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Incised valley fills at a lower Albian sequence boundary (Western basque-cantabrian basin, North Spain)

Rellenos de Paleovalles excavados en un límite de secuencia del Albiense inferior (Cuenca vasco-cantábrica, N España)

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RESUMEN

El límite de secuencia Albiense inferior basal del Complejo Urgoniano Vasco-cantábrico presenta un paleorelieve con valles excavados en la parte oeste de la cuenca. El relleno de estos valles fue de conglomerados fluviales en zona proximal (Polientes), areniscas y conglomerados fluviales en zona intermedia (Santa Gadea), y deltas conglomeráticos y areniscosos de tipo Gilbert en zona distal (Cotero-Lunada). El origen de las excavaciones se atribuye a una caída relativa importante del nivel del mar que siguió a un pulso tectónico regional. Los valles tuvieron polaridades N y NW, y se dispusieron en sinclinales y fosas siguiendo directrices tectónicas de bloques de zócalo o alineaciones diapíricas.

Palabras clave: *Incised valley fill, Sequence boundary, Lower Albian.*

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Introduction

Sequential arrangement in the Basque-Cantabrian Urgonian Complex (Aptian-Albian) was firstly established by García-Mondéjar (1979), who attributed the sequences to repeated tectonic pulses. García-Mondéjar and Fernández-Mendiola (1989) and García-Mondéjar (1990) described several Urgonian sequences formed by relative changes in sea-level. A type-1 Lower Albian sequence boundary is here described in the SW part of the Basin (fig. 1), where mostly fluvial conglomerates filled wide and shallow valleys comparable in size and origin with some of the «incised valleys» of the Gulf Coast region (Van Wagoner *et al.,* 1990). The aim of this paper is 1) to make the first report about the presence of incised valleys at this Lower Albian sequence boundary, 2) describe their general characteristics and fills in proximal (Polientes), intermediate (Santa Gadea), and distal areas (Cotero-Lunada), and 3) suggest some ideas about their origin and significance.

Proximal valleys (Polientes)

The sequence boundary in the proximal area (Polientes) is a disconformity surface on top of meandering fluvial sandstones and mudstones. An overlying quartz-conglomerate Quintanilla de An (García-Mondéjar, 1979) fills a paleo-relief in an E-W cross-section (fig. 2). This paleo-relief consists of one half-valley about 5 km wide and 4 m deep, and one complete valley about 15 km wide and 20 m deep. Detailed paleocurrent analyses from a total of 222 measures of imbricated clasts suggest that the two river valleys merged towards the north (this improves a previous distribution of paleocurrents, García-Mondéjar, 1982). The conglomerates are clast-supported, consist of quartz, quartzite and chert, and have the maximum size of clast (20-25 cm) between the

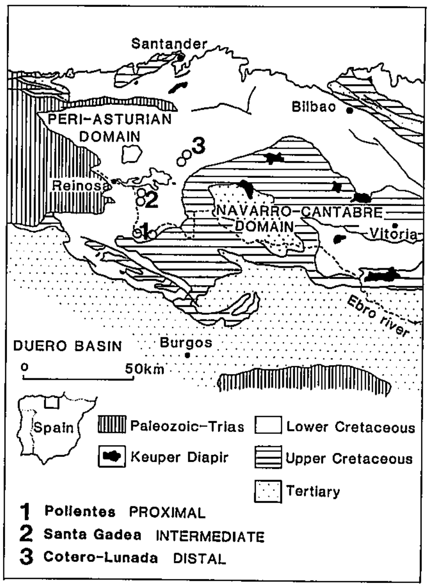

Fig. 1.—Geologic map of western Basque-Cantabrian region with location of the studied outcrops (1, 2 and 3).

Fig. 1.—Mapa geológico de la parte oeste de la región vasco-cantábrica con situación de los afloramientos estudiados (1, 2 y 3).

points of reference 772 and Polientes (fig. 2). They show horizontal and trough cross-stratification and locally contain abundant tree trunks. The conglomerates are attributed to a couple of fluvial braided systems confined within the two valleys.

