmental factors. Despite the advancement of GIS technology and its great impact in various fields over the past two decades, GIS applications in historical-linguistic-cultural studies are limited. This research seeks to demonstrate an innovative application of GIS and spatial analysis techniques to the study of place names in Yunnan place names.

The remainder of this thesis is organized as follows. The next chapter provides a brief survey of the ethnic groups in Yunnan and their historical evolution. Chapter 3 discusses the data sources used for this study and data processing. Chapter 4 presents the research results: using GIS to visualize the spatial pattern of Yunnan toponyms and regression methods to explain how the pattern is associated with various environmental and human factors. Chapter 5 explores whether the time stamps recorded in some of the

toponyms help us understand the historical interactions between ethnic minorities and the majority Han in the region. Chapter 6 concludes the thesis with a brief summary.

CHAPTER 2. ETHNIC GROUPS AND LANGUAGES IN YUNNAN

2.1 Historical Evolution of Ethnic Groups in Yunnan

The origin of ethnic minority groups in southern China can be traced to the “Diqiang” and “Baiyue” peoples, recorded in history as early as in the Spring and Autumn Period and the Warring States Period (770-221 BC) (e.g., You, 1994). Around the Christian era, Baiyue lived in the south and Diqiang occupied the north in Yunnan. Baiyue favored lower land with irrigation controls such as dams, and Diqiang tended to settle in mountainous highland. Around the Dian Lake in eastern Yunnan and the Erhai area in western Yunnan were cohabitated by Diqiang and Baiyue.

Yunnan is always considered as remote province by the central government, because of its geographic features such as jungles, mountains, rivers, and long distance from the political center. However, all these elements could not deter the ambitious expansions from the Central Government that eventually managed to overcome these natural barriers and conquered most of Yunnan (Yang, 2009). Its development history is interwoven with a relentless series of sinicization and indigenization from the northern neighbor, Han (the Chinese majority).

The Western Han government started the large-scale immigration. First, the central government sent some soldiers to protect administrative office established by central government and contain the local threat. Secondly, the central government moved rich and convicted people by force to fill in Yunnan. The Han immigration usually settled up in the most rich and populous region of Yunnan, such as Baoshan, Chuxiong.

During the Nanzhao period, the Tang central government recruited lots of soldiers to fight with Nanzhao in Yunnan. “Wars between Nanzhao and China brought a lot of

people to Yunnan. It was recorded that over 200,000 Chinese soldiers were recruited, and most of them failed to return. The number probably was an exaggeration, but the scale of the military clash was confirmed by its adverse effect on the Tang Empire” (Yang, 2009: Chapter 5, 16). In addition to the military colonists, other people, such as those rich and convicted people migrated to Yunnan all the time consisting mainly of Han Chinese.

Before the thirteenth century, numerous Han people moved to Yunnan. “While they contributed to the development of local societies, in most cases, they were also absorbed into native societies. The wave of assimilating Chinese immigrants was only reversed by the large scale of Han migrations sponsored by Government of the Ming and Qing empires” (Yang, 2009: Chapter5, 21).

During the mid-thirteenth century, the Mongol occupation century brought numerous Han people to Yunnan. The Yuan government also settled the administrative office in Yunnan, called “Xingsheng”. The “Xingsheng” certified that the whole Yunnan was under the control of Yuan central government.

From the Ming dynasty, the Han migration to Yunnan entered a new age. The Ming central government settled Wei-Suo system to protect the cities and towns. By doing so, it also made garrisons permanent homes for soldiers. The number of the first generation of Ming military households would be over 800,000(Yang, 2009). In addition to the military migration, the Ming central government also encouraged the exiles, peasants, merchants and refugees to move to Yunnan. A rough estimate of the number of Han migration to Yunnan would be over 2,000,000(Cang, 1997). As a result of the process known as *Sinification* or Sinicization that stemmed from the influx of Han soldiers and settlers moving in from many directions, but primarily the north, many

Yunnan place names were changed to Han or pronounced with a Han accent or spelled in Chinese in such a way as to obscure the original minority language form. One of the major objectives of this research is to uncover some of the process of change in the records of toponyms, often obscured by time, political events and the work of historians and mapmakers.

2.2 Major Language Groups in Yunnan

The place names collected in this study basically belong to the Zang-Mian, Zhuang-Dong and Han language groups, which are branches of Sino-Tibetan language family, and thus this study focuses on place names in the Zang-Mian and Zhuang-Dong ethnic minorities. The common characteristics of Sino-Tibetan language family are the tendency toward monosyllabism and the phonemic use of for each syllable (Li, 1937). The invariable syntactical rule of Zang-Mian is that the verb must be placed at the end of the sentence, followed only by suffixed elements or sentence-final particles. The object normally immediately precedes the verb and follows the subject, though no invariable rule can be stated (Benedict, 1972). This study covered 10 minority languages, Yi, Naxi, Bai, Lisu, Nu, Hani, Lahu, Jinuo, Zang and Jingpo. Minority languages in Zang-Mian language group not only have linguistic relativity, with a common set of cultural characteristics, but also have the same national source. They are long-term development of the ancient Diqiang people in the south and southwest during the formation of the continuous integration of the indigenous tribal people. About 4000 to 5000 years ago, the south branch of the Diqiang people merged with the local indigenous tribe, formed Bai Tribe (Pu). Bai was called as "the other species of Diqiang," and they lived on Bazi (small basins and valleys), which are endowed with flat and fertile soils. Kunming tribe is

the most populous and most widely distributed nation of Diqiang. During the Qin and Han Dynasty, they are distributed from Dian Lake, along the Jinsha River to Baoshan, they communicated with Pu, Liao, Ban, Sou, Maoniu, Bailiang and other tribes, then merged into a large group. One of the Pu-based tribes in the Dian Lake area established the Ailao regime. During the long-term war and exchange with Bai tribe, they developed in Wuman and Baiman. Wuman is made by the Kunming Tribal Development, and the Sou and Pu are the main body of Baiman. Sou minority group mainly living in northwestern of Gansu, Qinghai area, moved south to the junction of Yunnan and Sichuan and northeast, northwest of Yunnan Province. They lived with Kunming minority group, mixed together. After Qin and Han dynasties, Sou and Kunming minorities were in the process of differentiation and re-combination, then formed the Yi, Hani, Lisu, Lahu, Achang and other minority groups. Mosha minority group is also a branch of Diqiang, in Qin and Han dynasties gradually separated from the Sou and Kunming to be a new group. After the Eastern Han Dynasty, Mosha gradually settled in Sichuan, and Lijiang area in Yunnan, after the Ming Dynasty formed as the Naxi minority group.

Zhuang-Dong is another branch of Sino-Tibetan language family. In Yunnan, there are four languages in this group, Zhuang, Dai, Buyi and Shui. This study covered three Zhuang-Dong minority languages, Zhuang, Dai and Buyi. The common characteristics of Zhuang-Dong are that there are eight tones, and the order of syntax is subject, verb and object. The “Baiyue” peoples (475-221 BC) in southern China, are the origin of the Zhuang, Dai, Buyi and Shui minorities. “Historically, the Baiyue were farmers who specialized in growing rice in irrigated fields. They lived primarily in

thousands of villages or small towns in the lowlands close to rivers and streams that were dammed to divert water into the irrigated fields”(Wang, 2006). After the formation of ethnic differentiation, the distribution center of each minority has not changed. Dai lived in the west and southwestern of Yunnan, Zhuang mainly lived in the southeastern of Yunnan, Buyi and Shui distributed in eastern border areas with Guangxi and Guizhou Province (Cang, 1997).

CHAPTER 3. DATA SOURCES AND DATA PROCESSING

3.1 Data Sources for Toponyms in Yunnan

Scholars (e.g., Dai, 2004; Wu, 1989; Zhu, 1997) usually focus on the minority toponyms at the village level. They argue that toponyms at village level are the record of natural features: mountains, rivers, flowers, animals and so on. “These toponyms encapsulate more of what might be considered older minority vocabularies, spoken rather than written, and colored by the imagination of the peasants’ predilection of taking clues from the environment and creating a cognitive map of their immediate world”(Wang, et al. 2012:4). Therefore, we investigated the possibility of analyzing all village toponyms in Yunnan. However we chose to focus on the toponyms above the village level, based on the following reasons. There are 131 counties, and more than 40,000 villages in Yunnan, which is beyond our capacity to collect and analyze the numerous data. In addition, the data at village level are poorly recorded and hard to identify. Due to the limited time and data, we stay on the toponyms at town, county and prefecture level.

In this study, we selected the comprehensive toponym dictionary series of China edited by Cui (1999) as our primary data. They were compiled by the gazetteers with toponomical expertise. Figure 3.1 is a typical entry of this dictionary. It describes the location and history of “Menglun Town”. It was named by Dai (date unknown), and means “soft place” in Dai. We collected all the toponyms, input them into a GIS-database, and then deciphered the toponyms for relevant information, such as place name type and period to be first named. For some toponyms that needed clarification, we checked alternative data sources (Wu, 1989; Zhu, 1994).

勐仑镇 [Měnglún Zhèn] 在勐腊县西北部。面积 355 平方公里。人口 1.2 万,其中傣族占 49%,哈尼族占 19%。辖 6 行政村,有 38 自然村。1957 年设勐仑区,后改公社、区。1988 年改置镇。产橡胶、茶叶。有水库、灌渠和电站。有中小学 23 所。镇人民政府驻地勐仑,在勐腊西北 60 公里。人口 2 710,有傣、哈尼等民族。傣语“勐”为地方,“仑”为柔软,意即柔软的地方。传说释迦牟尼巡游至此,有感而叹说:“这里的石头柔软”,故名。有砖瓦厂、养殖场。镇南罗梭江对岸有中科院云南热带植物园。园内有著名植物学家蔡希陶纪念碑及塑像。附近有塔庄伞、塔庄峨两座佛塔。养腊公路经此。

Figure 3.1 A sample entry of place name.

