

## POST-EOCENE BASINS OF THE ARGENTINE CENTRAL ANDES

J.A. SALFITY\*, S.A. GORUSTOVICH\*, R.E. GONZÁLEZ\*, C.R. MONALDI\*, R.A. MARQUILLAS\*,  
C.I. GALLI\* and R.N. ALONSO\*

\*Universidad Nacional de Salta-CONICET, Buenos Aires 177, 4400 Salta, Argentina.

**KEY WORDS:** Basins, Tertiary, Central Andes, Argentina

### INTRODUCCION

The Neogene sedimentary basins of Argentine Central Andes and neighbouring regions developed into different tectonic frameworks; therefore, they were of different geologic origins. This paper deals with the tectonic setting and regional distribution of the Tertiary basins developed in the Argentine Central Andes (22°-36° LS) during post-Incaic (post-Middle Eocene) and pre-Diaguita (Late Pliocene-Early Pleistocene) times.

The meaning of Neogene is here used in its widest sense. The sedimentary history of these Neogene basins began from Miocene times on, or before from late Eocene up to Oligocene. These sedimentary episodes are also named "Tertiary".

### STRUCTURAL HIGHS

The available information about the present-day distribution and the thicknesses of Tertiary deposits -in outcrops as well as in subsurface- let Yrigoyen (1969) draw the isopach lines of the main Argentine depocenters.

The region considered in this paper includes the Argentine Central Andes between the southern end of the Central Volcanic Arc (AC) and the northern end of the Southern Volcanic Arc (AS).

It is possible to distinguish the following structural highs:

**El Desierto High**, located in the northern part of the Chaco-Paranense basin.

**Domeyko Arch**. It was the western edge of the Atacama Tertiary basin of northern Chile. The Tertiary deposits lay in angular unconformity on the Cretaceous-Eocene Purilactis Group.

**San Rafael High**, in the southern end of the region. Over this arc basaltic retroarc flows will take place during Pliocene-Pleistocene times.

**Central Andean Arch and Southern Andean Arch**. Both archs were the host rock of the Miocene-Pliocene volcanic arcs. The Central one has transverse volcanic belts into de Argentine Puna.

**Pampean Arch**. It was the western edge of the marine Paraná Formation ingression; nevertheless, a westward dispersion of this ingression between 28-30°SL has been proposed.

**Cordillera Frontal-Precordillera Occidental High**, where piggyback like basins developed.

Other structural highs, that were in force during Paleozoic and Mesozoic times, remain buried by Tertiary basins. They are:

**Michicola Arch**. It is located on the northern wedge of Olmedo Sag and governed pre-Tertiary basins from the Carboniferous up to Paleocene times.

**Quirquincho Arch**. It was buried by upper Cretaceous-Paleogene posrift deposits and also by Neogene strata.

**Traspampean Arch**. There developed sedimentary basins separated by Ordovician transverse structural

highs. From Miocene times, these highs were the host rock of transverse volcanic belts of the Argentine Puna.

**Pie de Palo Arch**, was a part of the Sierras Pampeanas Occidentales during pre-Oligocene times. Neogene deposits buried this arc completely, except for the present-day Sierra de Pie de Palo that emerged since the Quechua diastrophism.

### DEPOCENTER DISTRIBUTION

The post-Incaic orogenic front originated the foreland basins of the region (Figure 1). This front is a series of en echelon thrusts of N-S Andean trending; the northern thrusts are displaced eastward and the southern ones westward.

The main Neogene depocenters are divided according to their with regard to the orogenic front (Figure 1):

**a)** Andean depocenters located westward, and **b)** foreland and extra-Andean depocenters, some of them at the subsurface, located eastward the orogenic front.

The distribution of depocenters, their sedimentary history, and the geologic nature and structural framework of the pre-Oligocene basement, let us distinguish the following regional tectonic domains where the Tertiary sedimentary basins developed:

**Northern Foreland:** Includes the sub-Andean System of northern Argentina, developed to the east of Cordillera Oriental and Puna Austral. This foreland is the southern end of the Bolivian sub-Andean Neogene belt. The sedimentary filling (Orán Group) consists of foreland deposits at the base and taphric synorogenic basins at the top.

