INTERNAL ARCHITECTURE OF CHANNEL DEPOSITS AS A COMPELLING CLIMATE PROXY IN DISTRIBUTIVE FLUVIAL SYSTEMS (BAURU BASIN - BRAZIL)

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ABSTRACT: The controlling factors on the stratigraphic architecture of fluvial systems are mainly explained by the interplay between base-level and tectonics, where climate has been broadly undervalued. Nevertheless, climatic forcing has increasingly been recognized as an important factor, not only on the architecture of fluvial successions, but also on the sedimentary structures they preserve. The recognition of climate influence in the fluvial record is traditionally achieved through the study of palaeosol profiles. Naturally, in areas of high-subsidence (e.g. proximal zones of distributive fluvial systems - DFS) palaeosols are poorly developed or even inexistent. In such cases, the in-depth study of facies architecture may prove to be a compelling proxy to understand how climate controls the architecture in the fluvial record, in particular for DFS. Distributive fluvial systems are ubiquitous features over a large spectrum of modern sedimentary basins. They occur globally and across a wide range of climatic settings. These systems are expected to represent a substantial part of the geologic record and play a major role as petroleum, gas and water reservoirs. Therefore, understanding their dynamics and testing the resultant facies model is imperative to better identify and reconstruct the geologic record of fluvial deposits. The architecture of DFS relies primarily on the lateral distribution of architectural elements, controlled by channels radiating outward from the basin margin. This approach is mainly based on the downstream dynamics of the fluvial network, not considering its temporal variations, vertical organisation of architectural elements and relative factors controlling its dynamics. In order to understand the external and internal architecture of distributive fluvial systems and the factors influencing its sequential organisation a sedimentary succession of proximal portion of an Upper Cretaceous, semiarid, distributive fluvial system, localised at the northeastern margin of the Bauru Basin (Southeast Brazil), has been analysed in detail. Three fining- and thinning-upward fluvial sequences were identified, separated at the top and the bottom by two palaeosol profiles. Each sequence is formed of channel and floodplain deposits. Two types of channels were identified. One is composed of small-scale dune field deposits, suggesting perennial and steady fluvial regime, associated to more humid climate periods. The other channel type is constituted of large-scale flattened dunes associated to unsteady and swift fluvial flow deposits, formed in quasi-supercritical flow regime conditions, related to drier climate periods. The vertical alternation of these channels unravelled a fluvial succession brought out by high-frequency climate-induced cycles. The two palaeosol profiles, at top and bottom of the succession, indicate temporary interruptions of the fluvial sedimentation, related to morpho-depositional avulsion of the fluvial belt. Thereby, the studied succession reveals high-frequency climate-induced allogenic sedimentary cycles encompassed by a long-period autogenic geomorphologic-induced sedimentary cycle. This work suggests that the internal architecture of channel deposits can be used as climate proxy in the stratigraphic record, especially in successions with high sedimentation rate where low-developed palaeosol profiles do not permit a clear definition of the palaeoclimate conditions.

KEYWORDS: FLUVIAL PALAEOHYDROLOGY; CLIMATE PROXY; BAURU BASIN.