3.2 Place Names by Various Ethnic Minorities

This project covers place names in Yunnan at prefecture (*diqu*), county (*xian/shi*) and township (*xiang/zhen*) administrative levels. Figure 3.2 shows the 17 prefectures in Yunnan. We chose these three administrative levels for toponymical analysis for several reasons. First, it ensures the complete coverage of geographic places at the same level, and thus offers a systematic perspective. Second, place names were compiled by the local toponymical offices that are in charge of standardization of place name collection. Therefore, the descriptions of place names are more accurate and detailed (Wang, et al. 2012).

The study area has a total of 1,725 place names of prefecture (*diqu*), county (*xian/shi*) and townships (*xiang/zhen*). The 1,725 place names belongs to 14 languages: Han, Yi, Naxi, Bai, Lisu, Nu, Hani, Lahu, Jinuo, Zang, Jingpuo, Zhuang, Dai and Buyi. These 14 minority languages belong to the Sino-Tibetan language family. Based on linguistic classification, they can be classified as three language groups: Han, Zang-Mian

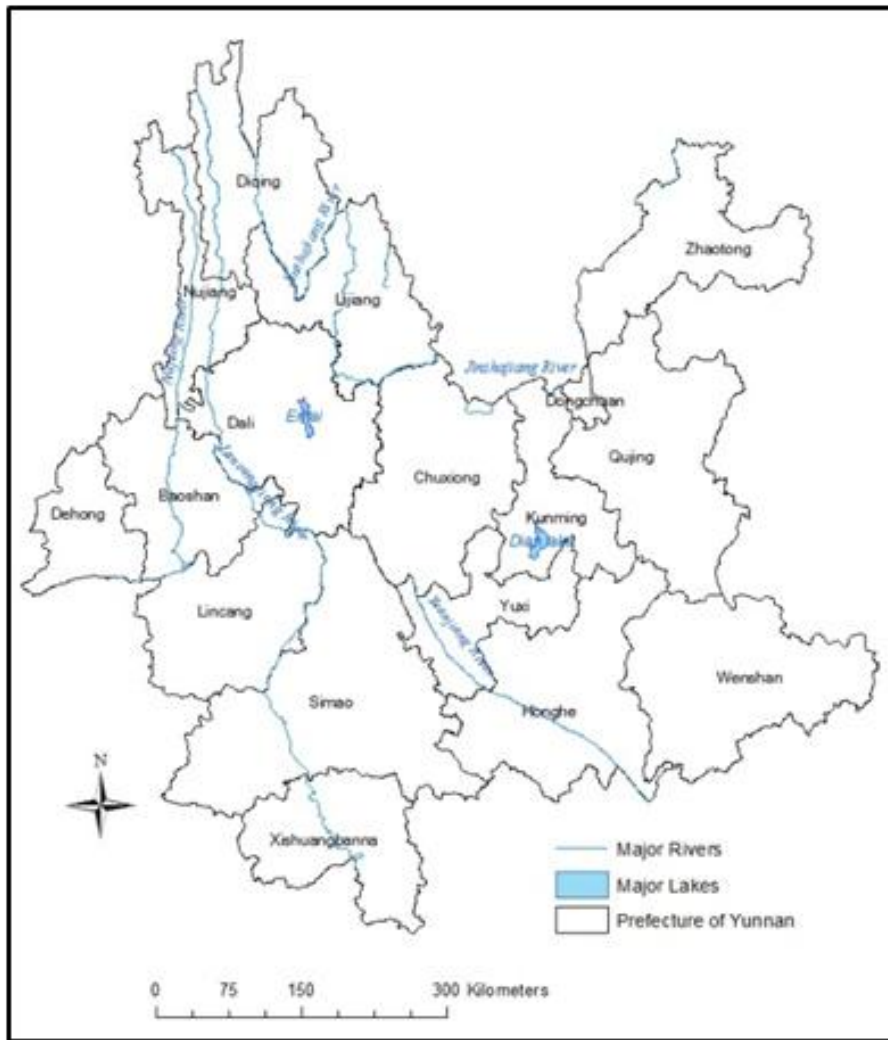


Figure 3.2 Prefecture of Yunnan.

and Zhuang-Dong, and represented as a point (where the place is located) in the GIS data set.

In our data set, Han toponyms are the mandarin Chinese. Zang-Mian toponyms include the Yi, Naxi, Bai, Lisu, Nu, Hani, Lahu, Jinuo, Zang and Jingpuo languages. Zhuang-Dong toponyms include the Zhuang, Dai and Buyi languages (Table 3.1) The GIS data set of these place names was built by digitizing a recent large-scale map of Yunnan from the National Geomatics Center of China. Figure 3.3, 3.4 and 3.5 show the

distribution pattern of Han, Zang-Mian and Zhuang-Dong, respectively. Table 3.1 shows the numbers and percentages of these three groups of toponyms at the prefecture, county, and township levels.

The concentrations of Zang-Mian toponyms are in the north, especially northeast. The Zhuang-Dong toponyms are concentrated in the south, especially in the southwest and southeast. It is also observed that the Han toponyms spread across the whole Yunnan Province. The distribution of the Han toponyms supports what Li (2002) observed: Han people has spread across Yunnan since the Ming dynasty (1440-1640 AD).

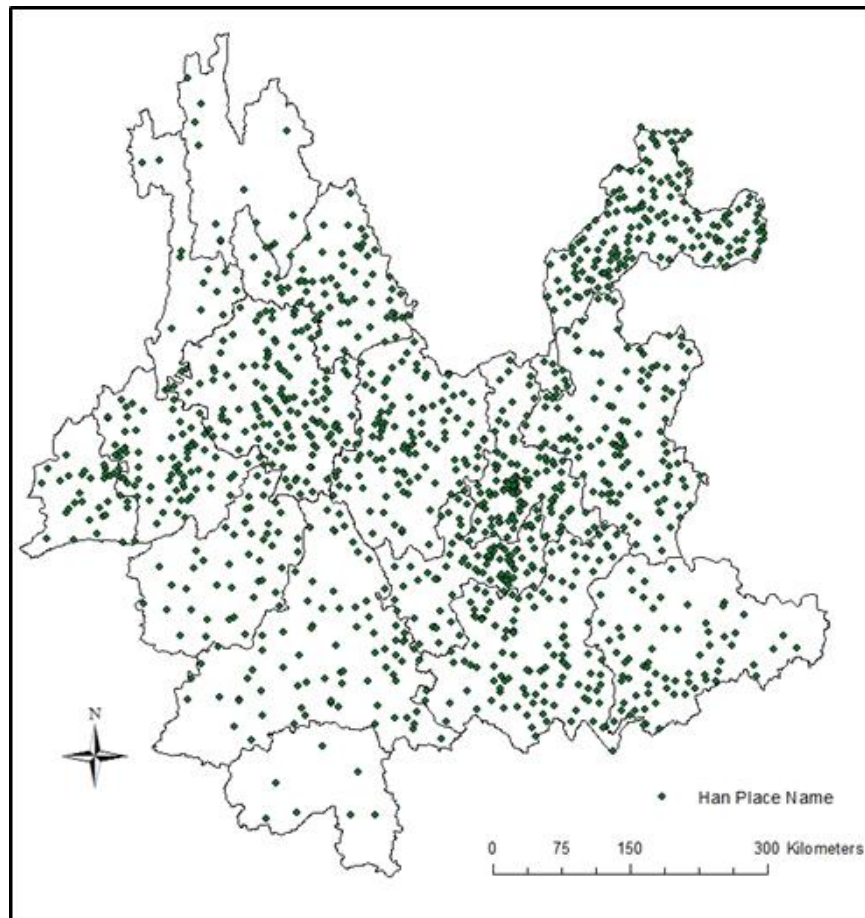


Figure 3.3 Distribution of Han place name.

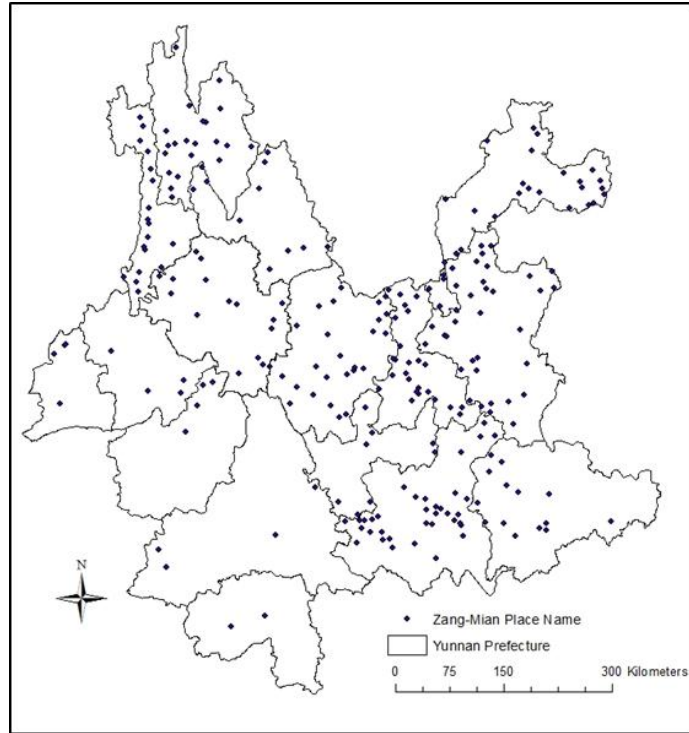


Figure 3.4 Distribution of Zang-Mian place name.

