

THE RECENT (NOVEMBER - DECEMBER 1989) MASS MOVEMENTS AND OTHER EROSIONAL PROCESSES IN PORTUGAL - SOME EXAMPLES.

M.L. RODRIGUES, J.L. ZÉZERE and C. RAMOS
Centro de Estudos Geográficos - Universidade de Lisboa

Summary

The researches carried on by some physical geographers from the Geographic Studies Center (University of Lisbon), about the relationships between certain rainy situations and the type, frequency and importance of mass movements and other erosional processes, revealed to be useful in the prediction of favourable type conditions. It became possible to point out two different climatological situations connected to the large mass movements or catastrophic flood factors. On the other hand, the geomorphological mapping at a very large scale (1:2,000 to 1:5,000), already performed in case areas with different instability degrees, has revealed a reliable instrument in the identification of potential unstable areas.

In this communication will be presented some preliminary results and several examples of mass movements and other erosional processes, related to the recent persistent and heavy precipitations (November - December 1989) that occur in Portugal.

1. INTRODUCTION

The physical geography researchers of the Geographic Studies Center (University of Lisbon) have been studying for some years the extreme climatological events (such as cold air invasions or heavy rains inducing the overflow of some rivers) and the geomorphological conditions which are related with slope instability.

On the climatological point of view, we are trying to establish the relationships between certain rainy situations and the type, frequency, importance and spatial distribution of mass movements and other erosional processes.

The study of active slope processes is mainly based on the detailed geomorphological mapping (at 1:2,000 or 1:5,000 scales), already performed in areas with different instability degrees (see examples of Maciço Calcário Estremenho and area north of Lisbon). This methodology has revealed a reliable instrument in the identification of potential unstable areas. In fact, the detailed geomorphological map, together with other features, such as climatological and hydrological ones, makes possible the evaluation and, even, the cartography of natural hazards.

Recently we had in Portugal, in November - December 1989, persistent and heavy rainfalls. We are analyzing this particular conditions both on a climatological and geomorphological point of view.

In this paper we present some case studies carried on the Portuguese Estremadura, located in the Western Portuguese

Mesocenozoic Basin and partly, in the Tagus Basin. The chosen examples concern to the Maciço Calcário Estremenho, Maior hydrographic basin, Lourinhã and Alcabrichel basins and area north of Lisbon (fig.1), where slope instability due to natural conditions (structure, topography, climate and hydrology) is, in many cases, activated by anthropic actions (vegetal cover destruction, cuts in slopes with unstable equilibrium, floodplains and river beds occupation), which contributed, frequently, to equipment damages and human losses.

2. MORPHOSTRUCTURAL CONDITIONS.

2.1. The Maciço Calcário Estremenho (Limestone Massif of Estremadura) is important not exactly by its area, but by its structural, erosional and karstic landforms (fig.1). Its singularity is given by the lithology (mostly jurassic limestones, specially Dogger's), the absence of perennial subaerial rivers, and its height, related with tectonic limits. It's formed by three major morphostructural units : the anticlines of Candeeiros, Aire and Alqueidão; the erosional surfaces of the Plateaus of S. Mamede (in the North) and Santo António (in the South), the tectonic depressions of Mendiga, Minde and Alvados. These depressions cut the massif's unit and the last two, that were object of geomorphological detailed mapping by one of us (M.L.RODRIGUES, 1988) are two asymmetric grabens, with uplift of the southwest side. In the closed basin of Minde a polje (typical by its morphology and hydrological activity) was developed. The open form of Alvados preserve a large variety of deposits, mainly of cold quaternary periods, and its geomorphological detailed mapping (fig.2, shows a small but particularly rich area) proved to be an important instrument for the assesement of the genesis and evolution of the western part of the Maciço Calcário Estremenho and, even, of the Atlantic border.

2.2. The hydrographic basin of Maior river is placed on the contact between two major morphostructural units : The Western Portuguese Mesocenozoic Basin moderately deformed, where limestones, marls and sandstones are dominant; Cenozoic Basin of Tagus river, formed mainly by sandstones, clays and some thin limestone layers.

In the upstream section of the Maior river basin, belonging to the first morphostructural unit, the main landforms are anticlines and diapiric depressions, between NNE-SSW tectonic accidents. In the middle and downstream sections, cuestas and tabular hills reflect the monocline and horizontal structures of the second morphostructural unit.

2.3. The Lourinhã and Alcabrichel basins, located near the western coastal line, are formed by jurassic formations, mostly clays, marls, sandy marls and some thin limestone layers. This soft materials are quite eroded by a dense hydrographic net which is responsible for a smooth morphology with small hills cutted by large U and flat shaped valleys. An anticline structure, with NNE-SSW orientation, has no morpho-