

## OLIGOCENE-RECENT SEDIMENTARY AND TECTONIC EVOLUTION OF THE CALAMA BASIN, N. CHILEAN FOREARC

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### INTRODUCTION

The Calama Basin is located between 22°S and 23°S in the forearc of N. Chile (Fig. 1). It forms one of the pre-Andean basins of the region that are situated between the Pre-Cordillera (Cordillera de Domeyko) to the west and the current volcanic arc (Western Cordillera) to the east. Sediments within the basin have been poorly constrained stratigraphically but were thought to comprise 3 unconformable successions of lower(?) Miocene to Pleistocene age (Naranjo & Paskoff, 1981). New data is presented that shows the basin fill to be older and more complex and recording a number of deformation phases which appear to correlate well with known movements on the West Fissure fault system.

### BASIN STRATIGRAPHY

The basin is filled with over 700 m of continental sediments that form 5 unconformable successions of Oligocene to Quaternary age (Fig. 2). Newly obtained <sup>40</sup>Ar/<sup>39</sup>Ar ages (Table 1) from ash horizons interbedded within each succession has allowed constraints to be placed on the timing of sedimentation and intervening deformation events.

A summary of the basin stratigraphy is shown in Figure 2. Up to 500(?) m of alluvial braidplain conglomerates comprise the lowest succession in the basin. They unconformably overlie the Cretaceous to Eocene Purilactis Group along the eastern margin of the basin and contain a 30.15±0.26 Ma ash near the top of the succession, thereby constraining their age as lower Oligocene. These are unconformably

Sample	Site	Location	Age (Ma)
EK19-A-34	1	Quebrada Yalqui	30.15±0.26
EK19-A-26	2	Quebrada Yalqui	19.62±0.36
Sifon Ign*	3	Various	8.33±0.15
EK19-A-20	4	Angostura	7.82±0.10
EK19-A-7	5	West of Calama	5.76±0.10
EK19-A-10	6	Angostura	3.37±0.06

Table 1. <sup>40</sup>Ar/<sup>39</sup>Ar ages for volcanic deposits within the Calama Basin. The site numbers correspond to the stratigraphic positions shown in Figure 2. \*indicates average age (K-Ar) of the Sifon Ignimbrite obtained by De Silva (1989).