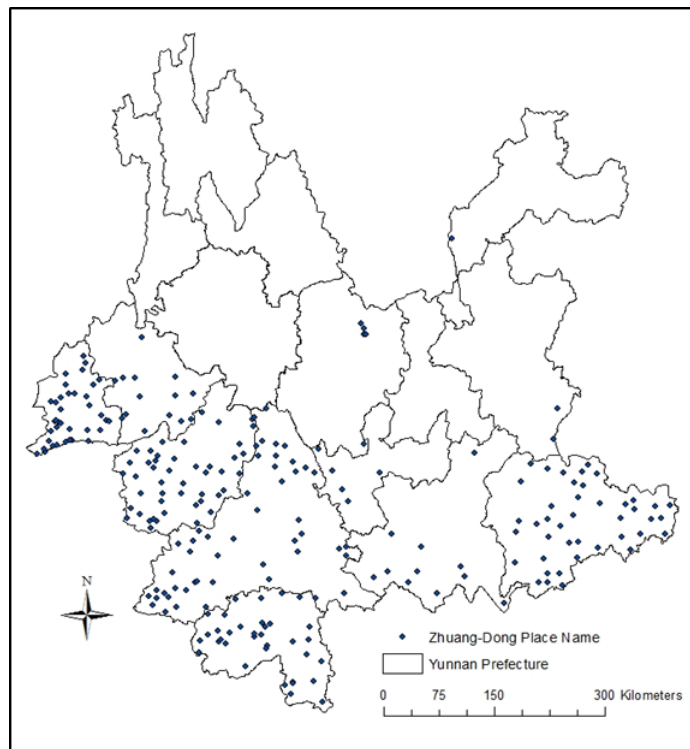


Figure 3.5 Distribution of Zhuang-Dong place name.

Table 3.1 Number and percent of each ethnic group

Total Toponyms (No. 1,725)							
Han group (No. 1,224)			Zang-Mian group (No. 254)				
Han	1,116	70.96%	Yi	175	Hani	17	14.72%
Zhuang-Dong group (No. 247)			Naxi	13	Lahu	2	
Zhuang	43	14.32%	Bai	13	Jinuo	1	
Dai	202		Lisu	13	Zang	13	
Buyi	2		Nu	4	Jingpuo	3	

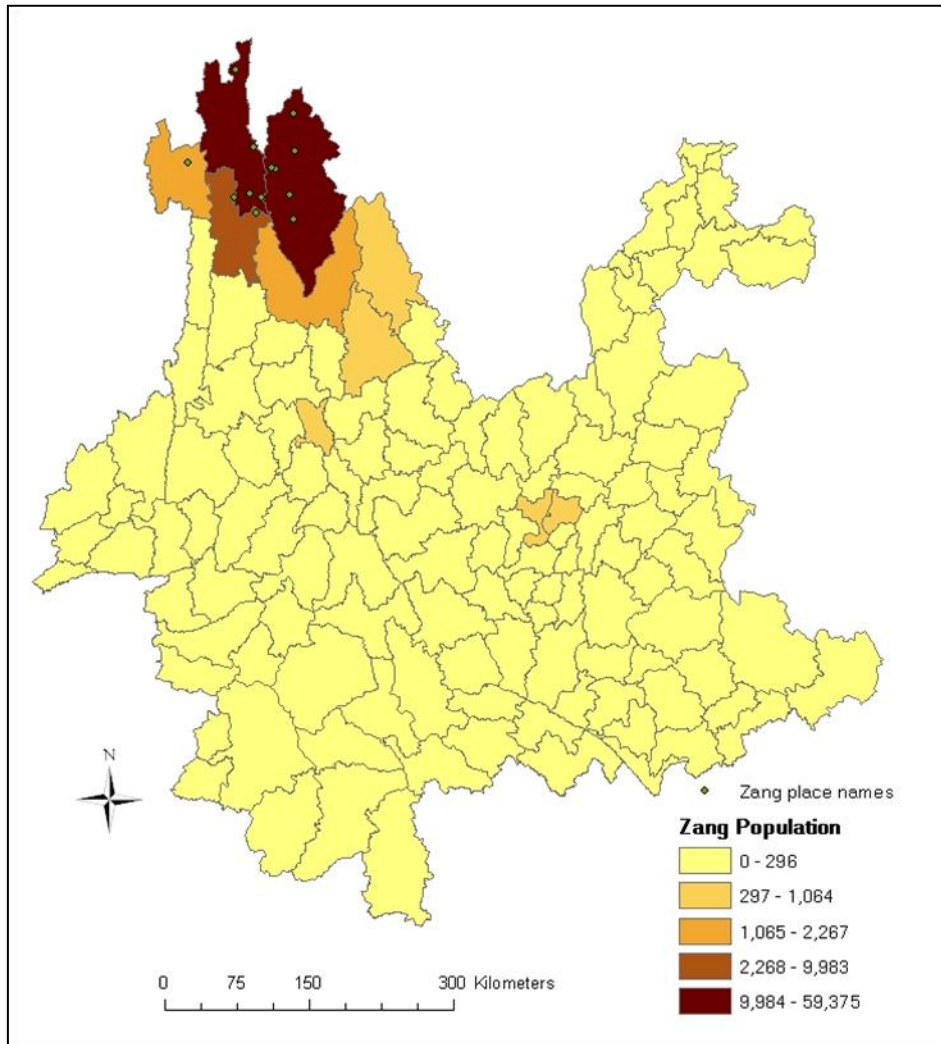


Figure 3.6 Distributions of Zang place names and population.

Does the spatial distribution of toponyms by an ethnic group reflect their settlement pattern? Figure 3.6, 3.7 and 3.8 map the distributions of place names (in points) and population of three ethnic groups (in percentage at the county level) as examples: Zang, Naxi and Lisu, respectively. They are generally consistent with each other. Zang, Naxi and Lisu place names are all concentrated in the northwest of Yunnan, similar to settlements of these ethnic groups. Zang place names are particularly clustered in the Diqing Tibetan Autonomous Prefecture and Gongshan County as shown in Figure 3.6.

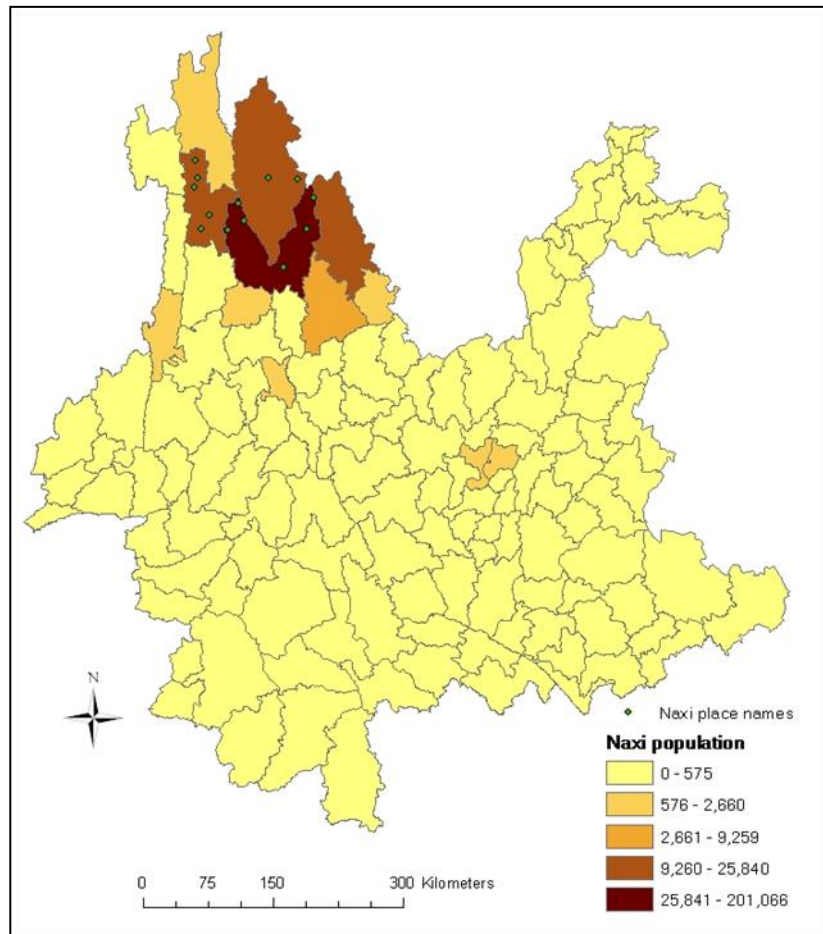


Figure 3.7 Distributions of Naxi place names and population.

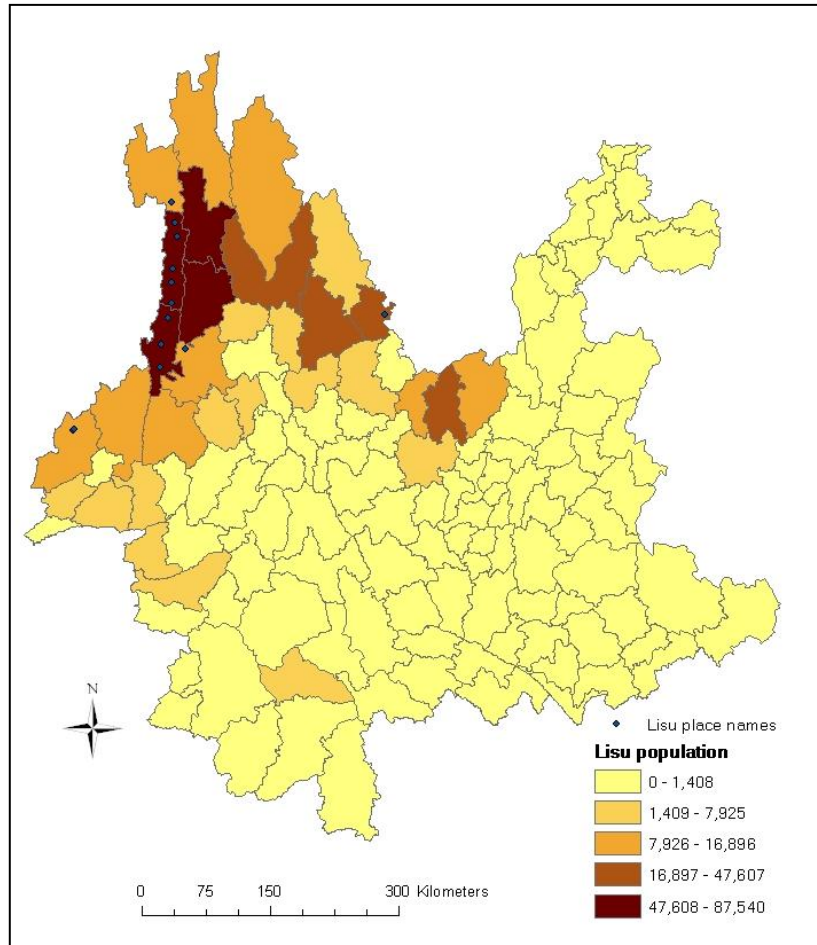


Figure 3.8 Distributions of Lisu place names and population.

