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The supraglacial debris supply in Cuerpo de Hombre paleoglacier (Spanish Central System). Reconstruction and interpretation of a rock avalanche event

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During the deglaciation stages of the last glacial period a rock avalanche took place in the glacier that occupied the higher sector of Cuerpo de Hombre Valley. The material displaced during the avalanche fell over the ice, was transported towards the glacier front and later on deposited as a supraglacial melt-out till. The cause of the avalanche was the decompression of the slopes in the valley after they were liberated of the glacier ice (paraglacial stress relaxation). Based on geomorphologic data and the implementation of a GIS, the reconstruction of ice masses during the main glacier stages have been carried out in order to quantify the stress relaxation that produced the collapse.

The Cuerpo de Hombre glacier was one of the most important valley glaciers spreading out from the Sierra de Béjar plateau Icefield. This plateau was developed in the summit of this mountain (above 2100 m asl) during the last glacial period and its maximum extension was 57.40 km2 (including the plateau, outlet and valley glaciers). The rock avalanche took place in the cirque headwall of Cuerpo de Hombre, in the site known as the Hermanito's cliff.

The Hermanito's cliff is a lithological homogeneous slope composed of porfidic granodiorites of coarse to medium grain size. The rock has an average slope of 55º, ranging from 40 to 70º. There is a dense fracture network with parallel (N.120º) and orthogonal (N-30º) directions in relation to the former ice flow. The avalanche caused a scar in the slope of 0.3 Ha, and the displaced material had a volume of 623[U+F0D7]103 m3. The deposit is an accumulation of heterometric big boulders (1-100 m3 in volume), angulated and with a coarse matrix (pebble size). The morphology of the deposit is complex, since both footwall and supraglacial features are identified in the deposit, which were rearranged afterwards by ice flow.

The avalanche can be explained as a paraglacial relaxation process. This implies the rock decompression once the glacier retreat caused the wall to be ice-free (debuttressing). Preliminary calculations show that the avalanche took place where the decompression stresses were higher (130-170kPa). The dates in surficial boulders based on 10Be suggest that the avalanche is younger than the Major Stabilization Stage dated at 18.8±2.1 ka BP, and is previous to the Postglacial Stage which could be around 15 ka BP.

Recent studies on Spanish Central System paleo-glaciers, have established that the larger accumulations of till did not occur during the maximum extension of glaciers (Glacial Maximum), but in subsequent stages, essentially during the Major Stabilization Stage. In this context, the identification of Hermanito's till deposit genesis in Cuerpo de Hombre Valley is of critical importance. The process here described is an example to formulate a hypothesis which suggests that the larger accumulations of tills were formed in relation to enhanced slope dynamics once some glacier retreat occurred. Thus, the ice-free walls were subject to decompression supplying large amounts of sediments to the tills.