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In relazione al bando in oggetto si dispone la pubblicazione sulla pagina del sito Internet del CNR agli indirizzi https://www.urp.cnr.it/ e https://selezionionline.cnr.it/ delle domande della prova colloquio allegate alla presente.

Il Responsabile del Procedimento
Dott. Gino Cofone

Firmato digitalmente da
Gino Cofone
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ALL. 2

N. 2

1. Il candidato illustri le esperienze maturate sul tema del rischio da frana ed il contributo che potrebbe fornire al progetto di ricerca.
2. Il candidato illustri le fasi necessarie per lo studio ed il monitoraggio di un pendio interessato da frana.
3. Il candidato descriva le metodologie di modellazione numerica di una frana a cinematica rapida.
4. Il candidato legga e traduca l'Introduction del lavoro dal titolo: *Role of the shear zone on the pore pressure regime in an active earthflow*; autori: Comegna, L.; Picarelli L.; Urcioli G. (2020); allegato alla presente.

   In particolare si chiede di leggere il passo da: "*In many cases*" fino a "*fluctuations*".

Role of the shear zone on the pore pressure regime in an active earthflow

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Abstract

The high deviatoric and volumetric strains induced by slope movements in earthflow bodies can deeply modify the hydraulic and mechanical soil properties. The soil is in fact completely destructured while large cracks continuously form and disappear in the mass; at the same time, a strongly anisotropic shear zone forms at the interface with the basal formation. All that unavoidably affects the current hydrological slope response. Being the long-term landslide activity essentially governed by seasonal pore water fluctuations, the effects of such changes on the mechanical slope response could be not negligible.

Based on data collected during long-lasting investigations and on some simple numerical analyses, the paper discusses the case of an active earthflow in fissured clay shales.

1 INTRODUCTION

Since the Eightees in-depth studies have been carried out by people of the Universities of Naples and Campania on some mechanical aspects of the behavior of earthflows, which widely occur in highly fissured tectonized clays and clay shales present along the Apennine chain (Cotecchia et al., 1986; Picarelli, 1988; Pellegrino et al., 2004; Picarelli et al., 2005; Comegna et al., 2007). Such soils, which have been subjected to intense tectonic events, include both a lapideous and a fine-grained component (Esu, 1977).

In many cases earthflows originate from an even limited slope failure (possibly a slide) in deteriorated stiff clays or clay shales, which overload the deposits located downslope (Hutchinson and Bhandari, 1971). The effect of undrained loading is the development of a moderate to rapid earthflow: while propagating, this replicates on the soils located downslope the process of undrained loading. With time the landslide tends to slow down as a result of excess pore pressure dissipation, the so-called sliding-consolidation process (Hutchinson, 1986). In turn the landslide style changes from flow to slide (Picarelli, 2001). In the last stage, which can cover tens of years or more (Giusti et al., 1996), the landslide takes the features of a slow active slide driven by seasonal pore pressure fluctuations.

An interesting feature of earthflows is their macrofabric (Picarelli, 1993). In fact, this consists of two well distinct parts: i) an upper "earthflow body", which is highly destructured and remolded by the strong deformations induced by movements and includes large and deep cracks which continuously open and close following earthflow deformations; ii) a thick (up to 1 m or more) shear zone generated by the high deviatoric strains induced by the flow/slide movement style, at the interface with the basal stable formation (Bromhead, 2004). This shear zone has completely lost its original highly fissured fabric and appears as a rather "soft" homogenous soil with an anisotropic microfabric possibly characterized by shear fissures in the slope direction (Comegna and Picarelli, 2008); it seems to thicken with movement, possibly according to mechanisms as those described by Agung et al. (2004), in turn discussed by Picarelli et al. (2006).

The different properties of earthflow body, shear zone and parent formation could significantly affect the hydrological response of the moving mass. This paper provides the main results provided by investigations on the Masseria Marino earthflow in the Basento valley (Southern Italy).

2 THE MASSERIA MARINO EARTHFLOW

2.1 Basic aspects of the landslide behaviour

The Masseria Marino earthflow is active at least since the Seventies of the last century (Giusti et al., 1996). It consists of tectonized clay shales from the Varicoloured Clays formation and covers a 400 m long slope located upslope the alluvial plain of the Basento valley. As typical of earthflows, it presents three different zones: a source area, a main track and a fan shaped accumulation zone (Fig. 1a). The source zone corresponds to an old slide area subject to periodic retrogression, which is usually induced by long-lasting precipitations. Due to retrogression of the main scarp, the alimentation zone discharges clayey debris into a 150 m long and about 30 m wide track. The average angle of the track is about 10° and its depth 4-6 m (Fig. 1b). The track conveys the debris into the accumulation zone located in the alluvial plain of the Basento river.

