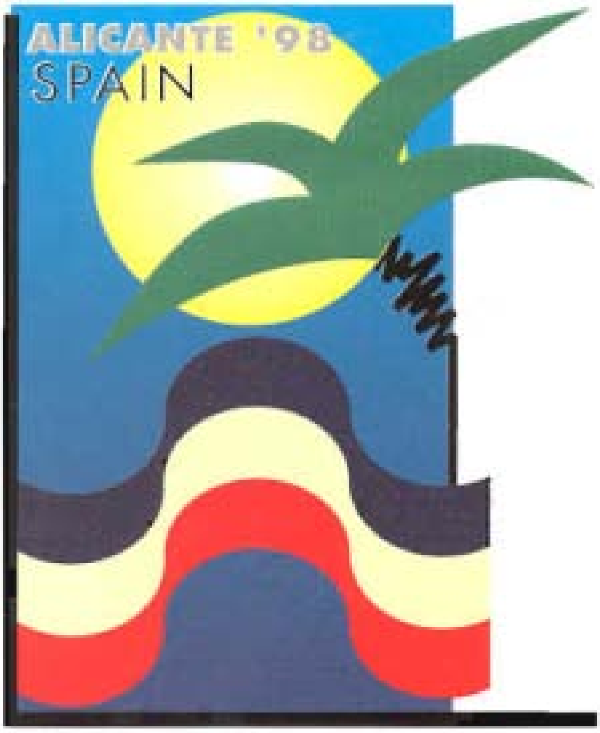

15th INTERNATIONAL SEDIMENTOLOGICAL CONGRESS

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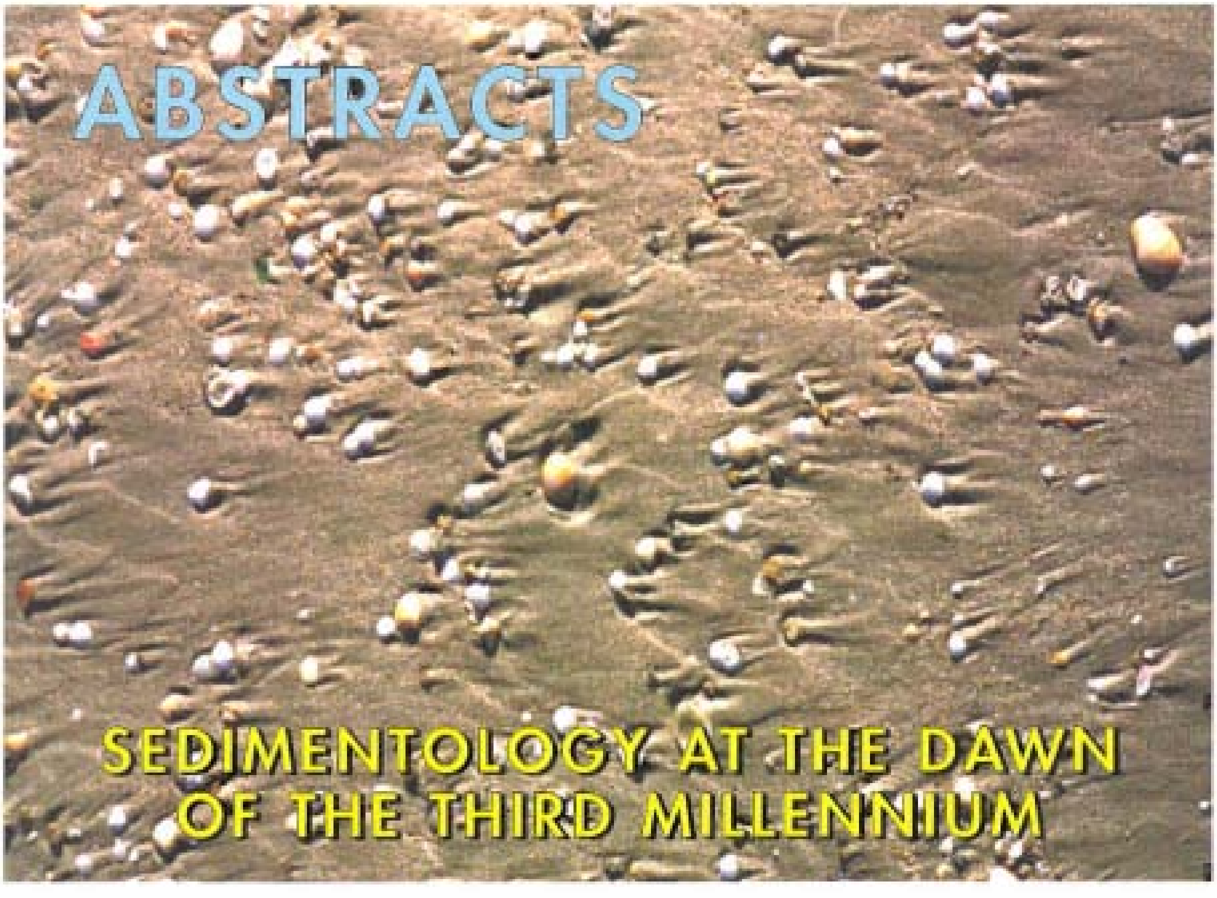
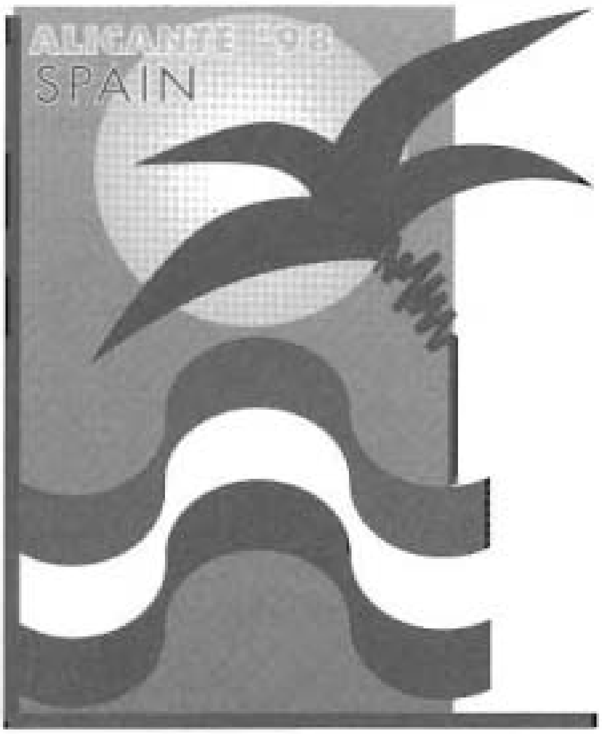


