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The Andaman Trench

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The Andaman Trench

One deep crack in the seafloor explains two very different things.

It built India's only active volcano. It also set off the worst natural disaster in living memory.

This lesson follows that crack from the plates below to the islands above. It also corrects some numbers that are often repeated wrongly.



Barren Island, built by the same subduction that forms the Andaman Trench. Photo: Rohitjahnavi, Wikimedia Commons, CC BY-SA 3.0.

Where is the Andaman Trench and why does it exist?

Which plates meet at the Andaman Trench?

The **Indian plate** moves north-east. It meets the **Andaman plate**, which is also called the **Burma microplate**.

A microplate is a small plate wedged between larger ones.

The Indian plate slides down under the Burma microplate. This sinking is called **subduction**, and it makes the trench.

Sources: cires1.colorado.edu

Do the plates only push head-on?

No. The plates meet at a slant, so they also grind sideways past each other.

Some of that sideways motion happens on the **Andaman fault** under the sea to the east.

Measured motion between the plates is only about 14 mm a year in the northern Andamans. That is slow, but strain builds for centuries.

Sources: cires1.colorado.edu

> **Quick check 1.** The Andaman Trench forms where the Indian plate slides under the Burma microplate. *(True or False?)* See answer ↓

How deep is the Andaman Trench?

Be careful with this number. The figure of **4,198 metres** is often given for the trench.

A marine source gives it as the maximum depth of the **Andaman Sea**, not of the trench itself.

The same source gives the sea an average depth of 1,096 metres and an area of about 797,000 square kilometres.

So in an exam, link 4,198 m to the Andaman Sea.

Sources: marineinsight.com

> **Quick check 2.** The figure of 4,198 metres is the maximum depth of the Andaman Sea. *(True or False?)* See answer ↓

How did the trench make Barren Island?

What does a subduction zone build above it?

Plate sinking does more than dig a trench. It also feeds a line of volcanoes above the sinking plate.

Barren Island is the only historically active volcano on the volcanic arc that joins Sumatra and Myanmar.

The island is tiny, only about 3 km wide. It sits about 135 km north-east of Port Blair.

Sources: volcano.oregonstate.edu

Trench Indian plate sinks under the Burma microplate
Islands Andaman and Nicobar chain rises above
Volcano Barren Island on the volcanic arc
Sea Andaman Sea to the east

What is inside Barren Island?

Barren Island has a crater 1.6 km wide that is open to the west.

Inside it stands a cone of volcanic ash and rock. Every historical eruption has come from this cone.

The summit stands 305 metres above the sea.

Sources: volcano.oregonstate.edu

When has Barren Island erupted?

Eruptions were reported in 1787, 1789, 1795 and 1803. One in 1852 is possible.

The 1803 eruption sent lava flows to the coast.

Then the volcano slept for almost a century and a half before it woke again in 1991.

Sources: volcano.oregonstate.edu

What happened in 1991 and 1994?

The 1991 eruption began in late April with hot gas and strong ash emissions. It ended in late October.

A new eruption was first seen by the Indian Navy on 20 December 1994. Lava flowed about 1.5 km into the sea.

Scientists from the Geological and Zoological surveys of India visited the island in 1995.

Sources: volcano.oregonstate.edu

> **Quick check 3.** Barren Island is the only historically active volcano on the arc joining Sumatra and Myanmar. *(True or False?)* See answer ↓

What happened on 26 December 2004?

How big was the 2004 earthquake?

The earthquake struck on **26 December 2004**. Its epicentre was off Sumatra, at about 3.3° N, 95.9° E.

Estimates of its size differ. Early reports said 9.0. Later studies used 9.2, and one analysis suggested 9.3.

Bilham notes that no earlier earthquake on this plate boundary had such a magnitude.

Sources: cires1.colorado.edu; authors.library.caltech.edu

How long was the break in the fault?

The rupture ran for more than 1,300 km along the plate boundary. A later study put it at about **1,600 km**.

That study traced uplift from Simeulue Island in Sumatra to Preparis Island off Myanmar.

The break was also very wide. It reached more than 160 km across, at depths between 4 km and about 50 km.

Sources: cires1.colorado.edu; authors.library.caltech.edu

Which islands rose and which sank?

The western shores of the Andaman Islands rose. The eastern shores sank.

The line between rising and sinking land lies east of Diglipur and Hut Bay but west of Port Blair.

Uplift in the Andamans was less than 2 m everywhere. The Nicobar Islands sank.

Sources: cires1.colorado.edu; authors.library.caltech.edu

How do scientists know which land rose or sank?

Scientists compared satellite images with a tidal model. The images show where shorelines moved against the sea surface.

This method gave limits on how much the land rose or sank. It was a new approach in 2006.

GPS data from the Andamans are scarce, because most of the region is off-limits to visitors.

