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# Ocean erosion: the main cause of Zhangjiajie landform

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**Abstract:** The available evidence indicates that ocean erosion is the main cause of Zhangjiajie landform. It is the strength of the sea that has created Zhangjiajie's unparalleled magnificent scenery. The various micro-landforms in Zhangjiajie landforms respectively correspond to various ancient sea-eclipse micro-landforms, such as ancient sea erosion headland bay, ancient sea erosion cliff, ancient sea erosion arch bridge, ancient sea erosion column, ancient sea erosion platform, ancient sea erosion cave and so on.

## 1. introduction

The Zhangjiajie landform refers to the middle and upper Devonian quartz sandstones that are near-horizontal occurrences as the main scenery rock, and the tall stone pillar forests with straight edges and corners, as well as the deep cut valleys, stone walls, Tianshengqiao, Fangshan, and platforms Landform landscape represented by isomorphic landforms. Existing evidence shows that sea erosion is the main cause of Zhangjiajie's landforms and the strength of the sea, which has created Zhangjiajie's unparalleled magnificent scenery. The position of the earth's seawater surface is neither fixed nor fickle, but it will be stably maintained in a certain position for a long time after a large change, which makes the ancient oceanic geomorphology widely distributed on the earth. Zhangjiajie landform is a typical ancient oceanic landform

## 2. Corroded Landforms in Zhangjiajie

### 2.1 Cave—Ancient sea cave (hole)

Sea erosion cave, also known as wave erosion, is a cave and groove left by the coastal bedrock due to the erosion of the waves. Sea caves are one of the most widely distributed landforms on the bedrock coast.



Figure 1 erosion cliffs on the coast. Ancient sea caves are widely distributed on the sandstone peak forests and rock walls of Zhangjiajie.

A coast. There are abundant sea caves on the sea



## 2.2 Tall stone pillar—Ancient sea eclipse

Tall straight pillar forest—Sandstone Peak Forest, Is the main feature of Zhangjiajie landform. These stone pillars in Zhangjiajie are sea erosion geomorphology during the paleogeological period, and are ancient sea erosion pillars.

Sea erosion pillars are rock pillars formed by the collapse of the coast after being eroded by the waves. Erosion pillars and horizontal lines are usually distributed on it, which is a sign that distinguishes them from non-eclipse pillars. The sea cave on the sea erosion column is the result of long-term sea erosion, and its horizontal lines may record that the sea surface does not stay for a long time at a certain location.



Figure 2 Scottish "Elder Hoy" sea column

Ancient tall eclipses and horizontal lines are distributed on the tall and straight stone pillars in Zhangjiajie, which shows their past marine survival process. They have been subjected to strong long-term erosion and erosion by seawater.



Figure 3 Zhangjiajie Sandstone Peak Forest. Sandstone peak forests are rich in ancient sea erosion caves and horizontal lines, which are the ancient sea erosion pillars

## 2.3 Tianshengqiao—Ancient sea eclipse arch bridge

Ocean erosion arch bridge, also known as land bridge or ocean erosion arch, is a very peculiar ocean erosion landform on the bedrock coast.

The Tiansheng Bridge and Xianren Bridge in Zhangjiajie Landform are ancient sea-eclipse arch bridges





Figure 4 An ocean arch bridge



Figure 5 "The First Bridge in the World" in Zhangjiajie. "The First Bridge in the World" is an ancient sea eclipse arch bridge



Figure 6 Tianmendong in Zhangjiajie. The Tianmendong is an ancient sea eclipse arch bridge

#### 2.4 platform—Ancient ocean eclipse platform

Sea erosion platform refers to the flat platform of bedrock formed in front of the sea erosion cliff.

The platforms in the Zhangjiajie landform are some ancient ocean erosion platforms.



Figure 7 An ancient oceanic platform in Zhangjiajie

### 2.5 Rock wall—Ancient sea erosion cliff

Sea erosion cliffs, also known as wave erosion cliffs, refer to cliffs and cliffs formed by the coast collapsed by the waves.