ABSTRACTS

SEDIMENTOLOGY AT THE DAWN OF THE THIRD MILLENNIUM

15th INTERNATIONAL SEDIMENTOLOGICAL CONGRESS



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Abstracts

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THEMES

THEMES A. ANALYTIC TECHNIQUES. DATA PROCESSING AND REPRESENTATION

THEME G. GEOLOGY AND OCEANOGRAPHY OF CONTINENTAL MARGINS

EVOLUTION OF SANDSTONE COMPOSITION IN A CONTINENTAL FORELAND BASIN. LORANCA BASIN, SPAIN

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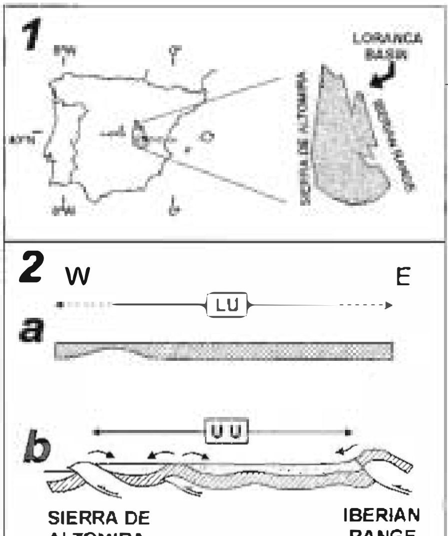
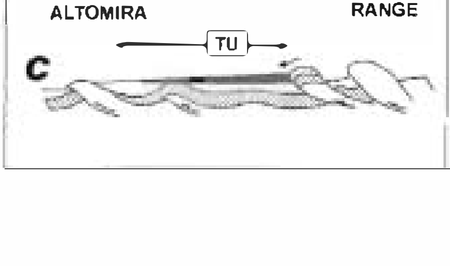
The Loranca basin, located in central Spain (Fig. 1), is a continental foreland basin that filled up from Eocene to Miocene times. The configuration of the E margin of the basin was produced by compressive stages of thrusting and folding of Mesozoic deposits (mainly carbonates) from the Iberian Range. This border migrated to the W during the sedimentation causing the shortening of the basin. The western boundary of the basin is constituted by the Sierra de Altomira thrust belt with N-S trending structure. Tectono-stratigraphic analysis and palaeogeographical reconstruction of the Loranca basin show a lack of foreward or hindward sequence of migration of thrusting and, thus, considered as a 'non sequenced' foreland basin (Gómez et al., 1996). The stratigraphic record of the basin is divided into three main units: Lower, Upper and Terminal Unit. The boundaries between units (unconformities) as well as the synsedimentary internal anticlines are caused by tectonic pulses from the foreland. All three units are constituted by a lower part of detrital deposits (fluvial conglomerates, sandstones and siltstones) that evolves in the upper part to lacustrine-evaporite deposits. Sandstone composition of the three units reflects changes in source lands during the evolution of the basin.

