

Introduction to Plate Tectonics 板块构造论简介

The surface of the Earth is called the "crust". A planet's crust is the outermost layer of solid rock above any planet's mantle. Even below the oceans there is a thick layer of rock which is part of the planet's crust. The planet's mantle is the region between a planet's outer crust and inner core. The mantle consists of hot dense molten rock.

地球表面叫做“地壳”，地壳是指位于地幔之上的由岩石组成的固体外壳，甚至海洋下的厚厚的岩石层也是地壳的一部分。地幔位于地球外壳和内核之间，地幔是由致密的熔融岩石构成的。

Natural phenomena such as the formation of mountains, earthquakes, and tsunamis are a result of the various sections of the world's landmasses forming the outer crust of the earth slowly moving on top of the earth's mantle which is made of molten rock. The theory that explains the movements of the land masses forming the earth's crust is called "Plate Tectonics".

很多自然现象如山脉的形成、地震和海啸都是由于地核慢慢移出地幔中的熔融岩石引发的。这一理论我们称为“板块构造论”。

The earth has 7 or 8 major tectonic plates and numerous smaller plates. These massive plates move slowly as convection currents below them in the earth's mantle causes pressure at various faults. Molten rock is forced up from the earth's mantle at divergent faults. This results in new crust being formed. This new crust displaces existing crust causing one plate to be pushed under another plate at a convergent fault. This process is ongoing, as new crust is created, and old crust is destroyed. Although each tectonic plate moves at different rates the movement typically ranges between 0 and 100mm annually.

地表有7、8个主要的板块和无数个小的板块构成。由于地幔中的软流圈的对流产生压力从而使这些大的板块慢慢移动，地表的扩张使得地幔中的熔融岩石被迫压出地表而形成新的地壳。当新的地壳取代现有地壳，在俯冲过程中导致一个板块被迫压在另一个板块之下。因为新的地壳不断产生而旧的地壳要不断被取代，所以以上过程会持续发生。每个板块移动的频率各不相同，在总体上每年板块移动的幅度在0到100毫米。

Although the causes for plate tectonics is still debated by scientist there are three leading theories that explain why the earth's tectonic plates move. These theories are not independent from one another. Many scientist also agree that all three theories work in conjunction and all have their own unique part of the bigger puzzle.

尽管科学家们对板块构造论的原因还是争论不休，但是普遍认为有三大理论，这些理论并不是相互独立的，他们认为这些理论是相互联系并各有其独特的见解。

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The first theory is “mantle dynamics”, which was proposed by Arthur Homes in the 1930s indicates that large scale convection currents in the upper mantle causes the earth’s plates to slowly move.

第一种理论是“地幔动态论”，是20世纪30年代 Arthur Homes提出来的，该理论认为上地幔中大范围的对流导致板块的慢慢移动。

The second theory is “driving forces related to gravity”, which elaborates on the different gravitational forces that would be present in various regions of the earth’s crust as the thickness and destiny of the crust varies greatly from thinner crust under oceans and thicker areas of crust in the various continental regions.

第二种理论是“地球引力动力论”，地壳的厚度和密度不同也会导致地球引力的不同，海洋下面的地壳比较薄而陆地下面的地壳比较厚。

The third theory is “driving forces related to the Earth’s rotation”. There are various aspects of rotational forces such as tidal drag and its effect on the Earth’s crust, strain as a result of North South Compression on the Earths crust, as well as centrifugal force which would push land masses away from the poles and towards the equator.

第三种理论是“地球转动动力论”，地球的转动会带来很多不同的动力，如潮汐力及其对地壳的影响，南北方向对地壳的挤压带来的张力，还有陆地远离两极靠近赤道的离心力。

Important Terms: 重要的术语

Lithosphere |'liTHə,sfi(ə)r| *Noun: Geology*

the rigid outer part of the earth, consisting of the crust and upper mantle.

