

CRETACEOUS TO PALEOGENE COMPRESSIONAL TECTONICS DURING DEPOSITION OF THE PURILACTIS GROUP, SALAR DE ATACAMA

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INTRODUCTION

On the western edge of the Salar de Atacama, continental deposits of the Purilactis Group, mid Cretaceous to Eocene-Oligocene in age, are up to 5 km thick (Mpodozis et al., 1999) (Fig. 1). Deposition is generally assumed to have occurred during extensional tectonics, in an arc or back-arc setting, even if syn-sedimentary extensional faults have not been described (Hartley et al., 1992; Flint et al., 1993; Charrier and Reutter, 1994). Similarly, unconformably overlying Oligo-Miocene sequences have been attributed to a stage of relaxation, following Late Eocene compressional tectonics (Götze et al., in press). Here we discuss new evidence for deposition of the Purilactis Group in a context of compressional tectonics, during uplift and eastward overthrusting of Cordillera Domeyko.

EVIDENCE FOR A COMPRESSIONAL CONTEXT

In the northern part of the area, on the western limb of the large cylindrical Barros Arana syncline (Fig. 1), a westward-verging back-thrust has detached the Purilactis Formation (in the hanging wall) from evaporites of the Tonel Formation (in the footwall). The back-thrust can be traced all along the El Bordo escarpment (Fig. 1). In the central part of the area (Cerro Quimal, Fig. 1), the syncline becomes tighter, adopting a chevron style, and its axial plane dips westward. In the footwall of the detachment between Purilactis and Tonel formations is an anticline, overturned to the E (Fig. 2a). About 1 km to the SE, a syncline and adjacent anticline mark the lower part of the Tonel Formation (Fig. 2b), whereas no folds are visible in the upper part. Another 5 km to the S, the basal section of the Tonel Formation shows growth strata. These were deposited over pre-growth strata, which form kink folds (Fig. 2c).

Further S, on the eastern side of Cerro Quimal, Late Paleozoic (and early Triassic?) volcanic rocks overthrust the Tonel Formation (Fig. 2e) above an eastward-verging footwall syncline (Fig. 2d).

DISCUSSION

Along the northern part of El Bordo escarpment, the overturned anticline appears to be a fault-propagation fold, above a thrust front that roots into the eastern edge of Cordillera Domeyko (Figs. 2a & 2e). From structural styles and growth strata, we infer that at least the lower section of the Tonel Formation accumulated in a compressional context. Fission track ages for the Cerro Quimal intrusion indicate fast uplift at about 63 Ma (Andriessen and Reutter, 1994). They thus account for Paleocene alluvial facies of the Naranja unit, which unconformably overlies Maastrichtian volcanic rocks (Fig. 1, Mpodozis et al., 1999). However, the main tectonic event in the area was probably the Eocene Incaic phase, which accounted for deposition of more than 1000 m of proximal alluvial facies (Loma Amarilla strata), large clockwise tectonic rotations, uplift and eastward overthrusting of Cordillera Domeyko (Arriagada et al., 2000). Evidence for Oligocene or post-Oligocene compressional tectonics can be found to the S of Cerro Quimal, where the Tonel Formation overthrusts Eocene (and perhaps Oligocene) deposits of the Loma Amarilla strata (Fig. 1). In conclusion, the western edge of the Salar de Atacama appears to have developed in a compressional foreland setting, from mid-Cretaceous to Paleogene times.

