

## LEVEE TOE SCOUR: A MECHANISM OF FLOODPLAIN DEVELOPMENT IN THE PARANÁ RIVER FLUVIAL SYSTEM

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### ABSTRACT

The floodplain of the Middle Paraná River (maximum width: ca. 40 km; more than 600 km long) is a large Argentinean wetland with a morphodynamics do not completely studied. This floodplain is a complex geomorphic region within which some distinctive alluvial surfaces lying at different topographic levels were recognized. At a river reach located between 30° 45' S and 32° 30' S, some of these surfaces join with level differences of at least 1 or 2 meters. Transversal slopes in the order of 0.01% and longitudinal slopes from nearly 0.015% to 0.005% were also measured here. An horizontal 4-to-10-m-thick body of silts and clayey silts overlying more than 20 m of sandy strata is the typical stratigraphic column in the lower floodplain areas. Coarsest sands including scarce gravels become more frequent with depth in the former unit. Lakes, inland deltas and flood-born “deltaic splays” are conspicuous features of the lower surfaces maintained by streams of diverse sizes, according to their connectivity with the Paraná River. Its main channel occupies a belt of 0.5-to-7 km-width in the valley. The deltaic splays origin is related to crevassing phenomena on the natural levees of the main order channels. The levees have backward slopes as high as 5%, and heights up to 2 meters from the local relief. Thus, some streams associated with deltaic splays are (or were) high velocity currents, a fact reflected by their toponymy: “Correntoso” (i.e., “Rapid water”), “Zanja Brava” (“Brave Trench”), etc. In the last 25 years three extraordinary floods occurred. The largest, in 1982-1983, had a peak discharge of 61,100 m<sup>3</sup>/sec and flows above the bankfull levels during 464 days. Some existing deltaic splays (or built during those events) were enlarged till nowadays at mean rates of tens or hundreds meters per year. Sand-sized sediments (including isolated small gravel patches) prevail in the new alluvial areas. These sediments were supplied by eroding processes of the deltaic splay channels with the main sources located at the toe zones of the crevassed levees. Deep holes were recorded in these zones with their bottoms scoured far down into the sandy strata of the floodplain. The scour holes resemble those frequently recorded downstream of a dam spillway, a fact in agreement with the hydraulics observed in these particular areas of the floodplain: mean surface velocities near to 2 m/sec were measured over the holes sites during the rising limb of (even ordinary) floods. It is noticeably that this mechanism of alluvial landscape development combining deep scouring with floodplain expansion is nearly unreported in the international literature about fluvial geomorphology. The authors found occasional references for the Mississippi River floodplain, where similar features were reported after the 1990's extraordinary flood.

Key words: levee toe scour – floodplain building – Paraná River.