

## STRATIGRAPHY OF THE "CELICA-LANCONES BASIN" (SOUTHWESTERN ECUADOR- NORTHWESTERN PERU). TECTONIC IMPLICATIONS.

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**RESUMEN :** En la "Cuenca de Celica-Lancones", se distingue una serie sedimentaria occidental, que constituye la cobertura del Bloque Amotape-Tahuin, y una serie oriental en parte volcánica perteneciendo a la margen andina. Están separadas por una sutura tectónica, que involucra rocas maastrichtianas. Por lo tanto, la colisión del Bloque Amotape-Tahuin con la margen andina ocurrió después del Maastrichtiano, probablemente en el Eoceno basal.

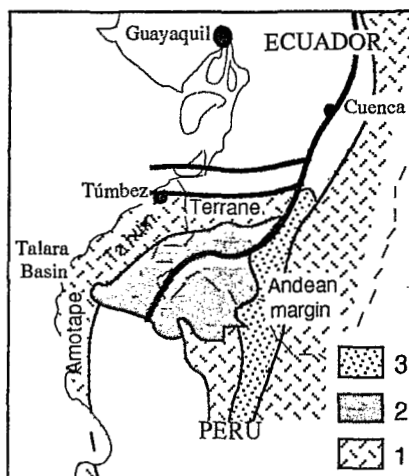
**KEY-WORDS :** Late Cretaceous, Paleogene, Andean margin, Terrane, Accretion.

### INTRODUCTION

The Andes are classically divided into Central, liminal Andes without accretions nor ophiolites, and Northern and Southern Andes, which underwent obduction and/or accretion of oceanic and/or continental terranes. Moreover, the tectonic rotations are clockwise in the Northern Andes, whereas they are counter-clockwise in the Central Andes (Kissel et al. 1992). Therefore, the Peru-Ecuador border, that roughly coincides with the Northern to Central Andes transition (Mourier 1988), is a key area to understand the tectonic behaviour of the Andean margin and of the allochthonous terranes.

### GEOLOGICAL SETTING

The Cretaceous series of the Celica (Southwestern Ecuador) and Lancones (Northern Peru) zones were interpreted as the infilling of a back-arc basin located on the suture of the Amotape-Tahuin Block (ATB), accreted to the Andean margin at the Jurassic-Cretaceous boundary (Mourier 1988, fig. 1). In these interpretations, western facies unconformably overly the Paleo-



*Fig. 1: Location sketch. 1: Paleozoic rocks; 2: Cretaceous "Celica-Lancones Basin"; 3: early Tertiary rocks of the Andean margin.*

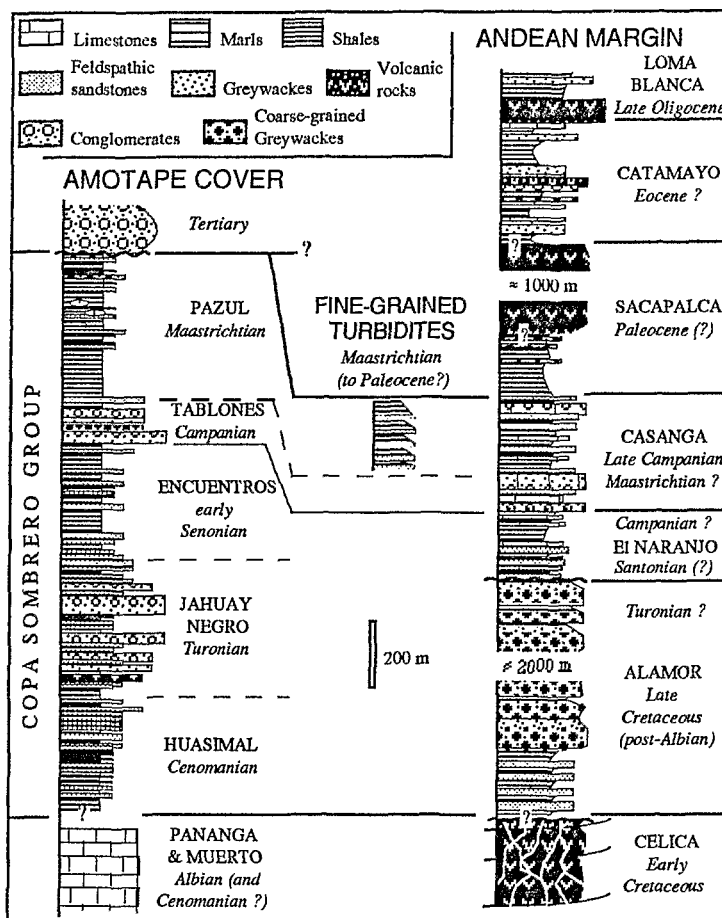
zoic rocks of the ATB, and laterally grade eastward into volcanic and volcanoclastic deposits, which are separated from the Andean margin by important faults (Kennerley 1973, Morris & Alemán 1975, Bristow &