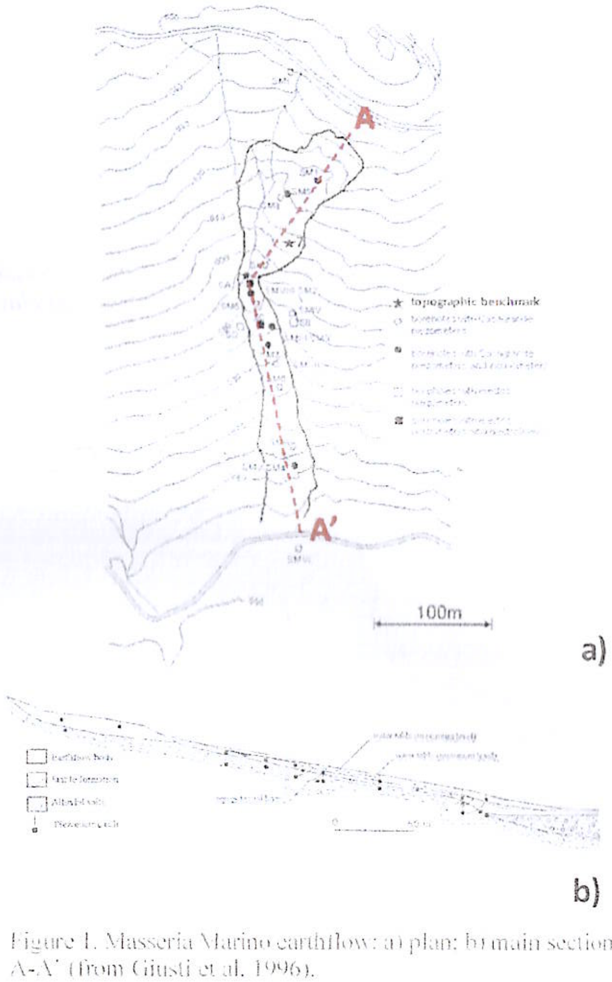

Figure 1. Masseria Marino earthflow: a) plan; b) main section A-A' (from Giusti et al. 1996).

ALL. 3

N. 1

1. Il candidato illustri le esperienze scientifiche e professionali da lui maturate attinenti alla tematica del bando ed il contributo che potrebbe fornire al progetto di ricerca.
2. Il candidato illustri le indagini in sito e le prove di laboratorio da effettuare per la caratterizzazione geotecnica di un pendio interessato da un movimento franoso.
3. Il candidato descriva le metodologie di modellazione numerica di una frana a cinematica lenta.
4. Il candidato legga e traduca la Synopsis del lavoro dal titolo: Stability of natural slopes and embankment foundations; autori: Skempton, A.W. and Huchinson, J. (1969); allegato alla presente.

STABILITY OF NATURAL SLOPES AND EMBANKMENT FOUNDATIONS

STABILITE DES TALUS NATURELS ET DES FONDATIONS DE REMBLAIS

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SYNOPSIS A system of classification of landslides in clay slopes is proposed involving the recognition of five basic types and six complex forms of movement. Clays are described in terms of their geotechnical characteristics and their mode of origin. The shear strength properties of clays are reviewed with particular emphasis on possible discrepancies between strengths in the field and as measured in conventional laboratory tests. Some methods of stability analysis currently in use are summarised. Fourteen analytical case records are then considered in some detail and field data are presented relating to the development of slopes in clay strata. It is concluded that great progress has been made during the past two decades in the scientific study of landslides and related processes in clay slopes, but many uncertainties still remain and some types of mass-movement have not yet been analysed quantitatively.

1. INTRODUCTION

The scientific study of earth and rock slopes has applications ranging from problems in pure geomorphology to the prediction of slope stability for civil engineering purposes and the design of remedial measures where a landslide has destroyed or is threatening property, communications or the lives of people.

From whatever point of view the subject is approached a proper understanding is required of four interrelated groups of topics:

(i) recognition and classification of the various types of mass-movements that can occur on slopes; their characteristic morphological features; their geological setting; their rates of displacement, and the causes of failure;

(ii) classification and precise description of the materials involved in mass-movements, and the quantitative measurement of their relevant properties;

(iii) methods of calculating the stability of a slope in terms of the type of failure, real or anticipated, and the material properties;

(iv) correlation between field observations and the results of stability calculations based on measured properties of the materials involved in a mass-movement.

This fourth topic lies at the heart of the subject. Unless and until a corpus of analytical case records has been established, adequate scientific knowledge of any class of landslide or type of material cannot be said to exist.