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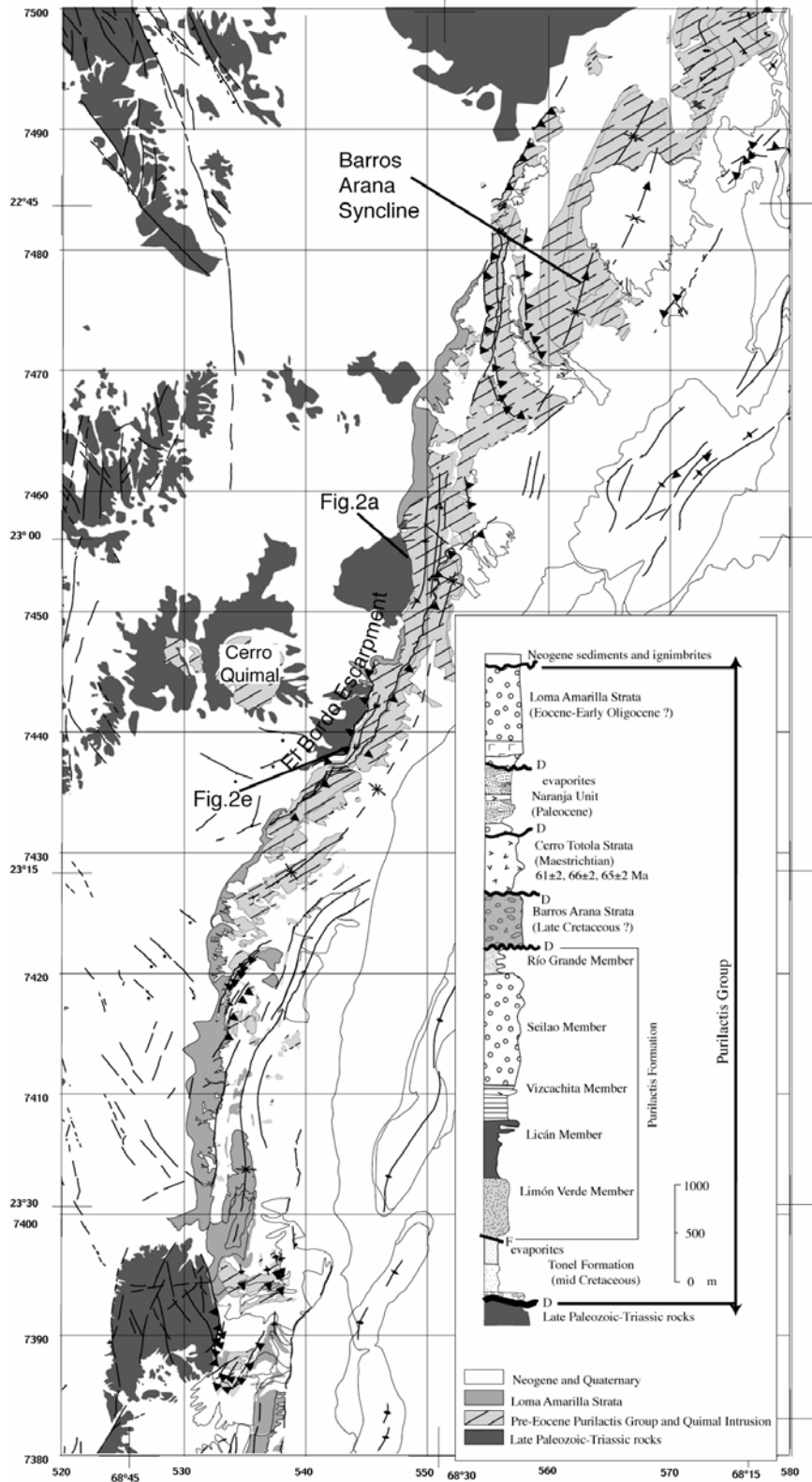


Figure 1: Simplified geological map and stratigraphy for the western edge of the Salar de Atacama basin