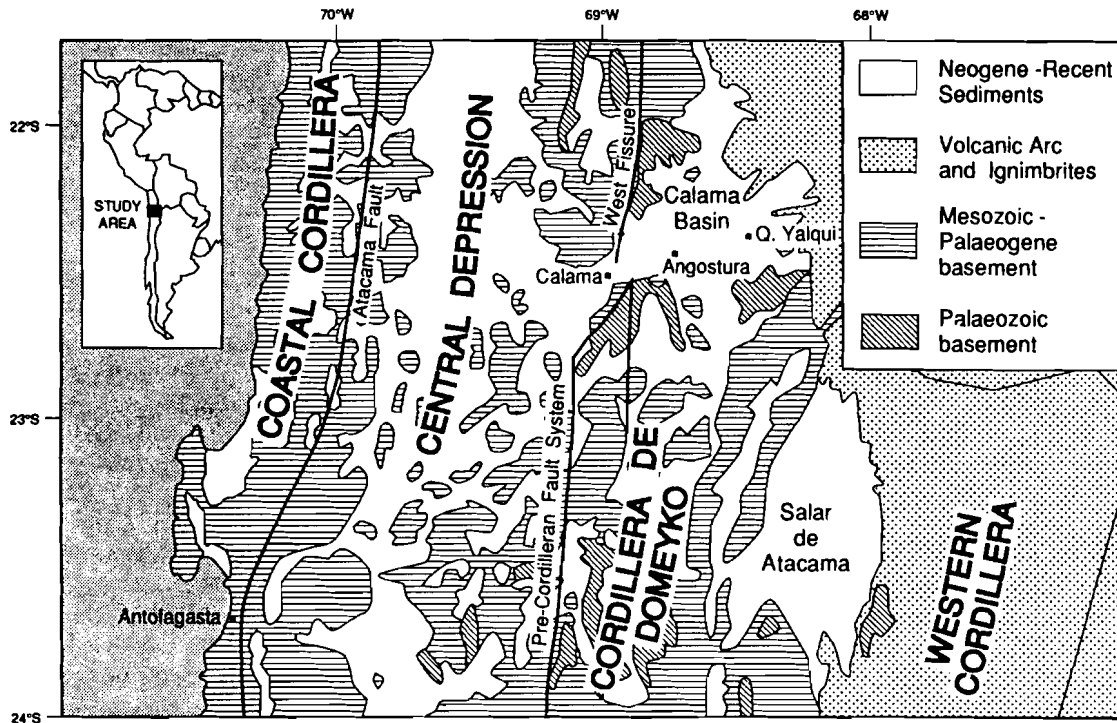
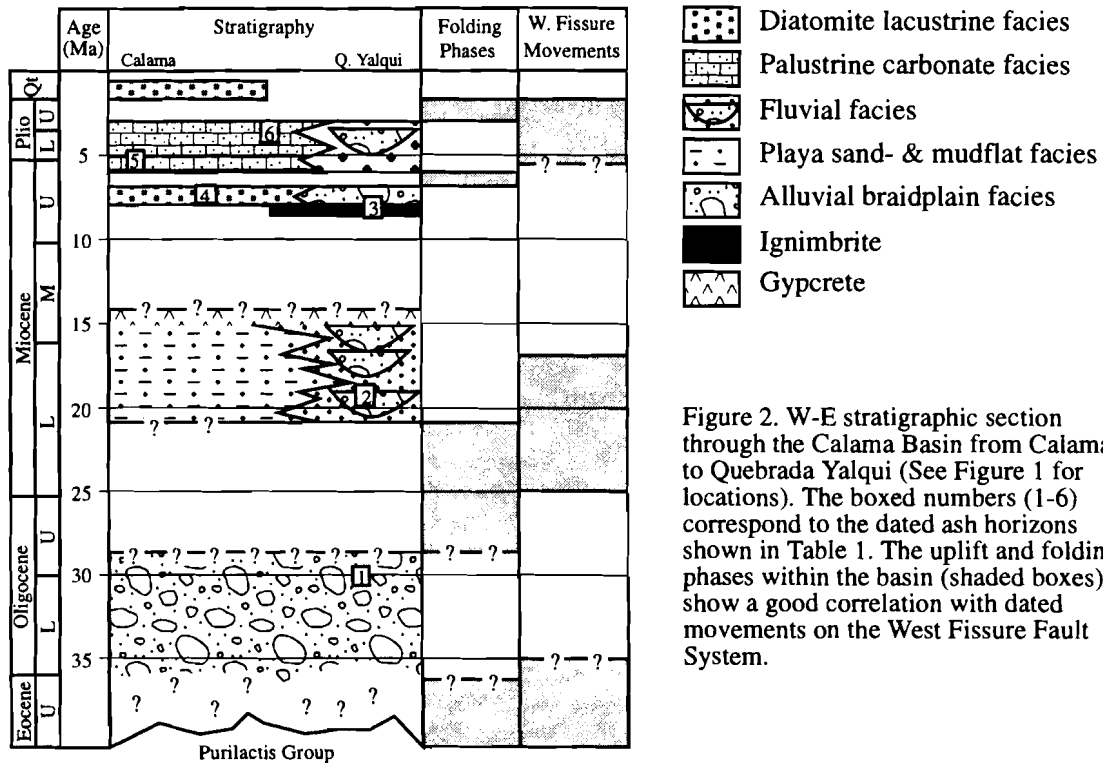


Figure 1. Location of the Calama Basin within the N. Chilean forearc.



overlain by approximately 100 m of fluvial and playa sediments. An ash towards the base of this sequence has yielded an age of  $19.62 \pm 0.36$  Ma placing sedimentation within the Lower Miocene. An upper age is uncertain but the development of thick gypcrettes suggests a significant time gap prior to resumption of sedimentation in the Upper Miocene. The Upper Miocene to Recent stratigraphy comprises 3 unconformable successions (May *et al.*, in review). Between 8.3 and 7 Ma 30 m of alluvial fan sediments, passing basinwards to lacustrine diatomites were deposited. These were locally folded prior to the deposition of up to 85 m of palustrine carbonates between 6 and 3 Ma. A widespread episode of folding followed, before the deposition of 20 m of localised Quaternary(?) fluvio-lacustrine sediments.

Phases of uplift and deformation within the basin are constrained as occurring during the upper Eocene, upper Oligocene-lower Miocene, upper Miocene and upper Pliocene. The cessation of sedimentation during the middle Miocene is presumably related to the regional change to hyper-arid conditions at this time (Alpers & Brimhall, 1988) and not tectonic uplift as the strata are conformable with overlying successions.

## DISCUSSION AND CONCLUSIONS

The onset of sedimentation during the lower Oligocene is mirrored in sediments of the Pacionia Formation in the Salar de Atacama Basin (Kape, 1996) and the Sihal Formation in the Central Depression (Jensen, 1992). Therefore, subsidence following the end of the Eocene Incaic phase of Andean deformation is seen across the forearc of the region. Phases of deformation on the West Fissure system (Fig. 1) occurred as dextral strike-slip during the Eocene (Reutter *et al.*, 1993), sinistral strike-slip during the lower Miocene (25-17 Ma: A. Tomlinson, pers. comm., 1995) and as post upper Miocene transpression. These tectonic phases correlate well with the observed deformation, and subsequent sedimentation, periods within the Calama Basin (Fig. 2).

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