RECENT DEVELOPMENTS IN DEBRIS FLOW RESEARCH IN ITALY

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ABSTRACT: Debris flows play an important role among natural hazards in mountainous areas of Italy. This paper provides an overview on the recent research on debris flows conducted in Italy, taking into account both hydraulic and geomorphological studies. Moreover, the most encouraging research perspectives in this field are briefly presented, such as the monitoring of debris flow in instrumented basins and the geotechnical analysis of the processes leading to debris flow initiation. Finally, two study cases are reported, with the aim of outlining the main characteristics of these phenomena and consequent risk conditions in representative sites in the Italian mountains.

KEY WORDS: Italy, Alps, debris flow, natural hazards, alluvial fan

I. INTRODUCTION

Italy is a peninsula in southern Europe, whose territory covers 301,277 km² and of which about 75% consists of mountainous or hilly areas (Fig. 1). It extends about 1,200 km in length, N–S trending and 900 km in width (E–W trending). Relief is high and differentiated; peaks on the Alps (Northern Italy) range between 2,700 m a.s.l. and 4,800 m, while on the Apennines (Central and Southern Italy), they vary between 2,000 m and 2,800 m. The Po River is the longest water course (652 km) and it crosses Northern Italy in an E–W direction, draining a basin of about 70,000 km². Its average annual runoff is about 660 mm; higher peak discharges reach values of about 10,000 m³ s⁻¹. Other important rivers are the Adige River in Northeastern Italy
The Alps originated by compression and foreshortening of the margins between Africa and Europe. This process of crustal shortening, which began in the late Mesozoic era (Upper Cretaceous) and continues up to the present, has led to the formation of thrust nappes of the crystalline basement and of its sedimentary cover complexes (carbonates, marls and sandstones) hundreds of kilometers northward since the Eocene age. Some of the rocks suffered intense regional metamorphism and granitic intrusives rose into the deformed pile of rocks. A subsequent compressive phase during the Oligocene—Miocene age led to the formation of the sedimentary Apenninic nappes, in which flysch facies prevail. Large areas of the Italian Peninsula are seismically active.

Most of Italy (Central and Southern Italy and the Islands) is characterized by a Mediterranean climate (warm, dry summer); in Northern Italy the climate is still Mediterranean-influenced, but with sufficient precipitation all year.