Sources: authors.library.caltech.edu; cires1.colorado.edu

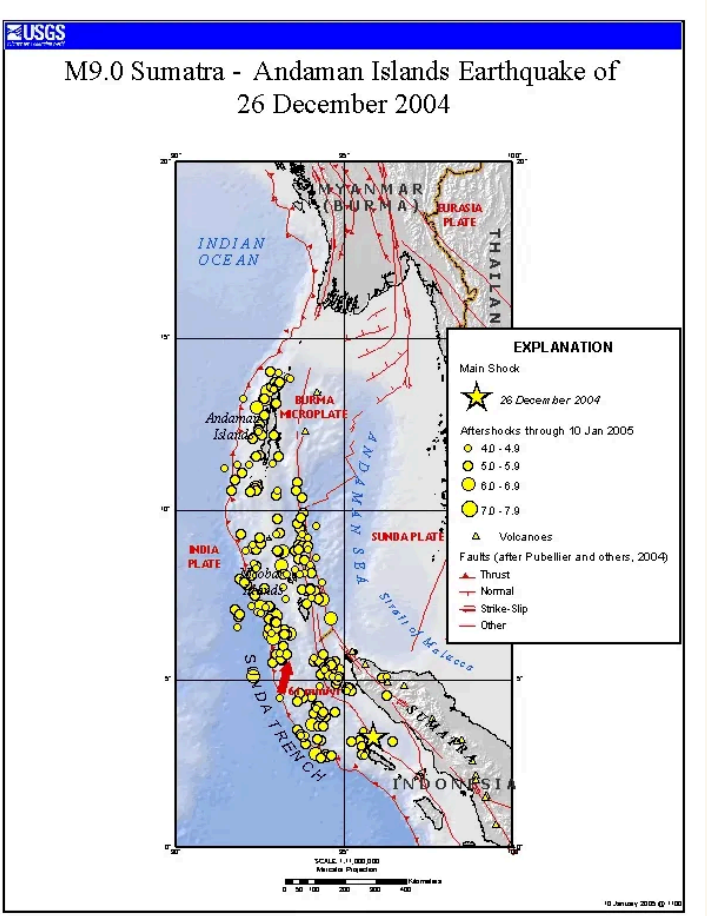
What did the shaking feel like?

Shaking on the islands seemed mild on the whole. But reports from Rutland Island described people who could not stand.

Grass roots were pulled from the ground as people tried to hold steady. Some felt sick.

That suggests local shaking stronger than intensity VIII.

Sources: cires1.colorado.edu



Aftershocks along the Andaman-Sunda subduction zone after 2004, tracing the trench. Map: USGS, public domain, via Wikimedia Commons.

Quick check 4. In 2004 the eastern shores of the Andaman Islands rose and the western shores sank. *(True or False?)* See answer ↓

What happened at Indira Point?

Indira Point is the southern tip of Great Nicobar. It is also India's southernmost point.

Bilham and colleagues judged that the southern end of Great Nicobar sank by **4.25 m**, give or take 0.2 m.

The lighthouse base ended up level with low tide and 1.5 m below sea level at high tide.

Sources: cires1.colorado.edu

Which lighthouses and islands were damaged?

Lighthouses at Katchal East, Katchal West and Interview Island were reported completely destroyed.

Pilomillow, a small island on the north-east coast of Little Nicobar, was heavily damaged. It was later evacuated.

The Indira Point lighthouse base sank to sea level. The shift was seen at the southern end of the chain.

Sources: cires1.colorado.edu

How far did the plates slip?

The plates slid past each other by a different amount in each island group.

In the Andamans the average slip was 7 to 8 m. In the Nicobars it was 15 to 19 m.

The slip was largest in the south, up to 23 m in one estimate.

Sources: cires1.colorado.edu

Why did the tsunami reach some places before the

ground moved?

The first big wave came from a rupture section about 600 to 650 km long. It slowed south of Car Nicobar.

A model of the rupture suggests it moved slowly and evenly. The ground at Port Blair shifted at least 45 minutes late.

That was later than the tsunami arrived there.

Sources: cires1.colorado.edu

How did the tsunami hit India?

Tsunami damage on India's east coast was worse because the main surge arrived near high tide.

At Tuticorin, the southernmost point of the mainland east coast, a 1.5 m surge came at low tide. At high tide it would have done more harm.

An early count gave 16,389 deaths in India out of about 298,000 in all countries.

Sources: cires1.colorado.edu

What is the Andaman Sea?

The Andaman Sea is a marginal sea of the north-eastern Indian Ocean. It is also called the **Burma Sea**.

Myanmar and Thailand surround it, along with the Martaban Gulf and the Malay Peninsula.

The trench lies on its western side, and the 2004 quake rattled its whole coast.

Sources: marineinsight.com

Was 2004 the first big earthquake here?

Which earlier earthquakes struck the same zone?

The same zone broke in 1847, 1881 and 1941. Aftershocks suggest the 2004 break re-ruptured those older zones.