So far as is possible within the limits of a single paper the authors have endeavoured to review these aspects of the subject in terms of clay slopes. Some restriction is clearly necessary in a field which, in its entirety, covers an exceptionally broad range.

7th ICSMFE, Mexico, 1969

2. TYPES OF LANDSLIDES AND OTHER MASS-MOVEMENTS

Mass-movements occur chiefly in response to gravitational forces, sometimes supplemented by seismic activity. The manner in which a slope yields to these forces is controlled by a multitude of factors, of which geology, hydrology, topography, climate and weathering are the more important. In view of the wide range of variation possible in each of these factors, it is hardly surprising that in combination they should give rise to mass-movements of such variety as to resist rigorous classification. Three broad subdivisions, namely frozen ground phenomena, creep and landslides, may be recognized, however (Hutchinson, in press). Attention here will be concentrated on the last of these, as developed on clay slopes.

The generic term, landslide, embraces those down-slope movements of soil or rock masses which occur primarily as a result of shear failure at the boundaries of the moving mass.

In the following an attempt is made to isolate and define those types of landslide which occur sufficiently often to be regarded as characteristic and to explore broadly the reasons for their particular features. The simplest movements, generally possessing a certain unity, are the most readily distinguishable. These are regarded as the basic types of landslide on slopes: the more important of these are illustrated diagrammatically in Fig.1. The remaining characteristic landslide forms are in general multiple or complex assemblages of these basic types. Some frequently occurring types of multiple and complex landslides are illustrated in Fig.2.

In categorising the various types of landslide, most weight is given to the shape of the moving masses in down-slope section at the time of failure. The ratio D/L (Fig.3) relating the maximum depth of the slide to its maximum initial down-slope extent, is a useful measure of this property (Skempton 1953a & 1953b).

Landslides of similar D/L ratio can, however, behave very differently during and after failure. Thus recognition is also made of the importance of the form of the masses after failure, both in down-slope section and in plan. Rates of landslide movement are, as will be shown subsequently, extremely variable and do not appear to form a useful basis for primary subdivision.

2.1 Some Basic Types of Landslide on Clay Slopes

2.1.1 Falls. Clay falls are typically short-term failures in the steep slopes of, for instance, artificial excavations or eroding river banks. Such falls are usually rather insignificant and few are described in the literature. Two phases of failure can generally be distinguished. As a consequence of the removal of lateral support, bulging occurs at the slope foot and tension cracks open behind its crest. The development of these cracks brings about a progressive increase of stress in the root of the separating mass. This eventually fails, releasing the fall (Fig.1). The presence of water in such tension cracks naturally produces a very marked reduction in stability.

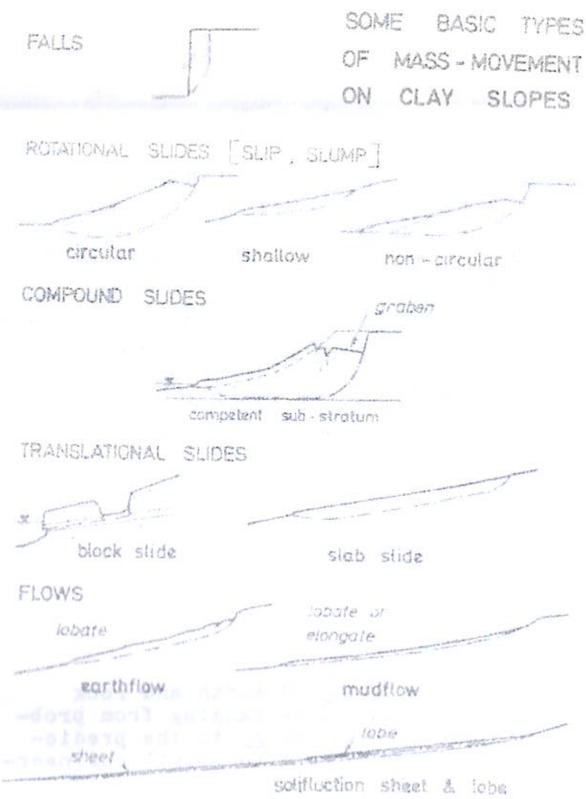

Fig. 1

The majority of slopes steep enough to be subject to falls are found in the stronger, over-consolidated clays. As these are rarely intact, the tension cracks usually develop along pre-existing joints or fissures. The position of these in relation to the slope crest may then considerably influence the size and manner of the eventual fall. The more deep-seated ones usually fall backwards in failing: a thinner clay mass, particularly on a near-vertical slope, may topple forwards.

Examples of clay falls from the walls of steep-sided excavations in over-consolidated