SESSION KEYNOTE BEG01-161

Understanding the Movement Behaviour of the Pos Selim Landslide Malaysia

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Evidence is presented showing that the Pos Selim landslide has experienced the four stages of movement of the standard model (Figure 1, after Vaunat *et al* 1994), pre-failure, failure, post-failure and active landslide; and there are three components of movement, seasonal surges, rainstorm-related surges and constant velocity movement (Figure 2).

The 190m high 9.5ha Pos Selim landslide formed within a 25ha cutting excavated for the second East-West Highway (Figure 3). Cracking at the main scarp and toe of the landslide appeared in 2002 (pre-failure) and rapid movement became evident in September 2003 (failure). Velocity peaked in October and declined until January 2004 (post-failure) (Figure 2). Thereafter the landslide surged seasonally (active landslide) (Figure 2).

The Cameron Highlands generally has two 'wetter' seasons each year. The pattern of seasonal surges is similar to the seasonal 30-day rainfall pattern (Figure 2). Short surges are superimposed on seasonal surges and some of these short surges coincide with individual rainstorms. The peak velocity of seasonal surges diminished year-by-year, though 30-day rainfalls were similar each year. Also the start of seasonal surges lagged behind rainfall in 2005 and no surge occurred in summer 2006. It seems the landslide was becoming less responsive to rainfall, less active, just as depicted in the standard model (Figure 1).

The periods of constant velocity seen between surges (4mm/day at cluster 2 Figure 2), as shown in the standard model (Figure 1), indicate viscous movement ('creep').

It's not only rainfall and creep that keeps this 3Mm^3 landslide on the move. A strong surge was triggered in November 2004 when about 100,000m^3 of ground was removed from the toe. The report by AML 2007 http://goo.gl/DJ03Ru has further details.

So far, the movement behaviour of the Pos Selim landslide is as expected from the standard model.

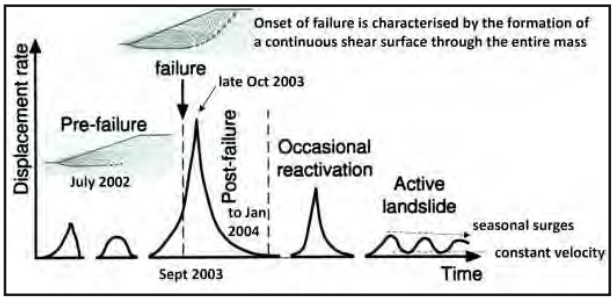

Figure 1: The four stages in the life history of a landslide, after Vaunat, J., Leroueil, S. & Faure, R., 1994 Slope movements: a geotechnical perspective. *Proc 7th International Congress International Association Engineering Geology*, Lisbon v1, 397-404.

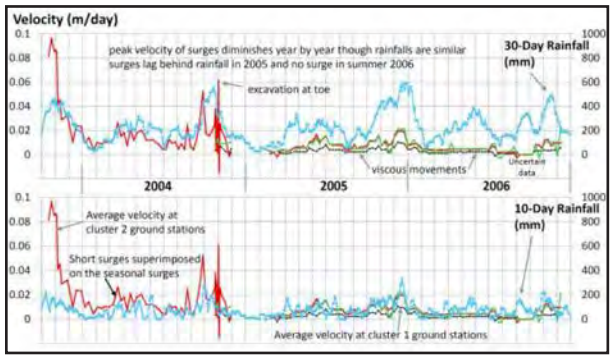

Figure 2: Average velocities at landslide ground stations (3 clusters) during total station monitoring (2003-6) with 30-day and 10-day rainfall at Cameron Highlands Station superimposed.

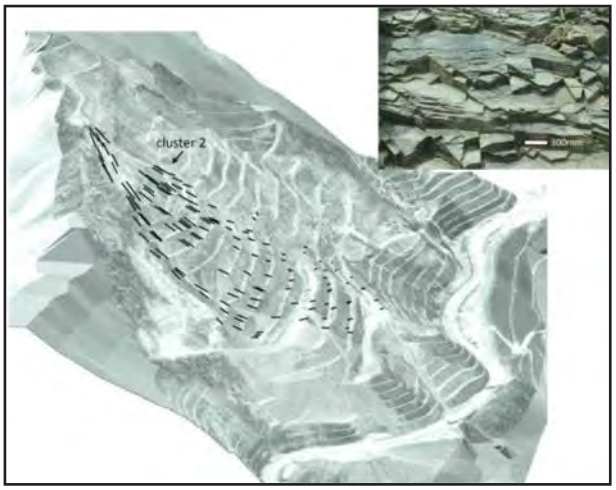

Figure 3: 3D visualisation of the excavated hillside (by A Hansen) showing the surface displacement vectors (2003-5) to scale. Inset: Several joint sets cutting the low-dipping foliation within the *Quartz Mica Schist Unit.* The quartz mica schists are generally strong and slightly to moderately weathered at outcrop within the cutting (using the terminology of MS 2038/2006).

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