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The Genesis of the Anomalous Sernio Fan (Valtellina, Northern Italy)

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Abstract : Massive rock avalanches formed some of the largest landslide deposits on Earth and they represent one of the major geohazards in high-relief mountains. This paper interprets a very large sedimentary fan (the Sernio fan, Valtellina, Northern Italy), located 20 Km SW from Val Pola Rock avalanche (1987), as the deposit of a partial collapse of a Deep Seated Gravitational Slope Deformation (DSGSD), afterwards eroded and buried by debris flows. The proposed emplacement sequence has been reconstructed based on geomorphological, structural and mechanical evidences. The Sernio fan is actually considered anomalous with reference to the very high ratio between the fan area (about 4.5km2) and the basin area (about 3km2). The morphology of the fan area is characterised by steep slopes (dip about 20%) and the fan apex is extended for 1.8 km inside the small catchment basin. This sedimentary fan was originated by a landslide that interested a part of a large deep-seated gravitational slope deformation, involving a wide area of about 55 km². The main controlling factor is tectonic and it is related to the proximity to regional fault systems and the consequent occurrence of fault weak rocks (GSI locally lower than 10 with compressive stress lower than 20MPa). Moreover, the fan deposit shows sedimentary evidences of recent debris flow events. The best current explanation of the Sernio fan involves an initial failure of some hundreds of Mm3. The run-out was quite limited because of the morphology of Valtellina's valley floor, and the deposit filled the main valley forming a landslide dam, as confirmed by the lacustrine deposits detected upstream the fan. Nowadays the debris flow events represent the main hazard in the study area.

Keywords : anomalous sedimentary fans, deep seated gravitational slope deformation, Italy, rock avalanche
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