The long rock wall in Zhangjiajie landform is an ancient sea erosion cliff.



Figure 8 Rock faces in Zhangjiajie. Rock face is ancient sea erosion cliff

### 2.6 Shan—Ancient ocean erosion headland

Ocean erosion headland refers to the pointed land formed by the ocean erosion and protruding into the sea.

An oceanic cape is a place recessed by the sea.

In the Zhangjiajie landform, the so-called barn valley is connected by the ancient sea eclipse headland and bay.



Figure 9 Zhangjiajie Aerial Garden. The sky garden is an ancient sea erosion platform, and the outer edge of the platform shows a state of headland and bay connection



Figure 10 Ancient Sea Eclipse Headland in Zhangjiajie

### 2.7 Zhangjiajie ancient sea erosion cone rock mass

A conical rock mass is a conical rock mass formed by sea erosion. Zhangjiajie has a large number of paleocean cone rocks.



Figure 11 A scene from Zhangjiajie. Ancient sea erosion cones are regularly distributed above the large rock wall

## 3. Sea surface location during the main period of Zhangjia landform formation

Ancient sea erosion caves, ancient sea erosion pillars, ancient sea erosion cliffs, ancient sea erosion arch bridges, ancient sea erosion cape headland bays, and ancient sea erosion cone-shaped rock bodies can indicate the location of the ancient sea surface. Zhangjiajie can produce such a large and diverse variety of sea erosion landforms. The sea and land divisions of Zhangjiajie landform formation period will definitely leave a deep imprint indicating the location of the ancient sea surface.

And this is indeed the case. There are a lot of markers reflecting the position of the sea surface in the formation period of Zhangjiajie landform. For example, the ancient sea erosion landforms of Zhangjiajie's First Bridge, Xianren Cave, Tianmen Cave, and Dayanwu are all distributed on the same horizontal plane, which not only indicates that they were formed in the same period and the same sea surface, but also in turn indicates the formation period of Zhangjiajie landforms. Sea surface location.

The most direct indication of the position of the seawater surface during the formation period of Zhangjiajie landform is the seawater mark on the large rock wall of Zhangjiajie. On the large rock wall in Zhangjiajie, there is a long sea water print. After tens of millions of years, it is still very deep and clear, which is enough to illustrate the depth of the original sea erosion here. It can be known from measurement that





Figure 12 A scene from Zhangjiajie. Deep ancient sea water marks remain on the big rock wall in Zhangjiajie Scenic Area

It can be known from measurement that in the main period of formation of Zhangjiajie landform, the marine intertidal zone was located between the current sea level of 772 milan and 782 meters. Since then, there have been many sea retreats. The Zhangjiajie landform was formed during the sea erosion relay, but the time spent on the sea surface at a certain location did not stay at the current sea level from 772 Milan to 782 meters. The impact was not large enough.

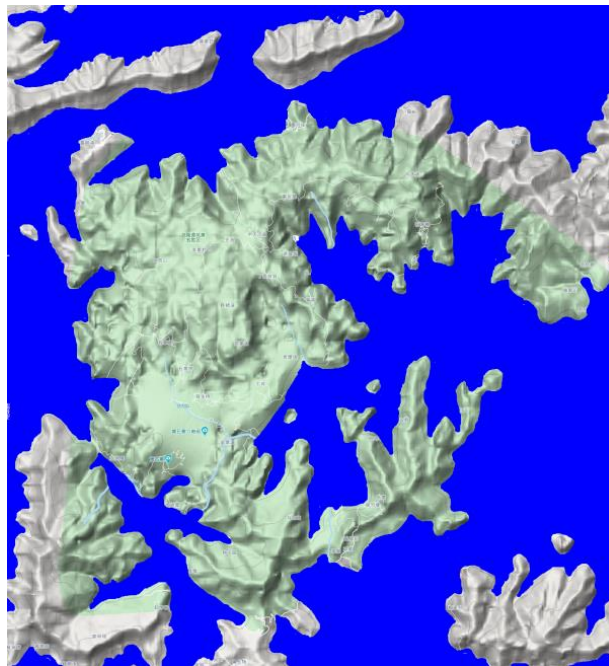


Figure 13 The formation period of Xianren Bridge, that is, the main period of formation of Zhangjiajie landform, the sea and land map of Wulingyuan Scenic Area