A study had put the gap between 1881-sized earthquakes at 157 years, give or take 43.

So the zone was always active. The 2004 event did not make it so.

Sources: cires1.colorado.edu

What followed in 2005?

On 28 March 2005 a magnitude 8.7 earthquake struck between the 1861 rupture and the 2004 rupture.

It released about ten times less energy than the December 2004 event.

A mud volcano on Middle Andaman also erupted with new force after the 2004 shock.

Sources: cires1.colorado.edu

> **Quick check 5.** The 2004 earthquake broke a zone that had never ruptured before. *(True or False?)* See answer ↓

What happened to the new earthquake zone for the islands?

What did the 2025 earthquake code propose?

In November 2025 India released a revised earthquake design code, IS 1893 (Part 1): 2025.

It added a new top category, **Zone VI**. The map placed the Himalayan belt and the Andaman and Nicobar Islands in it.

The old scale had four zones, II to V, with Zone V the highest.

Sources: etvbharat.com; visionias.in

Is Zone VI still in force?

No. The Bureau of Indian Standards withdrew the 2025 version by a gazette notice dated 3 March 2026.

The 2016 standard was brought back. So India again has four zones, II to V.

Reasons given included cost, with estimates of more than a 20% rise for homes and up to 50% for infrastructure.

Sources: visionias.in; etvbharat.com

What should you remember?

What are the key exam pointers?

The trench forms where the Indian plate subducts under the Burma microplate.

The 4,198 m figure belongs to the Andaman Sea.

Barren Island is India’s only active volcano. It erupted in 1991 and 1994-95.

The 2004 earthquake broke about 1,300 to 1,600 km of fault. Indira Point sank about 4.25 m.

The 2025 Zone VI map was withdrawn on 3 March 2026.

Sources: cires1.colorado.edu; marineinsight.com; visionias.in

Practice MCQ

Practice MCQs

1. The Andaman Trench forms where the Indian Plate subducts beneath which other plate?

A. The Burma microplate

B. The Arabian Plate

C. The Australian Plate

D. The Eurasian Plate

See answer ↓

2. By how much did the southern end of Great Nicobar, near Indira Point, subside in the 2004 earthquake?

A. About 4.25 m

B. About 1.5 m

C. About 10 m

D. About 0.4 m

See answer ↓

3. During the 2004 earthquake, which shores of the Andaman Islands rose?

A. Eastern shores

B. Western shores

C. Southern shores only

D. No shores rose

See answer ↓

4. In which year was the first eruption of Barren Island reported?

A. 1787

B. 1852

C. 1991

D. 2004

See answer ↓

5. What happened to India's Zone VI earthquake map issued in 2025?

A. It became law for all buildings

B. It was withdrawn in March 2026

C. It was extended to Zone VII

D. It replaced the 2016 code permanently

See answer ↓

Answer Key

1. **A.**
   The Indian plate moves north-east and slides under the Burma microplate. This sinking is called subduction. It makes the Andaman Trench.
   Sources: Bilham: 2004 Sumatra–Andaman earthquake · Bilham: 2004 Sumatra–Andaman earthquake (1).
   ↑ Q1

2. **A.**
   Bilham and colleagues judged that the southern end of Great Nicobar sank by 4.25 m, give or take 0.2 m. The lighthouse base ended up level with low tide.
   Sources: Bilham: Indira Point subsidence · Bilham: Indira Point subsidence (1).
   ↑ Q2

3. **B.**
   The western shores of the Andaman Islands rose while the eastern shores sank. The line between them lies west of Port Blair.
   Sources: Bilham: 2004 Sumatra–Andaman earthquake (4) · Meltzner et al., Caltech (2).
   ↑ Q3

4. **A.**
   Eruptions at Barren Island were reported in 1787, 1789, 1795 and 1803. The volcano then slept for almost a century and a half before 1991.
   Sources: Oregon State Volcano World: Barren Island (2) · Oregon State Volcano World: Barren Island.
   ↑ Q4

5. **B.**
   The Bureau of Indian Standards withdrew the 2025 code by a gazette notice dated 3 March 2026. The 2016 standard returned, with four zones, II to V.
   Sources: Vision IAS: BIS revokes seismic map (1) · ETV Bharat: seismic code reversed (1).
   ↑ Q5

Quick-check answers

1. **True.** The Indian plate subducts beneath the Burma (Andaman) microplate. This makes the trench. ↑ 1

2. **True.** A marine source gives 4,198 m as the maximum depth of the Andaman Sea. ↑ 2
3. **True.** Volcano World calls Barren Island the only historically active volcano on that arc. ↑ 3
4. **False.** It was the other way round. The western shores rose and the eastern shores sank. ↑ 4
5. **False.** Aftershocks suggest the 2004 break re-ruptured the 1847, 1881 and 1941 zones. ↑ 5

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