3.3 Data Sources for Environmental and Human Factors

In the many factors that affect the settlement patterns, the physical environments are those important ones. This is particularly true for the minority people, as they grow plant for life, which requires supply of water and low lying flat areas (Husson et al., 2001). Figure 3.9 shows variables of Yunnan. The first group of factors includes environmental variables related to land forms such as elevation, slope and aspect.

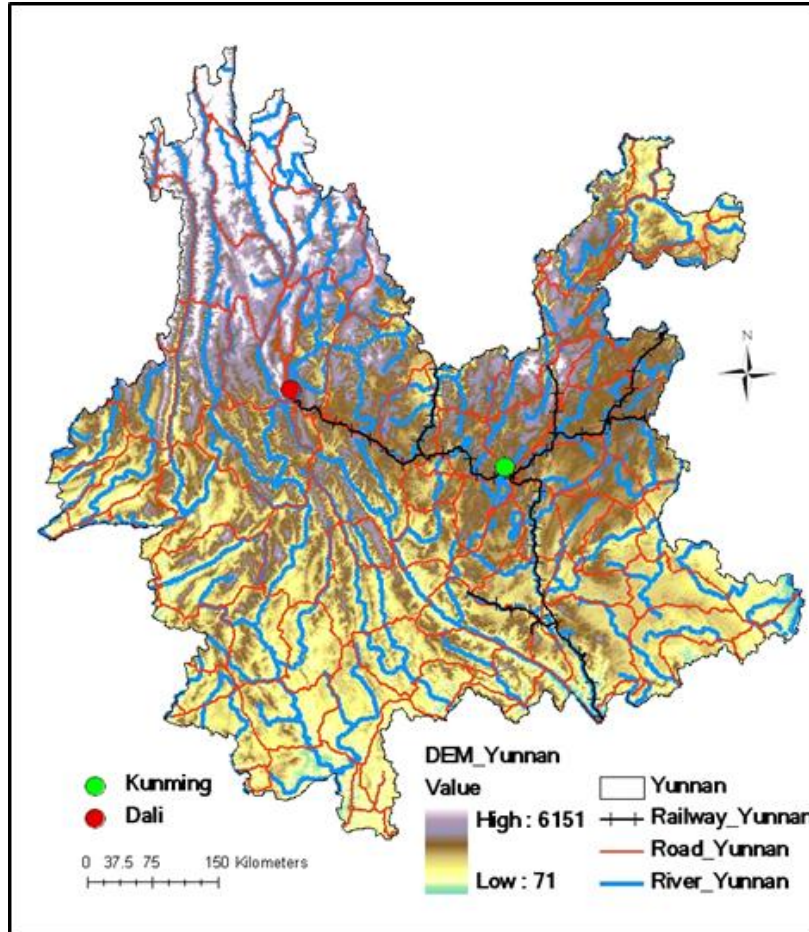


Figure 3.9 Variables of Yunnan.

We extracted these three topographic variables from the digital elevation model (DEM) data using ArcGIS terrain analysis tools. We obtained the DEM data from the USGS's GTOPO30 global dataset with 1km spatial resolution. This is sufficient for examining the effect of land form on settlement patterns of the minority groups. We use contemporary environment data based on the following assumption: physical environment features have remained relatively stable over time. However, caution needs to be taken when we make the analysis or interrupt the results.

We used three variables (distance from river, distance from railroad and distance from major road) to capture possible relationship between the transport routes and the

settlement of place names. We used the three variables based on the following considerations. Rivers in Yunnan are of great interest. “Although most rivers in Yunnan are not navigable, and overland roads were so crucial for communication with neighbors” (Yang, 2009), these rivers “have historically provided passages for the movement of people, goods, and ideas” (Higham, 1999). The river channels in Yunnan have stayed fairly stable in the history. As for the roads and railways, we hesitantly utilized major roads and railways of modern era, because of the lack of data on historical roads. Zhang(2001) and Chen et al.(2007: 22) pointed out that major transport routes of modern era tend to follow ancient pathway. (Wang et al, 2011)

The historical interaction between minorities and Han were promoted by proximity to major political and trade centers (Cang, 1997). In Yunnan, there are lots of “baizi”(the small fertile area) among mountains and rivers. The bazi take an important role in Yunnan, because people developed agricultural economy in these areas. “The Dian Lake (dianchi) region and the Erhai Region are two of the largest bazi and have cultivated the most developed agriculture. It is in such ecological conditions that the two large modern-day cities, Dali and Kunming, have developed into urban centers of Yunnan” (Yang, 2009: Chapter, 8).

Kunming and Dali were chosen as the major centers (see Figure 3.9 for their locations). The two cities rotated as the capital of the region ever since the Tang Dynasty. Both cities were major military posts established by Han rulers to control and exert influence on the minority people in Yunnan. Dali in western Yunnan was the capital of the Nanzhao and Dali Empire. From Yuan dynasty, the capital of Yunnan moved from Dali to Kunming, the central city of eastern Yunnan and has traditionally served as the

springboard of Han incursion to the region. “The variable “*distance from major cities*” is measured as the distance from the nearest city (i.e., whichever of the two is nearer) to capture this effect” (Wang et al, 2011: 9).

CHAPTER 4. RESEARCH METHODS AND RESULTS

4.1 Geo-visualization of Toponyms in GIS

“Mapping is a fundamental function of GIS. However, direct mapping minority place names has limited value. Spatial analysis techniques such as spatial smoothing and spatial interpolation methods can help enhance the visualization of the spatial pattern of Zang-Mian, Zhuang-Dong toponyms in contrast to Han toponyms”(Wang et al, 2011: 7).

We start our analysis with classification of place names as a binary variables, whether a place name is Zhuang-Dong (= 1) or non-Zhuang-Dong (= 0). We select the “Floating catchment area” (FCA) method to examine the relative concentrations of Zhuang-Dong place names. First, the method defines a filtering window around a toponym by drawing a circle, and then calculates the ratio of Zhuang-Dong toponyms to all toponyms within the window. We need to try different radii to figure out which radius can best capture the overall trend of the place name while preserving the local detail of the place names. After trying several radii, such as 5km, 10km, 15km, 20km and 30km, we chose 20km as the radius. Second, after calculating the ratio of one place name, the circle moves to another, and get the ratio. By doing so, the circle calculate the ratio one by one until the ratios are captured for all places. Each ratio represents the concentration of Zhuang-Dong toponyms around a place. “A larger circle (i.e., a larger filtering window) leads to stronger spatial smoothing, and thus better reveals regional than local patterns; and a smaller circle corresponds to reverse effects” (Wang, 2006: 36). The FCA method converts the original discrete variable of Zhuang-Dong toponyms (0 or 1) to a continuous ratio (any numerical value ranging from 0 to 1). We also apply the same process to compute the ratio of Zang-Mian toponyms.

The spatial interpolation can highlight the overall spatial trend of place name. The method uses known values at given locations to compute unknown values at other locations, and then generates a continuous surface for the entire study area. “One commonly-used spatial interpolation method is trend surface modeling, which assumes that the value of a variable at any location is a polynomial function of its x-y coordinates” (Wang, 2011:7). Here the known values are the 1,725 Zhuang-Dong (or Zang-Mian) toponym ratios, and the task is to estimate the ratios at the unknown locations within the study area.

Figures 4.1(a)-(b) show the relative concentration of Zhuang-Dong toponyms and that of Zang-Mian toponyms, respectively. Figure 4.1(a) shows two clusters of Zhuang-Dong toponyms: one in the southwest area bordering eastern Burma that also has significant Tai population and the other in the southeast corner neighboring Baise prefecture in Guangxi Province (one of the largest concentrations of Zhuang-Dong population outside of Yunnan). According to Figure 4.1 (b), at least two clusters of Zang-Mian toponyms can be observed: one in the northwest corner neighboring Burma and Tibet (as we mentioned before, Zang-Mian is also called as Tibeto-Burman, and Tibetan and Burman languages are important components of the Tibeto-Burman language group), the other in the middle of Yunnan (from the Nanzhao Kingdom, the Wuman tribe lived here, then formed the Yi minority group).

4.2 Spatial Cluster Analysis

The above spatial smoothing and trend surface modeling are fairly useful for mapping the place names. However, both of the two methods are lack of detailed description. Wang et al (2006:5) pointed out that “one method to detect spatial clusters of

