Comparative Analysis of traditional settlement landscape of Leizhou Peninsula under the difference of topography and landform

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Abstract. Leizhou Peninsula is located in Beibu gulf between Leizhou bay, has the good geographical position and pleasant climate environment for the development of appropriate settlement, is one of the important settlement developed gradually in the process of migration settlement of the formation and development is inseparable from the specific geographical conditions, different topography characteristics formed the different human settlements, therefore, traditional settlement forms are closely associated with geomorphology. Base on the geomorphic features of Leizhou peninsula, it can be classified into 5 geomorphological types, combined with the research of Google Earth and ArcGis Software and historical informations, collected the basic data of Leizhou peninsula, the representative of the traditional settlement landscape areas, statistic and analysed the data of settlement elevation settlement, waterfront distance settlement morphological characteristics and settlement landscape pattern characteristics, summarized the landform has significant influenced on traditional settlements, as the Leizhou peninsula, providing the theory basis for the protection and development of traditional settlement heritage.

1. Introduction
The formation and development of traditional settlements are influenced by natural factors, social factors, cultural factors, historical factors and other factors of the settlements and the surrounding environment[1]. The spatial form and landscape structure of traditional settlements in different regions are obviously different, among which the natural factors are more closely related to the landscape of traditional settlements. Among the natural elements such as water system, soil, climate and topographic conditions, geomorphology has the most obvious influence on traditional settlement landscape. Leizhou Peninsula has a unique natural geographical environment, with high axis in the middle, gradually decreasing to the east and west, north and south are higher than the middle and rise and fall gently. There are many traditional settlements in Leizhou Peninsula, and the diverse geomorphological conditions directly affected the formation and development of settlements, especially settlement site selection and living and production mode[2]. In leizhou Peninsula, the site selection was combined with the specific folk culture of multiple immigrants during different periods, and interacted with the natural environment to form a characteristic traditional settlement landscape.
2. Leizhou Peninsula immigration development and settlement geomorphic zoning
In a sense, the formation and development of settlements is a process of continually migration and development. The inflow of foreign immigrants and the flow of local original residents play a vital role in the construction and development of Leizhou Peninsula. Since the Qin Dynasty, the Leizhou Peninsula has attracted the attention of feudal government. The immigrants from the central Plains migrated to the land or inland rivers of Leizhou spontaneously or organized by the government. The terrain is flat and the farmland is cultivatable. In the Han and Tang Dynasties, the policy force a lot of immigrants moved to Hezhou from Fujian, and the development of Xuwen trading port along the Silk Road which initiated ocean migration boom. Fujian coastal residents moved to the suburbs and south side of Zhanjiang that have sufficient water resource, and the environment was dominated by rice fields and dry land. During the Song and Yuan Dynasties, a large scale of Fujian migration moved to Leizhou, forming trading ports such as Chikan Port and Xuwen Port. They immigrated spontaneously for profit and settled along the coast of Leizhou Peninsula, and still involved in ocean exploration. During the Ming and Qing Dynasties, the Wei system led to the emigration of troops, which increased the population of Leizhou Peninsula. Classified into five types of settlement basing on the geomorphologic characters: flowing plain settlement groups, volcanic geomorphic settlement groups, hilly geomorphic settlement groups, marine geomorphic settlement groups, man-made geomorphic settlement groups.

3. Comparative analysis of traditional settlements
3.1. Geomorphic type classification and settlement selection
Leizhou landform can be classified into five types: flowing plain, volcanic landform, hilly landform, marine landform and man-made landform. Based on the village database of Guangdong Province, combined with the "Leizhou Prefecture History", "Leizhou Inmovable Cultural Relics List", cultural relics protection units at all levels and gazetteers and other relevant materials, figure out the located points of traditional settlements on the map by using Google earth and ArcGIS. There are 108 typical traditional settlements with obvious landscape features and well-preserved spatial pattern were screened out from Leizhou Peninsula villages in total. Taking a single settlement as one sample point, the site selection characteristics and distribution rules of settlements could be concluded. Among them, the settlements of flowing water plain are mainly located in the central and eastern plain with little fluctuation and flat surface, including 30 traditional villages such as Tiofeng Village, SuEr Village and Shuangcun Village. Volcanic landform settlements are mainly concentrated in the south Xuwen area and the volcanic mound area near Suixi County, including bronze Village, Maipan Village, Xishan Zai and other 25 traditional villages. The hilly landform settlements are mainly located on the north of the low hilly areas, including 20 traditional villages such as Dayan Village, Huqiao Village and Shangcun village. The landform settlements of Haicheng are mainly concentrated in the Marine plain and coastal area, including Jijia Village, Xuhuang Village, Jiaoliao Village and other 18 traditional villages. Man-made geomorphic settlements are mainly concentrated in coastal areas near yantian and artificial farms, including 15 traditional villages such as Changtsai Village, Jianling Village and Nantian Village.

