Paper Number: 3827

Liberating water during volcano collapse

Delcamp, A.[1], Roberti, G.[2] and van Wyk de Vries, B.[2]

[1]Department of Geography, Vrije Universiteit Brussel, Pleinlaan 2, 1050 Brussel; delcampa@tcd.ie

[2]Laboratoire Magmas et Volcans, 5 rue Kessler, 63 000 Clermont Ferrand

---

Volcanic landslides are catastrophic events that result in debris avalanches and can trigger eruptions [1]. By definition, a debris avalanche is dry but can however turn into saturated debris flow depending on water availability [2]. Such transition is usually attributed to the release of interstitial pore water and to water incorporation during transport [3]. However, volcanoes can store large volumes of water in fracture networks, the influence of which has should be considered in volcano collapse.

Based on field observations at Meru (Tanzania) and Meager (Canada) volcanoes, we developed model for volcanic edifice evolution that integrates water based on volcano geology, hydrogeology, and volcano tectonics. As the volcano grows, the topography increases the amount of water the edifice receives by precipitation. In parallel, the volcano develops impermeable zones and aquifers where water is trapped behind barriers. This stored water can be liberated by barrier breakage. Breakage can occur by slow gravitational deformation that develops as the edifice mass increases. The water migration can accelerate deformation to trigger large-scale landsliding.

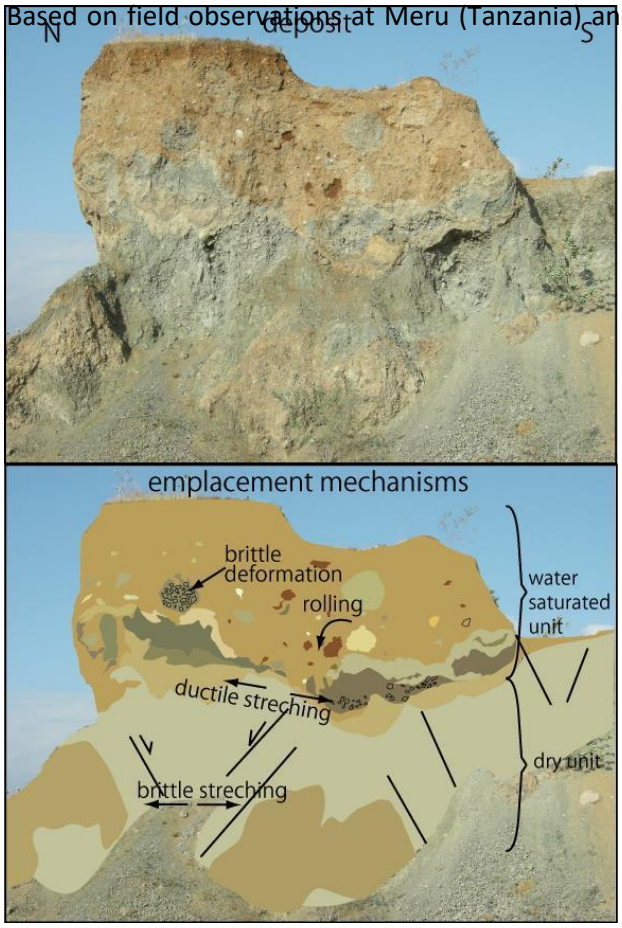

Figure 1: Cross section through a 15m high hummock at Momella debris avalanche, Meru volcano, Tanzania. Brittle and ductile deformation occurs within the same deposit. The occurrence of ductile deformation would correspond to water saturated unit, where angular blocks would be

Water migration will also have a key role in avalanche behaviour, by generating coeval water-rich and dry debris avalanche units (Fig.1). Therefore, the development and evacuation of large, unstable water reservoirs is linked to the growth of the volcanic edifice, the volcano environment and it's eventual collapse. The growth and loss of such resources could change the type of activity at a volcano by drying it out and could seriously impact communities by removing a vital resource

smoothed into rounded blocks that will roll as the sliding mass is moving and stretching.

References:

1 van Wyk de Vries B and Davies T (2015) in *Encylopedia of volcanoes*, second edition, Springer, 665-685

2 Capra L and Macıaś JL (2002) J. Volcanol. and Geotherm. Res. 17: 213-235

3 Vallance W and Scott KM (1997)Geol. Soc. Am. Bull. 109:143-163