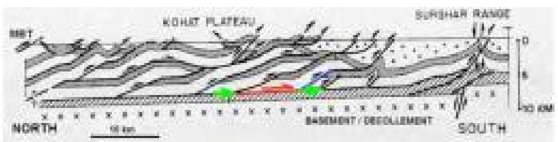
New research shows 1992 earthquake in Pakistan was due to rare horizontal shift

January 16 2012, by Bob Yirka



A North-south cross section passing through the Kohat earthquake showing the decollement and (south-dipping) faults branching upwards. Image: *Nature Geoscience* (2012) doi:10.1038/ngeo1373

(PhysOrg.com) -- The media (and school teachers, of course) has done a very good job of informing most people about how earthquakes work. We can all very easily imagine two great plates rubbing against one another, like two fists rubbing together, creating havoc along fault lines. But what most of us have never likely imagined is the type of earthquake that occurred back in 1992 in Kohat, Pakistan.

Instead of two plates rubbing together, a whole section of the earth simply moved from one place to another, like a rug being pulled out from underneath those that were living there. In some ways, it appears the quake was more like a giant mud slide than a normal earthquake. It's only now, twenty years later, that scientists have put the pieces together though. S. P. Satyabala, Zhaohui Yang and Roger Bilham, as they describe in their paper published in *Nature Geoscience*, have found using satellite radar and historical seismic data, that the 6.0 quake was in fact a rare horizontal one.

Such quakes occur, the researchers say, when a parcel of land sits atop another with something that works as a slippery agent between them. In this case, the team believes it's a layer of salt. What happens is, a whole swath or slip of land is very, very slowly moving downhill, like a glacier. In this case, the rate is about one to two millimeters each year; so slowly that the movement is not noticed by those that are living on the land above. Unfortunately, it's not always such a smooth ride. Every now and then, something causes a problem with the slippery layer, resulting in the upper and lower rock touching. Without the slippery stuff between them, the two layers of land stop sliding, but only for awhile as the forces that caused the top part to slide in the first place, continue to work. Eventually, the top layer gives way and lurches forward, causing a very noticeable earthquake. In 1992, over 200 people were killed as buildings fell on top of them.

To come to their conclusions the team turned to interferometric synthetic aperture radar, which is a method of data collection via satellite that maps the surface of the Earth over time. In this case, when that data was combined with seismic recordings, it was easy for the team to see that some 3,800 square miles of land surrounding Kohat, had shifted about a foot, all at once.

Unfortunately for those that live there, it appears that such an occurrence will likely happen again, though at least now they will have more knowledge about what is going on beneath them and thus will be able to make more informed decisions going forward.

More information: Stick–slip advance of the Kohat Plateau in Pakistan, *Nature Geoscience* (2012) doi:10.1038/ngeo1373

Abstract

Throughout most of the Himalaya, slip of the Indian Plate is restrained by friction on the interface between the plate and the overlying wedge of Himalayan rocks. Every few hundred years, this interface—or décollement—ruptures in one or more Mw ≥8 earthquakes. In contrast, in the westernmost Himalaya, the Indian Plate slips aseismically beneath wide plateaux fronting the Kohistan Mountains. The plateaux are underlain by viscous décollements that are unable to sustain large earthquakes1. Potwar, the widest of these plateaux is underlain by viscous salt2, 3, which currently permits it to slide at rates of about 3 mm yr−1 (refs 4, 5), much slower than its 2 Myr average6, 7. This deceleration has been attributed to recently increased friction through the loss of salt from its décollement. Here we use interferometric synthetic aperture radar and seismic data to assess movement of the Kohat Plateau—the narrowest and thickest plateau8, 9. We find that in 1992 an 80 km2 patch of the décollement ruptured in a rare Mw 6.0 earthquake, suggesting that parts of the décollement are locally grounded. We conclude that this hybrid seismic and aseismic behaviour represents an evolution of the mode of slip of the plateaux from steady creep towards increasingly widespread seismic rupture.

Citation: New research shows 1992 earthquake in Pakistan was due to rare horizontal shift (2012, January 16) retrieved 1 May 2024 from https://phys.org/news/2012-01-earthquake-pakistan-due-rare-horizontal.html