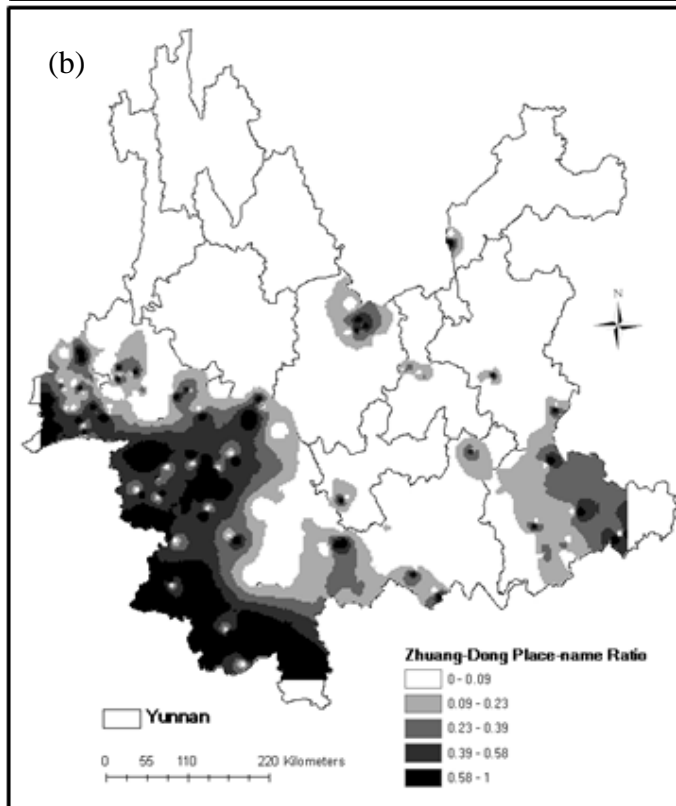
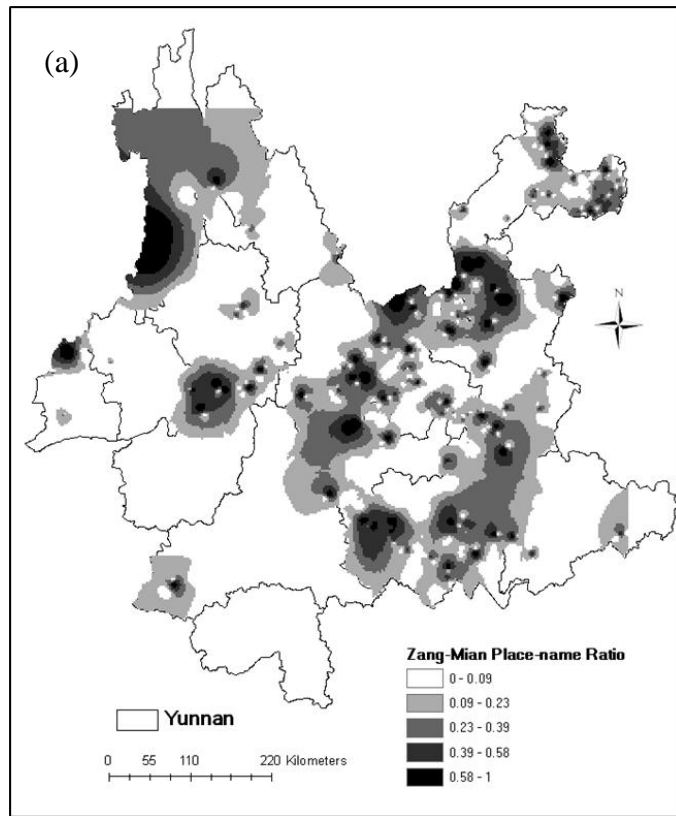


Figure 4.1 (a) Interpolated Zang-Mian place name ratio in Yunnan, and (b) Interpolated Zhuang-Dong place name ratio in Yunnan.

data is the spatial scan statistic or SaTScan. SaTScan uses a circular window to scan the entire study region, and the radius of the window varies continuously in size from 0 to 50 percent of the total observations”. Our study utilized the spatial cluster analysis method that was mentioned by Fahui Wang (2006).

In our case, we set the non-Zang-Mian place name and Zang-Mian place name as binary variables. Such as a non-Zang-Mian place name as “control” (coded as 0), and a Zang-Mian place name as “case” (coded as 1). First, we drew a circle around a place name. For each circle, we calculated the occurrence of case inside the window, and then compute the occurrence outside the window. Second, we computed the likelihood that the occurrence of case is higher inside the window compared to outside the window. “The likelihood function is maximized over all windows, and the “most likely” cluster is one that is least likely to have occurred by chance. The likelihood ratio for the window is reported and constitutes the maximum likelihood ratio test statistic. Its distribution under the null hypothesis and its corresponding p -value are determined by a Monte Carlo simulation approach”(Wang et al, 2006:5).

Figure 4.2a shows the primary and minor clusters of Zang-Mian place names in the study area. The spatial cluster analysis confirms that the major concentration of Zang-Mian place names is in the northwest, and three minor concentrations in the north and south. Figure 4.2b shows the primary and secondary clusters of Zhuang-Dong place names in the study area. The spatial cluster analysis confirms that the major concentration of Zhuang-Dong place names is in the southwest, and a minor concentration in the southeast.

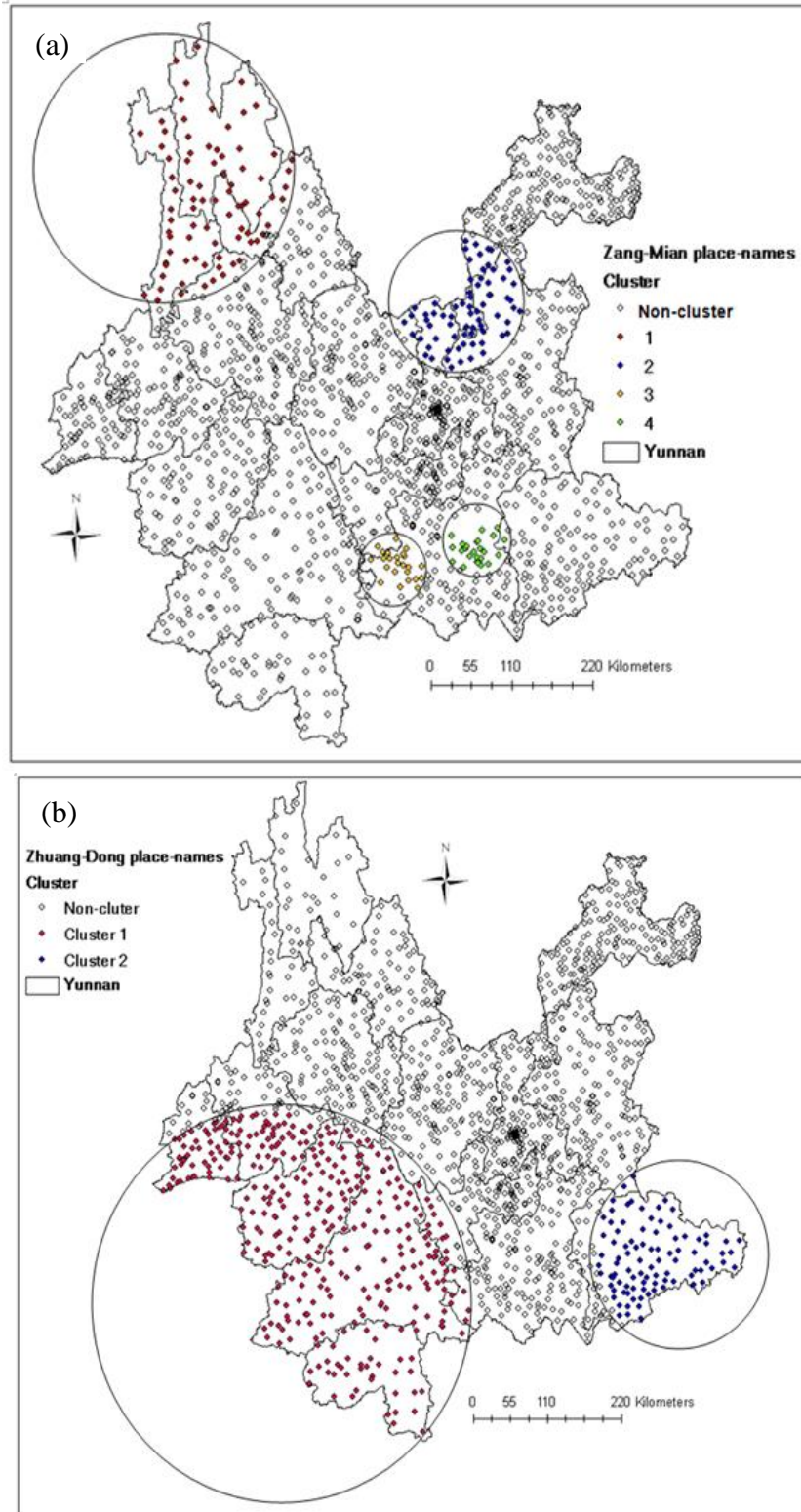


Figure 4.2 (a) Zang-Mian clusters, and (b) Zhuang-Dong clusters.

4.3 Differences in Environmental Factors among Various Groups of Toponyms

The ANOVA test is used to assess how each environmental factor differs among the three toponym groups. The results are reported in Table 4.1. The p-values in the F-tests indicate that each of the four variables varies statistically significantly across the three toponym groups: elevation, distance from river, distance from railway and distance from major city.

Table 4.1 ANOVA results of environmental variables among Han, Zang-Mian and Zhuang-Dong toponyms

	Han: Average (n=1,224)	Zang- Mian: Average (n=255)	Zhuang- Dong: Average (n=251)	F-value (Pr > F)
Elevation(m)	1715.89	1893.75	1191.26	164.58 (< 0.0001)***
Slope (degree)	11.82	14.69	12.12	0.50 (0.6092)
Aspect	185.18	176.49	184.66	0.23 (0.7958)
Distance from river (km)	7.612	9.38	8.76	7.50 (0.0006)***
Distance from major road (km)	8.83	8.41	5.97	1.57 (0.2080)
Distance from railway (km)	106.64	86.27	89.68	192.68 (< 0.0001)***
Distance from major city (km)	193.81	152.44	155.12	107.35 (< 0.0001)***

Note: P-values are in parentheses; *** significant at 0.001, ** significant at 0.01, * significant at 0.05.

The following observations are based on the four variables with statistical significance:

- (1) On average, places of Han toponyms are 154 meters lower than those of Zang-Mian toponyms, and 562 meters higher in elevation than those of Zhuang-Dong toponyms. The Zang-Mian toponyms are mostly in the northern mountainous Yunnan with higher elevations, and the Zhuang-Dong toponyms are mainly in the southern

Yunnan with valleys and basins with lower elevations. Major mountains in Yunnan converge in the northwest and from there they fan out southward and southwestward (Yang, 2009). Yi place names account for the majority of Zang-Mian toponyms (175 out of 254), and Dai place names are the majority of Zhuang-Dong toponyms (202 out of 247). Yi people tend to settle in terrace areas and mountains since the Nanzhao Empire, whereas Dai people usually live in *Bazi* (basin or valley with easy access to water) as they rely wet rice agriculture (You, 1994).

