PALAEOSURFACE RECONSTRUCTION BASED ON SEDIMENTARY RECORD AND IN SEA LEVEL EVOLUTION IN THE GUADIANA ESTUARY (SOUTHERN IBERIA)

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The sedimentary infilling of the Guadiana estuary, in the Southern Iberian Peninsula, has been extensively studied using a variety of laboratory methods, namely geochemical and sedimentological analyses, foraminifera assemblages and palynological profiles, supported by ^{14}C dating [1-3]. The application of multiple methods and proxies allowed a more complete and accurate reconstruction of the Holocene paleoenvironments as well as to refine the regional postglacial sea-level rise for the Gulf of Cadiz [4].

During the past Glacial period lowstands a deeply incised river valley was developed, cutting the Paleozoic and Mesozoic substratum and also the gravel deposits accumulated during Marine Isotope Stadium (MIS) 3 or 5e in the deepest parts of the estuary. Prior to the establishment of marine/estuarine conditions there was a transitional period of fluvial sand/estuarine silt accumulation between 11 000 and 10 000 yr BP. The Holocene sequence was then deposited over the fluvial sands or directly on the Pleistocene gravels [1, 4].

Throughout the Holocenic transgression the estuary presented two main phases of sedimentary infilling accordingly to the rates of sea-level rise. The first phase ended around 6500 yr BP and occurred during accelerated sea-level rise in the order of 0.85 m/century. The second phase lasted until 5000 yr BP when the sea reached the level close to the present, being characterized by a slower sea-level rise, below 0.25 m/century. Since then the sedimentation has remained stable with lower rates of vertical accretion but with a progressive reduction in the water surface due to horizontal accretion, which has lead to the present narrow estuary experiencing the final stages of its sedimentary infilling [1].

Data from six cored boreholes (Figure 1), together with geophysical and non-cored geotechnical surveys allowed the estimation of the depths for the different sedimentary bodies, enabling the reconstruction of the

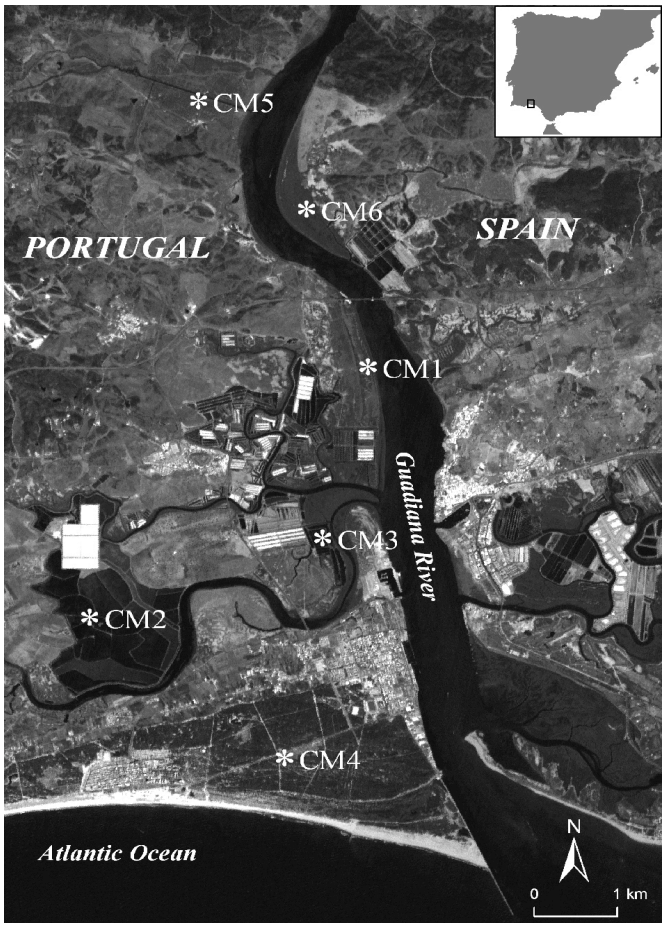

Figure 1 – Location of the study area with borehole sites (IRS Satellite panchromatic image)

palaeosurface from the Last Glacial Maximum and also the palaeosurfaces from the different phases of the Holocenic sedimentary infilling in response to the sea-level rise.

Palaeosurface reconstruction was made by interpolation techniques in ArcGIS environment, using point data from the boreholes and also from the geophysical and geotechnical surveys, through an elevation difference approach based on the analysis of the present surface. The elevation data for the present surface was derived from 1:25.000 topographic vector maps from the Portuguese Army Geographical Institute and also from 1:10.000 topographic maps from the Andalusian Cartographic Institute. The topographic maps present 10 meters contour intervals and also widely disseminated elevation points, enabling the generation of a detailed continuous surface using the triangular irregular network (TIN) method.

Data from borehole analyses made possible the identification of the sedimentary response of the Guadiana Estuary in precise locations corresponding to the borehole location. Although this by itself already allows the reconstruction of the estuary's evolution, the use of tridimensional modeling techniques enables a refinement in terms of palaeosurface generation and, therefore, contributes to the increasing accuracy in the knowledge of the Guadiana Estuary recent geological evolution.

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