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# GEOMORPHOLOGICAL AND GEOTHEMATIC MAPS: EXAMPLES APPLIED TO LANDSCAPE EVOLUTION, SLOPE INSTABILITIES, MEDICAL GEOLOGY AND GEOTOURISM



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#### INTRODUCTION

In this work several examples of geomorphological and geothematic maps are presented, realized in the Abruzzo region at different scales ranging form 1:15.000 to 1:50.000, within the research activities of the Laboratory of Tectonic Geomorphology and GIS, Department of Engineering and Geology, "G. d'Annunzio" University of Chieti-Pescara. Several examples of Morphotectonic maps, Slope instabilities maps, Geomedical maps and Geotourist maps are presented. These maps are realized in the main morphostructural sectors of the Abruzzo Region: chain, piedmont area and coastal plain. All the maps are based on the ISPRA (CARG Project) guidelines, eventually integrated and/or modified in order to be adapted to specific scopes and different scales of the maps. All the maps are realized within GIS environment.

#### MORPHOTECTONIC MAPS

The creation of Morphotectonic maps is based on drainage basin scale geomorphological analysis within GIS environment by means of: DEM- and map-based cartographic analysis, morphometry of orography and hydrography (raster and vector data 1:25,000 - 1:10,000 scale, 5m grid DEM), photogeology analysis (1:10,000 - 1:33,000 scale), Quaternary continental deposits, fluvial terraces and morphostructural field mapping (1:10,000 scale), morphotectonic profiles that couple landform, deposits and terraces.

The morphotectonic maps incorporates more main orography and hydrography section;

- main morphotectonic map section;
- quaternary fluvial deposits and terraces section; longitudinal morphotectonic profile section.

The morphotectonic maps are realized in the Chain area (Marsica and Peligna region, Central Apennines, scale 1:50.000) and in the Piedmont-Coastal area (Aventino River basin - lower Sangro River area, SE Abruzzo scale 1:50.000; Osento River basin, SE Abruzzo, scale 1:30.000)

The maps presented in this work are the base for recognition of morphotectonic features at basin scale, detection of tectonic control on landscape, and reconstruction of paleo-landscapes. They provide a contribution to define the main phases of post orogenic landscape evolution of the piedmont area of the Apennines chain, resulting from the link of alternating morphotectonics and surface processes, due rock uplift processes, local tectonics and alternating slope and fluvial processes.

#### **SLOPE INSTABILITIES MAPS**

Slope instabilities maps are realized by geoscientist at different scales, with different methods and for different purposes (research or applied purposes; landslides mapping, soil erosion mapping, flood mapping, etc.). In this work, maps of the geomorphological instabilities, triggered by heavy rainfall events that affected the Coastal area Abruzzo Region in the last 5 years, are presented. These maps are mainly based on aerial photo interpretation (taken after the rainfall events) and field geomorphological mapping carried on immediately after the rainfall events.

Particularly, the maps presented refers to the 1-2 March 2011 heavy rainfall event (up to ~200 mm/day) which affected the coastal slopes and the coastal hills of the northern Abruzzo. The main mapped landform are due to slope instabilities (earth flows, mud flows, gullies, areas affected by rill erosion) and flooding (flooded areas, crevasse splays).

These kind of maps are the base for flooding and slope instabilities hazard analysis and for the estimation of sediment volumes eroded during the events. This is particularly important for minor drainage basins of coastal slopes and coastal hills where erosion and hazard are frequently underestimated.

### **GEOMEDICAL MAPS**

Geomedical maps are recently developed in many countries incorporating multiple land features: bedrock lithology, surface deposits, pedology, geochemistry, disease distribution and incidence etc.

In this work the first example of geomedical maps realized in the Abruzzo regionis presented. It is based on the comparison of geological data and epidemiological data in order to evaluate the disease risk induced by natural and anthropic sources in the main fluvial valleys of the piedmont area of the Abruzzo region.

