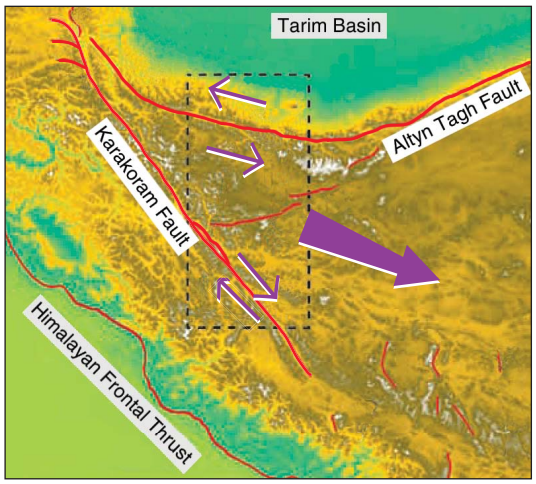
GEOPHYSICS

Hammered by India, Puttylike Tibet Shows Limits of Plate Tectonics

For almost 40 years, scientists have recognized that Earth's ocean floors jostle and slide past one another like enormous rigid plates. But how well continents fit into this plate-tectonic scheme has been less clear. Now, satellite measurements of the Tibetan Plateau suggest that when continents go head-to-head in mountain building, they can behave more like unbaked pizzas.

Tectonic forces are driving the Indian subcontinent into the Asian underbelly 4.5 centimeters every year, and the Tibetan Plateau bears much of the impact. Results reported on page 236 and other recent geophysical observations show that "Tibet is not rigid, it's deforming. It really acts like a fluid," says geophysicist Roger Bilham of the University of Colorado, Boulder (CU–Boulder), who was not involved in the reported work.



Big squeeze. Slower-than-predicted slip along two bounding faults shows that the Tibetan Plateau doesn't behave like a tectonic plate.

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The latest evidence for squishy continents comes from a satellite-borne technique called interferometric synthetic aperture radar (InSAR). By bouncing radar waves off Earth's surface and letting the waves from a satellite's different orbital passes interfere, researchers can calculate the number of radar wavelengths by which the distance has changed. The technique can measure the motion of spots on the surface a few tens of meters across with a precision of a few millimeters.

In the case of the Tibetan Plateau, geophysicist Tim Wright of the University of Oxford, U.K., and colleagues focused on a 500-kilometer-long swath cutting across two great San Andreas–style faults: the Altyn Tagh and the Karakoram. If the plateau sandwiched between the two faults were a rigid plate, it's been calculated, northward compression would be squeezing it eastward between the faults like a watermelon seed between two fingers at a rate of 20 to 30 millimeters per year.

Examining InSAR data that the European Remote Sensing satellites 1 and 2 had gathered between 1992 and 1999, Wright and colleagues found that the Karakoram fault was slipping at most 7 millimeters per year—and might not be moving at all. "That's quite a robust measurement," says Wright's Oxford colleague Barry Parsons. "I think you can rule out" fast slip on the Karakoram. On the Altyn Tagh, less certain results yielded a fault motion of only 5 ± 5 millimeters per year. The plateau, the researchers conclude, is yielding and deforming like so much putty.

The InSAR observations "look reasonably persuasive to me," says tectonophysicist Wayne Thatcher of the U.S. Geological Survey in Menlo Park, California. In addition, the "GPS [Global Positioning System] has given no support to high rates" of movement, notes geophysicist Peter Molnar of CU–Boulder.

Not everyone is convinced. Geologist Paul Tapponnier of the Institute of Physics of the Globe in Paris has inferred fault movement over tens of thousands of years by gauging how much geologic features such as glacial deposits have separated since the Tibetan faults sliced them in two. "We have some really good evidence from the Karakoram that its rate is 10 times that [InSAR] rate," he says, adding that InSAR and GPS measurements might have caught the faults during a recent, uncharacteristic pause. But Thatcher says that's unlikely, because other faults would have sped up to compensate—something geologists have not observed.

"In my view, there's no question," says Molnar. "Continental tectonics is not plate tectonics." The plateau's thicker crust, he says, must leave underlying mantle rock so deep and therefore so hot that it can flow under India's squeeze. Softened and weakened, the upper 100 kilometers of rock "really looks like a fluid" in GPS maps of surface motion, says Bilham. "It's as if India were colliding with a water bed." In GPS data, rock can be seen to be flowing northeastward and then turning to the south into Myanmar. This part of the continent, at least, is trying to escape rather than stand and fight. **–RICHARD A. KERR**

ScienceScope

Colombian Rebels Free Two, Hold Ornithologist

A botanist and his guide who were kidnapped by Colombian guerrillas while conducting an ecological survey (*Science*, 28 May, p. 1223) have been released after 8 weeks in captivity. Diego Calderón, a 21-year-old ornithologist who was abducted at the same time, remains a captive of the Revolutionary Armed Forces of Colombia, which claimed responsibility for the 17 April kidnapping.

Hermes Cuadros of the University of the Atlantic in Barranquilla and guide José Saurith were released on 18 June and walked 2 days through the forests of northern Colombia to reach the nearest town of Manaure. Cuadros's wife, biologist Myriam Salazar of the Botanical and Zoological Barranquilla Foundation, says that Cuadros and Saurith were separated from Calderón a few days after their capture and were hustled from one camp to another to elude Colombian Army helicopters. Salazar says that Cuadros was treated well by his captors and plans "to resume his field trips" as soon as an eye infection clears up.

Calderón is a diabetic who needs two shots of insulin daily. The kidnappers called Calderón's family 3 weeks ago to play a recorded message from him saying that he was safe and had enough insulin, according to Andrés Cuervo, a graduate student at the University of Puerto Rico in San Juan working on a campaign to free him.

–YUDHIJIT BHATTACHARJEE

E.U. Steps Up Effort to Ease Talent Flow

PARIS—European research commissioner Philippe Busquin is determined to improve the flow of scientists across Europe and attract more talent to the continent. Last week he made it easier for scientists to obtain advice on dealing with Europe's patchwork of languages, immigration laws, and tax, school, and pension systems by linking up more than 200 existing "mobility centers" in 33 countries.

Moving abroad can be a major headache, says André Smits of Nuffic, the Netherlands Organization for International Cooperation in Higher Education; teaming up will help the centers make their information more comprehensive and easier to access, he says.

–MARTIN ENSERINK