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New Study Explains How the Indian Plate Built the Tibetan Plateau

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GEOGRAPHY ·

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New Study Explains How the Indian Plate Built the Tibetan Plateau

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WHY IN NEWS

*In , a study published in **Nature Geoscience** showed that the **underthrusting (subduction) of the Indian plate beneath the Eurasian plate** drove the uplift of the **Tibetan Plateau** and explains the striking **topographic contrast between western and central Tibet**. The researchers dated the cooling and exhumation of rocks using **thermochronology** on **granite and sandstone samples** collected from the **Rutog and Gerze areas** of Tibet.*

THE ROOF OF THE WORLD AND ITS PUZZLE

The Tibetan Plateau is the highest and largest upland on Earth, averaging about **4,500 metres** in elevation, which earns it the name the “**Roof of the World**.” It is the water tower of Asia, feeding the headwaters of major rivers including the **Brahmaputra, the Indus and the Yangtze**, and it exerts a powerful influence on the **Indian monsoon** by heating the atmosphere in summer and helping draw moist air inland.

Despite its uniform grandeur, the plateau is not uniform in how it was built. Geologists have long noted that western Tibet and central Tibet rose at different rates and times. The July 2026 study set out to explain this contrast by reconstructing the deep history of when different blocks of crust were pushed up and eroded.

WHAT THE COLLISION SET IN MOTION

The plateau owes its existence to one of the great events in Earth’s recent geological history: the **India-Eurasia continental collision**, which began about **50 million years ago**. Before that collision, the Indian plate had been drifting northward across the Tethys Ocean. When the two continental masses met, neither

could easily sink into the mantle because continental crust is relatively light and buoyant. The result was crustal thickening, folding and uplift, which raised both the **Himalayas (classic fold mountains)** and the plateau behind them.

The new work adds precision to this picture. Rather than treating the plateau as a single block that rose all at once, it shows that the **Indian plate slid, or underthrust, beneath the Eurasian plate**, and that the geometry and timing of this underthrusting differed from west to east, producing the topographic differences seen today.

How Thermochronology Reveals Uplift

The method at the heart of the study is **thermochronology**, which dates the moment rocks cooled as they were exhumed toward the surface. As mountains rise and erosion strips away overlying material, buried rocks move upward into cooler zones. Minerals lock in a temperature signal at known thresholds, so measuring these signals in granite and sandstone lets scientists reconstruct how fast and how long ago a region was uplifted and eroded.

TWO TIBETS: A TALE OF DIFFERENT TIMINGS

The central finding is a contrast in **exhumation histories** between the two regions studied.

FEATURE	CENTRAL TIBET	WESTERN TIBET
Exhumation style	Slow exhumation	Rapid exhumation
Timing	From about 45 million years ago	Between about 45 and 20 million years ago
Samples studied	Granite and sandstone (Gerze area)	Granite and sandstone (Rutog area)
Driving process	Underthrusting of the Indian plate	Underthrusting of the Indian plate

The difference in the rate and timing of exhumation is what the study links to the present-day topographic contrast between the two parts of the plateau. In effect, the same collision produced different surface outcomes depending on how the underthrusting Indian plate interacted with the overlying Eurasian crust in each region.

WHY IT MATTERS BEYOND GEOLOGY

Understanding how the plateau grew is not an abstract exercise. The plateau's height governs the strength and timing of the **monsoon**, on which the agriculture and water security of a large part of Asia depend. The same collision that built the plateau also makes the **Himalayan belt one of the most seismically active**

regions on Earth, since the Indian plate continues to push northward and stress accumulates along the boundary. A sharper model of how and when different blocks rose helps scientists interpret both the long-term climate record and the pattern of earthquake hazard along the mountain front.

UPSC RELEVANCE

GS Paper 1: Physical geography, specifically **plate tectonics, mountain building (orogeny) and the origin of fold mountains**, alongside the link between the Tibetan Plateau and the Indian monsoon, and the seismicity of the Himalayan region.

Prelims pointers:

- The **India-Eurasia continental collision** began about **50 million years ago**.
- The **Tibetan Plateau** is the highest and largest upland on Earth, averaging about **4,500 metres**, and is called the **“Roof of the World.”**
- It is the source of major Asian rivers, including the **Brahmaputra, Indus and Yangtze** headwaters, and strongly influences the **Indian monsoon**.
- **Central Tibet** shows **slow exhumation** from about **45 million years ago**; **western Tibet** shows **rapid exhumation** between about **45 and 20 million years ago**.
- The **Himalayas are fold mountains** formed by the India-Eurasia collision.
- The study used **thermochronology** on **granite and sandstone** from the **Rutog and Gerze** areas and was published in **Nature Geoscience** (July 2026).

Mains question: “The uplift of the Tibetan Plateau is a textbook example of continental collision, yet its internal topography records a more complex history. Discuss the role of the underthrusting Indian plate in building the plateau and explain how the plateau influences the Indian monsoon and Himalayan seismicity.”
(15 marks, 250 words)

FACTS CORNER

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Study (July 2026): Published in Nature Geoscience; underthrusting of the Indian plate beneath Eurasia built the Tibetan Plateau and explains the west-central contrast.

Method: Thermochronology on granite and sandstone from the Rutog and Gerze areas.

Collision: India-Eurasia collision began about 50 million years ago.

Plateau: Highest and largest upland on Earth, averaging about 4,500 m, the “Roof of the World.”

Rivers: Feeds the Brahmaputra, Indus and Yangtze headwaters; drives the Indian monsoon.

Exhumation: Central Tibet slow from about 45 Ma; western Tibet rapid between about 45 and 20 Ma.

Himalayas: Fold mountains formed by the same collision, making the belt highly seismic.

Sources: Nature Geoscience (<https://www.nature.com/ngeo/>), *Down To Earth* (<https://www.downtoearth.org.in/>)

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