### **GEOTOURIST MAPS**

In the geotourist maps, geology and geomorphology are presented in an easy and educational way, as a base of a new way of reading landscape and tourism. Going back over a history wrote during millions of years, where books are rocks, pages are layers, words are fossils and ink ...is time. In this work the first geotourist map in Abruzzo

(southern chain piedmont area) realized in the Àventino - middle Sangro area is presented. The map is reinterpreted from geological maps, distinguishing outcropping rocks as concern their surface expression into distinct geological landscapes. Limestone, marls, sandstones, clays, chalks, gypsum, gravels and landforms are presented as windows over a 200 million years history that today can be observed in a unique "breathtaking" landscapes rich of colours and suggestions, labelled with appealing names (i.e. the sliding rocks, the shining hills, the floating mountains). Symbols highlight the location of main geological and geomorphological features (i.e. national geosites, fossil sites, oil well, caves, glacial cirque remnants, and other geological interest areas). Finally, tourism facilities (offices, information centres, museums, trails, etc.) are added to the geological and geomorphological aspects in order to complete the geotourist map.

The backside of the map and the explanatory notes include text and figures explaining features and origin of different types of rocks and related landscapes.

## **CONCLUSION**

This work is a contribution of data and examples to enhance the value of modern geomorphological and geothematic maps for several purposes such as: research activities concerning morphotectonics and landscape evolution, hazard and slope instabilities analysis, geomedical analysis, geotourism and enhancing geological and geomorphological heritage.