**Olmedo Sag.** Post-Incaic strata of Orán Group inherited the extensional tectonic framework, with thermal subsidence, that governed into the underlying Salta Group basin during Campanian-Eocene times. Thus, the sedimentary processes would have been able to be continuous between both Salta and Orán groups; Cenozoic Andean tectonics did not reach the Olmedo rift.

These deposits buried the previous Cretaceous basin and covered northward the Paleozoic basement of Michicola arch. In these regions the Neogene deposits overburdened and matured Devonian (Los Monos Formation) and Cretaceous (Yacoraite Formation) sources oil rocks.

**Famatina Foreland.** The Famatina foreland and associate basins developed in the transition area between southern Puna and northwestern Sierras Pampeanas, and between Northern Foreland and Cuyo Foreland. The sedimentary succession has a thick coarsening-upward stratigraphic column.

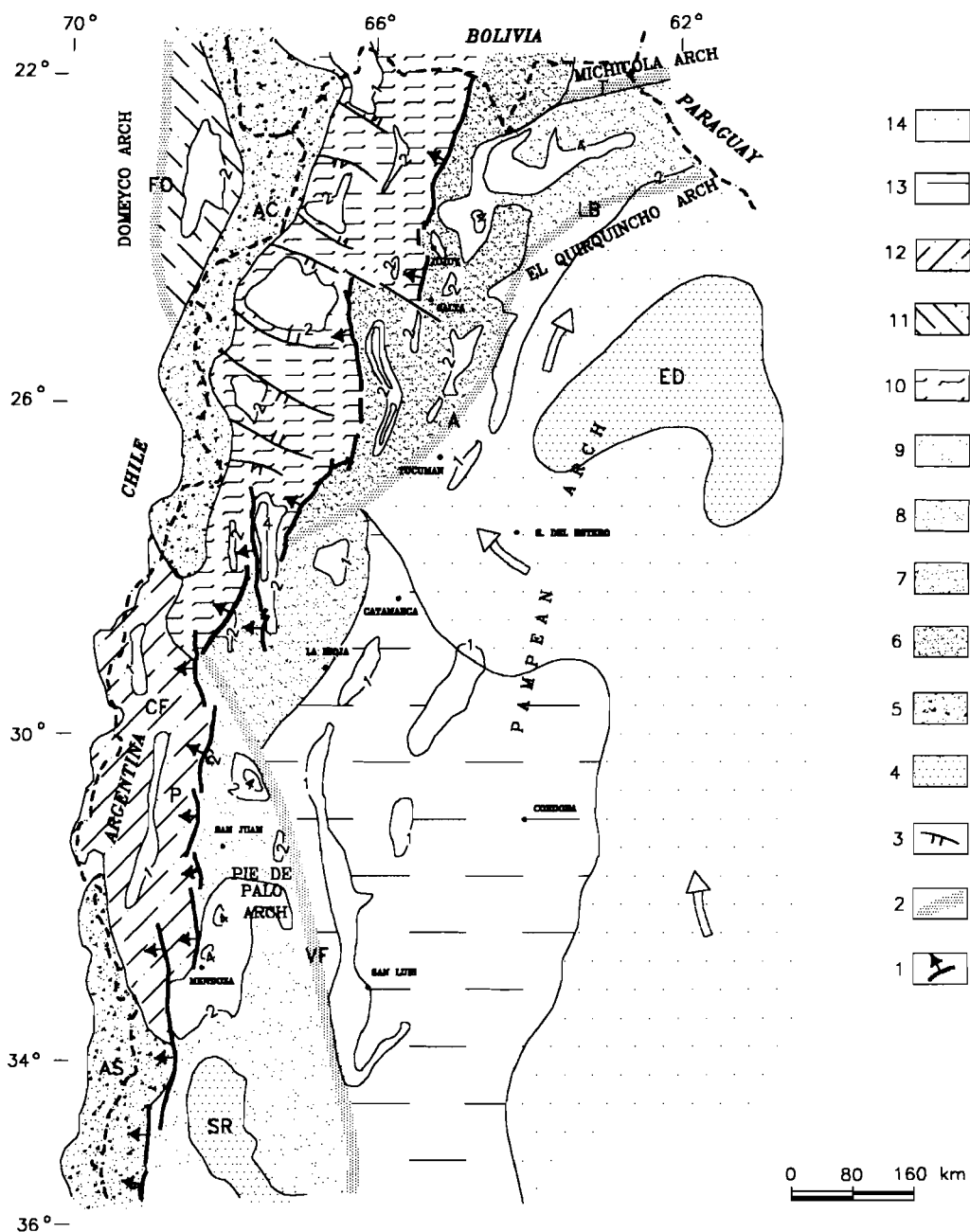
**Cuyo Foreland.** Post-Incaic coarsening-upward successions accumulated overlying the Precambrian basement, Lower and Upper Paleozoic, and non-marine Triassic and Cretaceous basins. The triangular geometry is curiously symmetrical to that of Northern Foreland-Olmedo Sag, in both cases located between the orogenic front, and Valle Fértil and Aconquija-Los Blancos lineaments, respectively.