(2) On average, with comparison to Han toponyms, Zang-Mian toponyms are 1.8 kilometers farther from the nearest river, 20.4 kilometers closer to the nearest railway, and 42.4 kilometers closer to Kunming or Dali (whichever closer). Also with comparison to Han toponyms, places with Zhuang-Dong toponyms are 1.1 kilometers farther from the nearest river, 17.0 kilometers closer to the nearest railway, and 38.7 kilometers closer to Kunming or Dali (whichever closer). It is puzzling that the two minority groups of toponyms are slightly farther from rivers but closer to railways or the major cities than Han toponyms. We only have some explanation for the proximity of Zang-Mian toponyms to the major cities. Before the Tang Dynasty, the Wuman Tribe (Yi minority) were located in the northeast of Yunnan. With the growth of the Nanzhao Kingdom, the distribution of Yi expanded southwards to the downstream of Yuan River, but the center of Yi remained in the northern areas of Dian Lake and Erhai. The trend continued throughout the Yuan and Ming Dynasties (Cang, 1997). Yi, as a major ethnic group of the Zang-Mian group, have lived in the Dian Lake and Erhai areas for a long history. This may help make sense of the shorter average distance from the major city Dali or

Kunming for the Zang-Mian toponyms. Other findings call for more in-depth studies of the historical settlement and migration of various ethnic groups in the region.

4.4 Assessing the Joint Effects of Environmental Factors

The above analysis demonstrates that an environmental factor may vary statistically significantly among the three groups of toponyms. A multivariate logistic regression model is used to assess the joint effects of all variables together. In other words, we seek to analyze whether the three groups of toponyms tend to be associated with different environments that may be captured by a collective set of measures instead of a single variable. For the reason similar to the use of the logistic trend surface model as discussed previously, the binary nature of the dependent variable (i.e., a place name being Zhuang-Dong or non-Zhuang-Dong) calls for a multivariate *logistic* (logit) regression model.

In the logit model, we set the dependent variable as a dummy variable (i.e., 1 for Zhuang-Dong toponym and 0 for non-Zhuang-Dong) and the seven environmental variables as independent (explanatory) variables. We can write the model as following

$$L_T = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_7 X_7 \quad (1)$$

“where L_T is the logit, X_1, X_2, \dots, X_8 are the seven explanatory variables, and parameters $\beta_0, \beta_1, \beta_2, \dots, \beta_7$ are to be estimated by the regression. The model is commonly estimated by the maximum likelihood method (Hamilton, 1992)” (Wang et al, 2011). Based on the logit value L_T , a toponym being Zhuang-Dong ($T = 1$) is

$$P_{T=1} = \frac{e^{L_T}}{1 + e^{L_T}}$$

The two columns in Table 4.2 show the result from the logit model in equation (1). We use an example here to help interpret the result from the logit model. Say, a place

with the seven environmental variables assuming their *average* values such as 1155.26, 11.88, 186.76, 260682, 7431, 9863 and 187562 (the variables' order as shown in Table 4.2 from the top to bottom). Then we use those values in equation (1) with coefficients defined by the regression shown in Table 2.3, we get the result, $L_T = -1.4726$.

Therefore, we got the probability for the place being a Zhuang-Dong toponym, which is $1/(1+e^{1.4726})=0.1865$. The result is close to the percentage (14.32%) of Zhuang-Dong toponyms in our whole study area, Yunnan. The same process is applied to the Han and Zang-Mian toponyms.

Table 4.2 Multivariate logistic regression on three groups of toponyms (n=1,725)

<i>variable</i>	<i>Coefficient (Han VS Non-Han)</i>	<i>Coefficient (Zang-Mian VS Non- Zang-Mian)</i>	<i>Coefficient (Zhuang-Dong VS Non-Zhuang-Dong)</i>
Intercept	1.0485 (0.2859) ***	-3.6954 (0.3557) ***	-0.2482(0.4826)
Elevation	0.000384(0.000125) **	0.00103 (0.000155) ***	0.00237(0.000234) ***
Slope	-0.00745 (0.00579)	0.0229 (0.00717) **	-0.00118(0.00887)
Aspect	0.000555 (0.00054)	-0.00122 (0.00068)	-0.00049(0.000838)
Distance from river	-0.0378(0.045)	0.0451 (0.0529)	0.7629 (0.0756) ***
Distance from railway	-0.00704 (0.000906) ***	-0.00241 (0.00121) *	0.0195 (0.00235) ***
Distance from major road	0.00298 (0.00657)	-0.0025 (0.00809)	0.000130 (0.0161)
Distance from major city	0.000112 (0.000884)	-0.0013 (0.00111)	-0.0156 (0.00252) ***

Note: Standard errors are in parentheses; *** p value < 0.001, ** p value < 0.01, * p value < 0.05.

From the result of the logit multivariate model and the ANOVA tests, we can find that the results are largely consistent with each other. The effects of elevation and distance from railway are significant across all three models. For Zhuang-Dong toponyms vs. others, two additional variables (distance from major city and distance from river) also have significant effects for their distributions. For Zang-Mian toponyms vs. others, slope becomes significant. Other variables were discussed previously. Here we would

like to comment on the effect of slope on the difference between Zang-Mian and other toponyms. As stated previously, Zang-Mian toponyms tend to be more so in mountainous areas than lowlands, and thus it is understandable that they have steeper slopes in addition to being at higher elevations.

4.5 Stepwise Discriminant Analysis

Discriminant function analysis can be used to find a linear function of the characteristic variables and classify future observation into the above known categories: Han, Zang-Mian and Zhuang-Dong. Probably the most common application of discriminant function analysis is to include many measures in the study, in order to determine the ones that discriminate between groups. The followings are the procedure of the stepwise discriminant analysis.

Firstly, we built a model to show how we can best predict which group a place name belongs. Secondly, we called the step as “forward stepwise analysis”. In stepwise discriminant function analysis, we built a model of discrimination step-by-step. All seven variables were reviewed and evaluated to determine which one will contribute to the discrimination between groups. Therefore, that variable was included in the group, and the process started again. Thirdly, the step was called as “F to enter”. When entering the values, the stepwise procedure was "conducted" by the respective F. The F value for a variable showed its statistical significance.

From the Table 4.3, the elevation, distance to railway, distance to river and distance to major city are entered, which are consistent with the result of ANOVA test and the multivariate logistic regression methods.

Table 4.3 Stepwise discriminant analysis on three groups of toponyms (n=1,725)

Variables Stepwise Selection Summary					
Step	Number In	Entered	Partial R-Square	F Value	Pr > F
1	1	Elevation	0.1864	126.36	<.0001***
2	2	Distance to railway	0.1287	81.40	<.0001***
3	3	Distance to river	0.0107	5.93	0.0027**
4	4	Distance to major city	0.0117	6.48	0.0016**

CHAPTER 5. HISTORICAL EVOLUTION OF SPATIAL PATTERNS OF TOPONYMS

5.1 Toponyms with Time Stamps in Yunnan

In the toponymical dictionary, we can figure out the time that the place name was first named in history. Figures 5.1(a), (b) and (c) show the toponyms named in various dynasties by Han, Zang-Mian and Zhuang-Dong, respectively. Among the 1,725 toponyms in our whole study area, only 803 places or 46.55 percent have such a record. Among the 254 Zang-Mian toponyms, only 108 places or 42.35 percent have the era recorded. Among the 247 Zhuang-Dong toponyms, only 99 places or 39.94 percent have the era recorded. “The absence of a clear time mark in many toponyms is due to lack of historical records in places lower than county seats. The relatively small sample of minority toponyms with a time stamp (and even smaller breakdowns in various eras) prevents us from replicating the statistical analysis of association of the toponyms with environmental factors during various eras” (Wang, 2011:12). Our analysis is descriptive, and the following discussion may be speculative.

Before we interrupt the data, we need to mention two additional limitations of the data. Our data set is collected from records of place names at the *present* time. Although many toponyms have survived over time, plenty of toponyms have disappeared or have been altered by history. From figures 5.1 (a), (b), and (c), we can see the time of those places whose names were first named in that era. By no means, were they the only toponyms in that era (Wang, 2011). Another problem is that the minority place names are *recorded in Chinese*. This may yield possible bias into the data set. “Many places named

