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Tectono-sedimentary evolution of the Neuquén basin (Argentina) between 39°S and 41°S during the Neogene

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Sedimentary rocks deposited in foreland basins are of primary interest, because they record the interactions between the growth of the orogenic wedge, the isostatic readjustment of the lithosphere, the variations of base-level and earth surface process. The Neuquén basin (32°S - 41°S) is a triangular shape foreland basin located on the eastern flank of the Andes. Its filling began during the late Triassic, first as back arc basin context and as compressive foreland basin since the upper Cretaceous. The structural inheritance is thus important and old basement structures, like the Huincul Ridge, generate significant variations of both deformation and shortening. Its Mesozoic history is well constrained due to its hydrocarbon potential. In comparison, its Cenozoic history remains poorly documented. The modern configuration of this basin results from several successive compressive tectonic phases. The last one is dated from the Miocene (Quechua phase) and has conditioned the segmentation of the foreland basin in several intra-mountainous sub-basins, whose sedimentary filling could reach several hundred meters.

In this work, we document the relative chronology of the geological events and the sedimentary processes that have governed the Cenozoic history of the southern part of the Neuquen basin, to discriminate the relative rules of climatic and structural controlling factors on the evolution of the depocentres. Several NNW-SSE oriented intra-mountainous basins exist in this part of the Andes (Collon Cura basin and Catan Lil basin). On the contrary the associated foreland basin (Picun Leufu basin) is relatively underformed and is bounded to the North by the Huincul ridge and the North Patagonian massif to the South.

Fifteen sedimentary sections have been studied along the Rio Limay River in the southern border of the basin, from the range to the external part of the foreland. The sedimentation is discontinuous in time and important retrogradations of the depocentres are observed from the outer part of the foreland to the intra-mountainous basins. Tertiary sedimentation begins at the end of the Oligocene until the end of the middle Miocene in the Picun Leufu basin. During the paroxysm of the Quechua tectonic phase, (middle Miocene to Pliocene) the Picun Leufu basin is characterised by a sedimentary hiatus of $\sim$10 Ma that illustrates the closure of the Collon Cura basin and a migration to the internal zone of the range of the depocentres. The filling of the Collon Cura basin is characterised by a continental fining upward sequence of a thickness of several hundred meters. This sedimentation begins with lacustrine and alluvial plain paleoenvironments with some syn-eruptive events (ignimbrites) and ends with continental conglomerates and paleosoils. A first reconnexion with the foreland basin occurs at the beginning of the Pliocene, with the deposition of an alluvial fan. Since the end of the Pliocene another anticline grew in the Picun Leufu basin and controlled the deposition of more recent alluvial fans with the arrival of coarse conglomerates (Pampa Curaco and Bayo Messa Formations). The modern drainage network is established during the Pleistocene in the Collon Cura and Picun Leufu basins, which are since only characterised by the construction of erosional surfaces (terraces) and the apparition of the Rio Limay system on the Miocene and Cretaceous deposits.