THE KIMMERIDGIAN (?) - EARLY VALANGINIAN TECTONIC EVENTS ON THE PERUVIAN MARGIN

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Resumen: En el Perú, el Jurásico más tardio está marcado por importantes eventos tectónicos distensivos que provocan según los lugares, el renacimiento de la sedimentación detrítica, la formación de cuencas, una emersión o el desarollo de un arco volcánico. Esos eventos afectan mayormente la parte occidental de la margen y estan relacionados con eventos geodinámicos originados en el dominio Paleopacífico. En cambio, la llegada brutal de areniscas derivadas del Este cerca del límite Berriasiano-Valanginiano parece resultar del inicio del "Rifting" Atlántico en esta latitud.

Introduction.

In Peru, the late Jurassic "Nevadan orogeny" has been invoked to explain the unconformities observed below the Neocomian sandstones. However, the importance and the age of these events are still poorly known. This paper is an attempt to precise the chronology and the significance of the Kimmeridgian to early Valanginian events, through stratigraphic and sedimentological studies.

Geological setting.

During middle Jurassic times, the Peruvian margin underwent widespread tectonic events that resulted in a contrasted paleogeographic pattern (Jaillard et al. 1990). Since this time, it is possible to distinguish from W to E: (1) a narrow coastal zone which is badly known as far; (2) a Western area characterized by marine sedimentation (presently Western Cordillera); (3) an Axial Cordillera which acted as a positive swell (Marañon geanticline and SW Altiplano), and (4) an Eastern domain which received mainly continental deposits (Oriente and NE Altiplano).

Geological evolution.

1. From Kimmeridgian (?) to early Tithonian.

Kimmeridgian deposits have not been recognized in northern Peru.

In southwestern Peru, they are represented by shalow marine sandstones and shales (Labra Fm, Vicente et al. 1982), and on the Axial Cordillera and part of the eastern zone, by alluvial fan conglomerates (Chupa & Huambutio Fms, Klinck et al. 1986, Carlotto 1989, Batty & Jaillard 1989).

These detrital deposits are often capped by marine, partly calcareous deposits of early Tithonian age (Gramadal, Sipin & Jaguay Fms, Rüegg 1961, Vicente et al. 1982, Batty & Jaillard 1989), which probably correlate with the Simbal Fm of northern Peru (Jaillard & Jacay 1989). They are coeval with a major eustatic sea-level rise (Haq et al. 1987).

This period is marked by numerous synsedimentary tectonic features which express a NW-SE-trending extensional regime in the Axial Cordillera (Batty & Jaillard 1989, Carlotto 1989).

2. From middle to latest Tithonian.

After early Tithonian times, large areas of southwestern Peru emerged (Batty & Jaillard 1989), but marine, sandy black shales of late Tithonian to Berriasian age are locally known (Bellido 1956, Geyer 1983).

In the Axial Cordillera, undated, continental to tidal fine-

grained sandstones and red shales overlie the calcareous beds (upper Huambutio and lower Goyllarisquizga Fms, Carlotto 1989, Moulin 1989), and are associated with a week extensional tectonic regime (Muni Fm, Batty & Jaillard 1989).

On the coast of central Peru, the development of a volcanic arc probably began during late Tithonian times (Puente Piedra Fm, Rivera et al. 1975). It is associated with an extensional tectonic regime (Atherton et al. 1985).

In northern Peru, at the beginning of late Tithonian times, a deep, short-lived turbiditic trough was created (Punta Moreno Fm). The detrital input sharply decreased during latest Tithonian times (Zapotal Fm, Jaillard & Jacay 1989).

3. Berriasian times.

Southwestern Peru remains emergent.

In the Axial Cordillera, the deposition of the undated tidal to continental deposits continues (Muni, upper Huambutio, lower Goyllarisquizga Fms). However, it is also possible that they only belong either to the late Tithonian or to the Berriasian.

