ACTIVE TECTONIC CONTROL ON ALLUVIAL AND FLUVIAL DEPOSITS OF SAN JUAN RIVER. SAN JUAN, ARGENTINA.

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INTRODUCTION

Tectonics is a first-degree control which influences the arquitectural features of a basin, the climate conditions of the areas producing sediments as well as the sediment receptive ones, the magnitude of the flows, the valley slopes, the type, zize and amount of sediment to be eroded and transported and, finally, the arquitectural characteristiscs of the deposits.

This study take place in the middle-west portion of the Argentine Republic (Fig. 1) and involves the basin of lower de Los Patos river-San Juan river. It extends between 67°52' and 70°25' in western lenght and 30°16' and 32°25' in southern latitude. This basin has an extension of 32492 Km2 wiht a NW-SE oriented main axis of 294 Km and its principal heigts being the cerro Mercedario (6670 masl) and the Lagunas de Guanacache (515 masl). Its drainage system is part of the Desaguadero-Colorado fluvial system which empties its waters into the Atlantic Ocean whit the normal predictive flow in accordance with the other fluvial systems following the Horton laws and whit an alometric growth (Ruzycki, 1993). This drainage system covers the geological areas belonging to the Andes range, the Precordillera and the Pampeanas Range. The main trunk river (lower de Los patos river-San Juan river) is placed in the Barreal-Calingasta and Tulum valleys. It shows an antecedent section when it crosses the geological area of the Precordillera whit some minor sector of a subsequent type.

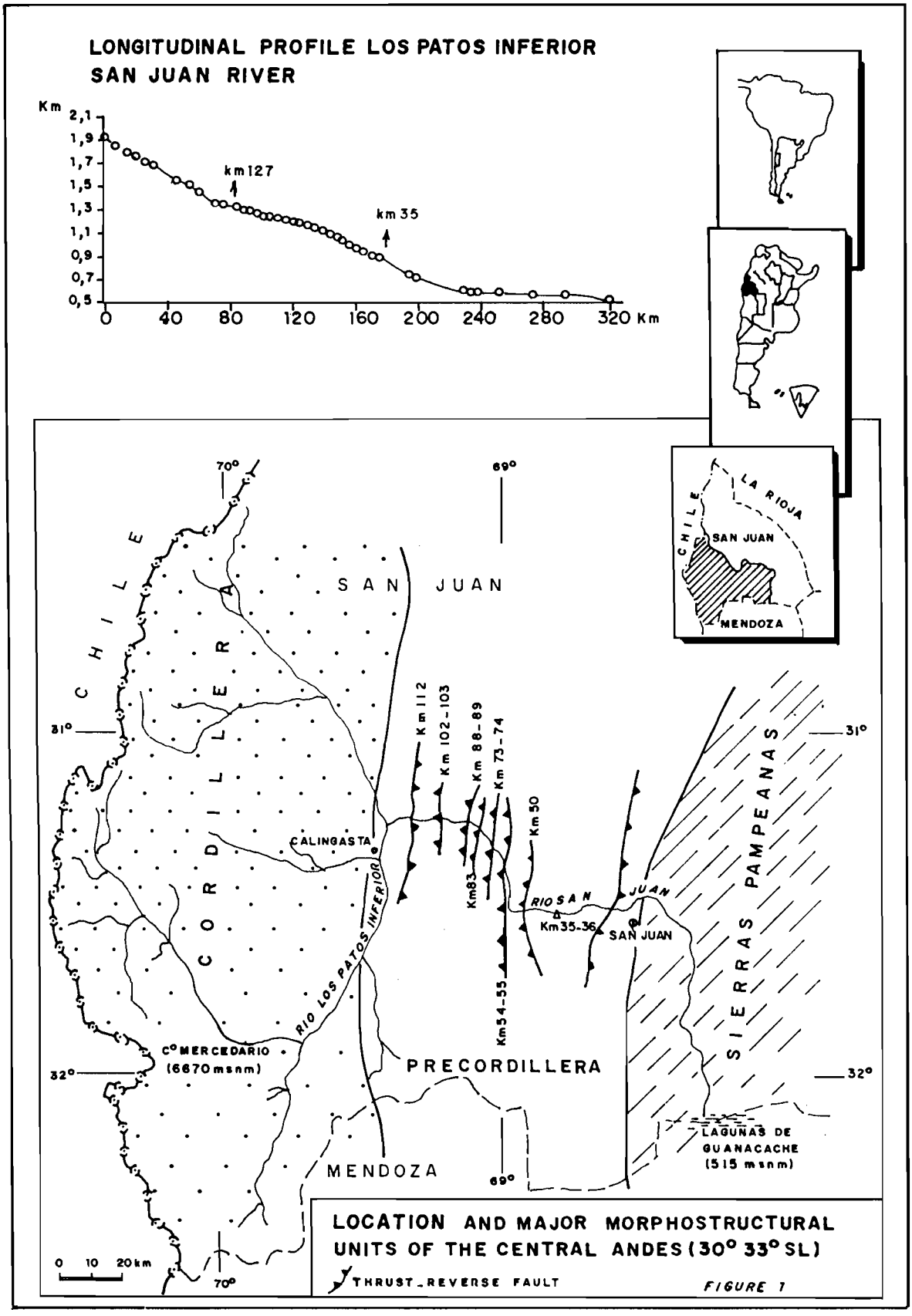
The basin and its fluvial system is situated in the Central Andes Range which is related to the flat subduction between the Nazca Plate and the South American plate.