thick subaerial andesitic flows with intercalations of fluvial red beds, crosscut by an early Eocene pluton (49 Ma, Kennerley 1973). It is thus probably coeval with the Llama and Porculla volcanics of Northern Peru (Reyes & Caldas 1987, Mourier 1988).

This volcanic series is overlain by the undated Catamayo Fm. It comprises regressive sedimentary sequences, grading from coastal-marine shales to fluvial coarse-grained conglomerates (fig. 2). The latter mainly contain clasts of metamorphic rocks, and thus contrast with the underlying, mainly volcanoclastic formations.

Southerly, the Sacapalca Fm is overlain by lacustrine black shales and turbiditic greywackes, with abundant slumpings and olistolites belonging to the undated Gonzanamá Fm. Its relationship with the Catamayo Fm is unknown.

The latter formations are unconformably capped by the probably Oligocene volcanic flows of the Loma Blanca Fm.



The Maastrichtian slices. Fig. 2: Stratigraphic sketch of the Celica-Lancones series.

The above-described series are separated by a major fault, within which are pinched discontinuous slices of black-coloured, thin-bedded turbidites and cherts, which have been locally dated as Maastrichtian (Bristow & Hoffstetter 1977)(fig. 2). These are usually affected by tight folds associated with well-developed axial plane cleavage.

### TECTONIC INTERPRETATIONS

The eastern, Andean series differs from the western, ATB cover, through : (1) the presence of an early Cretaceous volcanic "basement", (2) the dominant volcanic nature of the detritism throughout late Cretaceous and Paleocene (?) times and (3) the presence of a mixed carbonate-detritic shelf during Senonian

Fm), and the marine transgression of possible Eocene age (Catamayo Fm) still need stratigraphic confirmations, before to attempt correlations with Andean events known elsewhere. Whichever the case, the Celica series is one of the quite scarce examples of a complete sedimentary series deposited in a forearc setting throughout the whole central Andes.

	W	Amotape-Tahuin allochthonous bloc	E	Intermediate tectonic slices	Andean margin
Eocene	Conglomerates				Erosion W. Cord Transgressions
Paleocene	Disconformity.	Collision the with		Andean margin	Subaerial Volcanic arc
	Open-marine shales			Pelagic black shales and fine-grained turbidites	Shelf
Maastrichtian		Conglomerates			Conglomerates
Campanian					Shelf
Santonian			Northward shift ?		Unconformity
Ceno.-Turon.					Pull-apart trough ? Unconformity
Albian			Andean-type sedimentation		Volcanic arc
early Cretaceous					?

The early Cretaceous to Albian facies of the ATB cover are comparable with those of the West- Peruvian margin, and it probably belonged to this latter at this time (fig. 3). Since Cenomanian times onwards, the turbiditic sedimentation on the ATB differs totally from that of the Andean margin. This drastic change could be interpreted as the beginning of the northward migration of the ATB. As a matter of fact, late Cretaceous times are a period of very oblique, northward convergence, which would have induced dextral wrenching along the Andean margin. This could also account for the coeval creation of the Alamor, possibly pull-apart basin (fig. 3).

Fig. 3: Tectonic interpretations of the late Cretaceous-Paleogene evolution of the Amotape and Andean series.

The presence of Maastrichtian rocks in the suture between the two units demonstrates that these cannot have been emplaced in their present-day location before Maastrichtian times. Therefore, the hypothesis of the latest Jurassic to earliest Cretaceous collision of the ATB must be left out. The age of the accretion of the ATB could be indicated by the irruption of the early Eocene coarse-grained deposits (Mogollón Fm) in the Western side of the ATB (Talara Basin).

## CONCLUSIONS

The Celica-Lancones area comprises two distinct late Cretaceous-Paleogene sedimentary series and can no longer be considered as a "Basin" of that age. The western unit represents the cover of the Amotape-Tahuin Block, whereas the eastern one is a well-preserved example of an Andean series in a arc to fore-arc setting. The presence of deformed Maastrichtian slices between both units indicates that the accretion of the Amotape-Tahuin terrane occurred after Maastrichtian times, probably near the Paleocene-Eocene boundary.

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