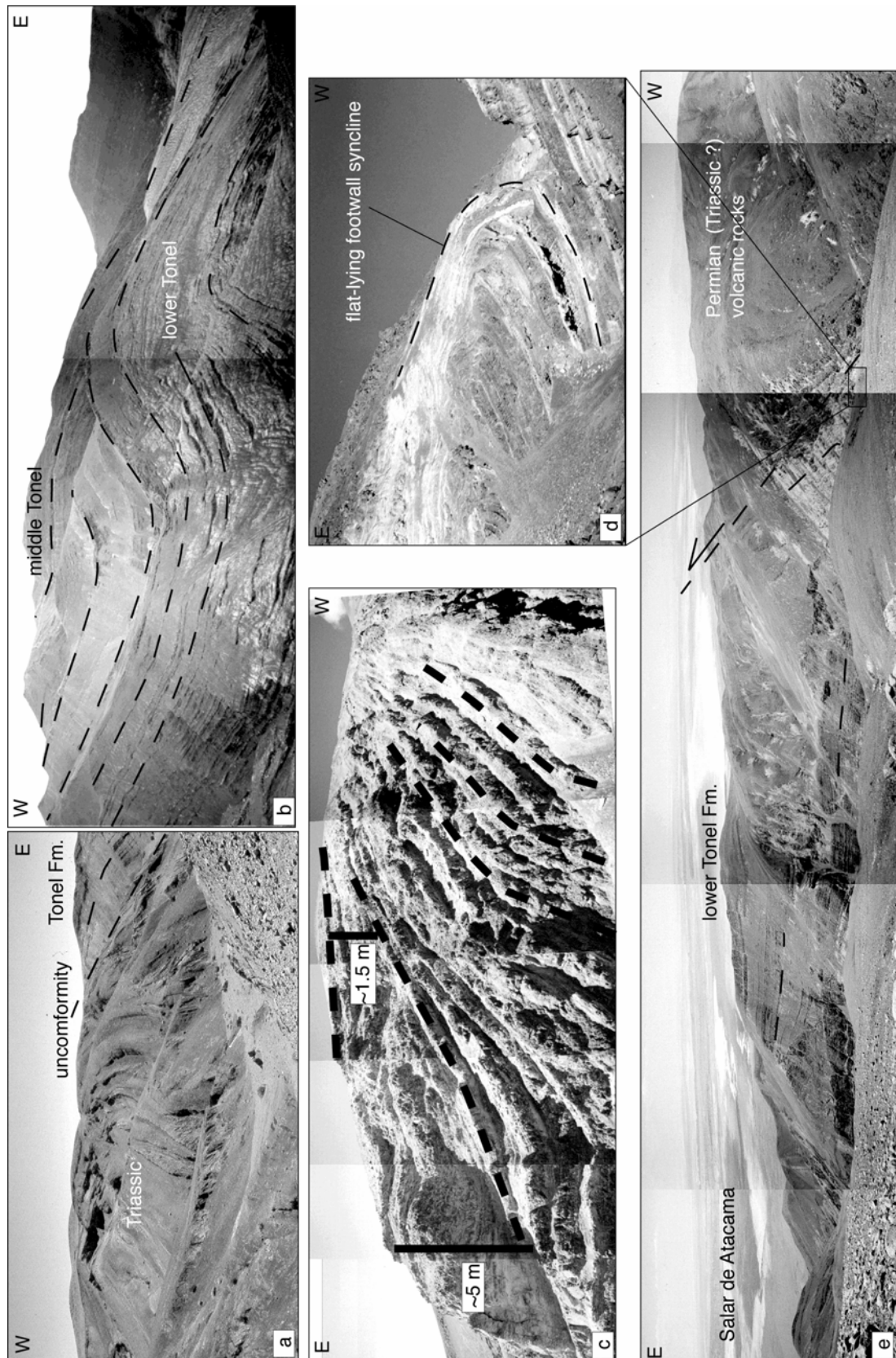


Figure 2: Structures at selected localities (see Fig. 1). a. Anticline overturned to E in Triassic and lower Tonel strata. b. Growth syncline in lower Tonel Fm. c. Growth strata in lower Tonel Fm. d. Footwall syncline in lower Tonel Fm (located in e). e. Thrust front at eastern edge of Cordillera de Domeyko.