

Table of Contents

1. Introduction
2. Earth's Interior
3. Convection Currents and the Mantle
4. Theory of Continental Drift
5. Evidence from Land Forms
6. Evidence from Fossils
7. Evidence from Climate
8. Sea-floor Spreading
9. Evidence from Molten Material
10. Evidence from Magnetic Stripes
11. Ocean Ridges and Trenches
12. Theory of Plate Tectonics
13. Earth's Lithospheric Plates and Boundaries

1. Introduction

Plate tectonics accounts for important features of Earth's surface and major geologic events.

As a basis for understanding this concept: students know evidence of plate tectonics is derived from the fit of the continents; the location of earthquakes, volcanoes, and mid-ocean ridges; and the distribution of fossils, rock types, and

2. Earth's Interior

The solid Earth is layered with cold, brittle lithosphere; hot, convecting mantle; and dense, metallic core.

3. Convection Currents and the Mantle

Many phenomena on the Earth's surface are affected by the transfer of energy through radiation and convection currents.

Heat from Earth's interior reaches the surface primarily through convection.

4. Theory of Continental Drift

Lithospheric plates that are the size of continents and oceans move at rates of centimeters per year in response to movements in the mantle.

5. Evidence from Land Forms

Wegener hypothesized that all the continents had once been joined together in a single landmass and have since drifted apart. He named this supercontinent Pangaea meaning "all lands."

The coastlines of Africa and South America look as if they could fit together like jigsaw-puzzle pieces.

6. Evidence from Fossils

Fossils of the reptiles Mesosaurus and Lystrosaurus have been found in places now separated by salty oceans that would have prevented their vast migration.

250 million year old fossils of the fern Glossopteris have been found in rocks in Africa, South America, Australia, India, and Antarctica. The seeds were too large and too fragile to be

7. Evidence from Climate

Fossils of 300 million year old tropical plants have been found near Norway and the Arctic Ocean.

Deep scratches in rocks showed that continental glaciers once covered huge masses of present-day South Africa, Australia, and South America.

8. Sea-Floor Spreading

At the mid-ocean ridge, molten material rises from the mantle and erupts.

The molten material then spreads out, pushing older rock to both sides of the ridge.

9. Evidence from Molten Material

Pillow lava forms only when molten material hardens quickly after erupting under water. Pillow lava has erupted again and again from cracks along the central valley of the mid-ocean ridge.

10. Evidence from Magnetic Stripes

Currents in the liquid outer core force the solid inner core to spin causing a magnetic field. The magnetic poles reverse themselves periodically, the last one being 780,000 years ago.

The ocean floor (renewed every 200 million years) may have up to 250 magnetic stripes left over from molten iron particles solidifying in the direction of Earth's magnetic poles.

11. Ocean Ridges and Trenches

At deep-ocean trenches, subduction allows part of the ocean floor to sink back into the mantle, over tens of millions of years.

The Pacific Ocean is getting smaller due to more subduction trenches than mid-ocean ridges.

The Atlantic Ocean is expanding due to more ridges than trenches.

12. Theory of Plate Tectonics

Pieces of Earth's lithosphere are in constant, slow motion, driven by convection currents in the mantle.

This explains the formation, movement, and subduction of Earth's plates.

Earth's Lithospheric Plates and Boundaries

Plates slip past each other at transform boundaries, move apart at divergent boundaries, and come together at convergent boundaries.