EROSION OF THE UPPER TAQUARI BASIN AND THE SEDIMENT ACCUMULATION IN THE PANTANAL MATOGROSSENSE.

ECrepani
Senior Researcher
A. R. dos Santos
Senior Researcher
National Institute for Space Research - Brazil

Comission VII, Working Group 6

KEY WORDS: Pantanal Matogrossense, Taquari River, Deforestation, Erosion, Sediment Accumulation.

ABSTRACT:
The Upper Taquari basin is eroded by an obsequent drainage system, which captures a consequent drainage system. This process occurs in a plateau which is formed by sedimentary rocks of the Paraná Sedimentary Basin. The basin consist of psamitic rocks which are easily eroded and transported after alteration, and deposited in the Pantanal Matogrossense plain.

The erosion and transportation by the rivers of the Upper Taquari basin are extremely facilitated by the conversion of savannah into pasture land and increased cattle-raising activities. Actually, the annual loss of soil per hectare increased one hundred times at present.

Landsat imagery allows to identify the deposition sites of the Pantanal Matogrossense plain, the monitoring of land use conversion and the identification of sites of erosion and transportation in the Upper Taquari plateau.

1. INTRODUCTION
This paper presents some ideas about the erosion of the Upper Taquari basin and the accumulation of sediments in the Pantanal Matogrossense. Those ideas are based on the interpretation of TM Landsat images at the scale of 1:100,000 (color composites bands TM3, TM4 and TM5 with the Blue, Green and Red colors respectively). Black and white bands TM 3 and TM 4 were also examined. The final interpretation was complemented with ground observations and bibliographic information.

2. GEOLOGICAL SETTING
A period of relative tectonic stability in the end of the Wealden Reactivation (Almeida, 1966) permitted the development of huge erosion surfaces in the Brazilian Platform, which later was lifted up to 1000 meters in relation to the sea level.

Locally, the epeirogenic lifting which occurred during the Pliocene and Pleistocene was suspended by gravity faults that shaped the tectonic basins within the Brazilian Platform. This is the origin of the Pantanal basin with nearly 500 meters of quaternary sediments, and located in the west border of the Paraná Sedimentary Basin.

3. EVOLUTION OF THE EROSIIVE AND DEPOSITION PROCESSES
Nowadays the Tertiary surface keeps an altitude of nearly 900 meters at the Municipality of Taquarí (MT), where the watershed of Tocantins River Basin and Prata River Basin is located. The Taquari river headwater is located near Taquari (figure 1) and is the largest river crossing the Pantanal Matogrossense.

If the present altitude of the Tertiary surface cutting the plateau of the Paraná Sedimentary Basin and the thickness of the quaternary sediments filling the Pantanal are taken into account, it is possible to hypothesize the Tertiary landscape and the geomorphologic processes that took place then to shape the present landscape. The ancient landscape was characterized by a tectonic basin at the border of the Paraná Sedimentary Basin with a fault cliff 1400 m high. (figure 2A).

The ancient landscape was then developed into a consequent drainage network (Davis, 1909) running eastward, heading to Paraná Sedimentary Basin axis. The drainage network was characterized by gentle longitudinal profile and long rivers as a consequence of the low dip of the sedimentary stratum. Another drainage network, also consequent running westward over the fault scarp (front of cuesta) was characterized by steep longitudinal profile and short rivers (figure 2B).

This short and steep rivers, with a high erosive and transportation power transposed the watershed and begun a quick process of capture named as "piracy stream" (Shumm, 1977), Figure 2C.

The evolution of this process started with the capture of the consequent rivers running eastward. Nowadays the old consequent rivers transformed into obsequent rivers running westward in the plateau of the Paraná Sedimentary Basin. The sedimentary rocks are psammites with a low resistance to erosion. It helps the expansion of the Upper Taquari Basin by the...
constant capture of the consequent network, with increase erosion and transportation (figure 2 D).

The most important river of the obsequent drainage network is the Taquari river which has its headwaters at 900 m and flows westward 300 km reaching the altitude of 200 m. Within the Taquari alluvial plain the river crosses 500 km before reaching the Paraguay river at the altitude of 80 m. (figure 3).

Thus outstanding decrease in the river Taquari channel slope (10 times within the alluvial plain) causes a "decantation effect" and sediment load is settled into an alluvial fan of 50,000 km². This settling can be observed in the color composites of TM/Landsat (3B4R5G) which shows the Taquari river water color changing from bluish to black as the river flows towards the Paraguay river. This fact was also confirmed through ground observation sailing from Paraguay river towards the Upper Taquari river. The water changes from high transparency (clear water type according Sioli, 1964, classification) to muddy water (white water type according Sioli, 1964).

Those finds were also confirmed by the preliminary results of a study to determine the transportation rates of the Taquari river. The authors (Souza and Hamilton, 1993) showed that the amount of sediment entering the Pantanal is 38 million of tons per year, with insignificant output of sediment to the Paraguay river (Tables 1 and 2).

The natural erosion and transportation processes of the Upper Taquari basin has been accelerated in the last 20 years by the conversion of savannah vegetation to pasture land for cattle-raising. Actually this activity increased one hundred times the annual loss of soil per hectare (Gilluly, in Leinz and Amaral, 1969).

4. CONCLUSION

The present set found in the Taquari river basin is warning. The natural landscape shows a framework characterized by an active drainage network in a region with very high precipitation, outstanding erosive capacity acting in a plateau supported by psamitic sedimentary rocks with low resistance to erosion. This natural set has been threatened by deforestation. It brings about a huge amount of material which enters into the plain but never comes out.

As a result of this situation, the region is facing economical and environmental problems. Pasture land and roads are being destroyed by gully erosion in the plateau of Upper Taquari basin. Pantanal plain is being filled up contributing to the instability of the Taquari river channel which turned to an unstable anastomosed channel (braided pattern).

These changes in the fluvial morphology of the Taquari river is changing the flooding pattern of the region, increasing the area periodically inundated, and therefore reducing the areas for cattle-raising during the wet season. Among the environmental changes, it is clear that the rates of erosion, transportation and deposition had increased affecting the wild life in the Pantanal Matogrossense by disrupting important links in the food-chain.

5. BIBLIOGRAPHY


TABLE 2 - AMOUNT OF SEDIMENTS IN THE RIVERS OF TAQUARI BASIN
(IN: SOUZA & HAMILTON, 1993)