**Backarc tectonic troughs of the Puna.** Since the Middle Eocene isolated troughs originated because of fragmentation of the Ordovician basement. These troughs are separated by WNW-ESE trending horsts. The first stage of filling is thinning-upward and was accumulated before the Miocene-Pliocene volcanic arc. In this way, the troughs developed between Central Andean Arch and the Northern Foreland. The Miocene-Pliocene volcanic arc had a great influence on the upper sedimentary succession.

**Atacama Forearc (Chile).** In this basin the angular unconformities in the base and top of Paciencia Group (Oligocene-Lower Miocene) are clearly distinguished. This group lies on Purilactis Group (Cretaceous-Paleogene) and underlies San Bartolo Group (Miocene). The sedimentary succession is thinning-upward, like the ones in the Puna backarc basins. In both cases there was magmatic quiescence. The Atacama basin was separated from the Puna's basins by the Central Andean Arch.

**Basins over Pampean Region.** They are intermontane basins mainly in the subsurface, of less thickness than in the Andean basins. They developed over Precambrian basement and over Upper Paleozoic, Triassic, and Cretaceous non-marine basins.

**Chaco-Paranense Marine Platform.** The Upper to Middle Miocene Atlantic marine ingression (Paraná Formation) reached the Northern Foreland, probably the Olmedo Rift, the Paraguayan Chaco and the Bolivian sub-Andean system.



**FIGURE 1:** Present-day location of the main post-Incaic depocenters. Isopachs lines in km (white).

1, Post-Incaic thrust. 2, Faults and lineaments: T, Tomasito; LB, Los Blancos; FO, Western Fault; A, Aconquija; VF, Valle Fétil. 3, Assumed faults of the Puna's horsts. 4, Main structural highs: ED, El Desierto; SR, San Rafael. 5, Structural highs (Central -AC- and Southern -AS- Andean archs) where the Neogene volcanic activity took place. Basin tectonic framework: 6, Northern Foreland. 7, Olmedo Sag; 8, Famatina Foreland; 9, Cuyo Foreland. 10, Puna's Backarc troughs. 11, Atacama Forearc Basin (Chile). 12, Cordillera Frontal (CF)-Western Precordillera (P) block, where piggyback basins developed. 13, Intermontane basins over Pampean region. 14, Marine platform of the Chaco-Paranense basin (arrows denote ingressión path).

**CONCLUSIONS**

Present-day distribution and tectonic setting of the post-Incaic basins of the Argentine Central Andes let to classify them in the following tectonic domains: Northern Foreland, Olmedo Sag, Famatina Foreland, Cuyo Foreland, Backarc Troughs of the Puna, Atacama Forearc Basin (Chile), Cordillera Frontal-Precordillera High where piggyback basins developed, Pampean Region Basins, and Chaco-Paranense Marine Platform.

The post-Incaic orogenic front separates the western Andean basins and the eastern foreland basins. This front is a series of en echelon thrusts of N-S Andean trending.

The main structural highs were El Desierto High, Cordillera Frontal-Precordillera High, and San Rafael High as the southern end of the Cuyo Foreland.

The Central and Southern Andean archs would be structural highs coevally with early Neogene basin evolution. These structural highs were the host rocks of the volcanic arcs, that began their evolution from middle Miocene.

**REFERENCES**

Yrigoyen, M.R., 1969. Problemas estratigráficos del Terciario de Argentina. *Ameghiniana*, 4: 315-326.