

EARTHQUAKE RISK IN BANGLADESH

PASSAGE THREE

Results

These are some of the things scientists have learned by analyzing the data:

Shillong Plateau and Fault System

Scientists are very interested in the Dauki fault system around the Shillong Plateau. They've made some important findings:

Many small faults are found along the Dauki fault system. But project data and field observations are confirming a **single, major fault** that dips under the Shillong Plateau. In fact, the enormous structure of Shillong may not be plateau at all, but an anticline (or large fold) formed by the powerful tectonic forces of this long, deep fault. "The Dauki fault is very young so it's completely buried," explains Seeber. "But we know it's there because one of the biggest anticlines on the globe is growing above this fault." Scientists think this major fault presents the greatest earthquake hazard. While multiple, smaller faults may cause frequent earthquakes, earthquakes produced by a large fault like this one are not as frequent, but could be huge.

The data has also revealed that the fault is **closer to Dhaka** than once thought. "It is very important to determine the fault location in order to assess the seismic events," explains Humayun Akhter. The team found that the dips, or angles of the rock layers, increased the farther south they measured. "If the fault is 10 to 20 km to the south, that means the source of the earthquakes is closer to the capital



The aftermath of the 1897 Assam Earthquake. Image courtesy of Roger Bilham, University of Colorado Boulder.

History of Major Earthquakes in the Region

NORTHERN INDIA:

Three "mega-quakes" occurred along the northern boundary of the Indian plate along the Himalayan Mountain range. In each of these earthquakes (in 1125, 1400, and 1505), the Himalayas jumped several meters over the India Plate.

SOUTHERN BANGLADESH / MYANMAR:

A huge earthquake and tsunami occurred in 1762 along the Burma Arc plate boundary. (This is part of the same fault system that caused the earthquake and tsunami of 2004.) This earthquake changed the landscape and uplifted many islands.

NORTHEAST INDIA:

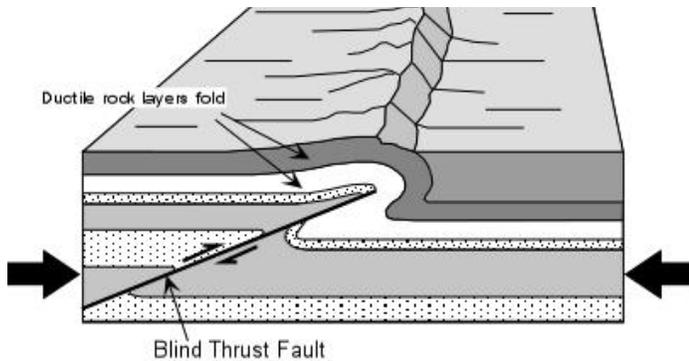
In 1897, a large earthquake pushed up the northern edge of the Shillong Plateau. About 125 miles (200 km) away, the ground under Dhaka "liquefied."

city of Dhaka."

Finally, the team has found that the Dauki fault is **highly active**. Seismic stations in the region have detected more than 300 seismic events in the region over a period of 1-2 years — including many too small for humans to feel — near the Dauki fault. "This tells us this area is very active," says Akhter. "And in the future, a large earthquake can occur."

CONTINUED

Results



This illustration shows how a blind thrust fault can form an anticline. The large arrows indicate the direction that force is being applied. Image courtesy of Stephen Nelson, Tulane University

GPS stations are also providing evidence of an active fault. GPS data shows the Shillong Plateau is moving to the south (relative to India) about eight millimeters per year. “We can actually physically see the motion of the plates with the GPS,” says Michael Steckler. At the same time to the east, the plate along the Burma Arc is pushing west toward Dhaka. In both these places, the strain is causing rocks to fold and buckle. And this strain is building up towards an enormous earthquake.

Putting the Data Together

Data from field observations, seismic stations, and GPS show that the area is very vulnerable to earthquakes. But it also shows the potential for a very large earthquake or “megaquake.” “A fundamental fact of seismology is that the bigger the fault, the larger is the potential earthquake that it can generate,” says Seeber. “In the case of the Dauki Fault, you’re talking about a structure that is 300 kilometers long, and about 100 kilometers wide. It’s a huge structure. So we expect a very large earthquake.” This prediction is further

supported by the region’s history. Today, scientists think that megaquakes along the Himalayas are not just possible but inevitable as the Indian Plate continues to push north under the Eurasian Plate.

Scientists can also use the data about the motion and strain around a fault to roughly calculate the time between earthquakes. Along the Dauki fault, the rocks are moving very slowly, indicating a long time between large earthquakes. Unfortunately, this has also made it easy for people in Bangladesh to overlook the threat lurking below the surface. “You may forget about it, and say, ‘Oh, we never had an earthquake, why should we worry?’” says Seeber. “Geology tells you no, there is fault, it is active, and the reason you haven’t seen any such major earthquake during recent history is simply that the repeat times are very long.”

STOP AND THINK

BASED ON THE TEXT:

1. What did the scientists observe about the tectonic activity in this region?
2. What did the scientists infer from their findings?
3. Which science practices were used by the scientists?

LOOKING AHEAD:

4. Scientists are also investigating the interaction between tectonics and the delta formed by the Brahmaputra, Ganges and Meghna Rivers. How might a major earthquake affect this river system?