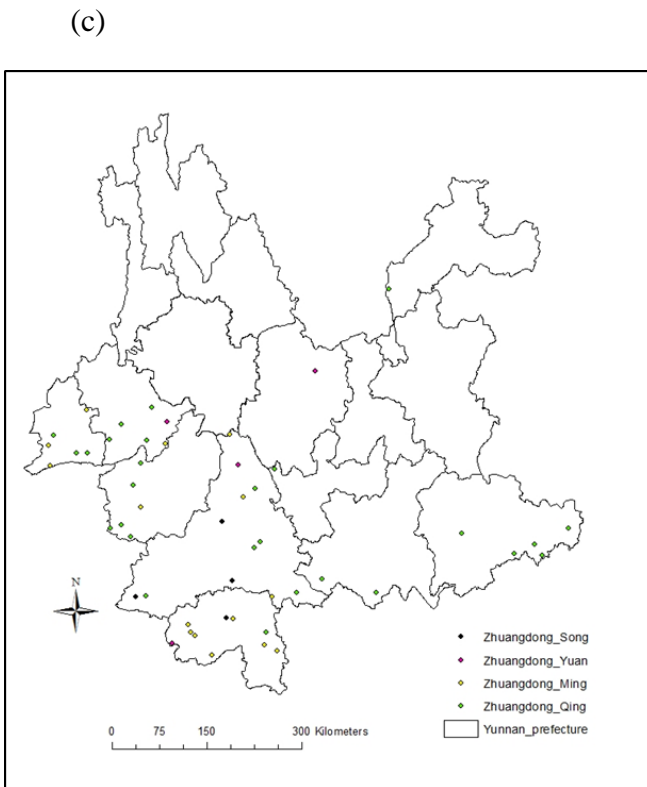
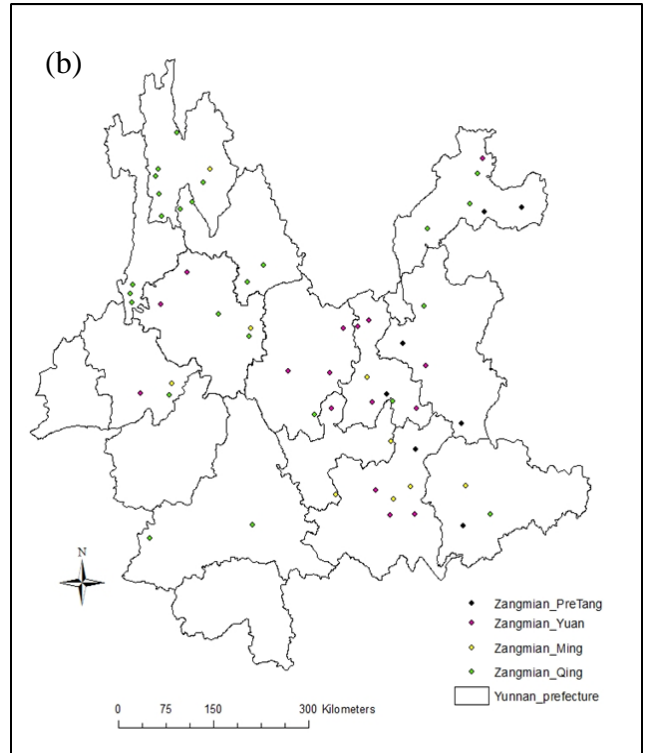
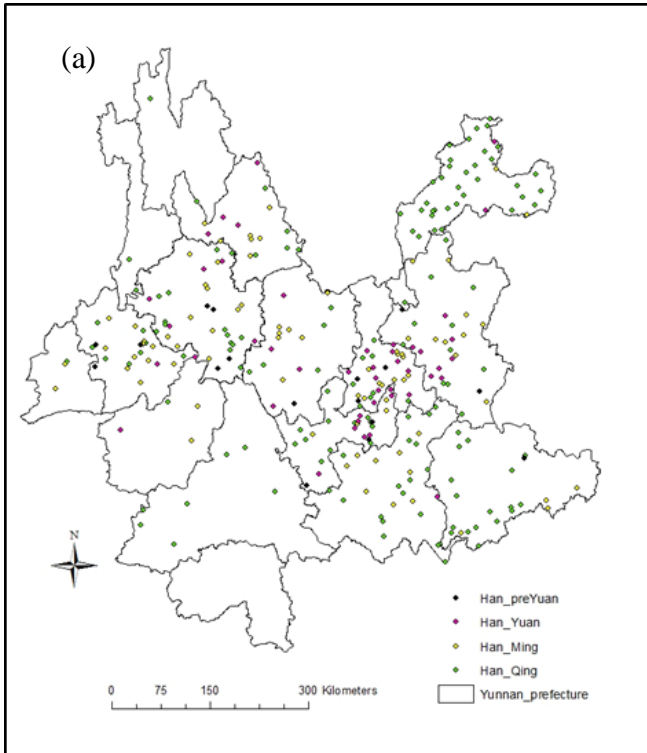


Figure 5.1 (a) First record of Han toponyms in each Dynasty; (b) first record of Zang-Mian toponyms in each Dynasty; (c) first record of Zhuang-Dong toponyms in each Dynasty.

written in Chinese. This may be attributable to the absence of minority intellectuals literate in Chinese in the area or simple lack of preservation in Chinese records for the area” (Wang, 2011:12). However, the timeline recorded in the toponyms does give us some important information on the interactions between minority and Han in history.

5.2 Historical Evolutions of Toponyms

Historical records indicate that the ancestors of minority people settled in Yunnan as early as in Spring-Autumn period (e.g., Fang, 1997). And the earliest minority toponyms in our data set were in the Han Dynasty (206 BC-220 AD). In the pre-Yuan eras, almost all Han migrants in the region were absorbed into minority groups, and not many minority toponyms were thus recorded. One minority toponym from our data set was first named in the Tang Dynasty. Different from the Nanzhao regime, the Dali (937-1253 AD) regime in Yunnan had more communication with Han. The Bai ethnic group, which ruled the Dali regime, began the process of sinicization. They learned the Han culture and created Bai characters based on the Chinese (Han) language. That explains that an increasing number of minority toponyms were recorded in the time of Dali, the same time as the Song Dynasty in the China proper. In the following analysis, we group the place names with time stamps into the eras of pre-Yuan, Yuan, Ming and Qing Dynasties.

In order to strengthen the control over minorities in southern China, the Ming ruler implemented the “Tu-si” administrative system. Although most of the administrators in the Tu-si system were minority people, some were also Han appointed by the central government. By doing so, Han were able to move into areas dominated by minority settlers and intensified the Sinification process. This also fostered the recording

of minority toponyms in Chinese. Figure 5.1(b) shows that Zang-Mian toponyms expanded to the Diqing area in northwest Yunnan in the Ming Dynasty (1368-1644 AD) by adding nine new Zang-Mian toponyms. Figure 5.1(c) shows that Zhuang-Dong toponyms expanded to the southwest and west of Yunnan in the Ming Dynasty by adding 15 new Zhuang-Dong toponyms. The Xishuangbanna area in southwest Yunnan had five new Zhuang-Dong place names. From Figure 5.1(b), we can see that three new Zhuang-Dong toponyms appeared in the Dehong area. Ming established the administrative regions of “Cheli Junmin XuanweiShisi” (Xishuangbanna) and “Lichuan Junmin XuanweiShisi” (in the Dehong area) with a comprehensive “Tu-si” system in place in 1384. This helps explain the new Zhuang-Dong toponyms in west and southwest Yunnan in the Ming Dynasty.

During Ming dynasty, 81 Han toponyms were also added, and almost doubled the Han toponyms in Yuan dynasty. These toponyms were concentrated in areas south of the Jinsha River and north of the Yuan River, and did not expand beyond the areas where Han toponyms were distributed in the Yuan Dynasty. The numerous Han toponyms recorded in this era coincided with the increasing migration of Han into Yunnan during the Ming Dynasty. “James Lee (1982) pointed out that between 1250 and 1600, population in southwest China increased from 3 to 5 million, and that this increase resulted from the agricultural expansion sponsored by the Yuan and especially the Ming state. Military colonization in the Ming period was the key to population settlement and growth in the region” (Yang, 2009: Chapter:29). Yunnan Zhi states that military colonies in Yunnan were the most important. In the beginning, the indigenous outnumbered the Han, and there were more mountains than fields, and therefore military forces in Yunnan

were unable to be fed. Military outposts by the Han ruler were built throughout Yunnan, and many military colonies were established in the plains. Increased harvests were able to meet the demand of troops, and the military companies were able to defend against bandits (Yunnan Zhi, Vol.2).

“Military colonization changed the urban population pattern where the Wei-Suo system was built to defend the administrative hierarchy. In each major city or town, troops were stationed and lands were occupied or cultivated to support them” (Yang, 2009: Chapter 5, 32). In some cases, the military strengthened and rebuilt the walled cities. In other cases, they built new walled cities, if there were no walled cities originally. As a rough estimate, the Ming central government built about 70 cities at the prefecture and county levels in total, and areas in or around the cities was occupied by Han immigrants. “Kunming, the major city in Yunnan, once saw six *wei* (Han districts) inside the city. During that time, the Han population in Kunming might have reached 100,000. Dali, Qujing, Chuxiong, Jingdong, Yongchang, Lin'an, Heqing, Menghua, and Yaoan all saw the *wei* in the cities” (Yang, 2009: Chapter 5, 32). Those cities could be large or small and “the Han population in those cities was varied from several thousands to tens of thousands” (Yang, 2009: Chapter 5, 32).

“Wei was also set up in the prefecture or county seats, for example, in Beisheng (Yongsheng), Binchuan, Yongping, Yiliang, Anning, Malong, Luoxiong, Ningyuan, and Dayao. Troops were stationed in large numbers in towns or frontier key posts to aid in military defense” (Yang, 2009: Chapter 5, 32). By doing so, as Bin Yang (2009: Chapter 5, 32) pointed out that, “the military and administrative presence in cities and towns facilitated urbanization in Yunnan. Consequently, the Han population began to dominate

urban Yunnan”. The Ming Dynasty was a period that the demography changed. Han people as a minority during the long history of pre-Ming Dynasty, increased into a majority of Yunnan.

The Qing Dynasty (1644-1912 AD) increased the number of Zang-Mian toponyms to 25, the number of Zhuang-Dong toponyms to 15, and these minority toponyms scattered across the region. Increasing migration of Han people led to more mixed settlements of Han and minorities, more interactions between them, and also more recorded minority toponyms in Chinese. Before the Qing Dynasty, the Han settlements were limited in the central area of Yunnan, i.e., south of Jinsha River, east of Lancan River and north of Yuan River. From the Yongzheng Emperor of Qing Dynasty, the state started to expand to the frontier areas such as Wenshan, Honghe, Xishuangbanna and Dehong areas. As a result, 17 new Han toponyms were added in Wenshan area, six Han toponyms added in south of Honghe area, seven in Banshan area, seven in Simao area, and 35 Han toponyms in Zhaotong area. Emperor Yongzheng implemented the an aggressive policy, “*gaitu guiliu*” policy. O’rtai was incharge of replacement of the native ‘Tu-si’ system in many areas of northeastern and southern Yunnan. In Wumeng, military forces were used to enforce it and faced a strong resentment. Lu Dingkun, a local chief in Wumeng, led a rebellion group in 1730, but was brutally brought down by O’rtai. O’rtai renamed Wumeng to Zhaotong, meaning an area reached by the imperial power (Yang, 2009). The Figure 5.1(b) shows that three Zang-Mian toponyms were added in Zhaotong area, and 10 in Diqing and Lijiang areas. The “*gaitu guiliu*” policy in late Qing Dynasty also helps explain the increasing number of Zang-Mian place names.