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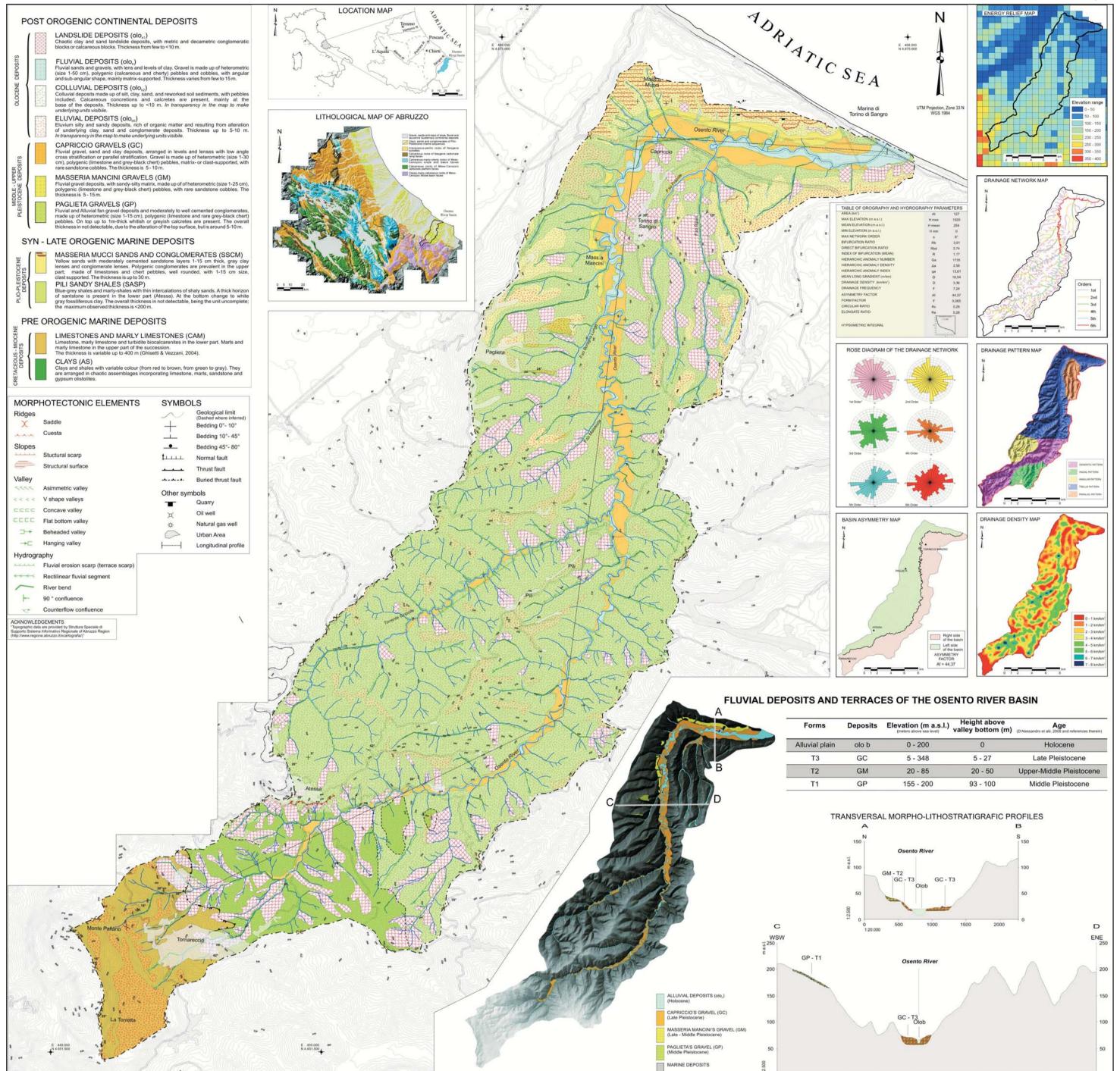
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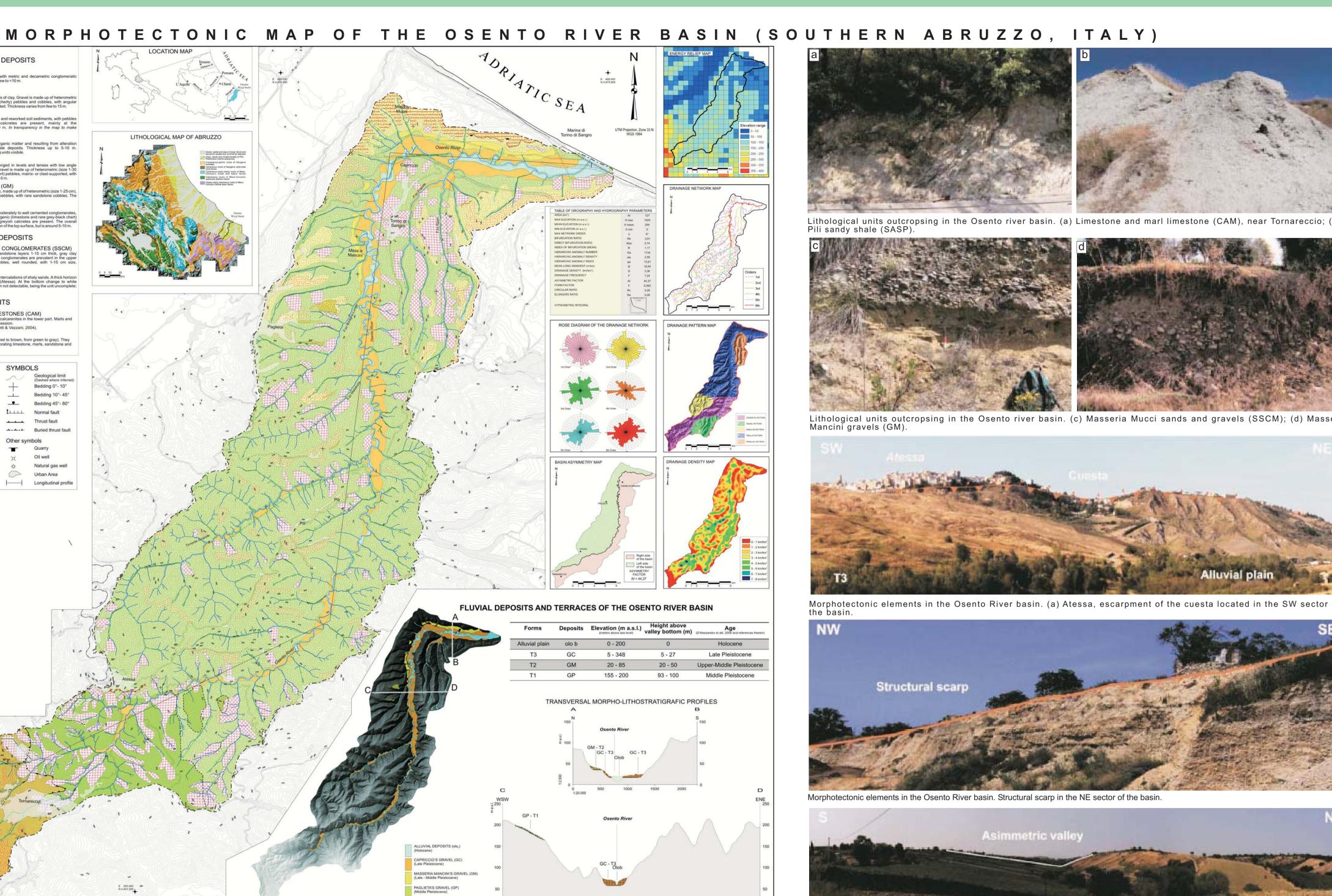
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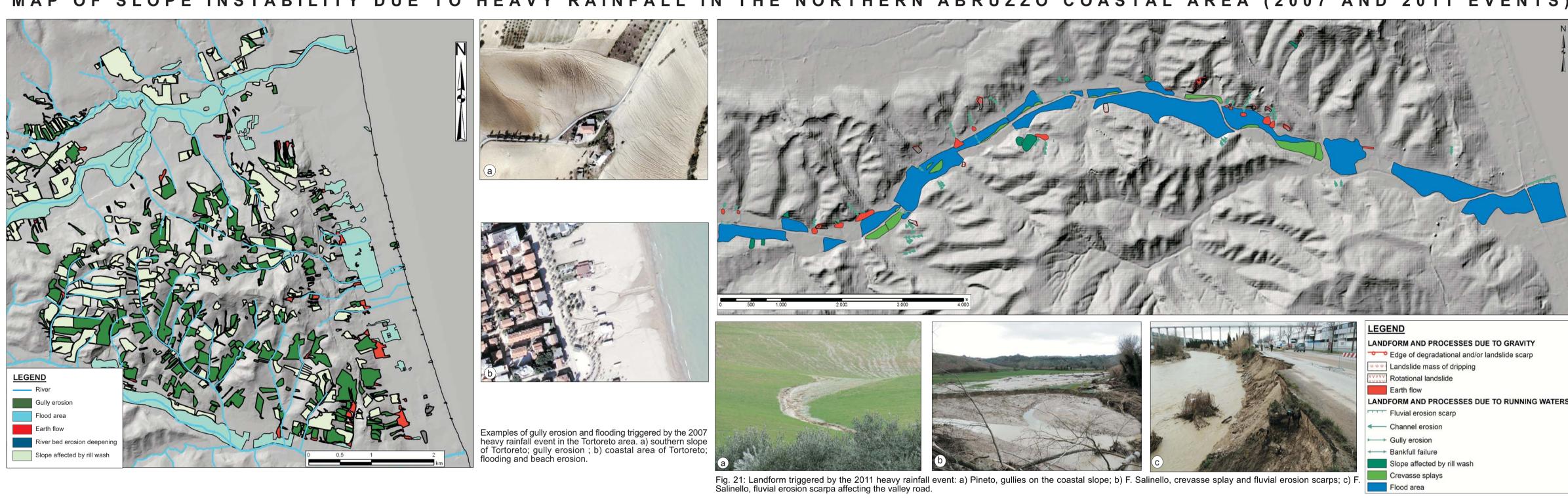
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Morphotectonic elements in the Osento River basin. Asymmetric valley near Paglieta.

MAP OF SLOPE INSTABILITY DUE TO HEAVY RAINFALL IN THE NORTHERN ABRUZZO COASTAL AREA (2007 AND 2011 EVENTS)



## GEOMEDICAL MAP OF THE PESCARA RIVER BASIN (CENTRAL ABRUZZO, iTALY)

