combination with still abundant water produced the thick pile of alluvial sediments (c. 25 Ma to 20 Ma). This episode ended with the deposition of ignimbrite sheets of up to 900 m in total thickness. The age of the youngest ignimbrite sheet is 19.3 ± 0.01 Ma (Ar/Ar sanidine step heating age, Walfort et al., 1995) which is in perfect agreement with age determinations of Naranjo & Paskoff (1985) for the same ignimbrites. Crustal melting after a period of thermal relaxation (several Ma) and, probably continued magmatic input from the mantle wedge were responsible for the formation of the ignimbrites at around 19Ma. Alluvial ramps overlain by ignimbrites are also known from regions further south (20° to 21°S). Here, however, the ignimbrites are younger (16 to 17 Ma; Baker & Keynes, 1977) and the tectonic style affecting the ignimbrites in Late Miocene times is dextral strike slip (in the W Salar de Huasco pull apart basin) rather than normal block faulting (see below).
During the following short episode of volcanic and tectonic quiescence a westward oriented dendritic drainage pattern eroded the ignimbrites. Mafic andesite volcanism (Ar/Ar amphibole total fusion age: 18,7 ± 0.8 Ma) shortly followed the erosional event. The typical dense and mostly aphyric andesites of the shield volcanoes are found as characteristic detritus of the conglomerates of the Formación Diabolo. This deposit, however, was considered by Tobar et al. (1968) and Vogel & Vila (1980) to be Quaternary in age. In our interpretation the Formación Diabolo must be at least of Late Miocene age.

A second episode of uplift resulted in westward steepening of the Miocene sediment and ignimbrite ramp, normal faulting and antithetic rotation of the Pampa de Oxaya block. As a result, the Pampa de Oxaya today is tilted to an east dipping position forming a new, upper, half-graben within the upper reaches of the Western Slope. Lacustrine, fluvial, and alluvial fan sediments filled up this new sedimentary basin. Furthermore, tilting partly reversed the drainage pattern of the Pampa de Oxaya leading to sedimentation within the upper courses of its valleys. The extensional style of this movement is clearly documented by graben structures which cut the valleys of the Pampa de Oxaya. The age of the second stage of uplift must be younger than the initial andesitic volcanism (c. 18 Ma) and older than the 8- 9Ma old mammal fossils found within the upper half-graben sediments (SALINAS et al. 1991). Our conclusions contradict those of Muñoz & Sepulveda (1992) and Munoz & Charrier (pers. comm.) who interpreted their observations in the region as compressional structures. Compressional structures in our working area are limited to the Belén metamorphic basement rocks and their Createaceous cover. Although we cannot entirely exclude compressional tectonic structures of Late Miocene age, the *general* tectonic, topographic and morphological regime indicates extension, uplift and normal faulting rather than compression.
The Early Miocene ignimbrites and the overlying low angle mafic andesite shield volcanoes are restricted to the region between 17°S and 19°S, coinciding with the distinct structural and evolutionary style of the Western Andean escarpment described here.
An important secondary effect of the uplift of the Pampa de Oxaya was the partial oversteepening of its western slope which resulted in a giant gravitational collapse. The "Lluta Collapse" is exposed on both sides of the Quebrada Lluta for 20 km to the E of Poconchile. It covers an area of about 600 km^2 and displaced a rock section over 800m thick. This displaced mass is characterized by large tilted blocks and an unregular topography which in some places rises up to 200 m over the undisturbed ignimbrite ramp. Compressional faults are abundant in its lower parts. The collapse forms an amphitheater shaped scar E of the Pampa Plazuela. In the basal detachment zone of the collapse structure soft sediment deformations imply landsliding above a (wet?) clayey sand layer. Further, diatomite deposits were formed in small basins within the Lluta-Collapse area. The formation of these pure diatomite lakes, lacking significant clastic input by rivers, must be explained by groundwater seeping into small basins within the collapse. The ponds formed in this way provided constant suitable conditions for the diatomites independent of the typical fluctuations of rivers in dry climates. The giant Lluta-collapse thus shows several features suggesting the presence and potential role of an extensive ancient groundwater body in the collapse process.
The age of the collapse is difficult to establish : It must be younger than the second stage of tectonic uplift (8 - 19 Ma) but older than the development of the Lluta valley (> 3 Ma). This time span also falls into the time of formation of the upper half graben sediments and the lacustrine sediments of the lauca Basin (Kött et al. 1995), again indicating the presence of water more abundantly than during the Holocene. This landscape was sealed by the 2.72 ± 0.01 Ma (Ar/Ar sanidine age, Walfort et al. 1995) Lauca-Perez Ignimbrite which forms an extensive outflow sheet in western Bolivia and the Western Andean Escarpment (Schröder & Wörner, this meeting).