Sedimentary evolution of the Cretaceous to Palaeocene Potosi Basin (Eastern Cordillera, Southern Bolivia)

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Introduction

Within the Andean orogen, the Eastern Cordillera forms a distinct geologic province. Precambrian and Paleozoic rocks are widespread in southern Bolivia. In places, this sequence is disconformably overlain by Cretaceous and Palaeogene strata, or by the Neogene infill of intramontaneous basins. The Cretaceous and Palaeocene deposits occur mainly in the Potosi region, the Otavi- and Camargo synclines, in the Atocha-Tatasi- and the Tupiza areas (fig. 1).

The latter deposits were accumulated in the Potosi basin. To the south, it is connected with the Salta rift system in north-western Argentina (SEMPERE 1993). Interaction of tectonic uplift and subsidence, eustasy and sediment supply controlled the sedimentation patterns within the basin, causing lateral facies changes. The sedimentary sequence is grouped into the Puca Group and parts of the Corocoro Group (LOHMANN & BRANISA 1962, SEMPERE 1993, 1995).

The present day backarc region of the Central Andes was integrated into continent-wide rifting processes during the Late Mesozoic and Early Tertiary times. The extensional structures of that phase strongly influenced the following compressional deformation. We investigate the Cretaceous to Palaeocene sequence of the Potosi Basin with emphasis on its palaeotectonic development. This study attempts to evaluate the lithostratigraphy and facies of the basin center deposits versus their marginal equivalents. It contributes new data to the general discussion concerning the evolution of the Potosi basin.

We selected five well exposed sections, La Palca, Otavi, Culpina, Sarcarca, and Tatasi, for a detailed facies analysis. They were measured and described using lithostratigraphic methods.

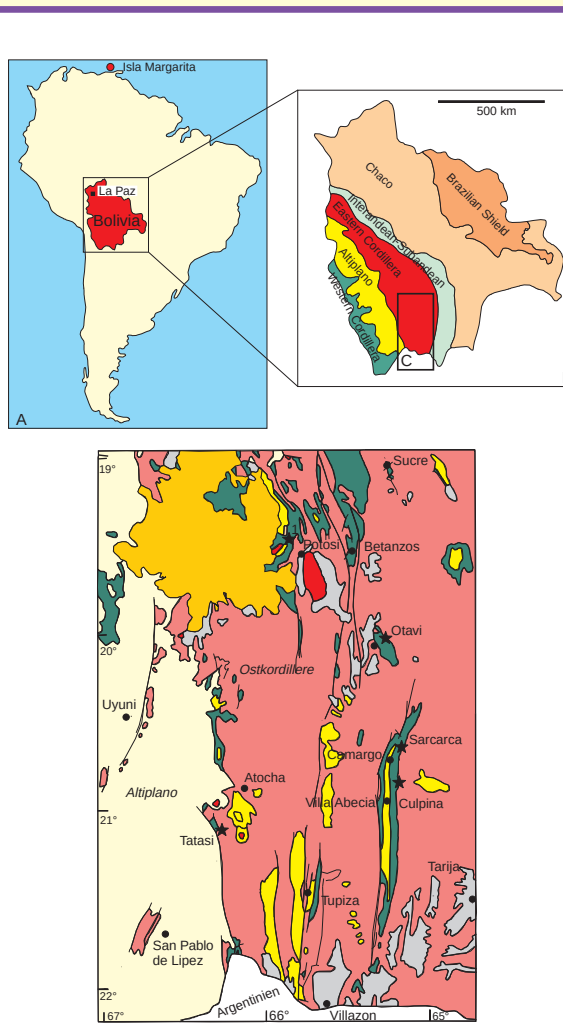

Figure 1 The study area in the Central Andes of Bolivia, their morphotectonic units (A, B, and a generalized geological sketch map of southern Bolivia with the location of the sections (C).

