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THE ROSONE LANDSLIDE (ORCO RIVER VALLEY, WESTERN ITALIAN ALPS): AN UPDATED MODEL

ABSTRACT: DELLE PIANE L., FONTAN D. & MANCARI G., *The Rosone landslide (Orco river valley, Western Italian Alps): an updated model.* (IT ISSN 0391-9838, 2010).

The Rosone landslide (Western Italian Alps) is a major sliding phenomenon affecting a metamorphic basement and periodically damaging the structures (tunnels and penstocks) of a nearby hydro-power plant. This paper presents the results of a recent study including field geology, seismic surveys and deep boreholes, investigating the poorly known deep structure of the sliding mass, as well as the geometry of the sliding surfaces. A synthetic comparison is made with another large landslide at Mt. Castello, showing some analogies with the Rosone landslide.

KEY WORDS: Rosone landslide, Gran Paradiso, Seismic surveys, Boreholes, Structural geology, Sackung.

RIASSUNTO: DELLE PIANE L., FONTAN D. & MANCARI G., *La frana di Rosone (Valle dell'Orco, Alpi occidentali italiane): un modello aggiornato.* (IT ISSN 0391-9838, 2010).

La frana di Rosone è uno dei più noti fenomeni gravitativi delle Alpi. Il fenomeno si sviluppa a carico di un basamento cristallino ed è causa del frequente danneggiamento delle strutture di un importante impianto idroelettrico, oltre che della passata delocalizzazione dell'abitato di Rosone. Questo contributo illustra i risultati di uno studio recente comprendente rilievi di terreno, prospezioni sismiche tomografiche e sondaggi profondi (fino a 300 m), il cui scopo è stato di investigare la struttura profonda del corpo in frana, fino ad oggi poco nota, e la geometria delle superfici di scivolamento. Viene presentato un breve confronto con un fenomeno analogo osservato nella stessa vallata, la frana del M. Castello, dove ricorrono condizioni strutturali predisponenti analoghe.

TERMINI CHIAVE: Frana di Rosone, Gran Paradiso, Prospezioni Sismiche, Sondaggi, Geologia strutturale, Sackung.

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INTRODUCTION

The so-called *Rosone landslide* is located in the Orco river valley (province of Turin, Italian Western Alps; fig. 1) and has been known since the beginning of the 20th century as an active phenomenon characterized by a slow yet constant evolution (Ramasco & *alii*, 1989; Forlati & *alii*, 1993; Luino & *alii*, 1993), repeatedly damaging some mountain villages and the Ceresole-Rosone hydro-power plant, presently owned by the City of Turin Electricity Board, IRIDE S.p.A. The penstocks and the diversion tunnel coming from the hydroelectric basin of Ceresole Reale have been suffering continuous deformations since the time of their completion, in 1929 (Bornati, 1930).

During the diversion tunnel construction, stability problems due to strong convergences in the underground charge tank area were caused by the presence of so-called «talcoschisti» (talc-schists) with very poor geomechanical characteristics, requiring the armouring of several tunnel sections (Bornati, 1930). The original diversion tunnel plan had to be successively abandoned for an inner and safer solution. Even today, continuous localized cracking of the concrete lining demands periodic maintenance. Deformations suffered by the penstocks along the landslide eastern margin made the adoption of adjustable bearings necessary, in order to maintain the penstocks alignment.

The Rosone landslide (fig. 2) is a typical but at the same time complex deep-seated gravitational sliding phenomenon affecting the pre-quaternary basement, made of granitic orthogneisses (fig. 3).

The basement is affected by a varying degree of disarticulation, with a gradual transition from an undisturbed to a fully disjointed rock mass, up to chaotic debris fields with large boulders and slabs of dislocated basement.

On the basis of its morphological characteristics, Ramasco & *alii* (1989) divided the sliding mass into three main sections (*Ronchi, Perebella, Bertodasco*) with different evolutional stages, from incipient to senescent. Instability at