This study takes into account the control of the cuaternary tectonic activity in the aluvial and fluvial deposits which are present along a fluvial section of 100 Km long. In this section, the San Juan river finds its way through the subprovinces of Western and Central Precordilleras inciceing its own deposits and the terminal portions of its tributaries fans.

GEOLOGICAL CONTEXT

The active thin-skinned thrust and fold belt of the argentine Precordillera, whith eastward vergence, forms a N-S mountain chain , about 400 Km long and 80 Km wide, whith maximun of more than 4000 masl. It is composed of a thick sequence of early to late paleozoic sediments while mesozoic deposits are mainly preserved in basin structures along the western and eastern margins. Late terciary clastic sediments with volcanic intercalations and cuaternary deposits fill some intramountain basins.

The structural style of deformation is generally characterized by N-S striking imbricated faults with easternward vergence which are interpreted as plunging reverse faults on the west showing a tendency


LONGITUDINAL PROFILE LOS PATOS INFERIOR
SAN JUAN RIVER
Km
2,1
1,9
1,7
1,5
1,3
1,1
0,9
0,7
0,5
km 127
km 35
0
40
80
120
160
200
240
280
320 Km
CHILE
LA RIOJA
SAN JUAN
MENDOZA
70°
69°
31°
32°
CHILE
CORDILLERA
SAN JUAN
Km 112
Km 102-103
Km 88-89
Km 73-74
Km 50
Km83
Km54-55
CALINGASTA
RIO LOS PATOS INFERIOR
RIO SAN JUAN
Km35-36
SAN JUAN
SIERRAS PAMPEANAS
C° MERCEDARIO
(6670 msnm)
PRECORDILLERA
MENDOZA
LAGUNAS DE
GUANACACHE
(515 msnm)
0 10 20km
LOCATION AND MAJOR MORPHOSTRUCTURAL
UNITS OF THE CENTRAL ANDES (30° 33° SL)
THRUST-REVERSE FAULT
FIGURE 1

to become horizontal in depth.

This Central Andes segment has a distinctive tectonic platte setting. Earthquake locations shape a Wadatti-Benioff zone which gently deepens to the east forming a shallow subduction zone (Isacks, 1988). This flat subduction segment, between Nazca plate snd South American plate, is characterized by an eastern dip with a 5°-10° range at about 100 Km deep and it is flanked by steeper segments to the north and south whit an about 30° easter deepining (Jordan et al, 1983).