3.2. Location characteristics
3.2.1. Settlement elevation analysis.
By overlay analysis of different groups on the elevation of the distribution of diverse: (1) the settlement of the plain water mainly concentrically distributing on delta plain and river terrace area between 0-80 m above sea level, because the relief effect, which is more suitable for living and farming, settlements are located on relatively higher altitude areas, most are between 20 and 50 m, a handful of between 50-80m. (2) Volcanic geomorphic settlements are mainly concentrated in the area between the altitude of 50-150 m near the volcanic mound. As the basalt terrain gradually decreases
from the volcanic mound to the surrounding area, settlements are mostly selected on the flat land between large gentle slopes. Settlements of 50-100 m account for 60% of the sample quantity. (3) Settlement of hilly geomorphology is mainly concentrated in the area between the altitude of hilly 80-250 m. Due to the high terrain, most of the villages were selected in the flat area between two hills, which conforms to the shape of the terrain. Settlements of 80-130 m account for 70% of the sample quantity, and a small number of settlements are settled at higher altitudes. (4) Marine geomorphological settlements are mainly concentrated in the region between 0-25 m of the sea-level plain. With the continuous erosion of waves, villages are located far away from the shoreline and parallel to the shoreline and choose to live high. Settlements between 10-15 m and 15-25 m account for 38% in total. (5) Man-made landform settlements are mainly concentrated in the area between 0-10m altitude near yantian and artificial farm, with more cultivated land, more dense villages and banded distribution along the river, basically concentrated in the range of 5-10 m. Thus, it can be seen that the settlement groups in the flowing plain choose to live high in the settlement site, and the hilly landform settlement groups and volcanic landform settlement groups choose to live in the valley. Marine and man-made geomorphic groups live around the lowlands.

3.2.2. Waterfront distance analysis of settlements.
There are many rivers distributed on Leizhou Peninsula, but most of them have shorter source and flow, less water volume and small drop difference[3]. There are many lakes and reservoirs in Leizhou Peninsula. As a landform, river affects the location of settlement and the occurrence of settlement culture, and many human beings are generated around the river. Though superposed the hydrological map and the site distribution map, establishing river buffer, there are water-front settlements 0.5 km away from the river and 2 km away from the coastline, water-near settlements 1 km away from the river, far-water settlements are defined as those 1 km above the river and 2 km above the coastline, figure out the relationship between the settlement and hydrology as following: (1) the large scale catchment of river is located in the Leizhou, Xuwen, Shuixi water system is relatively weak, but the settlement of all sorts of landscape has high hydrophilia. (2) The water system in the flowing plain is complex, with many branches and winding forms. The settlements distributed by the water are about 70%, while the settlements distributed away from the river has 30% in total. The majority of villages are concentrated near water bodies, which are rich in external economy and easy to form large market towns. (3) The water systems of volcanic landforms are mainly channels and reservoirs. The water-near settlements and the far-water settlements are basically equal, accounting for about 50% each. Villages are relatively clustered near the reservoirs or live by underground water. (4) Although the elevation of the hills is higher, but still distributed a lot of water channels, tributaries are scattered throughout the region, and the water-near settlements and far-water settlements account for about 45% respectively. Villages are selected along the direction and form of the river. (5) Marine geomorphology belongs to areas water-front and are basically water-front settlements. A few settlements are subject to sand loose and inclined terrain, and are located far from the coastline in a multi-zone arrangement form. (6) Man-made landform settlements have to rely on the aquaculture. Most of them are near shrimp farms or salt farms, and all of them are close to water. It can be seen that water system is an important factor for settlement site selection, which not only determines the location of site selection, but also guides the development trend of settlement. The settlement groups of flowing plain and hilly landform live along the canal on the settlement site. Volcanic landform settlements follow the terrains and live by water. Marine geomorphology and man-made geomorphological settlements live close to water.
3.3. Analysis of settlement morphological characteristics

