Field Investigations of Landscape Development in southeast Spain for use in Modeling Holocene (8,000 - 1,500 yr) Agropastoral Landuse and Landscape Interactions

1. Research Contribution

This research contributes geomorphic data that will enable modeling of landscape changes resulting from land use practices during the mid Holocene (8,000 - 1,500 yr) in SE Spain. This is a time of important changes in the interactions between humans and the landscape. We mapped landforms, described alluvial deposits and collected samples on terrace surfaces and near archaeological sites. We use the landscape progressed from a period of stability to erosion with deposition followed by rapid incision which initiated sometime near the time of human occupation of the surfaces.

2. Introduction

Dramatic changes in land use were associated with the rise of agriculture in the mid Holocene in the Mediterranean region. Both the surface properties and the drainage networks were changed along with the direct modifications to surface properties (vegetation removal and change, sediment liberation and compaction) and consequent drainage alteration (terracing, canals), up and downslope processes in the watersheds communicated these changes throughout the landscape. This magnitude, rate, and feedbacks with the growing human populations are critical questions in our effort to assess human-landscape interactions.

3. Methods

To investigate these relationships, recent field work in the Penaguila Valley in southeast Spain included landform mapping, alluvial deposit description, and sample collection emphasizing areas of active erosion, remnant land surfaces and their relation to archaeological sites. We have developed our geomorphic maps by refining the delineation of alluvial terraces, streamlined (100m deep) drainages (‘barrancos’), and hollows (‘barrancos de fondo plano’).

4. Terrace Mapping and Hollow Identification

Figure 4.1: This map highlights Holocene surface terraces, hollows, geology, and archeology sites, and topography in the Penaguila Valley. Alluvial terraces are crucial to this research because they record periods of past stable topography. This broad landform unit (terraces) is known by deep barrancos and hollow formation that expose bedrock marls and overlying alluvial deposits. Broad核查和ress (Terrace A) were observed within the main barrancos and indicate a late Neolithic (around 6600 BP) and subsequent periods. These photographs show surface delineation of Terrace A (Fig. 4.1) to document changes within the main barrancos where modern terrace surfaces are observed.

5. Stratigraphy of Terrace A

Stratigraphic sections and geochemical analyses of deposits from sites were used to establish the parent material consisting of sand, silt, and clay. We have correlated these sections with the overall topographic map of the area, and we have developed our geomorphic maps by refining the delineation of alluvial terraces, streamlined (100m deep) drainages (‘barrancos’), and hollows (‘barrancos de fondo plano’).

6. Textural Analysis of Terrace A

Sediment samples from terrace deposits. Dating these samples using optically stimulated luminescence (OSL) and luminescence (OSL) techniques have been completed (Fig. 5.1).

7. Archaeology Sites

In the Penaguila, sites dating back to late Mesolithic and early Neolithic (around 8000 BP) and subsequent periods (Chalcolithic and Bronze Age) are exposed on a prominent terrace surface mapped as Terrace A (Fig. 4.1). These photographs show material excavated from these sites in the Penaguila. Here we show results from two sites described above (Fig. 4.2) to document changes within the main barrancos where modern terrace surfaces are observed.

8. Analysis of Hollows

Figure 5.1: Hollows are cut, elongate, bedrock-bottomed gullies of deeply incised (40m deep) drainages (‘barrancos’). Hollows developed to pre-existing surface (Terrace Z) terraces below them.

9. Holocene Landscape Interpretation

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10. Results

Holocene landscape development in the Penaguila appears to have progressed from a period of stability to shape degradation with sedimentation (stream inflow) followed by rapid incision which initiated sometime near the time of occupation. This change from a low-relief alluvial surface to one cut by narrow channels may have been an important shift for local populations. This research contributes geomorphic data that will enable modeling of landscape changes resulting from land use practices during the mid Holocene (8,000 - 1,500 yr) in SE Spain. This is a time of important changes in the interactions between humans and the landscape. We mapped landforms, described alluvial deposits and collected samples on terrace surfaces and near archaeological sites. We use the landscape progressed from a period of stability to erosion with deposition followed by rapid incision which initiated sometime near the time of human occupation of the surfaces.

Our work provides an important data set to a larger international and multidisciplinary project that is examining long term socioeconomic processes that shaped Mediterranean landscapes, from the beginning of farming to the beginning of complex agriculture. Diagram (A) shows three, multidisciplinary geospatial layers that interact in a landscape and basin modeling. Paleokarst reconstruction is the Penaguila region presented here, contributes to the paleo-topo layer in the integrated analysis. Diagram (B) illustrates the network of dynamic models that integrate the main data sets crucial to the overall research goals. Paleokarst and geomorphological models will result from this research and will be used in developing the main reference landscape chronosequence, which will allow us to test the initial model for agropastoral socioculture and potential landscapes.