Intermediate valley (Santa Gadea)

The sequence boundary in this area is a subtle angular unconformity separating meandering fluvial sandstones and mudstones from the fluviatile braided sandstones and conglomerates of La Canal (García-Mondéjar, 1990a). A syn-tectonic (passive flank) unconformity represents the western margin of a paleo-valley, whose minimum width was 7 km and whose depth of original incision has not been possible to estimate. This valley was longitudinally and laterally filled with sandstones and conglomerates, respectively, and a common vertical sequence of facies represents a successive fill of channels and sand flats. A fluvial environment of braided rivers flowing towards the north is invoked to explain the fill of this paleo-valley.

Distal valleys (Cotero-Lunada)

In the outer platform the sequence boundary is a disconformity surface - locally angular unconformity- separating rudistid, subtidal limestones from deltaic sandstones and conglomerates. The boundary shows two paleovalleys, respectively 1.5 km. wide (Cotero) and 6 km. wide (Lunada), with 40 m. of minimum relief in Lunada (García-Mondéjar, 1990b). The fill of these valleys consists of an alternation of marine sandstones and limestones and deltaic sandstones and conglomerates. In Lunada three Gilbert-type deltaic lobes with siliceous clasts up to 5 cm. long make a part of a larger braided delta system (García-Mondéjar, 1990b). This system filled longitudinally the paleo-valley of Lunada towards the NW. An internal cyclicity in the delta lobes is attributed to multiple relative falls in sea level, which probably were originated by movements along a tectonic line or zone of weakness in the basement (García-Mondéjar, 1990b).

Origin of the incised valleys

The main direct cause of the presence of incised valleys in the study area was a relative sea level fall. Subtidal marine facies with a brusque upwards replacement by fluvial-deltaic facies in the outer platform, or meandering fluvial sandstones and mudstones disconformably eroded under conglomerates of a braided fluvial system in the inner platform (fig. 2), demonstrates it (e.g. Van Wagoner *et al.*, 1990). The sea level fall had a minimum value of about 50 m. in the outer platform (depth of incised valleys plus paleobathymetry of the sea floor in that area).

The reconstructed sediment dispersal pattern for the time considered is shown in fig. 3. In the area of Polientes two paleovalleys are respectively parallel to SW-NE and SE-NW trends of paleo-structures, and both of them occupy somewhat depressed areas or synforms. In Santa Gadea another depressed paleo-structure (syncline) conditioned the location of its only paleo-valley. And in the Cotero-Lunada area two paleovalleys took again advantage of depressed areas, in this case downfaulted blocks of a SE-NW tectonic pattern.

Thus, the actual configuration the whole paleo-drainage system (fig. 3) followed the pattern of areas structurally lowered during a previous- and in part coetaneous- tectonic pulse. A major SW-NE tectonic zone is deduced from the map in fig. 3, and other zones in a SE-NW direction are also revealed paleogeographycally important. Most probably all these zones were related with diapiric lines and blocks of a broken basement, whose differential extensional movements can be linked to the opening of the Bay of Biscay.

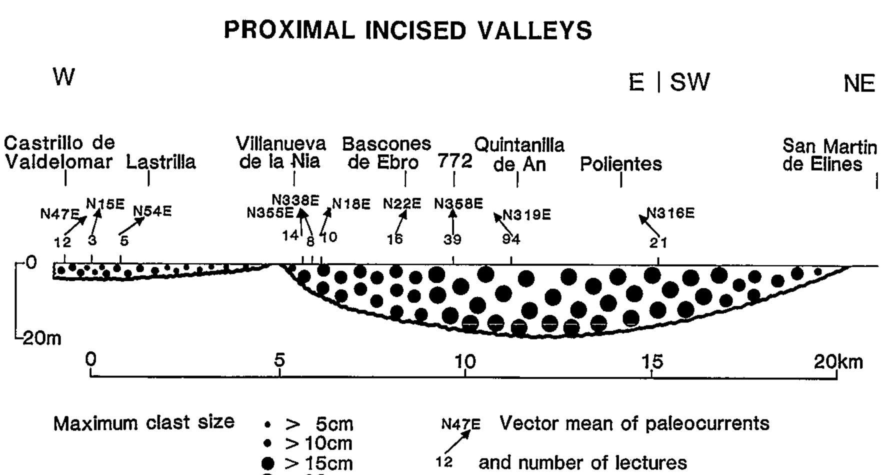

Fig. 2.—E-W stratigraphic cross-section of the sequence boundary and overlying conglomerates in the area of Polientes.