5.3 Centrographic Analysis of Historical Evolution Trend of Toponyms

This section uses the centrographic analysis methods in GIS to capture the overall trend of historical evolution of toponyms. Han toponyms account for over 70 percent of the toponyms in our study area and also have the highest percentage with time stamps (i.e., when they were first recorded). Han toponyms are thus used as an example to illustrate how the centrographic analysis methods can be used to outline the historical evolution trend of their spatial distribution and the association with and impacts on toponyms of ethnic minorities.

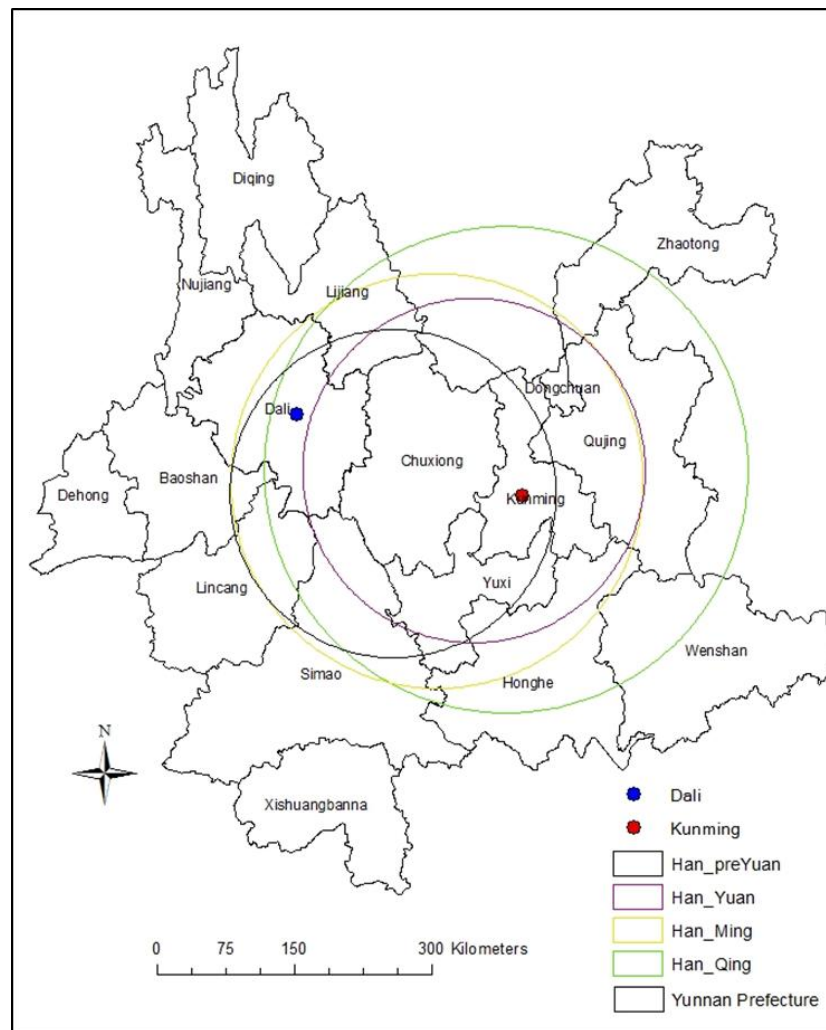


Figure 5.2 Distribution of Han place name.

First, the standard distance method is used to describe how much the distribution of toponym points deviates from their average location termed “mean center”. Standard distance is expressed as the radius (i.e., one standard deviation of the distances of all points from the mean center) to indicate the spatial spread of the point distribution. From Figure 5.2, in the pre-Yuan Dynasty, most Han toponyms were distributed in the Erhai area around central Yunnan; from the Yuan Dynasty to the Qing Dynasty, Han toponyms diffused outward and spread to the east; and in the Qing Dynasty, Han toponyms expanded to cover most of Yunnan.

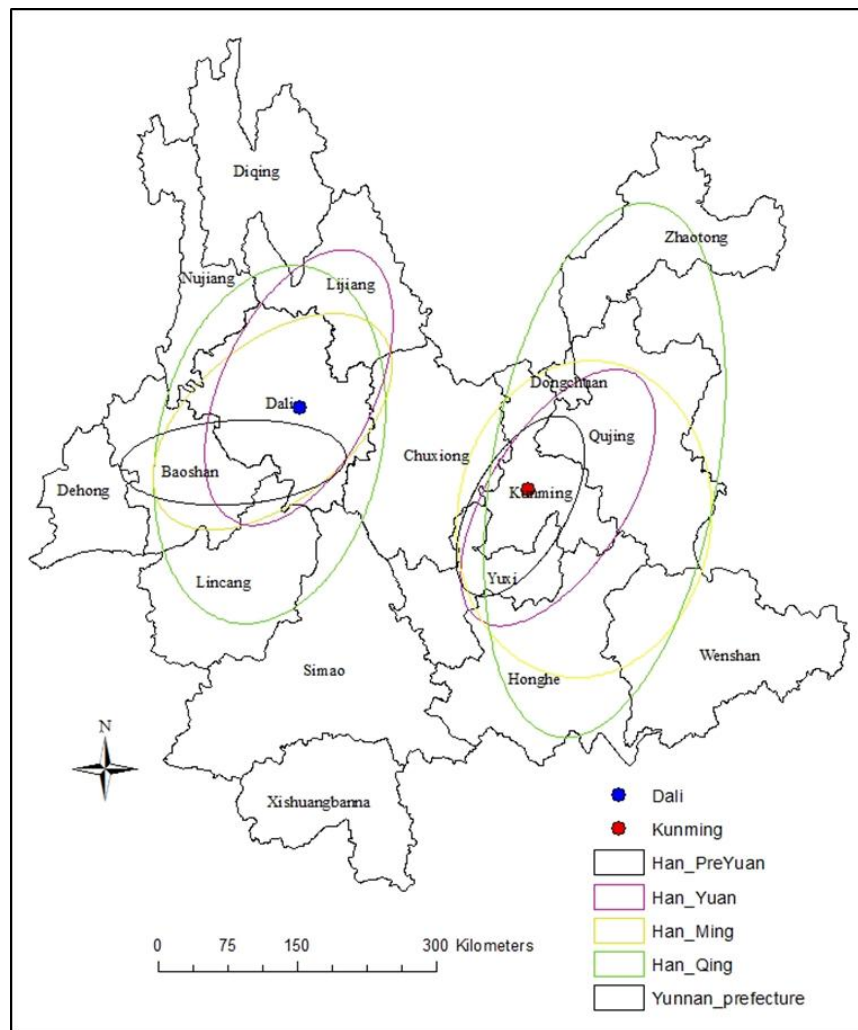


Figure 5.3 Directional distribution of Han place name.

The standard deviation ellipse method is then used to capture the directional distribution analysis of Han place names in each era. Because of the important role of the two major cities (Kunming and Dali) in the development of Yunnan as discussed in Chapter 4, the study area is divided into two regions around these cities, and the ellipse analysis is applied to each region. The division of regions is implemented by using the "near" tool to identify the Han toponym points near either city and then separate the toponym points into one group around Dali and another around Kunming. Before the Yuan Dynasty, the ellipse of Dali group is stretched along the west-east direction; in the Yuan Dynasty, the ellipse has become more towards south-north direction; by the Ming and Qing Dynasties, such a trend is increasingly evident. The Kunming group has also gradually moved from the SW-NE to S-N direction. In both groups, the expansion of Han toponyms over time is evident. As discussed previously, the Yongzheng Emperor in the Qing Dynasty started to expand to the frontier area, such as Wenshan, Honghe, Xishuangbanna and Dehong areas. This helps explain the wide spread of Han place names in the Qing dynasty.

Ethnic minority groups such as Bai, part of Yi and Dai, lived in dam areas in lowland for agricultural development for a very long time prior to the Han's arrival. A large volume of Han's influx drove much minority population to more remote rural and mountainous areas. Urban districts were commonly referred to as "Han Street" because of the concentration of Han people in cities. Before the Ming Dynasty, Han place names were mainly concentrated in the cities and towns with strategic significance and on major transportation routes. After the Ming dynasty, the increasing migration of Han people into Yunnan led the spread of Han beyond cities into more mountainous areas, and thus

naming places with Chinese semantic and Chinese surnames gradually became a norm (Lu, 2005).

CHAPTER 6. CONCLUSION

“The Sinification of ethnic minorities has been a long and ongoing historical process in China. One indication of historical change is reflected in place names over time” (Wang, 2011: 14). Many older minority names are named after geographical features. Therefore, they can be recognized at present time. “On the other hand, many other older minority place names have been obliterated or modified in the process of Sinification” (Wang, 2011: 15).

By carefully examining the comprehensive toponymical dictionary, this study constructed a GIS database of place names in Yunnan, which include three administrative levels: prefecture, county and township. Each toponym was classified as Han, Zang-Mian or Zhuang-Dong. Using GIS methods, the study shows that the highest concentrations of Zang-Mian toponyms are in north and the eastern mountainous areas, and Zhuang-Dong concentrate in the southwest and southeast areas with lower elevations. Statistical analysis reveals that Zhuang-Dong toponyms tend to have lower elevations than Han toponyms, and Zang-Mian toponyms tend to in places higher than Han toponyms. Both minority groups of toponyms are slightly farther from rivers but closer to railways or the major cities than Han toponyms.

The standard distance and standard deviation methods help reveal the historical trend of gradual expansion of Han settlement in Yunnan as recorded in the time stamps of toponyms. Before the Yuan Dynasty, the Han place names mainly were in the region of central Yunnan, i.e., the Erhai area. During the Ming dynasty, Han people spread out, into south and north, especially the north area. In the Qing Dynasty, Han people expanded to the frontier areas, such as Wenshan, Honghe, Xishuangbanna and Dehong.

This suggests that the most significant spread of Han settlement in Yunnan happened in the Qing dynasty.

The study is exploratory in nature, and illustrates the great potentials of GIS-based spatial analysis in toponymical study. However, several observations from the study call for more in-depth investigation of settlement and migration history of various ethnic groups in the region. One major challenge, encountered in this study, is the lack of historical written records of minority groups. Another direction to advance this line of work is by fieldwork and interviews of local experts on the subject.

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VITA

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