The volcanic arc of coastal central Peru remains active up to the latest Berriasian (Wiedmann 1981). It is coeval with the deposition of widespread marine (Bellido 1956) to deltaic sandy black shales (Oyon Fm, Wilson 1963).

In northern Peru, shallow marine sandstones abruptly overlie Tithonian to Liassic deposits (Tinajones Fm, Cobbing et al. 1981) and are associated with extensional tectonic features (Jaillard & Jacay 1989).

4. The latest Berriasian-earliest Valanginian disconformity.

Near the Berriasian-Valanginian boundary, the contrasted paleogeographic pattern is overlain by widespread, East-derived, clean sandstones (Chimu, Goyllarisquizga, Salto del Fraile, Hualhuani & Hancané Fms). The sands disconformably overlie rocks of Paleozoic to Berriasian age. Paleocurrent measurements indicate a westward transport in the eastern areas, and a SE-ward distribution along the western areas. Depositional environments vary from fluvial to tidal.

These Valanginian sandstones conseal the late Jurassic tectonics and level the inherited contrasted paleotopography.

Conclusions.

Between Kimmeridgian (?) and Valanginian times, the Peruvian margin recorded important sedimentary discontinuities (Jaillard & Sempéré 1989), among which two are major tectonic events (Middle Tithonian and Berriasian-Valanginian).

The Kimmeridgian (?) event mainly concerns the southern part of Peru, and has been related to the Araucan phase of Chile (Sempéré et al. 1988, Batty & Jaillard 1989).

The middle Tithonian tectonic event affects the whole margin. It is interpreted as resulting from a drastic change in the convergence direction of the Paleopacific oceanic plate, which would have triggered the collision of allochtonous terranes in northern Peru (and farther north), and an extensional tectonic regime in the rest of the Peruvian margin (Jaillard & Jacay 1989, Jaillard et al. 1990).

The discontinuity of the Tithonian-Berriasian boundary (?), mainly concerns northern Peru, and can be related to the collisional processes (Jaillard & Jacay 1989).

These three events mainly affect the western part of the Peruvian margin, and are related to geodynamic events occurring in the westerly Paleopacific plate.