Figure 14 The formation period of Tianmen Cave, that is, the main period of formation of Zhangjiajie landform, the sea and land map of Tianmen Mountain Scenic Area

#### 4. The age of Zhangjiajie landforms

The sea is so vast and the coastline is so long. During the paleogeological period with millions of years as the smallest chronological unit, when the seawater surface remained stable in one place for a long time, on the coastline at the same seawater location, Will create countless sea erosion landforms. They remain distributed at the same sea level today. On the ancient coastline at an altitude of 772 to 782 meters above sea level, there are famous scenic spots such as Lotus Baozhai in the Minjiang River, Zhuhaixian Shunan in the south of Sichuan, Wansheng Stone Forest in Chongqing, Sandstone Peak Forest in Zhangjiajie, and Redstone Wild Valley in Chishui. It is the sea that has shaped these amazing landscapes in tens of millions of years.



Figure 15 Ancient sea caves in Baozhai, Minjiang River



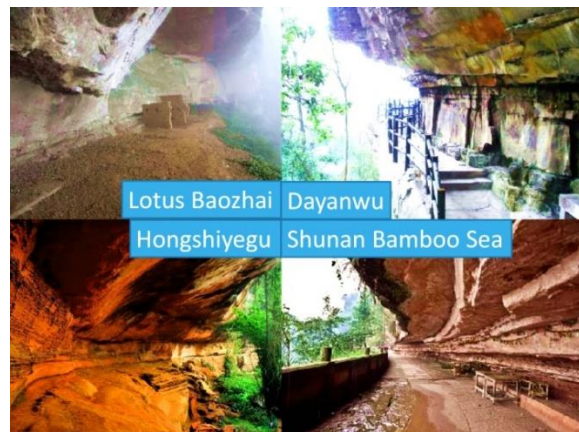


Figure 16 Minjiang River Lotus Baozhai, Zhangjiajie Dayanwu, Chishui Hongshiyegu, Shunan Bamboo Sea Fairy Cave Four ancient sea caves are formed on the same ancient coast, and their corresponding parts have the same altitude

Among so many ancient sea erosion landforms, the most peculiar is the ancient sea erosion cave of Baozhai in the Minjiang River. Fossils of dinosaur footprints were found in the ancient sea erosion cave of Baozhai in Lianhua. Fossil footprints of dinosaurs in the ancient sea caves of Baozhai in the Minjiang River, suggesting that the formation of the Zhangjiajie landform was the age of dinosaur activity. According to the inference of relevant experts, the period of fossil trails of dinosaur footprints in the ancient sea caves of Baozhai in the Minjiang River is about the early and middle Cretaceous. If the above inferences are reliable, the age of formation of Zhangjiajie landform is about the early and middle Cretaceous. From the analysis of the scale of sea erosion landform development, the duration should be no less than 30 million years.

## 5. Conclusion

The Zhangjiajie landform is actually an ancient sea-eclipse landform, and its formation period is about the early and middle Cretaceous. During the main period of formation of Zhangjiajie landform, the sea surface was about 772-782 meters above sea level, and the time of sea erosion should be more than 30 million years. There are five major landforms in China, including Zhangjiajie landform, ocher rock landform, Danxia landform, karst landform, and landform landform. The sea is the chief stylist of these landforms. It is clear that sea erosion is the main cause of Zhangjiajie's landforms, which helps people understand the process of the earth's sea and land changes, locks the trajectory of the earth's sea into and out of the sea, and more clearly understands the history of earth's growth.

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