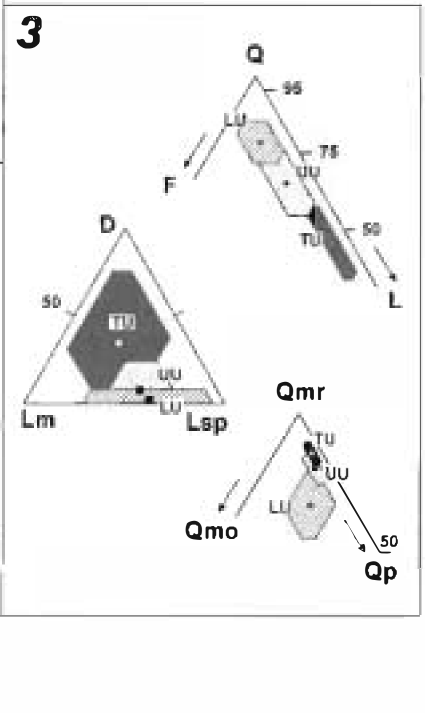
The sedimentation of the Lower Unit is coeval with the initial rising of the western boundary of the basin (Sierra de Altomira) (Fig. 2a). Deposits of this unit (Eocene-Late Oligocene) covered an area more extensive than the present-day basin and consist of gravels and sands filling low-sinuosity channels and silty clays deposits of the flood basin. Palaeocurrent data show a great variability (supplies from S. N and NW) that make difficult to locate the sourceland of these deposits. Sandstones filling the channel system are subarkoses and subsedarenites (mean $Q_{18}F_{10}L_{10}$) with dominance of calcitic rock fragments (Fig. 3). Dolomitic grains only appear close to the N margin of the basin. Spatial variations in sandstone composition reflect the presence oftwo different sedimentary sources to the SW (mainly siliciclastic rocks) and to the N-NE (mainly carbonate rocks).

During sedimentation of the Upper Unit (Late Oligocene-Early Miocene), the Loranca basin was filled by two coalescing depositional systems (Tortola and Villalba de la Sierra fluvial fans) with apexes located along the eastern margin of the basin. The most active time interval of the fans correspond to the base of the unit, representing an important tectonic pulse in the E margin. Palaeochannels show a general downstream change from low- to high-sinuosity. The fans were gradually abandoned, due to a period of tectonic inactivity, decreasing the frequency and thickness of palaeochannels which are mainly of braided type. Close to the Tártola apex, sandstones are sedarenites ($Q_{54}F_{7}L_{39}$) while in the proximal zone of Villalba de la Sierra fan sandstones are subarkoses ($Q_{76}F_{15}L_{9}$). This fact is interpreted as a greater apex incision of Villalba de la Sierra fan, than provides siliciclastic grains from the lower part of the Cretaceous section (mainly constituted by siliciclastic formations). The sandstone composition evolves downfan increasing the content of quartz and feldspar grains produced from recycling of the Lower Unit sandstones in synsedimentary internal anticlines of the basin ($Q_{67}F_{9}L_{24}$) (Figs. 2b and 3). Local alluvial fans located along the Sierra de Altomira provided sediments with high content in carbonate fragments to the tributary area in the outer part of the fluvial fans. These supplies disturb the general evolution of sandstone composition downstream. Detrital dolomite increase through this unit ($D_{5}Lm_{34}Lsp_{61}$ to $D_{22}Lm_{28}Lsp_{50}$) probably due to a climatic change to drier and colder conditions (Díaz-Molina and Tortosa, 1996).