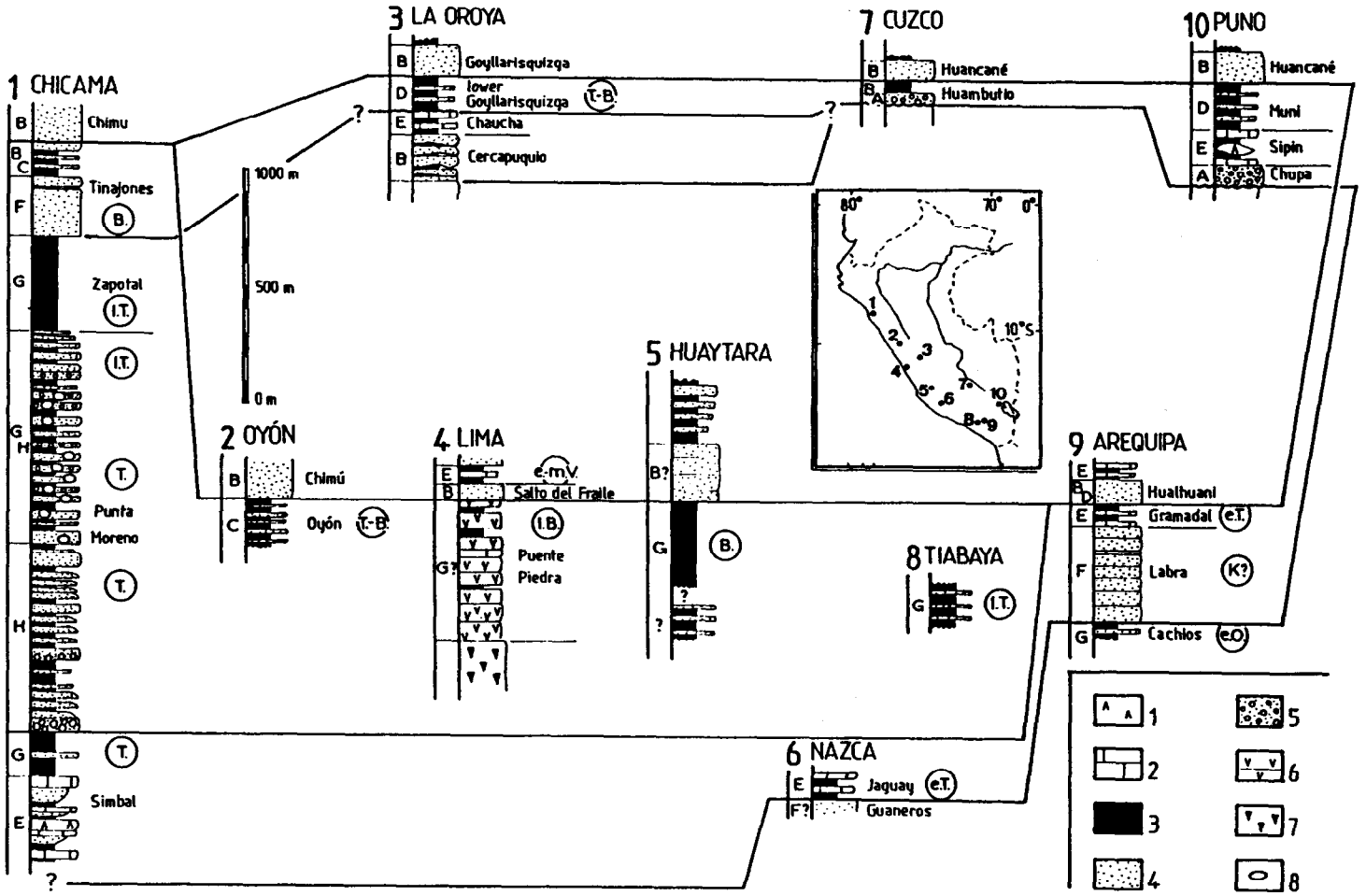
In contrast, the latest Berriasian-earliest Valanginian event is marked by the creation of a wide easterly source-area which provided the east-derived sands. It can be interpreted as the first manifestation of the southern Atlantic rifting at this latitude.

Figure: The late Jurassic to Valanginian sedimentation in the Peruvian margin.

Lithology: 1: evaporites; 2: limestones; 3: shales; 4: sandstones; 5: conglomerates; 6: partly volcanosedimentary deposits; 7: mainly volcanic flows; 8: olistolites.

Sedimentary environments (left column): A: alluvial fan; B: fluvial; C: delta; D: tidal; E: lagoon; F: shallow shelf; G: deeper shelf; H: turbidites.

Ages (in circles): e, m, l: early, middle, late; O: Oxfordian; K: Kimmeridgian; T: Tithonian; B: Berriasian; V: Valanginian.


1 CHICAMA
B Chimu
B C
Tinajones
F
B.
G
Zapotal
I.T.
I.T.
G H
T.
Punta
Moreno
T.
H
G
T.
Simbal
E
?
1000 m
500 m
0 m
3 LA OROYA
B Goyllarisquizga
D lower Goyllarisquizga
T-B
E Chaucha
B Cercapuquio
?
2 OYÓN
B Chimú
C Oyón
T-B
4 LIMA
E
B
e-m.V.
Salto del Fraile
I.B.
G?
Puente
Piedra
5 HUAYTARA
B?
G
B.
?
?
7 CUZCO
B Huancané
B Huambutio
?
8 TIABAYA
G
I.T.
6 NAZCA
E Jaguay
e.T.
F?
Guaneros
10 PUNO
B Huancané
D Muni
E Sipin
A Chupa
80°
70°
0°
10°S
1
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3
4
5
6
7
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9
10
9 AREQUIPA
E
B D
Hualhuani
E Gramadal
e.T.
F
Labra
K?
G
Cachios
e.O.
1
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