Fig. 2.—Corte estratigráfico E-W del límite de secuencia y de los conglomerados suprayacentes en el área de Polientes.

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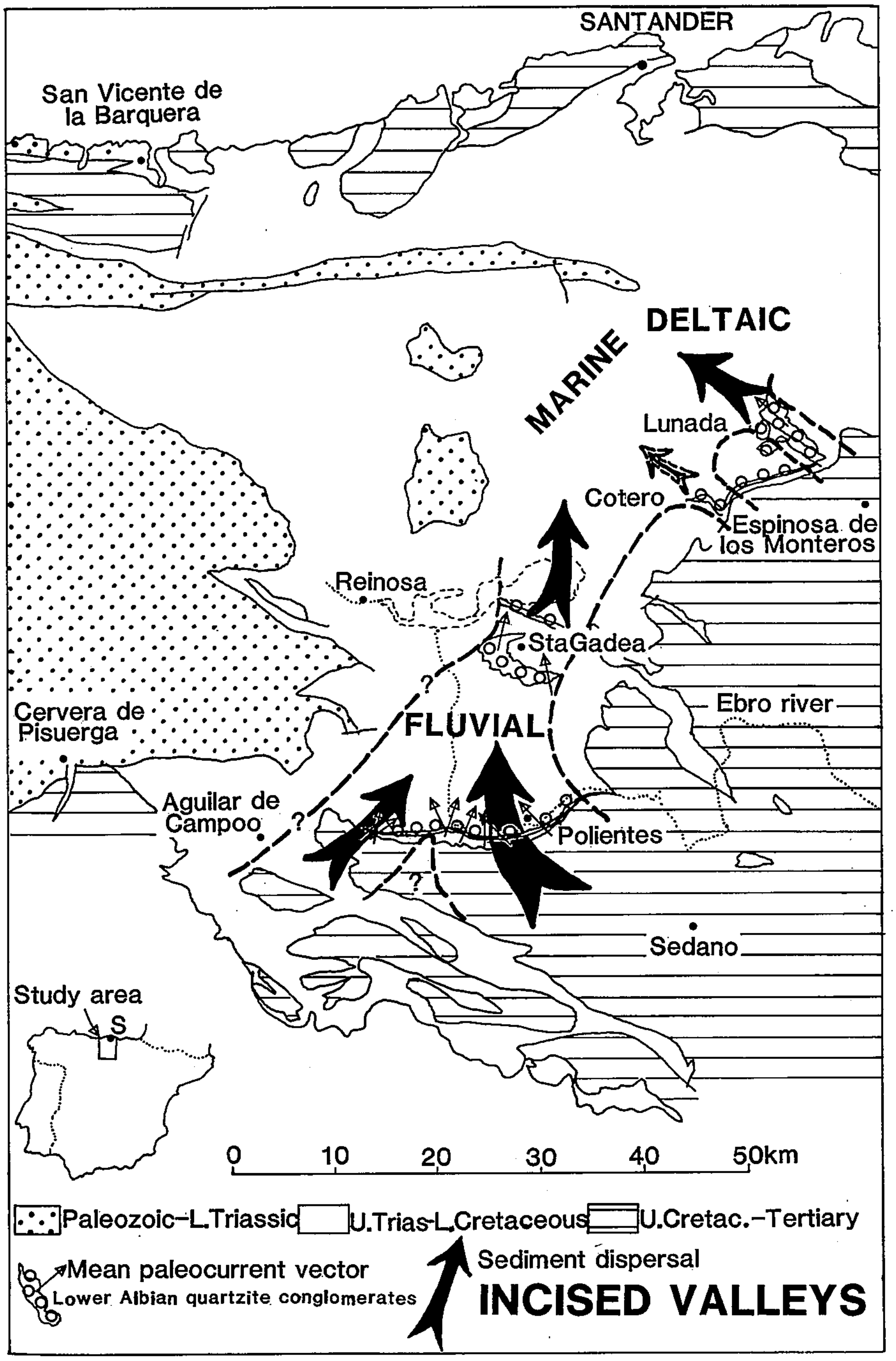

Fig. 3.—Sediment dispersal pattern and incised valley fills with conglomerates in proximal, intermediate and distal areas.

Fig. 3.—Modelo de dispersión de sedimento y rellenos conglomeráticos de valles excavados en áreas proximal, intermedia y distal.