The present San Juan river valley is flanked by precuaternary (paleozoic and tertiary) and cuaternary rocks mainly represented by two principal facial associations: fluvial and aluvial (in aluvial-fluvial-lacustral sectors).

The first association is composed of the present deposits and several continuos and discontinous levels of constructional terraces made up of thick and thin debris belonging to the Andes Range and the Precordillera.

The second associations is represented by its incisive tributaries fans (at present active) grading the San Juan River. It is copmposed of two (or three) superimposed generations of tributaries fans and debris from the local Precordillera section.

These two associations are interdidigitalized in at least eight erosion-acumulation levels (Ruzycki, 1996; in rev.).

LONGITUDINAL PROFILE

Ruzycki (1993) considers that the present lower de Los Patos river-San Juan River (Fig. 1), with a wandering morphology in almost all of its antecedent section (Ruzycki, 1992, 1994), shows an upward conves longitudinal profile when crossing the Precordillera due to a complex tectonic, lithologic and hidrologic factors interrelation ship, being the tectonic one the most relevant.

Ruzycki (1996, in rev.) also states, correlates and provides the longitudinal profiles of seven main erosion-accumulation levels (0= actual river, 0I, I, II, III, IV, V) and three main sublevels (0II, II, III) in the precordillera section of San Juan river between Km 127 and 35 of the Provincial Road N°20 linking San Juan city with the main town of the Calingasta Department.

In general, both the seven main leves and the trhee main sublevels are upwardly convexed and show some kind of parallelism with an almost steady heigh difference among them.

In particular, it can be seen that the convexity and the height difference between the levels and sublevels increase in some sections, that it is asymmetric and that there can also be some parallelism difference between the main levels and sublevels.

In the main leves 0 and 0I erosion whit minor accumulation intervals prevails.

The main levels I and II, with a relative heigh between 10 and 20 metres, are entirely erosive.

The main level III consist of an accumulation period that came to an end about 30000 years B.P. (Ruzycki and Paredes, 1996; in rev).

The main levels IV and V are erosive. They are characterized by carved surfaces in the paleozoic rocks with a thin aluvial-fluvial cover. These two last levels prevail only in some localized sections, mainly to the west of the Sassito river.

Out of the three main sublevels: III, II and 0II, only II and III are mainly erosive. They extend between Km 111-53 (from the west margin of the Tontal hill to the Sasso river mouth) and the Km 102-42 (from the Los Ratones river to near Quebrada Aspera river) and between Km 84-37 (from the north of La Fortuna river to a little to the north of the Qubrada Albarracín river), repectively.

Ruzycki (1996, in rev.) states that, in general, bouth the seven main levels and the main three main sublevels are upwardly convexed and show some kind of parallelism whit an approximate difference in heights among them. In particular, concludes that the convexity is asymmetric and that the height difference between the levels and sublevels increases in some sections. Also she points out that the main levels parallelism is practically constant whereas such parallelism is not constant either between the levels and sublevels or among the sublevels themselves.

CONCLUSIONS

As the presence of a spatial periodicity between the main levels involving cyclical-episodic (climatic) events and also the presence of convex longitudinal profiles, interpreted as a consequence of an uprising, can be conclude that the main levels are a complex answer to climatic and tectonic events which have ocurred at a regional level during the mid-Pleistocene and Holocene periods. These periods brought about the geomorphological threshold excess external to the system.

The climatic processes would be mainly connected to glacial and interglacial periods that affected the superior basin catchment influencing the hydrologic fluctuations and the transported sedimentary load.

The tectonic processes are mainly the result of the Andes efforts to provoke an important shortening in the Precordillera estimated over the 50% (Von Gosen, 1992; Allmendinger, 1990).

Morever, it can be conclude that the main sublevels would be mainly linked to local tectonic processes provoking the local geomorphologic thresholds in the river stream. These influence not only the pattern of the different fluvial sections but also the deformations of the distinctive fluvial and aluvial levels existing in Precordillera.

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