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INTENSITY OF EROSIVE PROCESSES AT CHANNEL BANKS OF THE UPPER PARANÁ RIVER, PORTO RICO TOWN AREA, PARANA STATE (BRAZIL)

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The intensity of erosive processes in the banks of 4 different segments of Parana river was studied through the monitoring of 29 points, during a hydrodynamic cycle. The studied points were distributed as following: ***Paraná river*** (13 points); ***Cortado channel*** (6 points); ***Baia river/Corutuba channel*** (6 points); ***Ivinheima river*** (4 points). This study evaluated the hydrodynamic behaviour in each segment (flow speeds and water level variation), banks sedimentological aspects, the land-use, and the identified erosive process. The data were analysed by cluster analysis and by linear regression between variables.

This studied area is located in "Baia River Compartment" (Souza Filho & Stevaux, 1997), and it is characterised by a large alluvial plain, placed at the right bank of Paraná river, and by archipelagos subdividing the channel in several branches of different orders of importance (Figure 1). In the floodplain, a system of anastomosing channels is in progress, bordering the Baia river/Corutuba channel and the low Ivinheima river. The main channel -Paraná River- is characterised as a multichannel system (braided), presenting two main channels and several secondary channels forming islands, for example. Cortado channel (figure 1). Table 1 presents each bank of each segment.

The bank erosion rate is conditioned by several factors such as, size, geometry and banks texture, the properties of its constituents, the hydrodynamic characteristics of the flow, and the climatic condition (Thorne & Tovey, 1981). However, under similar hydrodynamic condition, the erosion of a bank depends above all on its texture and on its representatives' proprieties, whether being cohesive, non-cohesive or composite (Leeder, 1982).

The hydrodynamics characteristics includes the water level variation along the hydrodynamic cycle, the turbulence, the waves' action and the flow speed variations. The continuous water level variation of a river is considered to be one of the most important factors of bank erosion, because it controls the performance of fluvial originated forces on banks constituents, being represented by waves and currents (Fernandez, 1990). Flow speed, turbulence and abrasive action on suspense load, are very important for the intensify of the rates of erosive processes on the banks.

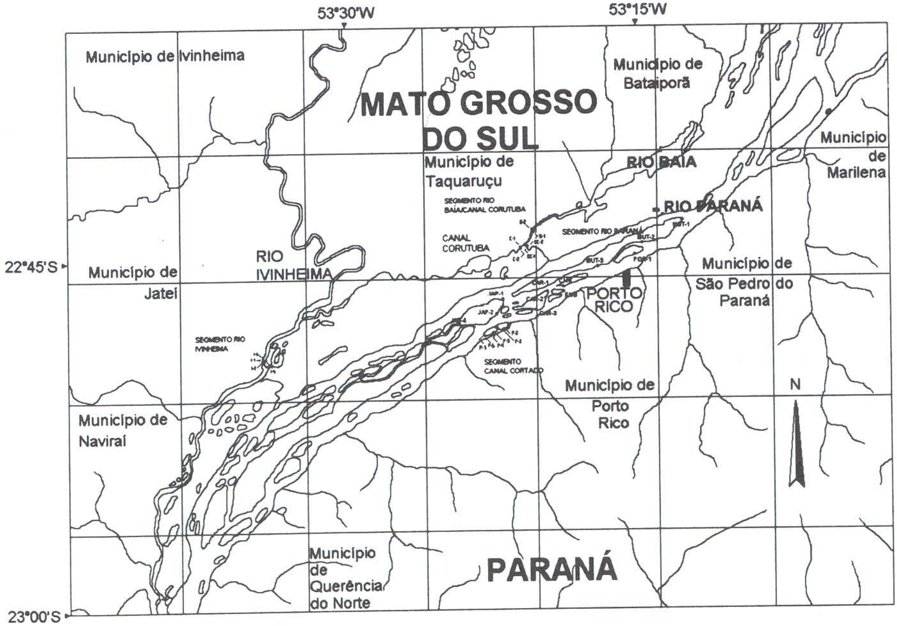

Figure 1. Localization of study area.

The results of such study showed that major bank erosion values take place at Parana river segment, with larger energy, where the processes of collapses prevail. However, there were some minor value points as well. The erosion minor values were obtained from Cortado channel, with no exception, where the corrasion processes prevail.

The cluster analysis of the erosion rate, flow speed, level variation, sedimentological composition, erosive process, and land-use, showed two main groups, which are compounded for points of all segments. The sedimentological condition is the determinant variable, and there are a sandy banks cluster and a clay banks cluster.

Table 1. General fluvial characteristics, with the mean values obtained in each segment.

Segment	Pattern	Discharge (m^3/s)	Erosion rate (m/y)	Max. Speed flow (m/s)	Level variation (m)	%of fines (silt+clay)
Paraná river	Braided	9000	2.43	1.42	3.86	56.65
Cortado channel	Braided	60	0.04	0.56	3.75	85.28
Baia river	Anastomosing	40	0.07	0.75	4.26	63.29
Ivinheima river	Anastomosing	300	0.17	0.85	2.94	32.54

Was understood that there is a variability in the sedimentological composition of banks in each segment (except Cortado channel, with clay margins), indicating that erosion rate may be related to another variable (Figure 2), that is to say, a relation between flow speed and erosion rate.

It can be proved with the linear regression analysis between erosion rate and all other variables, highlighting that the maximum and average speeds were the main determiners of major erosion rates (respectively *r:0,96 and r :0,83*).

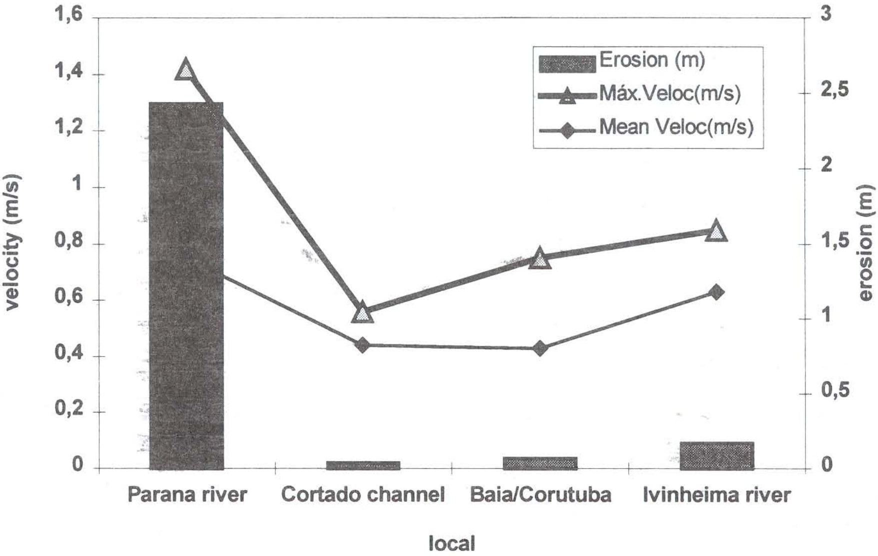

Figure 2. Intensity of erosive processes and flow speeds in the analysed segments.

The others variables don't have a great influence on the erosion rate. However, it must be highlighter that the bank composition is important where the flow speed is low.

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