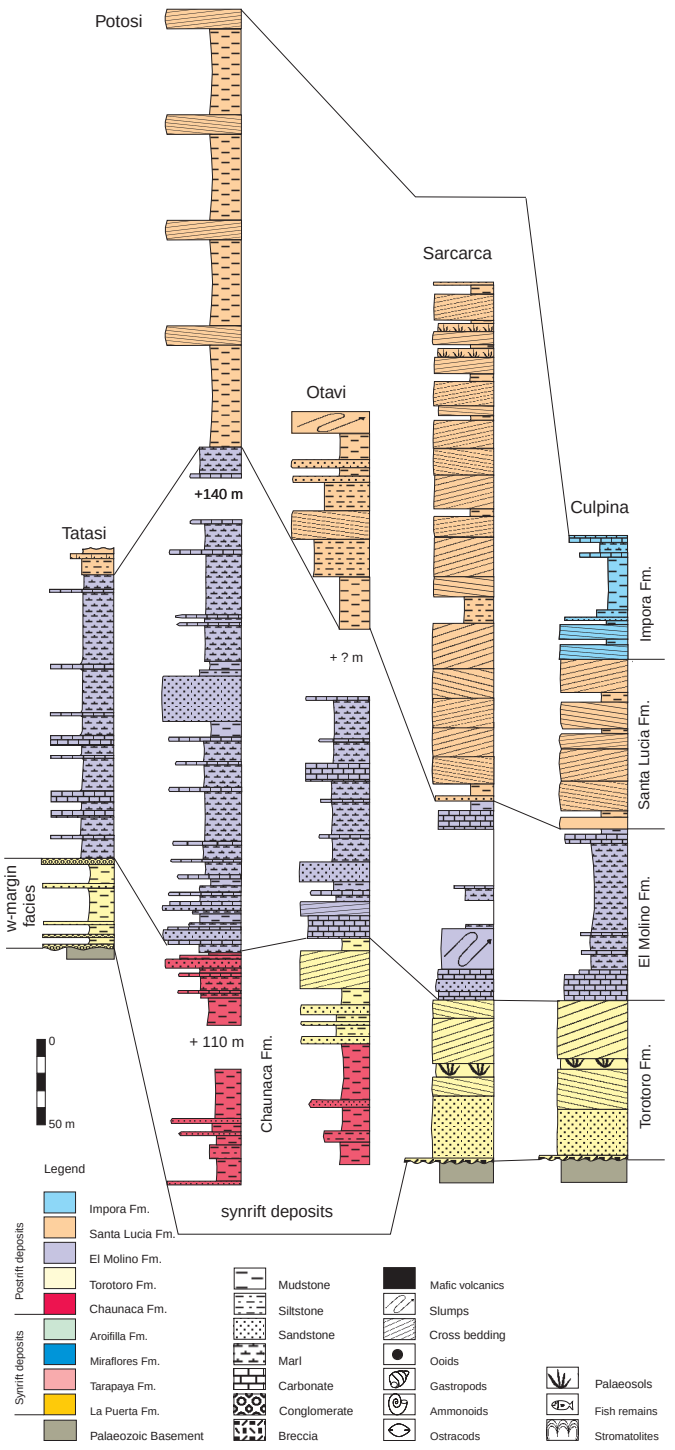

Figure 2 Facies of the postrift deposits in the studied sections.

Conclusions

The southern part of the Potosi Basin is sandwiched between the "San Pablo de Lipez" structural high in the west, and the "Subandean" foreland high in the east. The subdivision of the Cretaceous to Palaeocene sequence into a synrift- and a postrift phase is evident.
The oldest Cretaceous synrift deposits are confined to a graben segment between Potosi and Tupiza. The extensional tectonics may have been in part controlled by the break-up of Gondwana, related to the formation of the South Atlantic (WELSINK et al. 1995). Only once, during the Cenomanian sea-level high, marine waters reached the northern part of the graben. Otherwise fluvial and playa environments predominated (fig. 4).
A major change during the basin evolution took place, when widespread subsidence integrated previous parts of non-deposition (fig. 5,6). Presumably Santonian/Campanian sediments considerably onlap onto the Palaeozoic basement. They show a marked facies differentiation into a western marginal facies, a basin center facies, and an eastern marginal facies. The basin shows an asymmetrical shape with a steeper gradient in the west, relative to the east. Both marginal facies contain basal breccias, conglomerates and coarse grained terrigenous sandstones (FIEDLER et al. 1997). A pelitic playa facies persisted in the basin center (fig. 5). Sedimentation is arranged into two sedimentary cycles. Each consists of basal fluvial and overlying mainly lacustrine sediments. The El Molino Formation (Fig. 5,6,7,8) and the upper part of the Santa Lucia/Impora Formation represent the lacustrine parts. The sedimentary change from the El Molino Formation to the Santa Lucia Formation was controlled by a reactivation of the eastern hinterland, providing new detritus. Together with synsedimentary tectonics along the western margin this reactivation may indicate a gradual transition into a foreland basin. Late Palaeocene tectonic movements and subsequent erosion only occurred along the "San Pablo de Lipez" high (MAROCCO et al. 1987). An equivalent unconformity is missing along the eastern margin.

