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Late Quaternary evolution of the Upper Paraná River, southeast Brazil: a new geomorphological and chronological database

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The Paraná River has been extensively studied in terms of its hydrological and sedimentological aspects, but the geological history of its fluvial plain is still poorly understood due to the lack of geochronological data. Most of the published studies are focused on the low and middle reaches, and the region upstream of the Porto Primavera dam is an area almost unknown in terms of geomorphic evolution. Here, we aim to investigate the succession of geological events responsible for the evolution and current configuration of the Upper Paraná River fluvial system, in the stretch between the Jupiá and Porto Primavera Hydroelectric Plants (São Paulo and Mato Grosso states). Thus, we used an integrated approach including remote sensing data, geomorphology, sedimentology, bathymetric profiles, and chronological methods. Four geomorphological compartments were identified and three of these compartments were dated by Optically Stimulated Luminescence (OSL): Unit 1, raised terrace with circular and semicircular ponds (~150 ka); Unit 2, intermediate terrace with small ponds and waterlogged areas (~60 ka); Unit 3, low terrace with preserved paleochannels (~39–35 ka); and Unit 4, current river plain (>9 ka). The geomorphological units were correlated with previous studies downstream of the studied area and their sedimentary characteristics and depositional ages suggest that their genesis is linked to changes in climatic and hydrological conditions during the Late Quaternary. Units 1, 3, and 4 are considered extensions of the geomorphological units Taquaruçu, Fazenda Boa Vista, and Rio Paraná, respectively. Unit 2 is a compartment with unique morphological characteristics, therefore not correlated with units presented in previous works. Further, two main knickpoints were identified, suggesting an important control in the sedimentation and development of the terrace levels. Thus, this work brings new data on the evolutionary history of the Paraná River, which allows us to understand that the development of the terrace levels and the floodplain of the upper reaches are strongly controlled by the climatic changes that occurred during the Late Quaternary.