According to the geomorphic features, the Leizhou Peninsula is classified into several morphologies of settlement, and the northern settlements are concentrated and distributed in large clusters, while the southern settlements are sparse and show free scatter distribution. The eastern and western settlements show a banded shape distribution. Based on the statistical analysis of topographic and geomorphic superposition settlement site selection, it can be seen that: (1) the villages in the flowing plain have relatively high aggregation density, the surrounding areas are wide, fertile farmland and flat terrain, which are conducive to drainage, water intake and defence, and generally present the characteristics of clustering along the canal. (2) Villages with volcanic landforms are affected by the scattered distribution of volcanic mounds, with free morphology and small density, and the overall distribution features of scattered points. (3) Due to the small available area, villages in hilly landform are distributed in a concentrated manner, presenting the overall clustering distribution characteristics. (4) As a whole, the villages with Marine landforms are distributed in parallel and sparsely arranged, and the middle area of the parallel belt formed by different villages is farmland. (5) Villages with man-made landforms are parallel to shrimp farms or salt farms, and distributed in belts. It can be seen that the obvious difference of landforms has an important influence on the formation of settlement groups, and promotes the diversification of settlement forms.

3.4. Analysis of settlement landscape pattern

Basic on the further comparative analysis, explored the landscape patterns of settlement as following: (1) there are large area of paddy and farmland surrounding the settlement close to the plain settlements, which is more likely to form a large village, surrounded by the pond, the back or both sides with trees, the wind, defensive role, combined with small changes in the elevation difference, has formed "the woods - pool - village" or "the woods - village pond" structure. (2) Villages with hilly landforms are mostly located in flat areas among the hills, and farmlands are surrounded by villages. Due to the high terrain and lack of water resources, most villages are equipped with ponds, and forests are preserved on the hills, which has a good defensive effect. (3) Villages with volcanic landforms are usually surrounded by dense forests, which form a green ecological barrier between volcanoes and villages. There are large areas of farmland around them, most of which are ploughed through water channels, forming a structure of "field-forest-village-water". (4) Villages with Marine landforms have rich land for development. Villages are surrounded by farmland and located on terraces. Villages and rivers are separated by farmland or ponds, and trees are arranged on one side for wind and defense. (5) Villages with man-made landforms and rivers are connected with ponds or villages directly to rivers, forming dense market towns. Docks and boat berths are set near water, and villages and farms are generally separated from each other through water channels and farmland. Geomorphic differences are limited, therefore, forms the foundation of settlement landscape pattern and the main factors, different terrain conditions determines the farming conditions, especially the limitation of available for ploughing area.
and water resource, directly affect the size of the settlement and distribution of intensity, to determine the structure and characteristics of the settlement landscape.

4. Conclusions
(1) By focusing on the geomorphologic perspective, the interaction between geomorphology and settlement formation can be studied by software fixed-point quantization, on the one hand, it can provide a new perspective for the traditional settlement study of Leizhou Peninsula. On the other hand, the deep connection between man and nature can be comprehensively considered in the process of future village development.

(2) During the spontaneous formation of traditional settlements, the spatial morphological characteristics of settlements are closely related to natural forces and social internal and external forces. Based on the analysis of the site selection of traditional settlements in Leizhou Peninsula under the condition of geomorphological difference, it is found that under the influence of the natural geomorphological conditions and the time sequence of immigration development, the settlement groups in the flowing plain show the distribution characteristics of "living on the high side, living beside the channel, and living around groups along the channel". The hilly landform settlement group "chooses the valley to live, lives according to the canal, gathers the distribution". Volcanic landform settlement groups "choose the valley to live, live according to the water, scattered distribution". The Marine geomorphic settlement groups "live in low ring, near water and in parallel distribution". The distribution characteristics of anthropogenic geomorphology are "living in low ring, living near water and banded distribution".

(3) The formation and development of traditional settlements are inevitably inseparable from their unique historical background, natural environment and traditional culture. This paper revealed the rule of how traditional settlements distributed on the multiple landforms in Leizhou Peninsula, trying to figure out a method that could scientific preserve and innovate the traditional cultural heritage, also providing the theoretical reference for conservation planning of the traditional settlements.

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