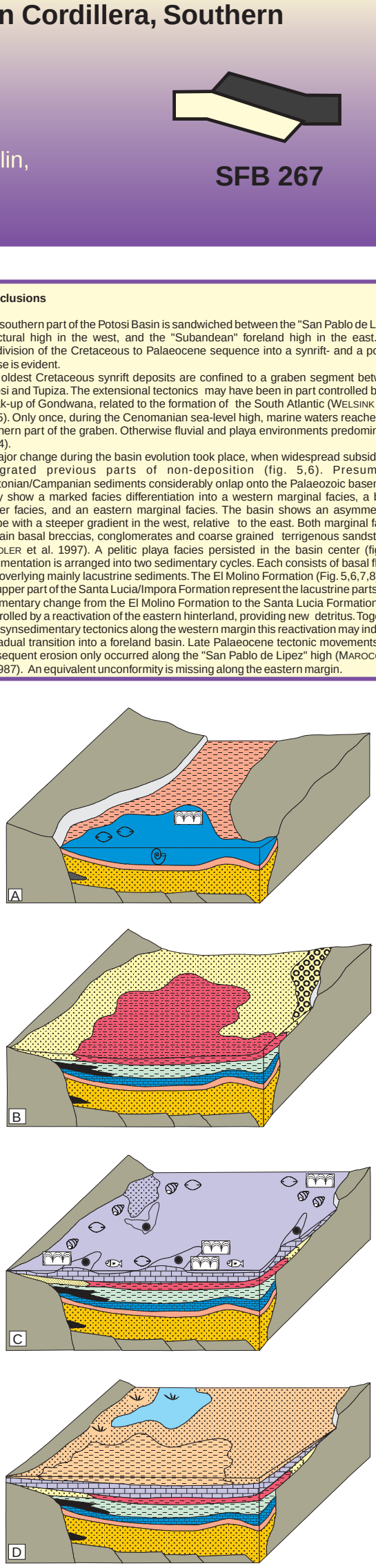

Figure 3 Schematic block sketches of the sedimentary environments of the Potosi Basin (not to scale, view towards the south). A - The synrift phase is characterized mainly by continental sediments. A marine ingression during the Cenomanian reached the northern part of the basin, only. B - The basal postrift deposits show an onlap onto the Palaeozoic basement. Marginal faciestypes are influenced by terrigenous input from eastern and western source areas. In the basin center a playa environment was established. C - Widespread subaquatic conditions are typical for the El Molino Formation during the Maastrichtian to Palaeocene. Oolitic shoals and lagoons were present. D - Fluvial and lacustrine settings prevailed during the Upper Palaeocene. Legend see fig.2.

Figure 4 White cross-bedded, fluvial sandstones of the La Puerta Formation. Potosi-area.

Figure 5 The basal red mudstones and siltstones of the Chaunaca Formation are overlain by the white carbonates of the El Molino Formation. Both belong to the postrift phase. Potosi area.

Figure 6 A greenish Ordovician sequence is overlain by red sandstones of the Torotoro Formation and white carbonates of the El Molino Formation. Camargo area.

Figure 7 Domal stromatolites with interfingering marls at the top of the El Molino Formation. Potosi area.

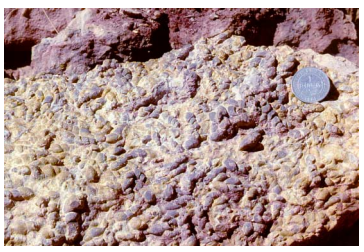

Figure 8 Gastropodal rudstones of the El Molino Formation. Culpina section.

The authors in the field

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