

An ultra-accessible fault of an impending earthquake at a 3.5 km depth in a South African gold mine.

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We would like to introduce a wonderful site to seismologists and rock mechanics. The Pink and Green Dyke in Mponeng Mine, South Africa (owned by AngloGold Ashanti Ltd.) is a near-vertical 20 m-thick slab-like feature lying in the pristine quartzite host rock. In the past, mining of gold reef around this dyke has caused numerous earthquakes, including many greater than M2 events that ruptured the boundary of PG dyke and host rock. PG dyke has been the most seismically active feature in the Mponeng Mine. A new phase of mining at 3400-3600 m depth will take place in 2006-2007, where high seismicity including large ones rupturing a 200 m section along the dyke is expected, from the past experience.

Exceptional accessibility distinguishes PG dyke from the sites of similar research in the past. Three tunnels at two levels are running along PG dyke, only 20-60m apart. Two of them, one at a 3500 m depth (46 crosscut tunnel at 116 level) and the other at a 3600 m depth (46 crosscut tunnel at 120 level), are even crossing the PG dyke. In addition, geometrical structure is very simple, so locating the future rupture plane (dyke-host rock boundary) is easy. Further, very few damages are seen in both host rock and dyke-rock, even at their boundary, suggesting a superb acoustic transparency.

We are currently planning two kinds of observations. One is covering the dyke with 25kHz accelerometers, right on the boundary plane. Such on-fault seismometer records, at multiple points, would have an overwhelming value for seismologists. The other is deploying acoustic emission sensors having sensitivity up to 200 kHz, in a small 3D array in the dyke. This will be a big rock fracture test of a ~20 m sample having one plane of weakness.

Further information from our site inspection (Jul. 2005, Feb. 2006) will be reported.

Tunnels around Pink and Green Dyke (Plan view), 116 level=3500 m deep, 120 level=3600 m deep