The base of the Terminal Unit (Early Miocene) comprises the Valdeganga depositional system, exhibiting braided channels that covered the southern and central areas of the basin. This depositional system is considered as a reactivation of the Tortola fan (Fig.2c). The sandstones of this unit are sedarenites ($Q_{53}F_{7}L_{40}$). Many of the carbonatic components have dolomitic composition ($D_{36}Lm_{24}Lsp_{40}$), related to the erosion of the upper Cretaceous







formations of the Iberian Range (Fig.3). Downfan sondstones tend to increase in quartz content as a consequence of maturation during transport.

Detailed analisys of the sandstone compositional data from the three units reveals different recycling events from one unit to the next. Thus, the Q/F ratio increase progresively from the Lower to the Terminal Unit as a result of maturation during recycling and the reduction of 'new' siliciclastic extrabasinal supplies. This fact is also supported by a progressive increase in the more stables quartz types between the three units. In addition, Cretaceous formations from the Iberian Range supplied extrabasinal components, mainly carbonatic fragments, producing an increase in these groins during shortening of the foreland basin. As a result, the increase in maturity from siliciclastic grains is acompained by an increase in lithic grains. These petrological evidences are consistent with tectono-sedimentary evolution of the basin as the shortening of the basin favoured the recycling and reworking processes of sediments (Fig. 2).

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ENVIRONMENTAL, BACTERIAL AND CYANOBACTERIAL CONTROLS ON THE CALCIFICATION OF MICROBIAL STROMATOLITIC SEDIMENTS (FRENCH POLYNESIA)

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These sediments, called «kopara» by native people from the Tuamotu archipelago, display a typical model of microbial sediment in which high-Mg calcite precipitates within a purely organic network derived from the polysaccharidic constituents of decaying cyanobacterial sheaths (Défarge et al., 1994). Precipitation occurs in organic laminae alternating with organic laminae in which carbonate precipitation is very limited or absent.

The colour of the bulk sediment is reddish and due to the presence of both bacterially (phototrophic sulfuroxidizing bacteria) derived pigments (such as lycopene) and cyanabacterially derived pigments (canthaxanthine, zeaxanthine, echinenone, ß-carotene).

Cross sections perpendicular to the lamination show that dark-red, not or paorly carbonate laminae, are distinct from only reddish, generally carbonate laminae. The thickness of such dark- red laminae can reach up to 5 cm. Microscopic observations show that they are very rich in purple sulfur-oxidizing bacteria. The pands displaying thick dark- red laminae have a high salinity, close, or sometimes slightly higher than that of sea water.

The reddish, generally carbonate laminae, carrespond to an organic sediment derived essentially fram cyanobacterial bodies. The organic matter in those laminae turns aut to be a favorable substrate for high- Mg calcite precipitation (Défarge et al., 1994), in particular thanks to its richness in diacidic amino acids (aspartic and glutamic) (Trichet, 1972; Disnar et Trichet, 1981). Such laminae result from the development of more or less thick layers of living cyanobacteria during relatively high water levels in the lake.

The succession and the thickness of carbonate and non carbonate laminae are therefare, at least under the control of the following environmental parameters: (1) variations and rate of variation of the water level above the top of the sediment Periods of inundation allow the growth of cyanobacterial biomasses, the decay of which leads to the formation of an organic sedimentary layer. The development af a layer of purple sulfur-oxidizing bacteria takes place soon, just under that of green living cyanobacteria. If the growth of cyanobacteria is slow and continuaus then the thickness of the dark-red layer, rich in living sulfur oxidizing-bacteria (in its top part) and in preserved red pigments (in its bottom part, where those pigments, inherited from dead bacteria, are stabilized in the highly reducing conditions prevailing immediately under the photosynthetic top layers of the sediment) can reach some centimeters. If the growth of cyanobacteria is quick enough, then sulfur oxidizing purple bacteria are restricted to the top part of the organic sediment under the cyanobacterial layer. The bottom part of this layer is under the contral of other bacterial populations (in particular sulfate reducers). Carbonate formation is observed in such layers; (2) the amount of sulfur available in the pond is also critical and high salinity waters, due to marine invasions, are associated with the development of thick darker non carbonate layers. Low salinity waters (some units per mil) would be favorable ta calcite precipitation.