岩石圈

地表的坚硬外壳，由地壳和上地幔组成

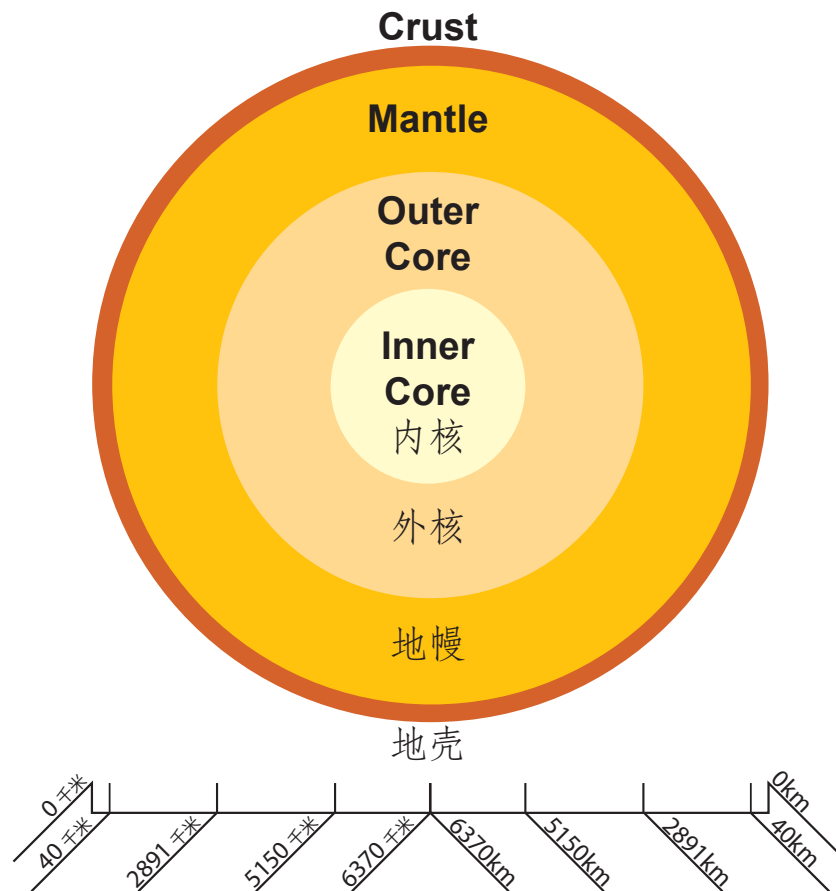
Asthenosphere |as'THenə,sfi(ə)r| *Noun: Geology*

the upper layer of the Earth's mantle, below the lithosphere, in which there is relatively low resistance to movement and convection currents of molten rock.

软流圈

位于上地幔上部岩石圈之下，其中熔融岩石对流强烈

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Crust 地壳

The Earth's crust is 40 Kilometers thick and is made of solid rock.

地壳厚达40千米，是由坚固的岩石构成。

Mantle 地幔

The Earth's mantle is between the depths of 40 and 2891 kilometers, and is made of molten rock.

地幔位于地表以下40千米到2891千米，由熔融岩石构成。

Outer Core 外核

The outer core is between the depths of 2891 and 5150 kilometers and consists of liquid iron.

外核位于地表以下2891千米到5150千米，由液体铁构成。

Inner Core 内核

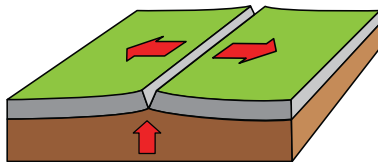
the inner core is between the depths of 5150 and 6370 kilometers, and forms a dense solid iron sphere at the earths core.

内核位于地表以下5150千米到6370千米，并形成一层致密的固体铁。

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There are three major transformations that are caused by the movement of the Earth's tectonic plates. **“Divergent”**, where plates separate from one another forming new crust, this is typical of geographic regions with volcanos or mountain ranges. **“Convergent”**, where plates destroy existing crust as old crust is pushed below another, earthquakes on convergent faults cause destructive earthquakes known as “Mega Thrusts”. If the epicenter located under the ocean the resulting earthquakes would result in tsunamis. Finally **“lateral”**, where plate movements neither create nor destroy existing crust.

板块运动有三种主要的形式：**“分离”**，两大板块相互分离形成新的板块，典型地区是火山喷发或山脉形成区域；**“会聚”**，一个板块被迫压在新生成的板块之下，这一过程产生的破坏性地震称为“特大推力”，如果震中大洋中会引发海啸；**“侧滑”**，这种情况下没有板块形成或消失。



Divergent
分离 (扩张运动)

Motion: Spreading

动态：张裂

Effect: Constructive

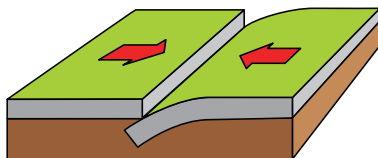
作用：形成

New crust is created as molten rock is pushed up from the mantle forming new crust.

熔岩涌出形成新的板块

Topography: Ridge

地势：山脊



Convergent
会聚 (趋近运动)

Motion: Subjective

动态：俯冲

Effect: Destructive

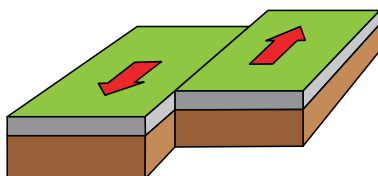
作用：消失

Old crust is destroyed as it is pushed under another tectonic plate.

一个板块地壳俯冲到另一个板块之下

Topography: Trench

地势：峡谷



Transform
改造 (碰撞滑开)

Motion: Lateral sliding

动态：侧滑

Effect: Conservative

作用：保守

Rock formations are neither created nor destroyed.

没有变化

Topography: No effect

地势：无